MINISTRY OF HEALTH
THE KINGDOM OF CAMBODIA

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL
IN
THE KINGDOM OF CAMBODIA

March, 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

AZUSA SEKKEI CO., LTD.

INTEM CONSULTING, INC.

PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey on the Project for Improvement of Sihanouk Province Referral Hospital in the Kingdom of Cambodia to the consortium consist of Azusa Sekkei Co., Ltd. and Intem Consulting, Inc..

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

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

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

March, 2013

Nobuko Kayashima
Director of Human Development Department
Japan International Cooperation Agency

Summary

Summary

① Outline of the Reccipient Country

1) Geographical and Climatic Conditions

The Kingdom of Cambodia (hereinafter referred to as Cambodia) is a constitutional monarchy, which became independent from France in 1953, located in the southwest of Indochinese peninsula. The land area is 181,035 km^2 (approximately a half size of Japan) and has borders with Thailand, Vietnam and Laos.

The climate of Cambodia features a tropical monsoon climate whereby the year is divided into a rainy season and a dry season. The rainy season falls between May and November. From mid-May, the wind direction changes, and towards the end of the month heavy rain starts to fall and the rainy season begins full-scale. During this period, the temperature is somewhat lower than that of the dry season. The dry season runs from December to April. The climate enters a hot period from February in the latter half of the dry season until around May when the rainy season begins, and daytime temperatures can exceed 35°C.

Sihanouk-Ville, the location of the project site, is situated 230 km southwest from the capital Phnom Penh by Route 4, and contains Cambodia's only deep water port, the Sihanouk-Ville Port. The town is affected by the maritime climate as it borders the coast, has an annual precipitation of around 3,000mm, which is greater than the average rainfall of 1,600 mm in Phnom Penh, and can reach as much as 900 mm/month in the late rainy season. The rainy season begins a month earlier than in Phnom Penh, and lasts roughly from around April to October. Temperatures are somewhat lower than in Phnom Penh. Humidity is 75%-80% in the dry season and relatively high at 80%-85% in the rainy season. However, many typhoons expire along the Vietnam coast and almost never reach Cambodia.

2）Socio-Economic Conditions

While Cambodia is a developing nation within ASEAN, full-scale reconstruction of the nation with the assistance of international society began following the conclusion of the 1991 Paris Peace Agreement, and from 1991 to 1999 the GDP growth rate reached an average of 6.2%[1], with formal accession to ASEAN in 1999. While the armed conflict of July 1997 and the Asian Financial Crisis caused the economy to deteriorate as overseas assistance and investment as well as tourist revenue fell, the establishment of the Hun Sen administration in 1998 achieved political stability and was followed by an upswing in economic growth. Although the GDP growth rate was 0.1%[1] in 2009 due to the Global Economic Crisis, it recovered to 6%[1] the following year, and the average GDP growth rate over the decade from 2002 to 2011 was recorded at 8.0%[1], with an outlook for future stable growth. However, Cambodia is 139th[2] out of 187 countries on the Human Development Index (HDI), and while it has emerged from the Low Human Development group, it is third from the bottom in the Medium Human Development group, and its severe situation still persists.

1 IMF (International Monetary Fund) World Economic Outlook Database 2012

2 UNDP (United Nations Development Programme) Human Development Report 2011

The problems of the economic mechanism that Cambodia faces include: the still inadequate maintenance of the socio-economic infrastructure, the state’s low tax-collection competency and strong dependence on customs duty and value added tax (VAT), the lack of internationally competitive export products other than needlework, and the lack of human resources due to the effect of the civil war. In addressing these problems, other than assistance from donor nations, it is believed industrial development and technology transfer based on the promotion of private investment including foreign investment are required. In order to strengthen these kinds of economic foundations in Cambodia, Japan is providing assistance with the hardware side such as the infrastructure as well as the software side of developing human resources and developing institutions. Similarly, with the Japan-Cambodia Investment & Economic Agreement and the Japan-Cambodia Public and Private Sector Joint Meeting that came into effect in July 2008, improvement of the investment environment is progressing in order to promote investment from Japan.

② Background and Outline of the Request for Japan's Grant Aid Assistance

Due to the effects of the Cambodian civil war from the 1970s, the number of medical practitioners decreased dramatically, and medical equipment and facilities have been destroyed. After the civil war, multiple donors have assisted the public health sector, and preventative care for specific illnesses has been implemented intensively. However, the system of delivering public health services from hospitals remains fragile, and basic medical equipment within hospitals is not being allocated particularly in provincial areas. Public health sector was noted as a priority issue in Cambodia's "National Strategic Development Plan" (NSDP) 2006-2010, update 2009-2013. Likewise, the plan stipulates the "Second Health Strategic Plan" (HSP2) (2008-2015) that aims to deliver public health services to contribute to the health of the poorest segment of the population in provincial areas, and illustrates the expansion of usage of public health services through upgrading hospitals and public health centers

This plan focuses on Preah Sihanouk Province where rapid urbanization and resort development is progressing. The province has Cambodia's only deep-water port, the Sihanouk-Ville Port, which was constructed with assistance from Japan, as well as Special Economic Zones, and its population is increasing annually. Furthermore, future population inflow from outside the province is expected due to the advance of many private corporations such as from Japan

The focus of this Project, the Sihanouk Province Referral Hospital, is the province's top referral hospital (CPA3), and is the only hospital capable of handling emergency transportation. The hospital was founded in 1964, while some additional construction and repairs have been made, appropriate public health service delivery is problematic as the facility shows signs of aging such as leaks in the ceiling and damaged flooring, as well as significantly aging medical equipment. Furthermore, the usage rate of the hospital is rapidly increasing, for example, the recent occupancy rate was over 176% for emergency ward beds, and the percentage of referrals from other hospitals in 2010 was 128% compared with the previous year. Hence, given the anticipated future population influx, the upgrading of the hospital capacity is an urgent issue. Within the urban zone of Sihanouk-Ville Municipality, the rate of annual population increase is coinciding with economic expansion which is recorded at 9.3%

(2009-2010), and patient numbers are predicted to increase furthermore. Amidst these conditions, the Government of Cambodia fears deterioration of the health situation in the province due to rapid urbanization, and has requested Grant Aid Assistance from the Government of Japan to upgrade the top referral hospital of Sihanouk Province Referral Hospital.

The upgrade of Sihanouk Province Referral Hospital will directly make a major contribution to strengthening the medical referral system and improving medical services in Preah Sihanouk Province. It will also indirectly contribute to the training of medical practitioners in Preah Sihanouk Province and Kampot Province since practical training will be conducted in the hospital for the students in Kampot Regional Training Center (RTC). The Project is therefore assessed as being of high need and relevance.

③ Outline of the result of survey and contents of the Project (outline design, outlines of the facility and equipment Plan)

Based on above mentioned request, Japan International Cooperation Agency decided to conduct preparatory survey and dispatched the survey team from August 12 to September 8, 2012. The survey team held a series of discussions with the officials concerned of the Government of Cambodia, and conducted a field investigation. As a result of further studies in Japan and the explanation of draft report from January 6 to 17, 2013, the present report was finalized.

The upgrades to Sihanouk Province Referral Hospital to be implemented under this project will go a long way toward enhancing the medical care referral system and improving medical care services in Preah Sihanouk Province. In accordance with the request from the Ministry of Health of Cambodia and the result of field investigation and discussions, the project plan was decided including the following policies.

1) Design Policy

a) Medical service function

- To plan facilities and equipment that enable staff members to appropriately manage the respiratory systems of moderately to severely ill patients and childhood illnesses, provide newborn care and diagnose and manage obstetrical and gynecology patients.
- To plan facilities and equipment that enable staff members to safely perform moderate abdominal surgery (acute appendicitis, exploratory surgeries, Caesarian, hysterectomies, etc.) and provide pre-operation and post-operation care.
- To plan facilities and equipment that enable staff members to perform operations (including orthopedics to address injuries from such events as traffic accidents), examine and treat patients with endoscopic technology for ENT care and X-ray technology for dental care, and perform urological operations.
- To plan facilities and equipment that enable staff members to perform triage and stabilization treatment for the patients to be referred to the upper level medical care facilities.

b) Facilities

- In the course of implementing this project, treat CPA guidelines as the major basis for planning conditions, fully understand their contents and develop basic plans that conform to them after considering the results of surveys of the state of medical care in Preah Sihanouk Province, issues facing Sihanouk Province Referral Hospital and other factors.
- Plans that fully consider Sihanouk Province Referral Hospital as the only public hospital in Preah Sihanouk Province that has the means to perform and provide examinations and treatment for the Main Four of general medicine, surgery, OB/GY and pediatric departments as well as for departments related to tuberculosis, eyes, ENT, dental and HIV/AIDS.
- Plans that expand the current capacity of 100 beds to 130 to account for future population growth and allow for further expansion.
- Avoid multi-story not to install elevator and the slope, and adopt the one-story except for some administrative unit
- Facilities will be of grades and scales suitable for operating and maintaining the hospital.
- As the top referral hospital in Preah Sihanouk Province, Sihanouk Province Referral Hospital will function as a critical emergency evacuation facility during disasters, so the buildings should have the specifications of strong structures/utilities.

c) Equipment

- Equipment will be selected according to the CPA Guideline for Medical Equipment Standard List formulated by the Ministry of Health, and plans will fully consider such things as technological innovations expected to improve the effectiveness and efficiency of current clinical services.
- Taking into consideration the role played by the target hospital in its area, plans will apply to ENT, dental and laboratory departments that currently lack critical equipment, though their facility buildings are not in the scope of the project.
- Plans will be consistent with activities of the target hospital.
- Plans will take consideration of easy maintenance for the targeted hospital by such as selecting equipment in proper level.
- Plans will avoid overlaps with existing equipment or equipment supplied by other donors to ensure efficiency.
- Since basic equipment is mainly planned to be procured in this project, basically it is assumed that any problems regarding operation and maintenance will not occur. However, for the equipment which have not used in the hospital before or have necessity of building system for operation, the both side of Japan and Cambodia confirmed the necessity of technical assistance with soft component to promote more effective utilization of procured equipment during field survey.

2) Details and scale

a) Facilities

Planned facilities consist of five buildings such as ER, Imagery & Operation Building, Administration Building, OB/GY & Pediatric Ward Building, General Medicine & Surgery Ward

Building, and Service Building, and ancillaries such as elevated water tank and corridor. The major contents, structure and floor areas are as shown in Table- i.

Table-i Details of facility plan

Building	Detailed structure	Facility	Total Area
ER, Imagery, & Operation Building	Reinforced Concrete, One-story building	ER/Outpatient Department, Imagery Department, Operation Department, Central Sterilization Department etc.	1,106.19 m^2
Administration Building	Reinforced Concrete Two-story building	Administration Department, Pharmacy, etc.	1,035.18 m^2
OB/GY & Pediatric Ward Building	Reinforced Concrete, One-story building	OB/GY Building (Delivery Room, Labor Room, Bed Rooms, Treatment Room etc.) Pediatric Building (NCU, Bed Rooms, Consultation room etc.) etc.	1,335.69m^2
General Medicine & Surgery Ward Building	Reinforced Concrete, One-story building	General Medicine & Building (Bed Rooms、Consultation room, Nurse Station etc.) Surgery Ward Building (Bed Rooms, Treatment Room, Nurse Station etc.) etc.	968.49 m^2
Service Building	Reinforced Concrete, One-story building	Water Tank Room, Pump Room, Electric Room、Generator Room	179.79 m^2
Ancillary	Reinforced Concrete	Elevated Water Tank, Outside Corridor	559.83 m^2
Total			5,185.17 m^2

b) Equipment

The quantity and purpose of planned equipment are shown in Table- ii.

Table-ii Quantity and purpose of major planned equipment

Division	Name of Equipment	Purpose	Q'ty
Equipment for ER and Surgery	Defibrillator	Cardiac arrest and treatment of ventricular fibrillation	2
	Electro Surgical Set	Incision, hemostasis during surgery	1
	Patient Monitor	Biological information monitoring critically ill patients	3
	Anesthesia Machine	Pain removal in surgical	1
	Operating Table	Patient table at the time of surgery operation	2
	Operating Light	Lighting of the operative field during surgery	2
	Respirator Set	Respiratory support in patients with respiratory problems	1
Equipment for X-ray room	X-ray Diagnostic System	Radiation diagnostics for disease	1
	Computed Radiography (CR) system	Obtain digital X-ray image information	1
	C-arm	Status confirmation of the affected area during surgery	1
Equipment for OB/GY Department	Delivery bed	Patient bed during delivery	2
	Cardiotocogram	Diagnostics of fetus and monitoring of fetus condition during delivery	1
	Examination Table for OB/GY	Examination table for OB/GY	1
Equipment for General Patient Ward	Patient Bed	Bed for adult patient	91
	Infant incubator	Daycare of prematurity	1
Equipment for Central Sterilization Department	Sterilizer for Central Sterilization Department	Sterilization of equipment for surgery	2
Equipment for Dental Department	Dental X-ray unit	Diagnostics for dental care	1
Equipment for Clinical Laboratory	Hematology Analyzer	Blood cell counting	1
	Spectrophotometer	Sample density measurement	1

And, outline of planned Technical Assistance (soft component) is as follows.

- Establish a system for the CR system operation which is the components of the X-ray imaging system for general use, Digital image processing technology and technical advice for maintenance.
- Establish a system for the Central Sterilization system operation and technical advice for maintenance.
- Technical guidance for emergency operation for the fields of OB/GY, abdominal surgery and orthopedic surgery.

④ Implementation Schedule and Cost Estimation

The project would be implemented in a single fiscal year, taking 7 months for the detailed design, 16 months for the construction and equipment procurement and 10 months for the soft component. In case of implementation by Japan’s Grant Aid, the initial cost to be borne by Cambodian side is estimated as 17 million Japanese Yen.

⑤ Project Evaluation

In light of the following points, this project has recognized relevance as a focus project through Japan's Grant Aid.

1) Relevance

a) Focus of the project's benefits

The focus region of the project is Preah Sihanouk Province in which the project site of Sihanouk Province Referral Hospital is located. The province has a population of 195,000 (2011), which will be the direct beneficiary. Also, the province is situated as a hub that forms part of the "growth corridor ," and not only are the Sihanouk-Ville Port and SEZ developing, but as a resort area the population is also expanding remarkably with the influx of visitors and tourists including foreign nationals from outside the region. Due to high annual population growth, deterioration of public health within the province is predicted.

The project will go a long way toward enhancing the medical care referral system and improving medical care services in Preah Sihanouk Province, and it is deemed to be highly necessary and relevant.

In light of the above, the following is a summary of the overall goal and project goal in terms of the functions of medical care services.

b) From a Human Security standpoint

Human Security is defined as a vision that focuses on each individual person and that protects the public from wide-ranging, serious threats to their survival, lifestyle and dignity. It is also deemed to be

a vision that promotes the independence of sustainable individuals and the creation of a society through strengthening safeguards and abilities in order to achieve the rich potential of each individual. Through the implementation of this project, Sihanouk Province Referral Hospital will have its facilities, equipment and system upgraded from which it delivers medical services as a top referral hospital. As such, the project can be said to be consistent with the standpoint of human security and linked to improving public life.

c) Contribution to achieving Cambodia's targets for its mid- to long-term development plan

This project exists to help strengthen the health care system (which covers the five health strategies - health service delivery, health care financing, human resource for health, health information system, and health system governance) illustrated in HSP2, an implementation plan that is part of NSDP of Cambodia. Scaling up provision of CPA at referral hospitals such as Sihanouk Province Referral Hospital, and strengthening of medical care services and referral systems are a part of the Health Service Delivery Strategy Components.

d) Consistency with Japan's Assistance Policy

The Country Assistance Strategy for Cambodia (2011) established by the Ministry of Foreign Affairs of Japan posits "investigating maintaining and improving key regional hospitals through Grant Aid" within (2) Promotion of Social Development, (b) Enhancement of Health and Medical Care, as a priority area (central target). As a top referral hospital of Preah Sihanouk Province, Sihanouk Province Referral Hospital is applicable as a key regional hospital, and therefore this project is sufficiently consistent with Japan's Assistance Strategy.

2) Effectiveness

Below are the expected target levels of implementing this project.

a) Quantitative Effects

Table -iii Outcome Indicators for Quantitative Effects

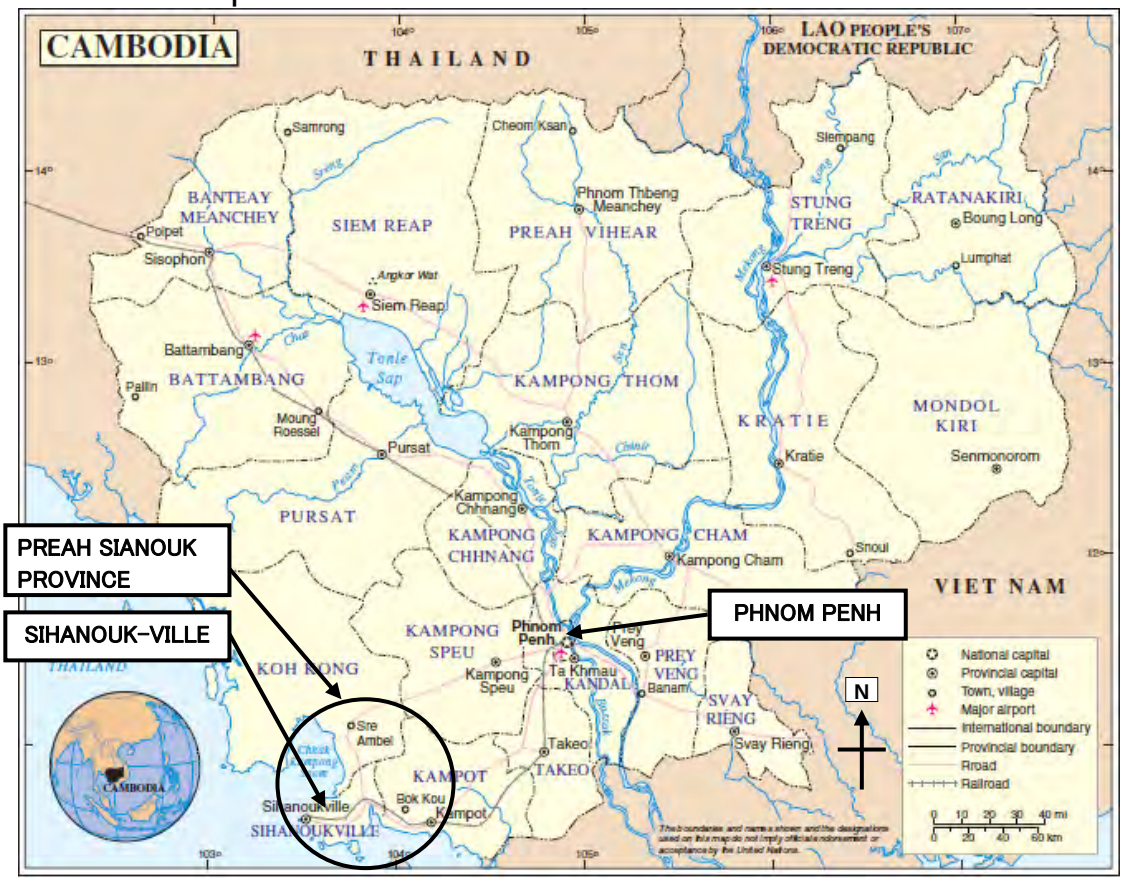
Indicators	Unit	Current Value (2011)	Target Value (2018) 【3 years after Project Completion】
No. of Inpatients	persons	6,010	7,060
No. of Outpatient & Emergency Patients	persons	19,563	26,712
No. of Operations	cases	388	447.6
No. of Deliveries	cases	1,170	1,487
No. of Hematological Examinations	cases	2,144	2,927
No. of Biochemical Examinations	cases	760	1,038
No. of X-Ray Inspections	cases	482	658
No. of Inpatient Stays in Private Ward	persons	0	443.6
Bed Occupancy Rate of ER & ICU	%	135.70	82.45

b) Qualitative Effects

1) Improving the medical services at Sihanouk Province Referral Hospital will allow the acceptance of patients with adequate diagnosis and treatment and prompt response to severely ill patients that the hospital would not previously have been able to handle, and will contribute to optimizing the referral system as a top referral hospital.
2) Sihanouk Province Referral Hospital is not protected against x-rays, and installing an x-ray room protected with reinforced concrete will improve safety.
3) Possibility of the recruitment of highly specialized medical practitioners will increase.

Contents

Location Map



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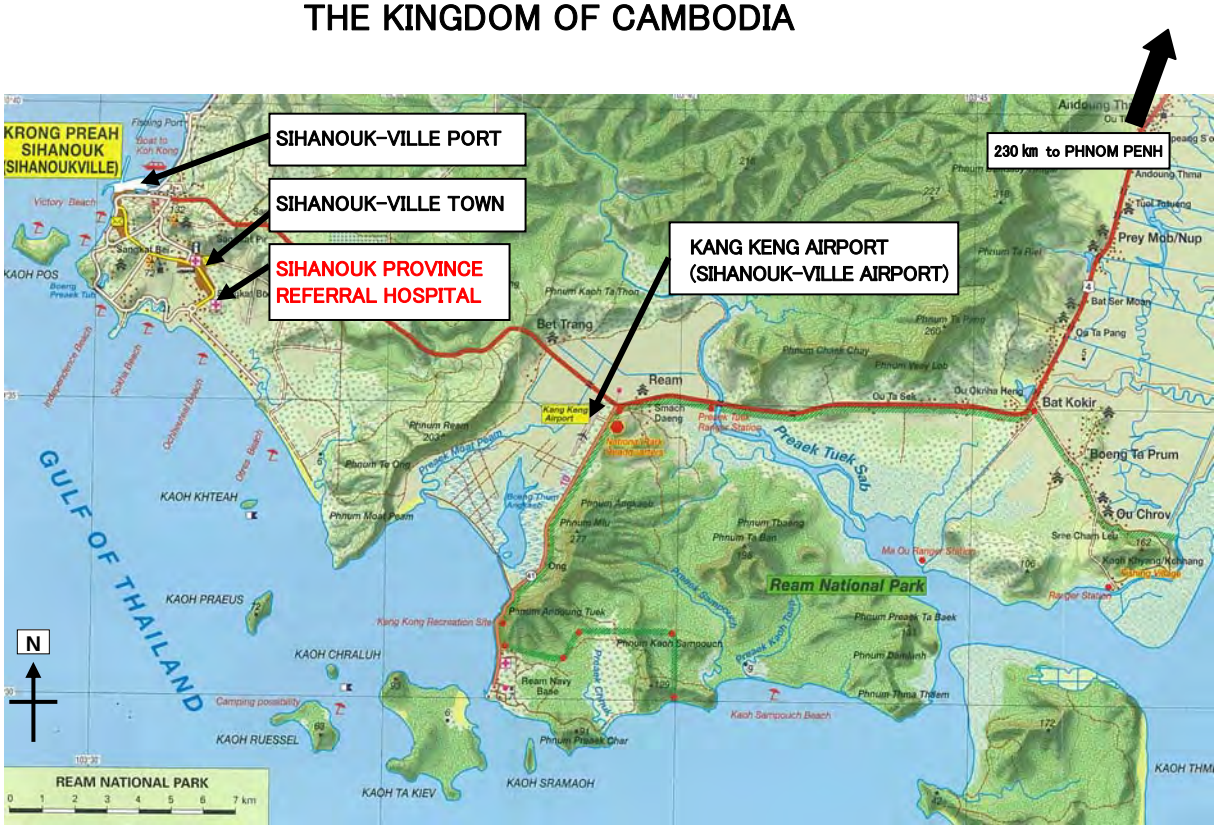

PREAH SIHANOUK PROVINCE

Perspective

List of Figures and Tables

Abbreviations

Abbreviation	Term
ADB	Asian Development Bank
AFD	Agence Française de Développement
AIDS	Acquired Immune Deficiency Syndrome
ALOS	Average Length of Stay
AOP	Annual Operational Plan
ARI	Acute Respiratory Infection Disease
ASEAN	Association of Southeast Asian Nations
AusAID	Australian Agency for International Development
BFH	Buddhism for Health
BHN	Basic Human Needs
BOR	Bed Occupancy Rate
BTC	Belgian Technical Cooperation
CDHS	Cambodia Demographic and Health Survey
CMDGs	Cambodia Millennium Development Goals
CPA	Complementary Package Activity
CR	Computed Radiography System
DAC	Development Assistance Committee
DES	Diplóme d'études Spécialisées
DFID	Department for International Development
DU	Diplóme Universitaire
EDC	Electricite du Combodge
ENT	Eye, Nose and Throat
EIA	Environmental Impact Assessment
EoJ	Embassy of Japan
E/N	Exchange of Notes
EP	Emulsion Paint
G/A	Grant Agreement
GAVI	Global Alliance for Vaccination and Immunization
GDP	Gross Domestic Product
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GL	Ground Level
HC	Health Center
HDI	Human Development Index
HEF	Health Equity Fund:
HIV	Human Immunodeficiency Virus
HP	Health Post
HSP2	Second Health Strategic Plan 2008-2015
HSS	Health System Strengthening
HSSP2	Second Health Sector Support Program 2009-2013
ICU	Intensive Care Unit
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standard
JOCV	Japan Overseas Cooperation Volunteers

Abbreviation	Term
JOICFP	Japanese Organization for International Cooperation in Family Planning
LAN	Local Area Network
MCH	Mother and Child Hospital
MEDEM1	JICA Project on Promotion of Medical Equipment Management System
MEDEM2	Project for Strengthening Medical Equipment Management at Referral Hospital
MEM-WG	Medical Equipment Management Working Group
MOH	Ministry of Health
MPA	Minimum Package of Activities
NCU	Neonatal Care Unit
NGO	Non-Governmental Organization
NiDA	National ICT(Information & Communication Technology) Development Authority
NMCHC	National Maternal and Child Health Center
NSDP	National Strategic Development Plan 2006-2013
NWT	National Workshop Team
OD	Operational District
ODA	Official Development Assistant
OECD	Organisation for Economic Co-operation and Development
OT	Operation Theater
PHD	Provincial Health Department
RC	Reinforced Concrete
RH	Referral Hospital
RHAC	Reproductive Health Association of Cambodia
RTC	Regional Training Center
SDG	Service Delivery Grant
SEZ	Special Economic Zone
STD	Sexually Transmitted Disease
UNDP	United Nations Development Program
UNICEF	United Nations Children's Foundation
UNPFA	United Nations Population Fund
VAT	Value Added Tax
VCCT	Voluntary Confidential Counseling and Testing
WB	World Bank
WHO	World Health Organization
WPRO	Western Pacific Regional Office

Chapter 1 Background of the Project

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1-1 Background and Outline of the Request for Japan's Grant Aid Assistance

Due to the effects of the Cambodian civil war from the 1970s, the number of medical practitioners decreased dramatically, and medical equipment and facilities have been destroyed. After the civil war, multiple donors have assisted the public health domain, and preventative care for specific illnesses has been implemented intensively. However, the system of delivering public health services from hospitals remains fragile, and basic medical equipment within hospitals is not being allocated particularly in provincial areas. Public health sector was noted as a priority issue in Cambodia's "National Strategic Development Plan" (NSDP) 2006-2010, update 2009-2013. Likewise, the plan stipulates the "Second Health Strategic Plan" (HSP2) (2008-2015) that aims to deliver public health services to contribute to the health of the poorest segment of the population in provincial areas, and illustrates the expansion of usage of public health services through upgrading hospitals and public health centers.

This project focuses on Preah Sihanouk Province where rapid urbanization and resort development is progressing. The province has Cambodia's only deep-water port, the Sihanouk-Ville Port, which was constructed with assistance from Japan, as well as Special Economic Zone (SEZ), and its population is increasing annually. Furthermore, future population inflow from outside the province is expected, due to the advance of many private corporations.

The focus of this project, the Sihanouk Province Referral Hospital, is the province's top referral hospital (CPA3), and is the only hospital capable of handling emergency transportation. The hospital was founded in 1964, while some additional construction and repairs have been made, appropriate public health service delivery is problematic as the facility shows signs of aging such as leaks in the ceiling and damaged flooring, as well as significantly aging medical equipment. Furthermore, the usage rate of the hospital is rapidly increasing; for example, the recent occupancy rate was over 176% for emergency ward beds, and the percentage of referrals from other hospitals in 2010 was 128% compared with the previous year. Hence, given the anticipated future population influx, the upgrading of the hospital capacity is an urgent issue. Within the urban zone of Sihanouk-Ville Municipality, the rate of annual population increase is coinciding with economic expansion which is recorded at 9.3% (2009-2010), and patient numbers are predicted to increase furthermore. Amidst these conditions, the Government of Cambodia fears deterioration of the health situation in the province due to rapid urbanization, and has requested Grant Aid Assistance from the Government of Japan to upgrade the top referral hospital of Sihanouk Province Referral Hospital.

The upgrade of Sihanouk Province Referral Hospital will directly make a major contribution to strengthening the medical referral system and improving medical services in Preah Sihanouk Province. It will also indirectly contribute to the training of medical practitioners in Preah Sihanouk Province and Kampot Province since practical training will be conducted in the hospital for the students in Kampot Regional Training Center (RTC). The project is therefore assessed as

being of high need and relevance.

1-2 Natural Conditions

(1) Climatic Condition

The climate of Cambodia features a tropical monsoon climate whereby the year is divided into a rainy season and a dry season. The rainy season falls between May and November. From mid-May, the wind direction changes, and towards the end of the month heavy rain starts to fall and the rainy season begins full-scale. During this period, the temperature is somewhat lower than that of the dry season. The dry season runs from December to April. The climate enters a hot period from February in the latter half of the dry season until around May when the rainy season begins, and daytime temperatures can exceed 35°C.

The location of the project site is situated 230 km southwest from the capital Phnom Penh by Route 4, and contains Cambodia's only deep water port, the Sihanouk-Ville Port. The town is affected by the maritime climate as it borders the coast, has an annual precipitation of around 3,000mm, which is greater than the average rainfall of 1,600 mm in Phnom Penh, and can reach as much as 900 mm/month in the late rainy season. The rainy season begins a month earlier than in Phnom Penh, and lasts roughly from around April to October. Temperatures are somewhat lower than in Phnom Penh. Humidity is 75%-80% in the dry season and relatively high at 80%-85% in the rainy season. However, many typhoons expire along the Vietnam coast and almost never reach Cambodia.

Meteorological data for Sihanouk-Ville is shown in Table 1-1.

Table 1-1: Meteorological Data for Sihanouk-Ville (2006 – 2011 average)

	Average	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Avg. High Temp.(℃)	31.2	30.9	31.3	31.9	32.5	31.9	31.3	30.7	30.5	30.3	30.8	31.4	31.1
Avg. Temp.(℃)	27.4	26.7	27.3	28.0	28.5	28.3	27.9	27.2	27.2	27.0	27.0	27.5	27.0
Avg. Low Temp.(℃)	24.6	23.8	23.9	25.1	25.3	25.2	25.1	24.4	24.6	24.5	24.4	24.9	24.2
Rainfall Amount (mm)	236.4	29.0	30.8	100.9	151.3	301.3	332.0	521.8	409.9	540.9	299,3	87.9	31.8
		Dry season			Rainy Season							Dry Season	
	Annual Rainfall: Avg.: 2,836.8mm, Max.: 4,056.3 mm (2006) Min.: 2,189.4 mm (2010)												
Avg. Humidity(%)	81.6	77.4	81.0	80.2	81.7	81.5	82.8	84.9	84.9	85.5	84.9	78.8	75.4

Source: Sihanouk-Ville Meteorological Observatory; latitude 10.38 degrees north, longitude 103.29 degrees east, 13m above sea level

(2) Natural Environment Surveys

A re-commissioned survey including a topographical survey, geological test, and water quality test was conducted focusing on the construction site within the premises of the Sihanouk Province Referral Hospital.

1) Topographical Survey

Sihanouk Province Referral Hospital is situated on the outskirts of downtown Sihanouk-Ville Municipality, and abuts the main road (Makara Road) linking the urban district with the beach resort area. The hospital premises is a triangular form of approximately

400 meters on one side, and cover an area of 73,358m^2. There is a slight incline from the entrance of the hospital inwards, and the difference in elevation is roughly 6m. Hospital facilities are scattered across the premises.

The planned construction site is in the hospital premises, and has been confirmed that the hospital has the rights of ownership through a copy of the land registry. There are some illegally occupied residences and restaurants along the road from the eastern to the southern side of the premises. The hospital has abandoned the land in that area and transferred it to the Municipality, and has set up a fence along the border of the illegally occupied premises. Therefore, this will have no effect on the facility to be constructed under this project.

The Cambodian side will remove the Operational Districts (OD) Pharmacy (E), Mortuary (G), and trees from the scheduled construction site, and will develop the land.

2) Geographical Survey

According to four boring surveys conducted in the planned construction site, there is a layer of gravel 0-2m deep from the surface, beneath which is a layer of sandy clay. The N level of both layers is 10 or higher, and no particularly loose layers were found. Cambodia is greatly removed from the circum-Pacific seismic zone, and there is no record of past earthquake damage. From the scale of the building, the column axial force is not great, and therefore spread foundation (an independent footing foundation or raft foundation) is planned. The borehole groundwater level observed in the boring survey was from GL-6m to GL-8m. It was therefore assessed that groundwater will have no effect during or after construction.

3) Water Quality Survey

As for the water quality test, water was sampled from two sites, one being a pre-existing well within the hospital that is currently in use, and the other from the public water supply buried under the road in front. The results of the water quality test showed that there is no major difference in water quality between the two. However, the chromaticity of the water from the public water supply exceeded standard levels. While the cause of the chromaticity is estimated to be aging pipework, the public water supply pipes are currently under renewal with assistance from the Government of Japan, and future improvement is expected. It was also assessed that the public water supply has adequate supply of water. On the other hand, although there was no problem with the water quality from the well, since there are many rocks on the premises, it is anticipated that drilling a new well is likely to fail.

From the above, as the source of water for the project, while there are two methods conceivable of drawing water, either by constructing a new well or by using the public water supply, it was decided to use water from the public water supply.

1-3 Environmental and Social Considerations

Since this project is for the construction of a hospital on preexisting hospital grounds, there is little environmental and social effect on the site and its surroundings, therefore the project is assessed as "Category C" within the "JICA Guidelines for Environmental and Social Considerations."

In the Environmental Act stipulated by the Ministry of Environment of Cambodia, since the project is a hospital, an Environmental Impact Assessment (EIA) is not obligatory. Similarly, since the land area of the project is less than 8,000m^2, it is below the obligatory scale of Environmental Impact Assessment (EIA) for general architectural structures.

Chapter 2　Contents of the Project

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2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Goal

This project contributes to strengthen the health care system (which covers the five health strategic areas - health service delivery, health care financing, human resource for health, health information system, and health system governance) illustrated in the Health Strategic Plan 2008-2015 (HSP2), one of the implementation plans of the National Strategic Development Plan (NSDP) of Cambodia. Scaling up provision of Complementary Packages of Activity (CPA) at referral hospitals such as Sihanouk Province Referral Hospital, and strengthening of medical care services and referral systems are a part of the Health Service Delivery Strategy Components.

Sihanouk Province Referral Hospital is the only public hospital in Preah Sihanouk Province. As the top referral hospital in the province, it opened in 1964 and currently has 100 beds. Facilities were built and minor repairs have been done through budget from the Cambodian MOH and aid from development partners and NGOs from various countries after the collapse of the Pol Pot Regime in 1979, and they continue to this day. In addition, the Tuberculosis Ward was repaired in 1990 by the Grant Aid for Grassroots Human Security from the Government of Japan.

The number of referral patients from other medical institutions has increased each year, with an increase of 128% in 2010 over 2009. Sihanouk Province Referral Hospital has grown more important as the top referral hospital in the province, but the capacity of its facilities and medical equipment has reached its limits. All buildings on the hospital campus are several decades old and are showing their age with wall tiles falling, floors caving in and concrete deteriorating in places. The aging has made it difficult to maintain a standard of cleanliness in operation theatres, delivery room and patient rooms. The medical equipment is also aging and its numbers are lacking.

The deterioration of facilities and equipment has brought with it a decline in the quality of medical services for local residents, including those from surrounding provinces. The high annual population growth rate associated with the economic development of Preah Sihanouk Province will significantly increase the population, and the number of business developers working in the SEZ, port workers added due to port expansion and tourists drawn by resorts is expected to increase. These circumstances caused the Cambodian side to become concerned about rapid urbanization of Preah Sihanouk Province causing the degrading the quality of hospital services. Therefore, the Cambodian side requested to the Government of Japan a Grant Aid Assistance to upgrade Sihanouk Province Referral Hospital.

The upgrades of Sihanouk Province Referral Hospital implemented under this project will enhance the medical care referral system and improve medical care services in Preah Sihanouk Province. Therefore, this project is deemed to be highly necessary and relevant.

The following Table 2-1 is a summary of the overall goal and project goal in terms of the functions of medical care services.

Table 2-1 Overall Goal and Project Goal

	Medical Service
Overall Goal	The quality of the medical services in Preah Sihanouk Province is improved.
Project Goal	Sihanouk Province Referral Hospital is provided with necessary facility and medical equipment to serve as a top referral hospital in the province.

2-1-2 Outline of the Project

In order to achieve the above project goal, this project will implement necessary inputs and activities on the Sihanouk Province Referral Hospital so that the hospital will satisfy the standards of the CPA guideline, from the aspect of facilities, medical equipment, human resources and technical capabilities. Among these aspects, Japan's Grant Aid will cover the construction of new hospital building including main four department (general medicine, surgery, obstetrics/ gynecology, and pediatrics) wards, procurement and installation of the medical equipment in conformity with the CPA medical equipment list, and the technical assistance for management and maintenance of the medical equipment.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

This project is meant to directly enhance the medical referral system, improve medical services in Preah Sihanouk Province and greatly boost the health of citizens of Preah Sihanouk Province and workers who work in the SEZ. It is also meant to indirectly help develop nurses, midwives and other medical personnel in Preah Sihanouk Province and neighboring Kampot Province by using Sihanouk Province Referral Hospital as a teaching hospital for the Kampot Regional Training Center. It was planned according to the following policy on the design of facilities and equipment intended to contribute to the above goals.

(1) Basic Policy

1) Medical Services

Under the referral system, Sihanouk Province Referral Hospital has all clinical departments as the only CPA3 hospital in the province. Also the hospital, as a top referral hospital in the province, is required to have the capability of receiving the patients who need hospitalization treatment and the patients who are difficult to be treated at lower level medical care facilities. However, in the case which is difficult to be treated at the Sihanouk Province Referral Hospital, those patients are sorted according to the urgency (triage), stabilized with first aid treatment and then sent to a national hospital in Phnom Penh. Therefore, taking private clinics out of consideration, Sihanouk Province Referral Hospital has a role to intervene in nearly all cases in the province.

In order to fulfill these functions, the hospital will need facilities and equipment upgraded through this project to enable the following treatments:

① Appropriate management of moderate to severe respiratory patients and childhood diseases, provision of newborn care, and diagnosis and management of obstetrics and gynecology patients.

② Safe performance of moderate abdominal surgery (acute appendicitis, exploratory surgeries, Caesarean, hysterectomies, etc.) with provision of pre-operation and post-operation care.

③ Operations including orthopedics to address injuries from such events as traffic accidents, examination and treatment including endoscopic technology for ENT care, X-ray technology for dental care, and urological operations.

④ Triage and stabilization treatment for the patients to be referred to the upper level medical care facilities.

2) Site Selection

The following policy was applied to select the location of the new buildings:

① Location with necessity of demolishing of the existing facilities are as few as possible and facilities to be relocated are not medical care facilities and the construction does not interfere with medical care activity.

② Location to avoid sloped ground and build on flat areas to the extent possible to minimize a difference in the level of buildings.

③ Location that the paths taken by patients and staff between new buildings and existing buildings are not too long.

3) Facilities

The scope and scale of cooperation were configured based on the following basic policies:

① In the course of implementing this project, treat CPA guidelines as the major basis for planning conditions, fully understand their contents and develop basic plans that conform to them after considering the results of surveys of the state of medical care in Preah Sihanouk Province, issues facing Sihanouk Province Referral Hospital and other factors.

② Plans that fully consider Sihanouk Province Referral Hospital as the only public hospital in Preah Sihanouk Province that has the means to perform and provide examinations and treatment for the Main Four of general medicine, surgery, OB/GY and pediatric departments as well as for departments related to tuberculosis, eyes, ENT, dental and HIV/AIDS.

③ Plans that expand the current capacity of 100 beds to 130 to account for future population growth and allow for further expansion.

④ Hospitals over two stories tall require elevators to transport patients and move supplies. However, elevators have been deemed inappropriate for these plans because the hospital is located far from the capital Phnom Penh, meaning that urgent problems with the elevators cannot be addressed quickly and that the cost of maintaining them is too high. Ramps are also inappropriate because they require large areas to build on and create more work for hospital staff, therefore only the Administration Building to rise to two stories and the rest of the building will be a one story building.

⑤ Facilities will be of grades and scales suitable for operating and maintaining the hospital.

⑥ As the top referral hospital in Preah Sihanouk Province, Sihanouk Province Referral Hospital will function as a critical emergency evacuation facility during disasters, so the buildings should have the specifications of strong structures/utilities.

4) Equipment

① Equipment will be selected according to the Medical Equipment Standard for CPA 3 Referral Hospital First Edition, 2014 (Medical Equipment Standard List) formulated by the Ministry of Health, and plans will fully consider such things as technological innovations expected to improve the effectiveness and efficiency of current clinical services.

② Taking into consideration the role played by the target hospital in its area, plans will apply to ENT, dental and laboratory departments that currently lack critical equipment, though their facility buildings are not in the scope of the project.

③ Plans will be consistent with activities of the target hospital.

④ Plans will take consideration of easy maintenance for the targeted hospital by such as selecting equipment in proper level.

⑤ Plans will avoid overlaps with existing equipment or equipment supplied by other donors to ensure efficiency.

(2) Policy on Natural and Environmental Conditions

The area features a hot and humid, tropical monsoon climate whereby the year is divided into a rainy season (April through October) and a dry season (November through March). Strong winds, thunder and heavy rains frequently visit the area during the rainy season, so eaves need to stick far out from buildings and walls need to be built with waterproofing materials to prevent mold from growing where rainwater could seep in. Also, sunlight and wind passage need to be considered when planning building layouts, structural specifications and building materials, especially for rooms that do not have air conditioning equipment to combat the heat and humidity.

The hospital campus sits on high ground with good drainage, and there are no reports of flood damage, but the floor level should be approximately 300mm above the ground level as it is in existing buildings to account for damage caused by inundation by heavy rains.

Plans will put precedence on properties of waterproofing, insulation, durability and other functional aspects, allow for the selection of materials that are relatively easy to maintain and enable the grade to be maintained.

① Plans will call for large eaves to be built to account for sunlight and rain and will keep the exterior walls clean and prevent leakage due to rain while taking advantage of natural ventilation.

② Direct sunlight during the dry season (November through March) can cause temperatures to rise over 40ºC, so the roof will be insulated and a gallery will be built to ensure sufficient ventilation beneath the roof. The ceilings and exterior walls of air-conditioned rooms will also be insulated to improve the efficiency of the air conditioning.

③ Horizontal-sliding, aluminum sash, glass windows for natural ventilation have been installed

in most existing buildings. Windows under this project will also be aluminum sash as in existing buildings.

④ Lightning rods will be installed to deal with the many lightning strikes that occur during the rainy season.

(3) Policy on Social and Economic Conditions

Steeply sloped roofs and raised, wooden floors are characteristics of the construction style of the average private residence in Cambodia. The style seems to incorporate considerations for wind passage, waterproofing and other natural conditions. Pagoda construction also features steeply sloped roofs stacked up in many layers, which is adopted for temples. In olden times, temples were built with wood and brick; now, the relatively new construction style calls for temples to be built mostly of reinforced concrete with complex, light structural steel roofs.

These plans will rely on general construction methods in the local area and call for reinforced concrete rigid frames, outer walls made of brick, and perforated blocks and steel/aluminum grids for rooms that will use natural wind passage. The exterior walls will be finished with mortar, which is the current construction method, and washed gravel for durability. Roofs will be sloped and consist of cement tiles and a space will be left inside the roof for the purpose of insulation.

(4) Policy on Construction and Procurement Conditions

1) Facilities

Very few large-scale construction projects take place in the countryside urban areas outside of the Cambodian capital of Phnom Penh. Japanese aid to Preah Sihanouk Province continues to drive along the development of Sihanouk-Ville Autonomous Port, which includes the SEZ, but nearly all skilled workers involved in construction projects have been sent in from Phnom Penh. This project demands quality befitting a medical facility, and there is no sufficient training for skilled construction workers of this kind in countryside areas, so skilled workers and other workers must be sent in from Phnom Penh for this project. Japanese people are also key in providing leadership for this work. The design will steer away from complicated and difficult results and focus on work that elicits simplicity and strength. Many construction materials will be procured from local agents, but it will be especially important to check material quality, adequately verify inventories and implement other process controls. There is no need to undergo procedures to apply for building permits before beginning construction, but required documents must be submitted to the Ministry of Land Management, Urban Planning and Construction through the MOH and land use permission must be granted.

2) Equipment

In general, equipment will be procured from Japan or locally, but the scope of procurement will be spread to include other countries if the competitiveness of equipment cannot be ensured in the course of bidding. However, regarding equipment require consumables or repair service from an agent in trouble, appropriate care will be taken to select the equipment handled by the agent locally or in surrounding countries to ensure smooth operation and maintenance.

(5) Policy on Utilization of Local Contractors

1) Facilities

There are around 200 local construction companies in Cambodia, and 5 or 6 Japanese construction companies have made a foray into Phnom Penh. Companies among those that could be called major have received Grant Aid from Japan in the past. In general, there is not much awareness of aspects of quality and safety control in Cambodia, so it is difficult to say that they have comprehensive construction capabilities, and Japanese management methods must be taught well. There are not many skilled workers in the area, so Japanese people will be assigned as site supervisors, and they will oversee construction and make maximum use of local contractors wherever they can be used.

2) Equipment

It has been confirmed that the manufacturers of the medical equipment to be procured under this project have local agents for equipment that requires after-sales services. It has been also confirmed the local agents in Phnom Penh had hired experienced engineers with the sufficient operating and installing skills and experience and were able to provide spare parts and other after-sales services. Thus, it is planned to make full use of these local agents for installation and instruction of operation. Under this project, the Cambodian side will make maintenance service contract with local agents at its own expense after one-year warranty periods for the equipment that is of expensive, lifesaving, or precision and deemed necessary with the maintenance service by the local agents, to ensure proper operation and maintenance. Thus, it will be necessary to be taken into consideration such as to include conditions on procuring equipment which requires making maintenance service contract with local agents.

(6) Policy on Operation and Maintenance

1) Facilities

There are 2 contract workers responsible for facilities maintenance at Sihanouk Province Referral Hospital. However, the maintenance they can do on facilities and equipment is limited because neither of them has special skills. Cases that call for repairs or replacements are outsourced to contractors through Administration Department. The hospital lacks an organization that functions as a maintenance department, so it needs to hire people and organize such department in the future.

These plans call for facilities to stay within the technical operation and maintenance abilities of current maintenance staff and for the selection of facilities and equipment with low maintenance costs. These plans also aim to cut down on running costs.

2) Equipment

The following points will be duly considered to make it possible for the Cambodian side to sustain operation and maintenance with their own system after equipment is procured:

① Equipment that does not require high cost for operation will be chosen.

② Specifications of equipment should be corresponding with the technical level at the target hospital.

③ Procurement plans will be taken into consideration to prepare adequate time to instruct how to operate equipment in installation such that operation and maintenance capability can be improved.

④ Due consideration will be given during the planning or implementing stage, so that equipment handled by appropriate agents locally or surrounding countries will be chosen.

⑤ To suggest the Cambodian side to make maintenance service contract for equipment requires periodical service by the engineers with technical skills.

(7) Policy on Grade Setting for Facilities and Equipment

1) Facilities

Plans will be made with the population growth rate in mind and 2018 as the target year under the following policies:

① The area of the project site is limited, but one-story buildings will be built to the extent possible out of consideration for paths taken by patients.

② Consideration will be given such that the number of buildings is restricted and the new buildings harmonize with existing buildings on the property.

③ Facility grades and scales will be such that operation and maintenance expenses are not excessive.

④ As the top referral hospital in the province, the structure will be strong enough to function as a critical location for treatment and evacuation in case of disasters.

⑤ The spread of disease will be prevented as follows:

- Pathways will be separated and clean and unclean clearly marked in the Operation and other departments.
- Sinks for hand washing must be installed in each patient room.
- Private rooms will be built in wards of each department to have a quarantine effect and increase hospital revenue.

⑥ X-ray rooms will be planned such that they eliminate the risk of radiation exposure to technicians and family members.

⑦ Consideration will be given to efficiency through centralization of management.

- Ultrasound, Electrocardiograph (ECG) and other instruments will be brought together with the X-ray room as the Imagery Department to strive for efficient operation.
- Scattered wards of each department will be brought together and corridors will connect various examination and treatment functions to make it easier to transport patients on rainy days.

⑧ Cramped environments for nurses and patients will be improved.

- Corridors are narrow and space for the nurses is lacking in existing wards, so a standard corridor width of 3m, bed placement such that nurses have space in each patient room and

other improvements will be made.

- Plan of building layout mainly consisting of 6 beds rooms.

⑨ Sihanouk Province Referral Hospital is the training hospital for students in the nursing and midwife courses at a nursing school (Kampot Regional Training Center) in Kampot Province and a private university (Life University) in Preah Sihanouk Province, so consideration should be given to establish waiting rooms for nursing and delivery practice and large meeting rooms that double as technical office and make training smooth for students.

2) Equipment

Equipment plans will be developed based on Standard Equipment List put forth by the Ministry of Health. Standard list shows descriptions and specifications as well, and the equipment from these plans will match the grades and specifications put forth in the list. However, much time has passed since the list was developed, and they do not necessarily fit the current technical level or activities of the target hospital. Thus, the list should serve as a reference while developing the equipment plan, but appropriate grades should be selected with existing equipment at similar facilities and the activities and technical abilities of staff members at the target hospital in mind.

(8) Policy on Construction/ Procurement Methods and Schedule

1) Facilities

Much of the framework, finishing materials and other construction materials and equipment can be procured from within Cambodia, but reliance on imports necessitates sufficient consideration toward factors like future maintenance, and construction methods that can accommodate local technology will be selected. Meticulous preparation must be done for material procurement on aspects such as temporary structures and labor, importing and transportation, and construction. Construction schedules need to allow ample time for foundations to cure, especially if finishing is to take place during the rainy season. The supply of sands and gravels for the stage when concrete is being poured into the framework needs to be procured early. Plans will consider measures to prevent mold and rust brought on by humidity from affecting construction materials and leading to the early demise of facilities. Though construction materials will be procured locally in principle, the procurement of materials and equipment will have a huge effect on the construction schedule because most of them will be imported from Japan or other countries. Thus, expected quantities and up-to-date inventory statuses of materials and equipment need to be checked constantly to avoid delay in the construction schedule due to the lack of materials.

2) Equipment

Precision equipment that could have a huge effect on human life are abundant among medical equipment. Thus, equipment of high quality and precision must be selected and procured and engineers familiar with said equipment must install and adjust it. It follows that careful consideration will be given such that equipment for this project is procured by experts with a

wealth of experience procuring medical equipment for Japan's Grant Aid project.

In addition, since this project concerns both facilities and equipment, schedules for equipment procurement, installation and such must coordinate properly with facility construction schedules and actual progress.

Thus, those involved in equipment procurement will coordinate closely with those involved in the work for facilities, giving care to appropriate construction schedules.

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

(1) Site/ Facility Layout

Sihanouk-Ville is the capital of Preah Sihanouk Province and is located 230km away from Phnom Penh on national road, route 4. Preah Sihanouk Province, home to Sihanouk-Ville Autonomous Port, the only port in Cambodia that faces the open sea, possesses many characteristics such as the following:

① Preah Sihanouk Province has Cambodia's largest port, Sihanouk-Ville Autonomous Port. In addition to being the focal point of the flow of many people and supplies, a SEZ has been developed through aid by Japan in recent years and it appears that many companies, Japanese and otherwise, will try to advance into Cambodia from there. Another SEZ, Sihanouk-Ville SEZ with 1,113ha, was built through aid from China 12km away from Sihanouk-Ville Autonomous Port toward Phnom Penh. The first factories for Chinese companies were built there in October 2008, and 20 companies are currently operating.

② Japan has reached 19.6 billion yen in yen loans for the development of Sihanouk-Ville Autonomous Port.

③ In light of the above, Preah Sihanouk Province is one of the main places that make up a "Development Corridor Area."

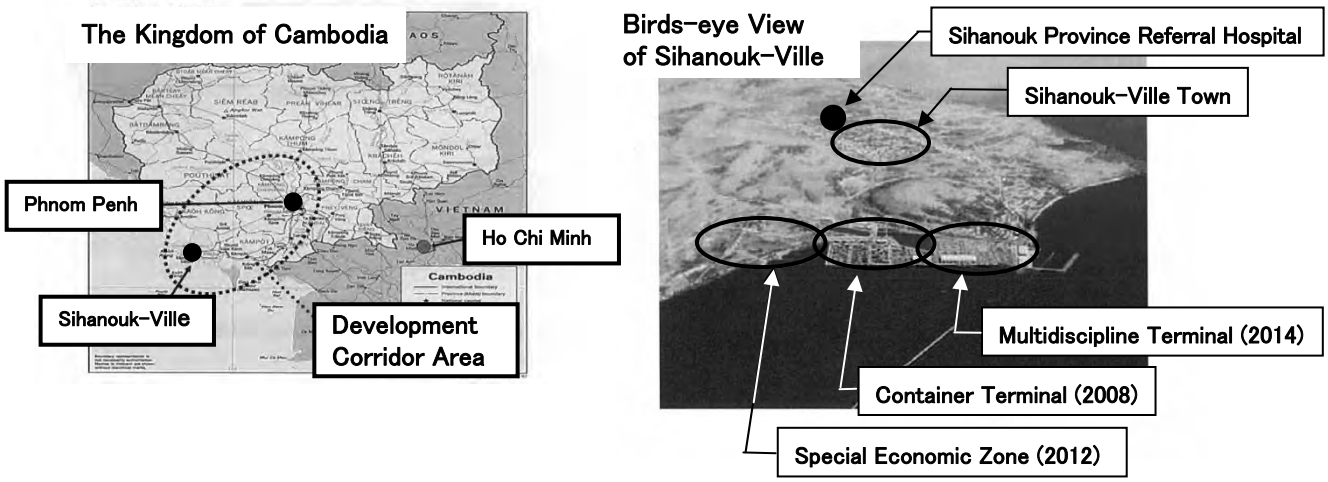


Fig. 2-1 Whole land of Cambodia and Birds-eye View of Sihanouk-Ville (( ) completion year)

④ Preah Sihanouk Province also functions as a resort area and contains many luxury hotels with private beaches and other resort facilities. Thus, there are many foreigners and other visitors from outside the area.

⑤ Preah Sihanouk Province has a population of 199,902 (as of 2008) in an area of 868km^2 for a

population density of 230.3 people per km^2, extremely high compared to the national average of 81.8 people per km^2.

Sihanouk Province Referral Hospital is located on the outskirts of the Sihanouk-Ville city center, and the property it sits on is roughly triangular with an area of 73,358m^2. There is a gentle upward slope from the hospital entrance toward its rear, with a difference of height of around 6m. There are 22 hospital facilities or so on the property, including the Tuberculosis Ward improved through Grant Aid for Grassroots Human Security from Japan in 1990.

The project site includes the site proposed in the request from Cambodia and was determined by weighing the advantages and disadvantages of multiple proposals and discussing matters with the Cambodian side. The two sides determined to limit facilities to be demolished to the smallest number possible and use the proposal that called for the demolition of the Operational District (OD) Pharmacy (E) and the Mortuary (G) so that medical facilities would not have to be relocated and so that the hospital could continue to fulfill its purposes during construction. Table 2-2 shows the current locations of the OD Pharmacy (E) and the Mortuary (G) and their planned new locations.

Table 2-2 Present Conditions and Relocation Plan of OD Pharmacy (E) & Mortuary (G)

Building Name	Present Conditions and Relocation Plan	
OD Phamacy(E)	Presents Conditions	OD Pharmacy (Building E) consist of 3 rooms, 1 of the rooms serving as a pharmacy storage while the other 2 rooms are left for the general storage. Furniture and broken medical equipment is temporarily stored in those 2 rooms. The medicine stored in the pharmacy storage is for the Health Center and Health Post within the District, which is sent from the Ministry 4 times a year. The medicine used in the Sihanouk Province Referral Hospital is stored in Building X, where the present Pharmacy is located.
	Relocation Plan	District medicines: Shall be temporarily relocated to a vacant room in EENT/Dental Building (Building D). The size of the room is nearly the same as the storage. After the project is finished, the district medicines will be relocated to the Building X, where the hospital medicine is presently stored. Furniture: Shall be relocated to vacant space in the hospital. The furniture does not belong to the hospital. Medical equipment: Shall be relocated to the storage in PHD office, workshop and the vacant space in the hospital.
Mortuary(G)	Presents Conditions	The building consists of open entrance porch and 1 room for lying dead body.
	Relocation Plan	Shall be temporarily relocated to the first floor of Hospital Worker's Residence (Building A). The permanent location for the new mortuary shall be decided and built under Cambodian Side.

In addition to the project site, a service building (water receiving tank, pump room, electric room, generator room) will be built behind the storage next to the existing Laboratory (U). By doing so, taking into account that high voltage power lines and the main water supply building are located along the street on the north side of the property, the distance over which power and water lines must be installed at the Cambodian side's expense will be as short as possible. The Cambodian side will cut down trees and grade this additional piece of land.

The project site is on hospital property, and copies of records were checked to confirm that the hospital has ownership. Residences and bars illegally occupy the road from the east side of the property to the south, but the hospital has abandoned and ceded to the city that part of the land and

has erected a fence along the border between itself and the land being occupied illegally. Thus, this issue has no effect on the facility construction in these plans.

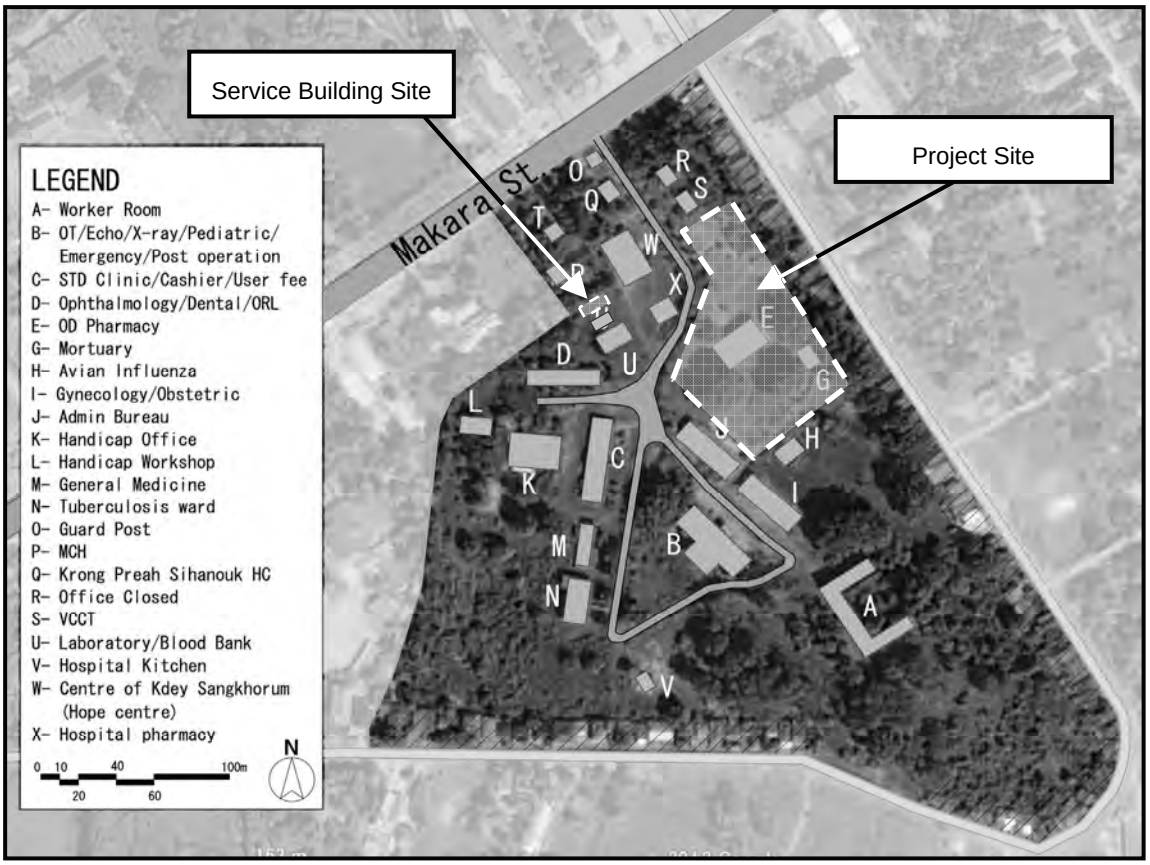


Fig. 2-2 Existing Hospital Site Plan and Project Site

(2) Building Plan

1) Selecting Target Facilities (Components)

Table 2-3 is a final list of the facilities requested for this project. It is noted that the requested sections are the same as existing sections; they do not include sections with new functions.

Table 2-3 Final Requested Facility

	Section		Component	Note
1	Clinical Services	1.1	Outpatient Consultations	Triage(*)
		1.2	Emergency Services Department	
		1.3	Surgical Services Department	
		1.4	Operation Theater	
		1.5	General Medicine Department	
		1.6	Obstetrics	Include Delivery Room
		1.7	Gynecology	
		1.8	Pediatric Department	
2	Para Clinical	2.1	Imagery	
		2.2	Pharmacy	Hospital Pharmacy
3	Administration	3.1	Hospital Administration	
		3.2	Training/Meeting	
4	Technical Support	4.1	Laundry and Sterilization	
		4.2	Warehouse storage and Maintenance	
5.	Infrastructure	5.1	Electricity Reception and Generator & Sewage water Treatment	
6	Others	6.1	Corridor and Common Space	

(*) Triage: identifying the nature and severity of each patient's illness.

Below is a list of sections to be included as target components in these plans from the final list of requested facilities above because of aging and safety issues and for reasons of scale and functionality as well.

① Operation Theater (including sterilization)/Surgical Services Department/Pediatric Department/Pediatric Department/Outpatient Consultations/Imagery Department (Building B)

The lack of space because of an increase in the number of patients and major deterioration make it difficult to maintain a standard of cleanliness. There is no separation of clean and unclean on pathways to operation theatre, an issue requiring urgent attention on the aspect of infection prevention. Neither have measures to protect against radiation been taken in X-ray rooms; radiation leaking out of the rooms creates a severe lack of safety.

Each section will have its own area in this project. Triage will be set up in the emergency services department/outpatient consultation so that the nature and severity of each patient's illness can be identified, and minor operation rooms and observation rooms will be set up to provide easy access to the operation theater and imagery department. Clean and unclean areas will be clearly marked in the operation theater, and it will become possible to prevent infection within the hospital, hold conferences in the operation theater and connect them to the ICU section. The imagery department will enact measures to protect against radiation and

feature safe radiation rooms. The surgery and pediatric wards will ensure patient privacy and provide space for nurses and treatment through a policy of 6 beds in each general patient room and through the establishment of nurse stations, consultation rooms and treatment rooms. High-priced private rooms will also be established to boost hospital revenue.

② OB/GY Ward (including Delivery Department) (Building I)

The patient environment is poor: delivery room is cramped and unclean and there is no treatment room or consultation room, so abortions are performed in delivery rooms. Corridors and entrances are full of beds because there are so many patients. The functional failures of the hospital stand out as well: patients who develop problems during delivery must be moved across a road to get to an operation theatre.

The project will totally separate delivery room and treatment room to ensure patient privacy and set up waiting rooms for midwives and nursing students to improve the working environment. The OB/GY ward will be planned as described above for the surgery ward and pediatric ward.

③ General Medicine Ward (Building N)

The existing general medicine ward is made up of 3 rooms of mixed-gender and multi-beds, and is extremely inconvenient because nurse station and consultation room are next door in Building C.

Including the general medicine ward in these plans will centralize the functions of Main Four and enable the hospital to run efficiently. The ward will be planned as described above for the surgery and pediatric wards.

④ Administration Department (including Meeting Rooms) (Building J)

This department building has been included in the plans to enable integrated management of centralized medical functions.

⑤ Pharmacy (Building X)

Space for pharmacy needs to be included in these plans since the OD Pharmacy (Building E), which is to be demolished, will eventually be moved to location of the current pharmacy. The pharmacy will also be located along the centralized line of flow of medical functions, allowing easy access to patients and enabling the hospital to run efficiently.

It should be noted that, “warehouse storage and maintenance” in 4.2 in Table 2-3 is not included in the target of these plans' components since (1) staff allocation and organization are required due to the lack of structure working as facilities maintenance department; and (2) an existing building (the current administration building (Building J)) can be used as a maintenance room after facilities are complete.

Those mentioned above are summarized in Table 2-4 below, of which Priorities 1 and 2 fall under the scope of these plans.

Table 2-4 Filtering of Components to be Included in the Project

No.	Section	Priority	Incl./Excl.	Reason of including/excluding the component
1.1	Outpatient Consultations	1	Included	Existing building (Building B) is deteriorated and does not have enough space.
1.2	Emergency Services Department	1	Included	Existing building (Building B) is deteriorated and does not have enough space.
1.3	Surgical Service Department	1	Included	Existing building (Building B) is deteriorated and does not have enough space.
1.4	Operation Theater	1	Included	Existing building (Building B) is deteriorated and dirty to have operation done. Also the infection control is not sufficient.
1.5	General Medicine Department	1	Included	To centralize the main functions of the hospital in one building.
1.6	Obstetrics	1	Included	Existing building (Building I) is deteriorated and does not have enough space. To improve the access from obstetrics department to the operation theatre.
1.7	Gynecology	1	Included	Existing building (Building I) is deteriorated and does not have enough space.
1.8	Pediatric Department	1	Included	Existing building (Building B) is deteriorated and does not have enough space.
2.1	Imagery	1	Included	Existing building (Building B) is deteriorated and the X-ray protection is insufficient.
2.2	Pharmacy	1	Included	To centralize the main functions of the hospital in one building. Shall be included in the project as the OD pharmacy storage will be relocated to existing pharmacy.
3.1	Hospital Administration	2	Included	Easier for unified hospital operation if located in the same building with the centralized hospital functions.
3.2	Training/Meeting	2	Included	Same as above
4.1	Laundry and Sterilization	1	Included	Existing building (Building B) is deteriorated and does not have enough space.
4.2	Warehouse storage & Maintenance	3	Excluded	Recommended to locate in the existing administration building (Building J).
5.1	Electricity Reception and Generator & Sewage Water Treatment	1	Included	
6.1	Corridor and common Space	1	Included	

**Priority : 1:High 2:Middle 3:Low*

2) Target Scale

The plans for facilities and equipment are based on the scale of examination and treatment, which includes the number of patients and operations. The scale will be planned with the goal set in 2018, 3 years after the completion of the new hospital. It will go according to the rapid population growth expected as the result of the development of Sihanouk-Ville Autonomous Port.

① Population Trends (2009-2011)

The application shows that the current population of Preah Sihanouk Province is increasing 6% (about 5,000 people) per year, but it was not possible to determine a clear source for that information. Setting 5,000 as 6% and working backwards yields a population of about 83,000, but this does not match the population of 195,000 according to population statistics from the province's 4 districts obtained from PHD and shown on Table 2-5 below.

Table 2-5 Demographic Trends of Preah Sihanouk Province

District	Population			Population Growth Rate (%)		
	2009	2010	2011	2009-10	2010-11	Average Annual Rate 2009-2010
Krong Preah Sihanouk	64,383	70,399	71,995	9.34%	2.27%	5.75%
Stung Hav	15,383	15,302	16,360	-0.53%	6.91%	3.13%
Pret Nob	86,428	86,480	91,850	0.06%	6.21%	3.09%
Kompong Seila	15,800	15,820	15,483	0.13%	-2.13%	-1.01%
Total	181,994	188,001	195,688	3.30%	4.09%	3.69%

Note Questionnaire & Answer

Table 2-5 above shows dramatic population growth of 9.34% in the Sihanouk-Ville city center (Krong Preah Sihanouk) from 2009 to 2010 and a calmer 2.27% from 2010 to 2011. The average population growth rate over this three-year period is 5.75%, which resembles the 6% mentioned above. Thus, the claim of "annual population growth of 6%" on the request was probably based on the data above.

Furthermore, the dramatic growth from 2009 to 2010 was likely affected by the creation of a 1,200 new jobs upon the 2008 completion of the container terminal at Sihanouk-Ville Autonomous Port with help from an yen loan by Japan. There were 4.7 people in the average Cambodian household (2008 census); simply put, multiplying a 1,200 people by 4.7 means an increase of 5,640 people, and once natural growth is accounted for, we arrive at nearly the same population growth from 2009 to 2010 (70,399–64,383=6,016).

② Projected Population Trends (2012-2018)

These plans include scale planning that projects the population of Preah Sihanouk Province in 2018, 3 years after construction is expected to end. Population trends for 2012-2018 were calculated based on the results of a field survey and with the following factors added as conditions:

[Factors of Population Growth]

- Natural population growth
  Suppose the natural growth rate of the Krong Preah Sihanouk District is 2.27%, as same as that of over 2010-2011, and the rate for the other 3 districts same as the average rate over 2009-2011. (See Table 2-5)

- Influx of laborers after completion of Special Economic Zone (SEZ) (2012)
  Suppose that 5 factories are built in the SEZ each year and that each factory employs 190 (80 workers x 2 shifts + 30 office workers, based on interviews at Japanese company factories (currently under construction)), and that they and their families (x 4.7 people) move into the province from outside of it.

- Influx of laborers upon completion of the multidiscipline terminal (2014)
  Suppose that a 1,200 laborers and their families (x 4.7 people) move into the province from outside of it in 2014 just as they did when the container terminal was completed.

The following Table 2-6 shows the population through 2018 based on the above.

Table 2-6 Forecast of Demographic Trends of Preah Sihanouk Province (2012 – 2018)

	District	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	Preah Sihanouk	64,383	70,399	71,995	73,651	79,810	85,252	95,373	101,173	107,106	113,175
	Yr/Yr growth rate	-	9.34%	2.27%	2.30%	8.36%	6.82%	11.87%	6.08%	5.86%	5.67%
2	Stung Hav	15,383	15,302	16,360	16,872	17,400	17,945	18,506	19,086	19,683	20,299
	Yr/Yr growth rate	-	-0.53%	6.91%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
3	Pret Nob	86,428	86,480	91,850	94,688	97,614	100,630	103,740	106,945	110,250	113,657
	Yr/Yr growth rate	-	0.06%	6.21%	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%
4	Kompong Seila	15,800	15,820	15,483	15,327	15,172	15,019	14,867	14,717	14,568	14,421
	Yr/Yr growth rate	0.13%	-2.13%	-1.01%	-1.01%	-1.01%	-1.01%	-1.01%	-1.01%	-1.01%	0.13%
	TOTAL	181,994	188,001	195,688	200,538	209,996	218,845	232,486	241,921	251,607	261,552
	Yr/Yr growth rate	-	3.30%	4.09%	2.48%	4.72%	4.21%	6.23%	4.06%	4.00%	3.95%
	Ave. Yr growth rate			3.69%							**4.55%**

Note Questionnaire & Answer until 2011

The number of hospital beds required for the hospital will be calculated based on Preah Sihanouk Province population growth rate over 2012-2018 of 4.55% as shown in Table 2-6 above.

③ Calculating the number of hospital beds

The number of hospital beds will be calculated based on the following conditions:

a) Calculate the average beds occupancy rate from 2009-2012 to determine the number of inpatients per day.

b) Calculate the number of inpatients per day in 2018 based on the above population growth rate.

c) Planned beds occupancy rate to be same as the Cambodian national average of 82.45% (Health Sector Progress in 2011, MOH).

d) Current ICU includes post-operative patients. Include the number of beds that corresponds with those patients in surgery ward figures.

Table 2-7 Number of Beds Calculation

Department	Nominal No. of Beds(a)	Beds Occupancy Rate (BOR)				Av. BOR (b)	No. of Patients /Day (a)x(b)	Population Growth Rate x4.55%[6]	Planned BOR ÷82.45%	Planned No. of Beds	Note
		2009	2010	2011	2012						
General Medicine	22	61.84%	66.59%	62.90%	76.53%	66.97%	14.73	19.24	23.34	24	
Surgery	10	93.46%	96.73%	98.96%	116.43%	101.40%	10.14	13.24	16.06	20	(16+4)Beds
OB/GY	16	100.84%	84.23%	90.10%	75.34%	87.63%	14.02	18.31	22.21	23	
Pediatric	15	78.40%	107.36%	113.00%	134.24%	108.25%	16.24	21.21	25.72	26	
Total	63									**93**	
Tuberculosis	(27)									(27)	
ER/ICU	10									10	
Total	100									**130**	

The 4 beds included in the surgery department are intended for post-operative patients and were calculated based on the following:

a) The number of surgical operations equal the total number of operations minus the number of Caesarean and suppose that they will be transferred to the surgery ward following post-operative observation.

b) From the above, calculate the average over 2009-2012 (double 2012 data since it is only from January through June) and multiply it with the population growth rate to determine the number of surgical operations in 2018.

c) The length of stay equal the average length of stay in the surgery ward from 2009-2012 (6.16 days).

d) As above, let the projected beds occupancy rate equal 82.45%.

e) Use the total length of stay of post-operative patients calculated above to calculate the number of beds required per day.

Table 2-8 Calculation of Additional Beds to be Included in Surgery Ward

	2009	2010	2011	2012 (Jan.-Jun.)	2012 x2	Av. 2009 ～2012		A x4.55%[b]	B (Surgery) x6.16 日	Plannec BOR ÷82.45%	C÷365	D
No. of Operation	338	299	388	(173)	346	342.75						
No. of Caesarean	182	173	257	(112)	224	209.00						
Total	156	126	131	(61)	122	133.75	→	174.68	1076.02	1305.05	3.58	4

A : Population Growth Rate
B : Number of Average Hospitalized Days
C : Number of Patients per Day
D : Number of Additional Beds

④ Calculating the number of operation theatres

Table 2-8 above shows that there were an average of 342.75 operations per year from 2009 through 2012, and that number is projected to rise to 447.63 by 2018 when the average annual population growth rate of 4.95% is applied (342.75×1.0455^6). This means 1.23 operations will occur daily (447.63/365); thus, the plan calls for 2 operation theatres. This figure is sufficient even when accounting for the 4 hours of ultraviolet sterilization that follows an operation, a time period in which a theater cannot be used.

⑤ Calculating the number of delivery tables

According to Table 2-9 below, an average of 1,138 deliveries (except Caesarean) occur on delivery tables. Applying the average annual population growth rate of 4.55% yields a projection of 1,487 deliveries in 2018 ($1,138.33 \times 1.0455^6$). Using statistics from Kampong Cham Hospital as a reference, each delivery table serves a 1,000 deliveries per year, so the plan calls for 2 delivery tables. It is apparent that 2 delivery tables are enough to handle 4.07 deliveries per day (1,487/365). The hospital currently has 3 delivery tables, but one of those tables is used for consultation and treatment. This plan calls for new consultation and treatment rooms.

Table 2-9 Number of Deliveries in Sihanouk Province Referral Hospital (2007-2012)

Year	2007	2008	2009	2010	2011	Average ('09～'11)
Normal Delivery	662	670	820	768	787	791.67
Abnormal Delivery	306	286	329	328	383	346.67
Caesarean	81	112	182	173	257	204.00
Total	1,049	1,068	1,331	1,269	1,427	1,342.34
Sum of normal & abnormal deliveries	968	956	1,149	1,096	1,170	1,138.33

Note: Answer to the Sihanouk Province Referral Hospital Questionnaire

3) Floor Plans

[ER, Imagery, & Operation Building]

① ER/Outpatient Department

- The emergency services department will have a minor operation room that enables minor surgeries and an observation room, and it will be situated to provide easy access to the operation theaters and imagery department.
- An minor operation room that enables minor surgeries and an observation room for emergency patients will be equipped with sufficient functionality for emergency treatment.
- A shower room will be installed at the entrance of the treatment room for the purpose of preventing infections from spreading throughout the Emergency Services Department.
- The outpatient consultations department will receive a dual-purpose room (for triage), and outpatients referred from health centers or who came to the hospital directly will be led to OB/GY, General Medicine, etc.

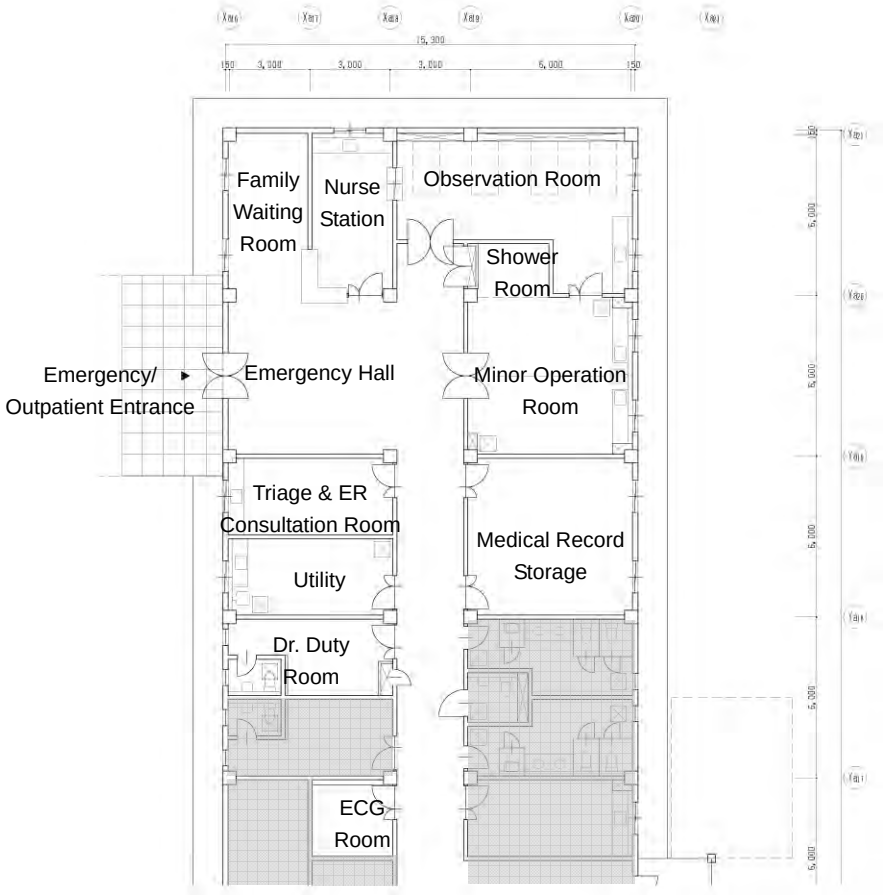


Fig. 2-3 Emergency/ Outpatient Dept. Plan Scale: 1/200

② Imagery Department

- In addition to an X-ray room, an ultrasound room will be added, and plans will enable centralized management of expensive diagnostic imaging instruments.
- A reception desk for diagnostic imaging patients will be set up to manage their records and collect payments to make management more efficient.
- A control room will be added to the X-ray Room to protect operators from radiation.
- The imagery department will receive a digital X-ray machine, and though it will generally not be necessary to develop images, a Dark Room will be added for times when the digital machine is not functioning properly.
- The Cambodian side is considering the possibility of adding CT scan capabilities in the future, so space will be set aside so they can add a CT room in the future.

Fig. 2-4 Imagery Dept. Plan Scale: 1/200

③ Operation Theater & Central Sterilization Department

- As mentioned in scale calculations, there will be 2 operation theatres.
- Cleaning area, assembly area, sterilization area and clean storage will be established in that order in the central sterilization department. A laundry will be established for linens and such related to the operation department.
- A dedicated corridor will link the central sterilization room to the operation theatres such that general patients and family members do not cross paths with post-operative patients and equipment.
- Gown changing rooms will be placed at the entrance to the operation theatres to clearly set apart clean and sub-clean areas.

Fig. 2-5 Operation & Central Sterilization Dept. Plan Scale: 1/200

[Administration Building]

- The entrance hall ceiling will be vaulted, and the front side of the entrance will be a space open to the outside, consisting not of a brick wall but of a grid with a door attached, to improve the patient environment.
- The pharmacy will face the entrance hall to ensure space for patients to wait for their prescriptions.
- The director room, deputy director rooms, meeting room and other rooms off-limits to all but hospital staff will be located on the second floor.
- The second-floor meeting room will be a space for all employees (other than workers) to gather, just as the current meeting room is, and will be equipped with a movable partition to account for the number of attendees.
- The request did not include the accounting department and, thus, it is not included in these plans. However, considering the possibility that the hospital may move the accounting department in the future to make operations more efficient, a reception counter facing the entrance hall will be established in the administration office.

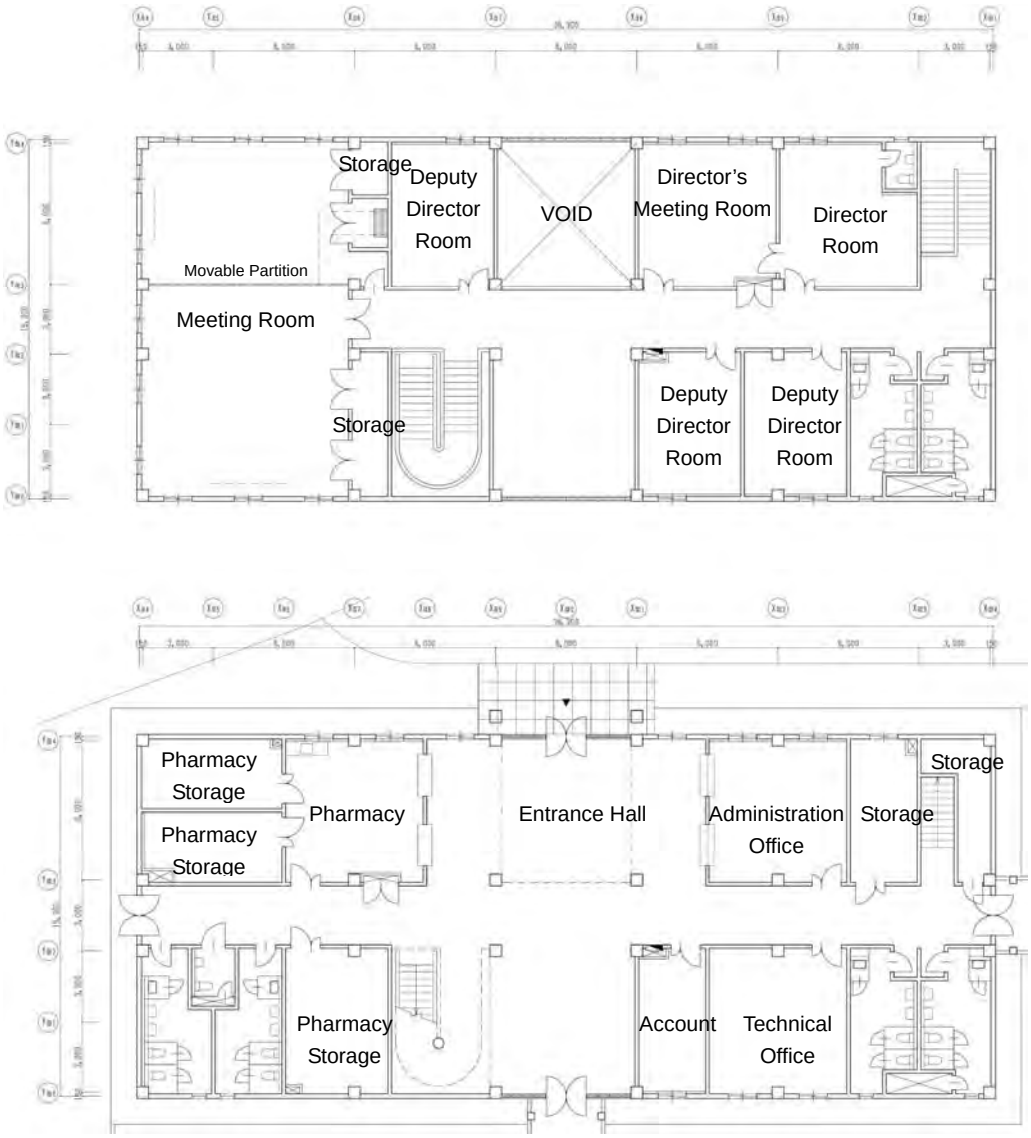
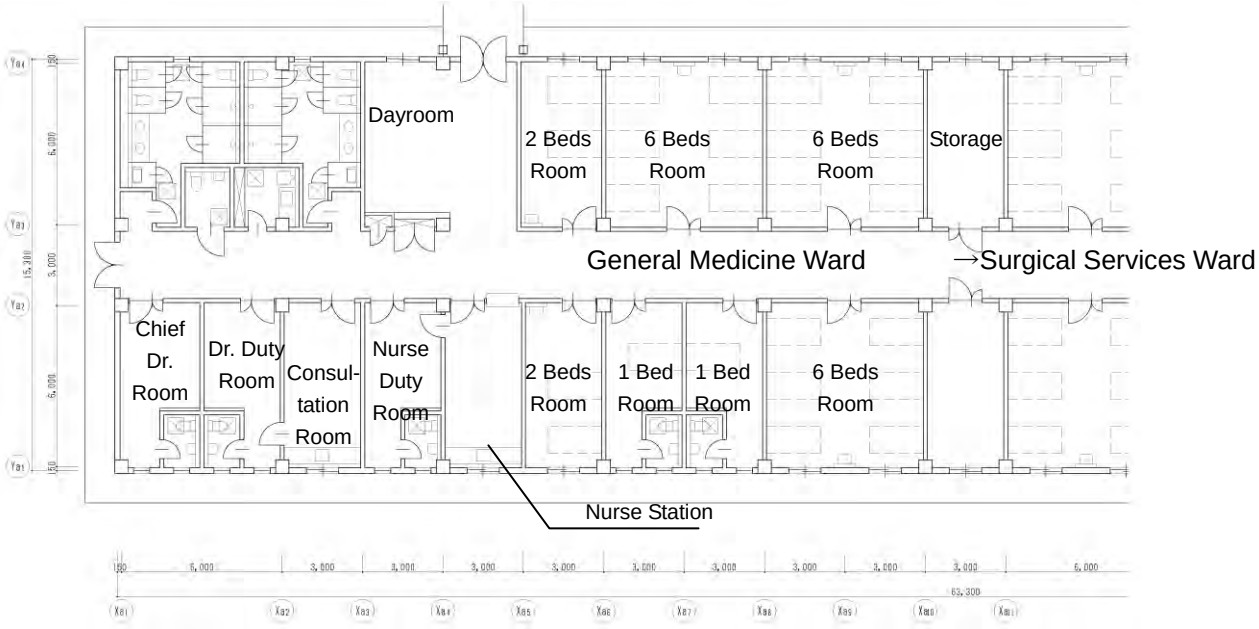


Fig. 2-6 Administration Building Plan Scale: 1/200

[General Medicine & Surgery Ward Building]

- Nurse stations and consultation rooms will be placed near entrances.
- General patient rooms will have 6 beds rooms to ensure a minimum level of privacy.
- 1 bed rooms featuring toilets and showers and higher fees than the 6 bed room will be established, and revenue from those rooms will help offset hospital operation costs. They can also be used to prevent the spread of infection among patients.
- A dayroom will be established and used as spaces for conferences with patients' families.



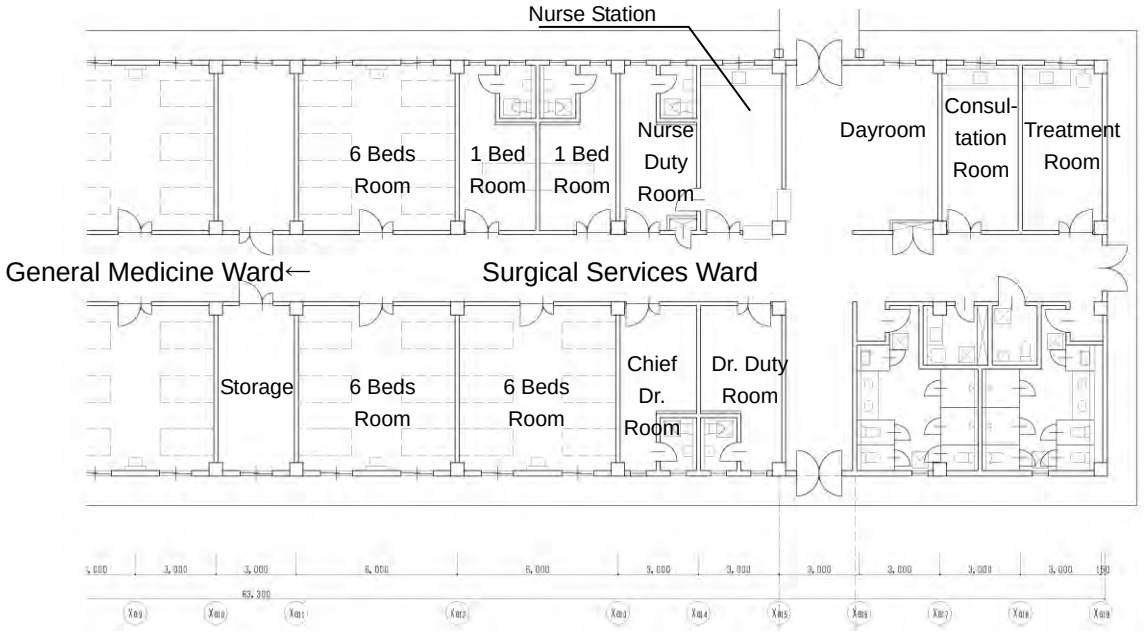


Fig. 2-7 General Medicine & Surgery Ward Building Plan Scale: 1/200

[OB/GY & Pediatric Building]

- The OB/GY ward will include the delivery department with a total of 2 delivery tables as mentioned above in scale calculations.
- A student room for midwife students will be established.
- A preparation room will be added to a delivery room to ensure privacy.
- A treatment room and a delivery room will be located as far apart as possible to separate patients giving birth from those receiving abortions and treatment.
- The ward areas will be the same as those for other departments.
- There is a play room in the existing pediatric ward featuring play equipment set up through aid from UNICEF. These plans also call for a play room in which play equipment provided through UNICEF aid can be set up.

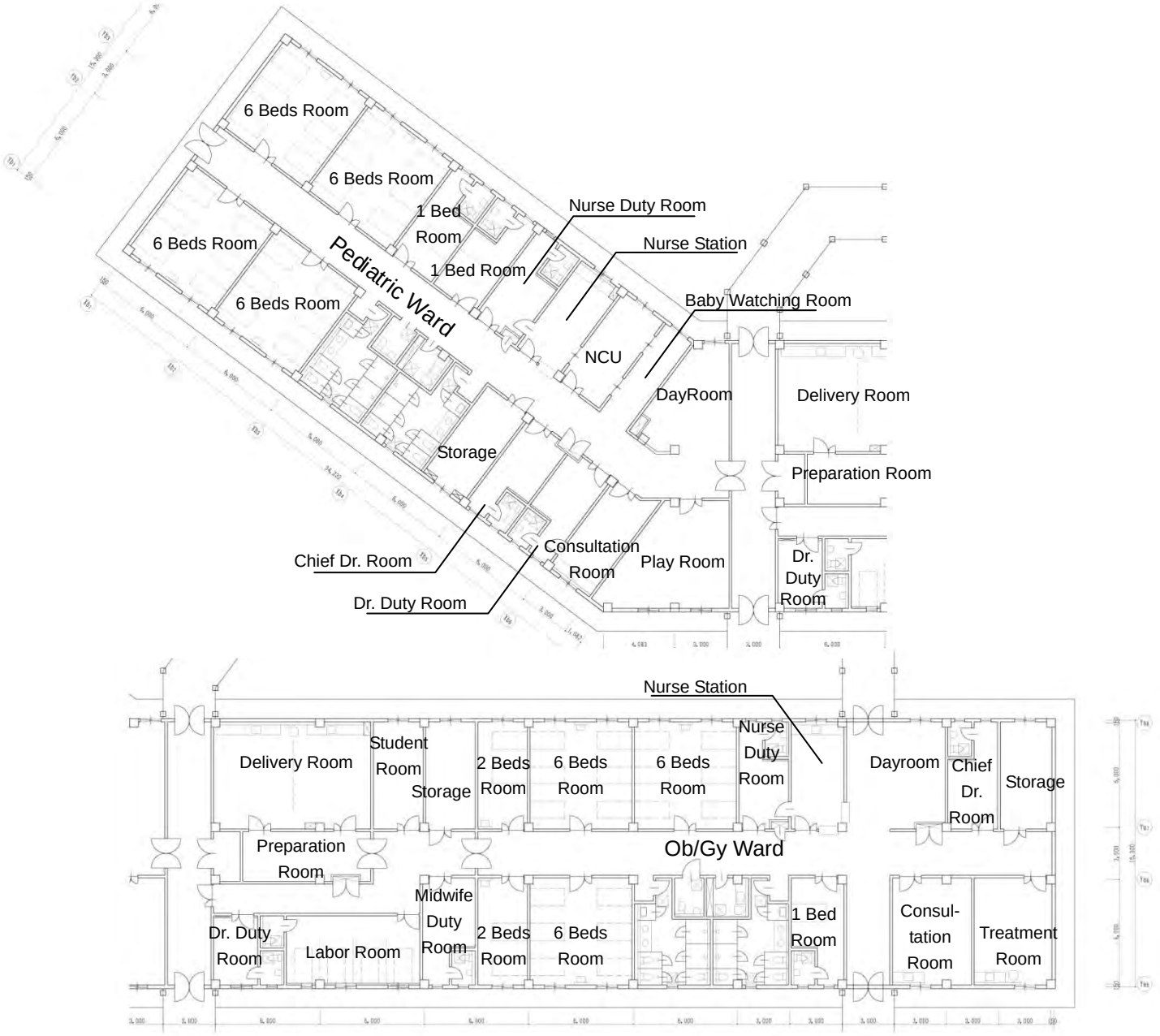


Fig. 2-8 Ob/Gy & Pediatric Ward Building Plan Scale: 1/250

[Service Building]

- Setting up a maintenance room and a storage in the existing Ward J (the current administration ward) was suggested to the Cambodian side, and those rooms are not included in these plans.
- The service building will house a water tank room, pump room, electric room and generator room.
- An elevated water tank and septic tank will also be established.

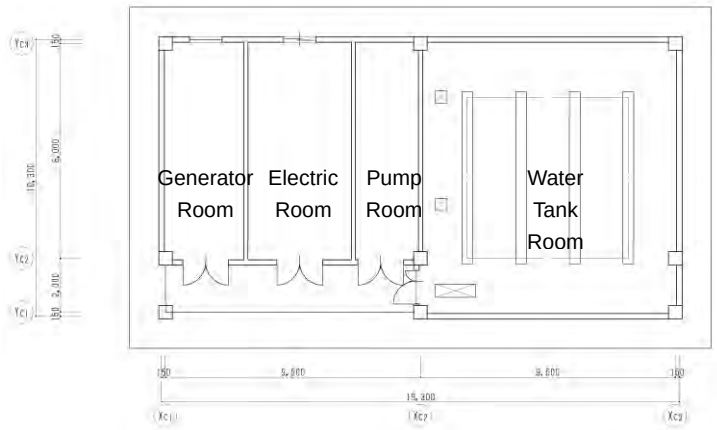


Fig. 2-9 Service Building Plan Scale: 1/200

4) Floor size table

Table 2-10 Floor Area of Each Building

Building	Department	Room	No. of Rooms	Area per Room(㎡)	Total Area (㎡)
ER, Imagery, & Operation Building	ER/Outpatient Department	Emergency Hall	1	59.40	59.40
		Family Waiting Room	1	19.37	19.37
		Nurse Station	1	19.37	19.37
		Observation Room	1	43.65	43.65
		Shower Room	1	6.30	6.30
		Minor Operation Room	1	37.80	37.80
		Medical Record Storage	1	37.80	37.80
		Triage & ER Consultation Room	1	18.90	18.90
		Dr. Duty Room	1	18.90	18.90
		ECG Room	1	9.45	9.45
	Imagery Department	Film Storage	1	18.90	18.90
		Imagery Reception	1	9.45	9.45
		Ultrasound Room	1	18.90	18.90
		Imagery Waiting Room	1	18.90	18.90
		X-Ray Room	1	25.20	25.20
		Control Room	1	12.60	12.60
		Dark Room	1	9.45	9.45
		Imagery Duty Room	1	18.90	18.90
		Storage	1	9.45	9.45
	Operation Department	Nurse Station	1	18.90	18.90
		ICU	1	78.75	78.75
		Operation Theatre	2	37.80	75.60
		Storage	1	9.00	9.00
		Storage	1	6.75	6.75
		Dr. Duty Room	1	18.90	18.90
		Conference Room	1	18.90	18.90
		Gown Changing Room	2	18.90	37.80
		Machine Room	1	20.93	20.93
		Manifold	1	21.62	21.62
		Anteroom	1	11.34	11.34
		Anteroom	1	16.65	16.65
		Operation Hall	1	67.49	67.49
		Collection Corridor	1	45.90	45.90
	Central Sterilization Department	Clean Storage	1	21.38	21.38
		Central Sterilization Room	1	41.18	41.18
		Laundry	1	28.60	28.60
		Dispatch Corner	1	6.30	6.30
	Others	Corridor, Toilet, etc.			147.53
				Total	1,106.19

Building	Department	Room	No. of Rooms	Area per Room(㎡)	Total Area (㎡)
Administration Building	Administration Department	Administration Office	1	37.80	37.80
		Storage	1	18.90	18.90
		Storage	1	19.85	19.85
		Technical Office	1	37.80	37.80
		Account	1	18.90	18.90
		Meeting Room	1	144.14	144.14
		Storage	1	10.40	10.40
		Storage	1	3.96	3.96
		Director's Meeting Room	1	37.80	37.80
		Director Room	1	37.80	37.80
		Deputy Director Room	3	28.35	85.05
	Pharmacy	Pharmacy Waiting	1	18.90	18.90
		Pharmacy	1	37.80	37.80
		Pharmacy Storage	2	19.37	38.75
		Pharmacy Storage	1	28.35	28.35
	Others	Entrance Hall, Staircase, Corridor, Toilet, etc.			459.00
				Total	1,035.18
OB/GY & Pediatric Building	OB/GY Department	6 Beds Room	3	37.80	113.40
		2 Beds Room	2	18.90	37.80
		1 Bed Room	1	19.85	19.85
		Nurse Station	1	19.85	19.85
		Nurse Duty Room	1	18.90	18.90
		Day Room	1	19.85	19.85
		Chief Dr. Room	1	18.90	18.90
		Storage	1	19.85	19.85
		Treatment Room	1	29.30	29.30
		Consultation Room	1	29.30	29.30
		Student Room	1	18.90	18.90
		Labor Room	1	35.58	35.58
		Delivery Room	1	57.65	57.65
		Preparation Room	1	22.50	22.50
		Manifold	1	4.95	4.95
		Storage	1	18.90	18.90
		Midwife Duty Room	1	19.85	19.85
		Dr. Duty Room	1	14.22	14.22
	Pediatric Department	6 Beds Room	4	37.80	153.09
		1 Bed Room	2	18.90	37.80
		Nurse Station	1	18.90	18.90
		Nurse Duty Room	1	18.90	18.90
		NICU	1	18.90	18.90
		Baby Watching Room	1	12.60	12.60
		Day Room	1	26.15	26.15
		Storage	1	18.90	18.90
		Chief Dr. Room	1	18.90	18.90
		Dr. Duty Room	1	18.90	18.90
		Consultation Room	1	19.31	19.31
		Play Room	1	38.33	38.33
	Others	Corridor, Toilet, etc.			415.5
				Total	1,335.69

Building	Department	Room	No. of Rooms	Area per Room(㎡)	Total Area (㎡)
General Medicine & Surgery Ward Building	General Medicine Ward	6 Beds Room	3	37.80	113.40
		2 Beds Room	2	18.90	38.75
		1 Bed Room	2	18.90	37.80
		Nurse Station	1	18.90	18.90
		Nurse Duty Room	1	18.90	18.90
		Consultation Room	1	18.90	18.90
		Dr. Duty Room	1	18.90	18.90
		Chief Dr. Room	1	19.85	19.85
		Storage	1	18.90	18.90
		Day Room	1	19.85	19.85
	Surgery Ward	6 Beds Room	3	37.80	113.40
		1 Bed Room	2	18.90	37.80
		Nurse Station	1	19.85	19.85
		Nurse Duty Room	1	18.90	18.90
		Day Room	1	19.85	19.85
		Consultation Room	1	18.90	18.90
		Treatment Room	1	19.85	19.85
		Chief Dr. Room	1	18.90	18.90
		Dr. Duty Room	1	19.85	19.85
		Storage	1	18.90	18.90
	Others	Corridor, Toilet, etc.			338.18
				Total	968.49
Service Building	Service Department	Water Tank Room	1	99.70	99.70
		Pump Room	1	20.75	20.75
		Electric Room	1	33.20	33.20
		Generator Room	1	26.15	26.15
				Total	179.79
Ancillary	Ancillary Buildings	Elevated Water Tank			79.38
		Corridor			480.45
				Total	559.83
				Grand Total	5,185.17

5) Cross-Section Plan

① The exterior will adhere to Cambodian traditions and feature a sloped roof as the focal point of the design. Fig. 2-10 below is a standard cross-section drawing.

② There is an elevation difference of around 3.5m between the north edge of the project site to the south edge, and the Cambodian side will minimize the grading work by changing the floor plans of buildings that stand on the north and south edges and connecting them together with a corridor that bridges the slope.

③ The floor level of the first floor will be 300 mm above the ground level to prevent flooding from heavy rains. Thus, a ramp will be required at entrances and exits to accommodate wheelchairs, stretchers and items being carried in and out.

④ Ceilings will be raised in patient rooms designed to take advantage of natural wind passage to ensure an air volume.

⑤ Eaves will be built to block direct sunlight from entering rooms and prevent rainwater from seeping into the walls.

⑥ Ceiling heights in each department will be determined based on the following ceiling heights:

- Ceiling height will be 2.8m in air-conditioned rooms.
- Ceiling height will be 4.0m in wards without air-condition and applies natural ventilation in conformity with CPA standards.
- Ceiling height will be 3.2m in non-air-conditioned rooms other than patient rooms to account for clearance from ceiling fans.
- Ceiling height in corridors will be 2.8m to take advantage of natural wind passage. (The upper part will be made of perforated blocks or feature galleries to make it easier for outside air to pass through non-air-conditioned rooms.)

⑦ An underground pit will be established to facilitate pipe maintenance.

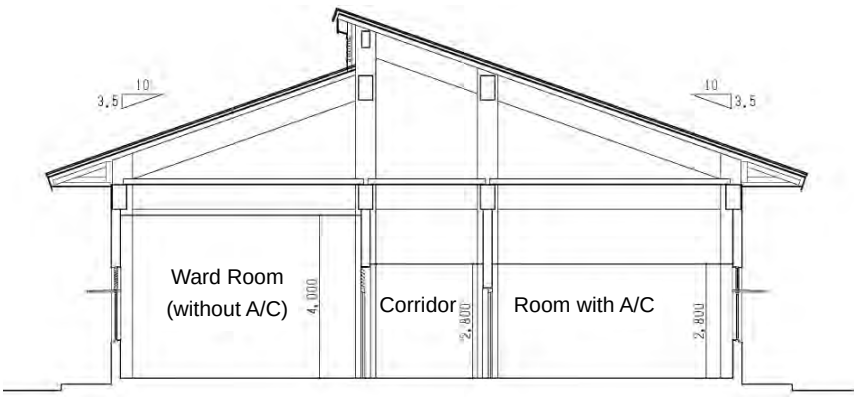


Fig. 2-10 Typical Building Section Scale: 1/150

6) Structural Plans

① Structural planning conditions

- Earthquakes: Cambodia is located far away from the zone in which earthquakes originate in the Pacific Rim, and there are no records of damage from past earthquakes.
- Strong Wind: There are many floods and strong winds in Cambodia, but there are no clear records of actual damage. Wind speed records suggest that they are at the same level as those in Japan.
- Soil Properties: The ground on the site for these plans slopes from south to north. Fou boring investigations on the site revealed a 0m to 2m gravel layer beneath the surface followed by a layer of sandy clay. The N-value of each layer is greater than 10.

② Structural plans

- Structure type: Principal structures are made of reinforced concrete based on the ease of procuring materials locally, cost and performance.
- Frame: In principle, and in areas other than X-ray Rooms and some staircases, rigid frame structures will be built rather than concrete walls because there are no earthquakes on the site and because mold precision is poor.

③ Foundation plans

- These plans call for a one-story building with/without partially two-story building. Spread foundations (foundations with column footings, or solid foundations) are planned since the scale of the buildings precludes strong axial forces on the pillars.
- Groundwater level: Water levels inside holes observed during boring investigations showed groundwater levels between 6m and 8m below ground level. Thus, we can determine that groundwater will have no effect during construction or after it is complete.

④ Design Load

- Earthquake load: It is not possible to confirm records of past earthquakes, but main frames other than brick walls will be built to withstand small to minor earthquakes according to the Japanese Building Standards Act. The earthquake load is half the seismic force used for designs in Japan.
- Wind load: It is not possible to confirm records of typhoon damage, but main frames other than brick walls will be built according to the Japanese Building Standards Act with regard to wind speed records. They will be the same as Tokyo (V0=34 m, roughness class III).
- Movable load: Refer to Table 2-11 below for enforcement orders of the Japanese Building Standards Act.

Table 2-11 Main Movable Load Capacity

Room Usage	Movable Load (N/m2)			Remarks
	For Floor	For Frames	For Earthquake	
Consultation Rooms, Waiting Rooms	2900	1800	800	
X-Ray Room	6000	4500	3000	Heavy Machines
Offices	2900	1800	800	
Wards, Toilets	1800	1300	600	
Storages	7800	6900	4900	

Based on National Building Code of Japan, etc.

⑤ Materials

- Concrete: Since ready-mix concrete can be procured from the local area, there should be no need to build a concrete batch plant. The concrete plant near the project site uses imported cement from Thailand, which is possible to procure in Cambodia, and sands and gravels from Kampong Speu Province, the closest area that features large quarries clustered together.
- Reinforcement bar: Deformed reinforcement bar made in Vietnam, Thailand or other neighboring countries can be procured in Cambodia and will be used. Re-bar bendings will be done on-site. For quality control, an official examination agency from Phnom Penh will conduct tensile strength testing on the reinforcement bar.
- Structural steel: Imported structural steel can be procured in Cambodia and will be used, and they will be processed at a plant in Phnom Penh before being transported to the site.

7) Electrical and Mechanical Facility Plans

① Electrical facility plan

a) Installing power lines

- 22kV power lines from an electric distribution company (EDC) are buried beneath the sidewalk on the north end of the property. Diverter housing stands to the side of the hospital entrance, so the plan calls for power lines to be diverted there and power to be distributed from on the property.
- A 380V/220V step-down transformer will be built in the service building to supply electricity to the new hospital.
- The EDC will handle construction in the zone from the diverter housing to the primary side of the transformer, and the Japanese side will handle construction for all that remains, including transformer installation.
- Only facilities newly constructed under this project will receive a power supply as a result of this construction. Supplying power to existing facilities is not being considered.

b) Emergency generator facilities

- The Sihanouk-Ville area often experiences power outages. Thus, the plan calls for the installation of emergency generator facilities to prevent disruptions to medical activities in consultation and treatment rooms such as in the operation theatres, ICU, emergency services department and other areas. Care will be taken to thoroughly examine instruments to be supplied through the generator circuit and ensure that they do not exceed generator capacity.
- A survey of the power supply revealed that there are voltage fluctuations of 10% or more, so voltage stabilizers will be installed on medical equipment that requires a stable power supply.

c) Trunk line/engine facilities

- Each department building will have an electricity diverter panel where electricity will be

supplied at 380V or 220V as needed.

- The power supply will be split into 3 systems (general, emergency generator and voltage stabilizing), creating a highly reliable power delivery system.

d) Lighting/outlet facilities

- Since the Cambodian side has no standards for brightness in each room, minimum values of JIS (Japanese Industrial Standard) will be used as targets to plan lighting. Fluorescent lighting will be used in lamps since it is inexpensive to replace locally.
- The plan calls for a standard of 1 outlet for every 1 or 2 beds, which is the current standard.
- Emergency lights with internal batteries will be set in critical rooms and corridors.

e) Communications facilities

- There are currently 3 fixed telephone lines. Wiring pipes will be installed in the new hospital at nurse stations and in offices and other important places. The Cambodian side will bear the installation of these telephone lines.
- Intercoms will be installed in each room thought to be critical for medical activities.
- Wiring will be strung through the X-ray control room and consultation rooms to create a Local Area Network (LAN) to accommodate the digital X-ray machine.
- Only the communications facilities newly constructed under this project are subject to this construction. Connecting them to existing facilities is not being considered.

f) Disaster management facilities

- There are no fire codes in the area, but fire warning facilities will be installed to satisfy minimum requirements. Japanese fire code will serve as the installation standard.

g) Lightning protection facilities

- Lightning strikes the area very often, so lightning rods will be installed to provide lightning protection for all buildings.

② Mechanical Facility Plan

a) Water supply facilities

- Digging new wells and drawing water from Preah Sihanouk Province public waterworks are two possible ways to provide a water supply, but water quality surveys showed that there was little difference in the quality of well water versus tap water. That said, only the tap water exceeded standard values for color, probably due to the aging of supply pipes. However, water mains are currently being updated through Japanese aid, so improvement is expected. Furthermore, public waterworks is clearly able to deliver a sufficient water supply. Well water, on the other hand, suffers no problems with quality, but excavating new wells is very risky because of the large number of rocks on the property. Thus, the tap will supply water for these facilities.
- Water mains run under the sidewalk at the northern end of the property. They split in front of the property, and water is drawn into a water receiving tank. The Cambodian side will handle construction from the split to the meter.
- Drawing water from existing supply pipes will be considered so that water from existing

wells can be used as a backup supply.

- The water receiving tank (85m^3) is constructed of highly safe FRP panels that enable inspection from all directions. The elevated water tank (three 2.5m^3 tanks for a total of 7.5m^3) is integrated and made of stainless steel, as many in the area are.
- Only facilities newly constructed under this project will receive water as a result of this construction. Supplying water to existing facilities will not be considered.

b) Drainage equipment

- Sewage and miscellaneous drainage from inside buildings leaves the buildings in separate pipes, merges together in the first sump outside the building and is carried via natural slope to a simple septic tank.
- Sediments separate inside the simple septic tank, and, after solid matter is disposed of, remaining fluids are pumped into the public sewer main.
- The public sewer main runs beneath the property but cannot be accessed directly because of the density of buildings illegally occupying the property, so the connection to the main is made beneath the sidewalk on the north end of the property.
- The Cambodian side will handle construction on the connection from the final sump on the property to the public sewer main.
- Developing fluid from the dark room in the imagery department is saved and disposed of by professional agencies; it is not released into the sewer.
- In principle, rainwater will be drained naturally through the ground.
- Only facilities newly constructed under this project will benefit from wastewater system construction. Wastewater for existing facilities will not be considered.

c) Hot water facilities

- Hot water will be provided through a localized system, with wall-mount electric instantaneous water heaters installed in necessary places.
- Hot water will be supplied in minor operation room, central sterilization room and delivery room.

d) Sanitary equipment

- Toilet basin, washbasin, utility sink and other sanitary equipment will be installed in toilets.
- Toilet basin will have handheld showers attached.
- Public toilets will have flush valves, and private toilets will have low tanks.

e) Fire control facilities

- There are no fire codes in the area, but fire extinguishers and indoor fire hydrants will be installed as a maintainable, minimum level of fire control on site. Japanese fire code will serve as the installation standard.
- Only facilities newly constructed under this project will benefit from construction of fire control facilities.

f) Medical gas facilities

- A central supply of oxygen will be available for the operation theatres, ICU, minor operation room, observation room and delivery room.

- Oxygen cylinders will be installed in the manifold room, and oxygen will be delivered through outlets in rooms that require oxygen. 2 banks will be installed for the cylinders, and switching between cylinders will be automatic.
- Systems will differ for the delivery room, which are set apart, and for operation theatres and other places in which oxygen is required. Cylinders and delivery pipes will be installed in the immediate area of the delivery room.

g) Air conditioning facilities

- In principle, the scope for air conditioning facilities will include rooms within existing facilities in which they are already installed. (Administration office, account, director room, director meeting room, deputy director rooms, pharmacy, pharmacy storage, minor operation room, observation room, ECG room, ultrasound room, X-ray room, control room, operation theatres, conference rooms, ICU, NCU, labor room, delivery rooms, 1 bed rooms, chief doctor rooms, doctor duty rooms, nurse duty rooms, midwife duty room)
- Machine rooms will be placed next to operation theatres, and packaged air-cooled floor units that blow through ducts will control air temperature. The air conditioners will force outside air into the system to create positive pressure indoors.
- Split air-cooled units will be installed in rooms other than operation theatres. To make it easy for the Cambodian side to update facilities in the future, wall-mount, household air conditioners will be selected for smaller rooms to the extent possible.

h) Ventilation facilities

- Ventilation facilities will be installed in toilets, shower rooms, storage and machine rooms.
- In principle, exhaust ventilation type will be used.
- Ceiling fans or wall-mount, rotating fans will be installed in living spaces that do not have air conditioning.

8) Construction Material Plans

In Cambodia, many construction materials are imported, but the main construction materials to be used are common in the country and can be easily and independently maintained in the future.

Table 2-12 and 2-13 are the main exterior and interior finishing materials.

Table 2-12 Exterior Finish

Parts	Finishing
Roof	Cement roof tile on steel beam and purlin, fiber cement board with asphalt roofing
Exterior Wall	Emulsion paint (EP) on mortar trowel (below GL+400), Washed gravel finish (above GL+400)
Doors & Windows	Colored Aluminum Sash

Table 2-13 Interior Finish

Rooms	Finishing			
	Floor	Base board	Wall	Ceiling
Entrance Hall	Non-slip ceramic tile	Ceramic tile	EP	EP
Consultation Room, Treatment Room, etc.	Ditto	Ditto	Ditto	Acoustic rockwool board
Offices, Wards, Nurse Station, etc.	Ditto	Ditto	Ditto	Ditto
Corridors, Stairs	Ditto	Ditto	Ditto	EP
Operation Theatre, Minor Operation Room, Delivery Room	Vinyl flooring sheet	Vinyl flooring sheet	Ceramic tile	Ditto
Utility, Toilet, Shower Room, etc.	Non-slip ceramic tile	Ceramic tile	Ceramic tile, EP above cross bar	Ditto
Medical Record Storage, Film Storage	Ditto	Ditto	EP	Acoustic rockwool board
Machine Room, Generator Room, Electric Room	Dust preventive resin	Dust preventive resin	Glasswool mat	EP (with glasswool above ceiling)
Water Tank Room	Ditto	Ditto	Mortar trowel	Exposed ceiling

(3) Equipment Plan

1) Investigating Request Details

Final request equipment organized through field surveys will be selected according to the CPA Guideline Standard Equipment List put forth by the MOH, and, in general, the details are relevant. However, another investigation of relevance was performed in Japan by setting the following selection criteria and adding investigations for each piece of equipment.

[Equipment Selection Criteria]

① Clinical equipment that conforms to the nature of activities and clinical levels at the target hospital.

② Equipment that is not likely to be used frequently or that has a low cost-benefit relationship is out of scope.

③ Equipment that is inexpensive or otherwise can be procured by the Cambodian side is out of scope.

④ Existing equipment and the equipment that overlaps with the request for other project is out of scope.

⑤ Equipment that does not easily conform to Japan's Grant Aid schemes (equipment that qualifies as consumable goods, equipment that can be used for other purposes, etc.) is out of scope.

In general, the investigation results supported the relevance of requested equipment, but the following are investigation results for equipment that requires especially careful investigations:

[Computed Radiographic (CR) systems that use general X-ray machines]

Currently, radiographic equipment is turning from mechanical to digital in many of the countries, not only in the developed world; digital X-ray machines are common even in neighboring Vietnam.

The digitization of diagnostic imaging has a multitude of advantages as described below, but it presents some troubling issues to Cambodia:

Advantages of Digitization

- Image processing is easy by using digital data, and it is possible to enlarge certain parts of images and highlight others for use in diagnosis, and it is also possible to some extent to revise images taken under less than ideal conditions to produce suitable images.
- In general, a dark room is not necessary because images can be processed under regular lighting, and handling cassettes (containers that act as screens to allow X-ray film to be carried into regular lighting) becomes easier.
- Images can be observed and conditions diagnosed via PC monitor, so there is no need to print images onto X-ray film, which can reduce running costs.
- Even when film is required, images are printed with a laser printer that uses a special dry film, so developing fluid is not necessary, nor is there any need to dispose of it after it is used, which is environmentally friendly.
- All images are digital and the data can be saved on hard disks and other media, so there is no

need to build film storage facilities.

- Data saved in radiology rooms can be shared with all medical departments via Local Area Network (LAN).
- Even medical institutions in areas that lack radiological diagnosis experts can send image data to central, specialized medical institutions over the Internet, which will help them make more precise diagnoses.

Common Concern Items

- Doctors who do diagnostic imaging are not used to interpreting images on a monitor.
- Operators need to learn new operating methods because it is a new system.
- A special film that differs from common X-ray film is required for printing, and there are concerns about the state of distribution in Cambodia

An investigation was performed on the above attributes, and troubling issues were analyzed. The results showed that Japanese products alone are already being used and CR systems have been set up in at least 5 locations in Phnom Penh, including Calmette Hospital and the private SOS Clinic, and use of such equipment is expected to become more and more common. The results also showed that consumable goods required by CR systems would be distributed without event and that operation did not require any special, complicated maneuvers. In short, the investigation and analysis revealed that the troubling issues are hardly troubling at all.

Thus, the aim of adopting CR systems rather than automatic developers under this project is considered relevant.

2) Planned Equipment

The above investigation resulted in the 91 planned equipment items shown below in Table 2-14.

Table 2-14 Equipment Allocation List

No.	Equipment	Total	Pediatric Department					General Medicine Ward					Surgery Ward					OB/GY Department									ER/ Outpatient Department						ICU/ Operation Theatre			Imagery Department				Central Sterilization Department		Pharmacy	ENT Department	Dental Department	Laboratory
			Consultation Room	NCU	Nurse Station	6 Beds Room	1 Bed Room	Consultation Room	Nurse Station	6 Beds Room	2 Beds Room	1 Bed Room	Consultation Room	Treatment Room	Nurse Station	6 Beds Room	2 Beds Room	1 Bed Room	Consultation Room	Treatment Room	Labor Room	Preparation Room	Delivery Room	Nurse Station	6 Beds Room	2 Beds Room	1 Bed Room	Triage & ER Consultation Room	Nurse Station	Emergency Hall	ECG Room	Minor Operation Room	Observation Room	Operation Theatre	Operation Hall	ICU (6beds)	X-Ray Room	Control Room	Dark Room	Ultrasound Room	Central Sterilization Room	Laundry				
	Number of rooms		1	1	1	4	2	1	1	3	2	2	1	1	1	3	1	2	1	1	1	1	1	1	3	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	–	–	–
1	Infant Incubator	1		1																																								
2	Syringe Pump	4		1	1																										1			1									
3	Infusion Pump	4		1	1																										1			1									
4	Suction Machine	12		1	2				2							1							1								2		2		1									
5	Diagnostic Instrument Set	4	1		1			1																			1																	
6	Patient Bed for Pediatric	6				6																																						
7	Baby Bed	3		3																																								
8	Examination Bed	8	1					1					1	1					1									1			1							1							
9	Examination Lamp	2	1											1																															
10	Intubation Set	4		1																											2		1										
11	Oxygen Cylinder Set	8			2				2						2									2																				
12	Examination Desk & Chair Set	5	1					1					1						1									1																	
13	Nebulizer	2		1	1																																							
14	Sphygmomanometer Set for Pediatric	3	1																					1							1													
15	Stethoscope	2	1		1																																							
16	Dressing Cart Set	7			1				1						1									1					1		2													
17	Scale Set for Pediatric	1	1																																									
18	Negatoscope	9	1					1					1						1									1				1		2			1							
19	Sterilizing Drum	17			2				2					1	2								2	2					2				4											
20	ECG	2							1																						1													
21	Patient Bed	91				18	2			18	4	2				18	0	2			4				18	4	1								2									
22	Stretcher	13			2				2						2									2						2					2		1							
23	Sphygmomanometer Set for Adult	8	1					1	1										1					2							1	1												
24	Minor surgery Instrument Set	5												2																	3													
25	Traction Set	2														2																												
26	Wheelchair	4													2													2																
27	Instrument Set of Plaster Remover	1												1																														
28	Instrument set for Osteosynthesis	1																																1										
29	Caesarean & Hysterectomy Set	1																					1																					
30	Caesarian Section Set	1																					1																					
31	CTG	1																					1																					
32	Delivery Bed	2																					2																					
33	Examination Table for OB/GY	1																		1																									
34	Examination Unit for OB/GY	1																		1																									
35	Resuscitator for Adult	5							1							1							1								1		1											
36	Resuscitator for Child	3			1																		1								1		1											
37	Resuscitator for Infant	5		1	1																		1								1		1											
38	Delivery Set	4																					4																					
39	Hand Scrub Unit	4																				1									1		2											
40	Consultation Obstetric and Gynecology Set	1																		1																									
41	Cervic Reparation Set	1																					1																					
42	Episiotomy and Perino Repair Set	1																					1																					
43	Tubal Legation Set for Abdominal	1																		1																									
44	Vacuum Extractor	1																					1																					
45	Scale for Infant	1																					1																					

No.	Equipment	Total	Pediatric Department					General Medicine Ward					Surgery Ward					OB/GY Department								ER/Outpatient Department				ICU / Operation Theatre			Imagery Department				Central Sterilization Department		Pharmacy	ENT Department	Dental Department	Laboratory
			Consultation Room	NCU	Nurse Station	6 Beds Room	1 Bed Room	Consultation Room	Nurse Station	6 Beds Room	2 Beds Room	1 Bed Room	Consultation Room	Treatment Room	Nurse Station	6 Beds Room	2 Beds Room	1 Bed Room	Consultation Room	Treatment Room	Labor Room	Preparation Room	Delivery Room	Nurse Station	6 Beds Room	2 Beds Room	1 Bed Room	Triage & ER Consultation Room	Nurse Station	Emergency Hall	ECG Room	Minor Operation Room	Observation Room	Operation Theatre	Operation Hall	ICU (6beds)	X-Ray Room	Control Room	Dark Room	Ultrasound Room	Central Sterilization Room	Laundry				
	Number of Rooms		1	1	1	4	2	1	1	3	2	2	1	1	1	3	1	2	1	1	1	1	1	1	3	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	–	–	–
46	Scale for Adult (Weight and Height)	3						1											1									1																	
47	Denudating Set	2																	1													1													
48	Abortion Set	1																		1																									
49	Wash Basin Set	3																					1										2											
50	Operating Table	1																															1										
51	Operating Light (Ceiling Mount Type)	2																															2										
52	Anesthesia Machine	1																															1										
53	Patient Monitor	3																													1	1	1										
54	Electro Surgical Unit	1																															1										
55	Operation Theater Cart Set	2																															2										
56	Anesthesia Table	2																															2										
57	Defibrillator	2																													1		1										
58	Laparotomy Set	2																															2										
59	Amputation Set	1																															1										
60	Orthopedic Instrument Set	1																															1										
61	Urology Set	1																															1										
62	Blood Warmer	2																															2										
63	Air Tourniquet	1																															1										
64	Instrument Set for FESS	1																																							1			
65	Nerve Stimulator	1																															1										
66	Respirator Set	1																													1												
67	Emergency Bed	5																													5												
68	ICU Bed	6																																	6								
69	Operating Light (Mobile Type)	4																					2								2												
70	Irrigator Stand	23							7						4									6							2	2	2										
71	X-ray Diagnostic System	1																																		1								
72	CR System	1																																			1							
73	C-arm	1																															1										
74	X-ray Accessories Set	1																																			1							
75	Dark Room Equipment Set	1																																				1						
76	Dental X-ray Automatic film processor	1																																								1		
77	Dental X-ray	1																																								1		
78	Sterilizer for CSD	1																																						1				
79	Dry Sterilizer	1																																						1				
80	Working Table	1																																						1				
81	Shelves	2																																						1		1			
82	Washing Machine	1																																							1				
83	Dryer Machine	1																																							1				
84	Refrigerator for Pharmacy	1																																								1			
85	FESS	1																																									1		
86	Autoclave (Table Top Type)	1																																									1		
87	Spectrophotometer	1																																										1	
88	Hematology Analyzer	1																																									1	
89	Incubator	1																																									1	
90	Hematocrit Centrifuge	1																																									1	
91	Blood Bank Refrigerator	1																																									1	

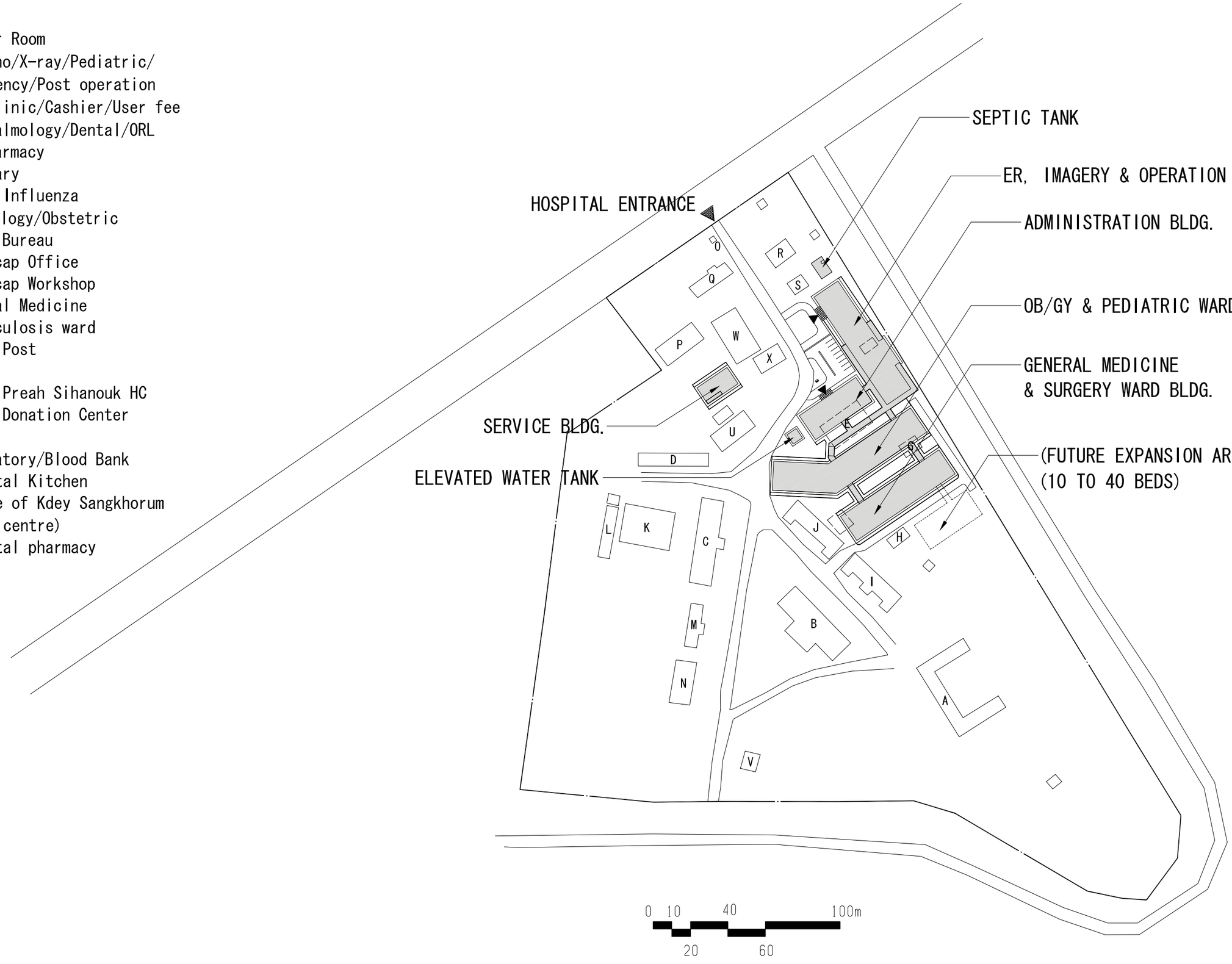
2-2-3 Outline Design Drawing

Table 2-15 Outline Design Drawing List

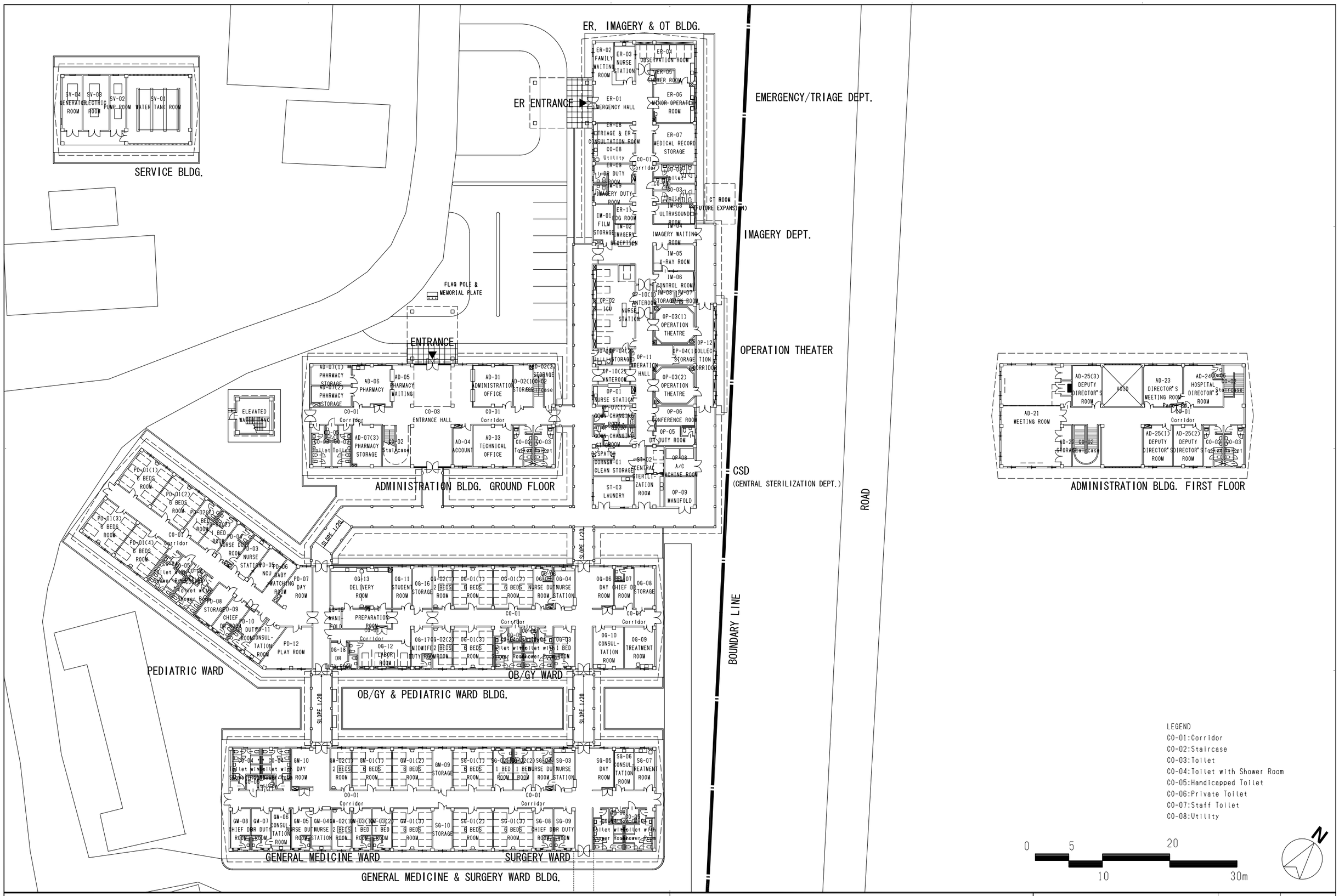
No.	Building Name	Drawing Name	Scale
A-1	Overall Site	Site Plan	1/2,000
A-2	Overall New Buildings	Ground Floor & First Floor Plan	1/500
A-3	Administration Building	Ground Floor & First Floor Plan	1/200
A-4	Administration Building	Elevation	1/200
A-5	Administration Building	Section	1/200
A-6	Emergency, Imagery & Operation Building	Ground Floor Plan	1/200
A-7	Emergency, Imagery & Operation Building	Elevation (1)	1/200
A-8	Emergency, Imagery & Operation Building	Elevation (2)	1/200
A-9	OB/GY & Pediatric Ward Building	Ground Floor Plan (1)	1/200
A-10	OB/GY & Pediatric Ward Building	Ground Floor Plan (2)	1/200
A-11	OB/GY & Pediatric Ward Building	Elevation (1)	1/200
A-12	OB/GY & Pediatric Ward Building	Elevation (2)	1/200
A-13	General Medicine & Surgery Ward Building	Ground Floor Plan	1/200
A-14	General Medicine & Surgery Ward Building	Elevation (1)	1/200
A-15	General Medicine & Surgery Ward Building	Elevation (2) & Section	1/200
A-16	Service Building	Plan & Elevation	1/200
A-17	Emergency, Imagery & Operation Building	Medical Equipment Layout Plan (1)	1/200
A-18	Administration Building and Wards	Medical Equipment Layout Plan (2)	1/300

LEGEND

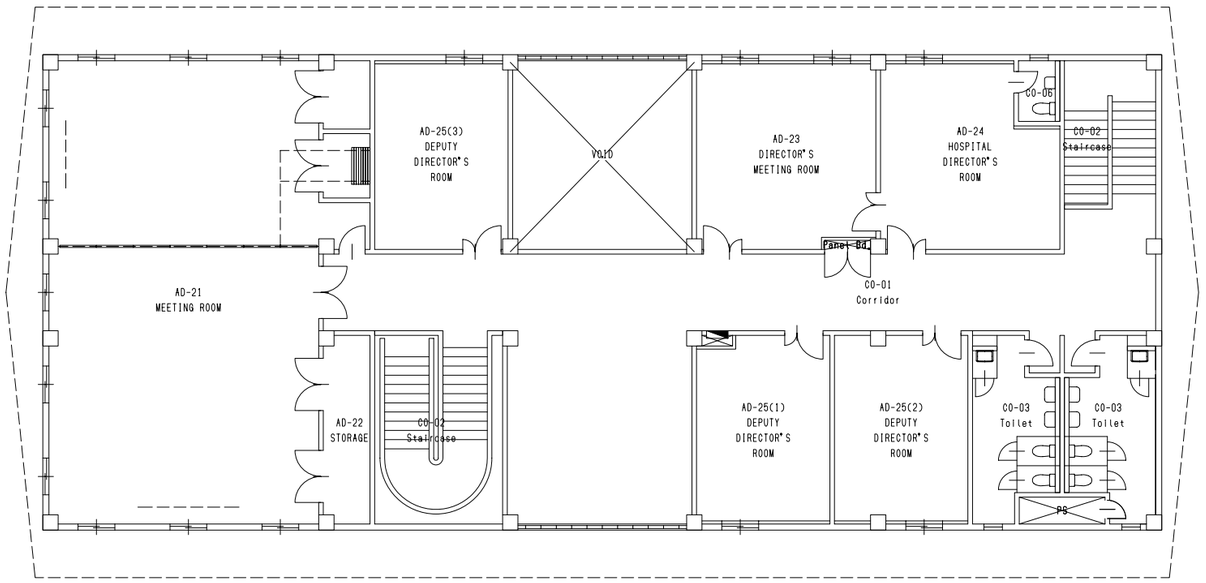
A- Worker Room
B- OT/Echo/X-ray/Pediatric/
Emergency/Post operation
C- STD Clinic/Cashier/User fee
D- Ophthalmology/Dental/ORL
E- OD Pharmacy
G- Mortuary
H- Avian Influenza
I- Gynecology/Obstetric
J- Admin Bureau
K- Handicap Office
L- Handicap Workshop
M- General Medicine
N- Tuberculosis ward
O- Guard Post
P- MCH
Q- Krong Preah Sihanouk HC
R- Blood Donation Center
S- VCCT
U- Laboratory/Blood Bank
V- Hospital Kitchen
W- Centre of Kdey Sangkhorum
(Hope centre)
X- Hospital pharmacy



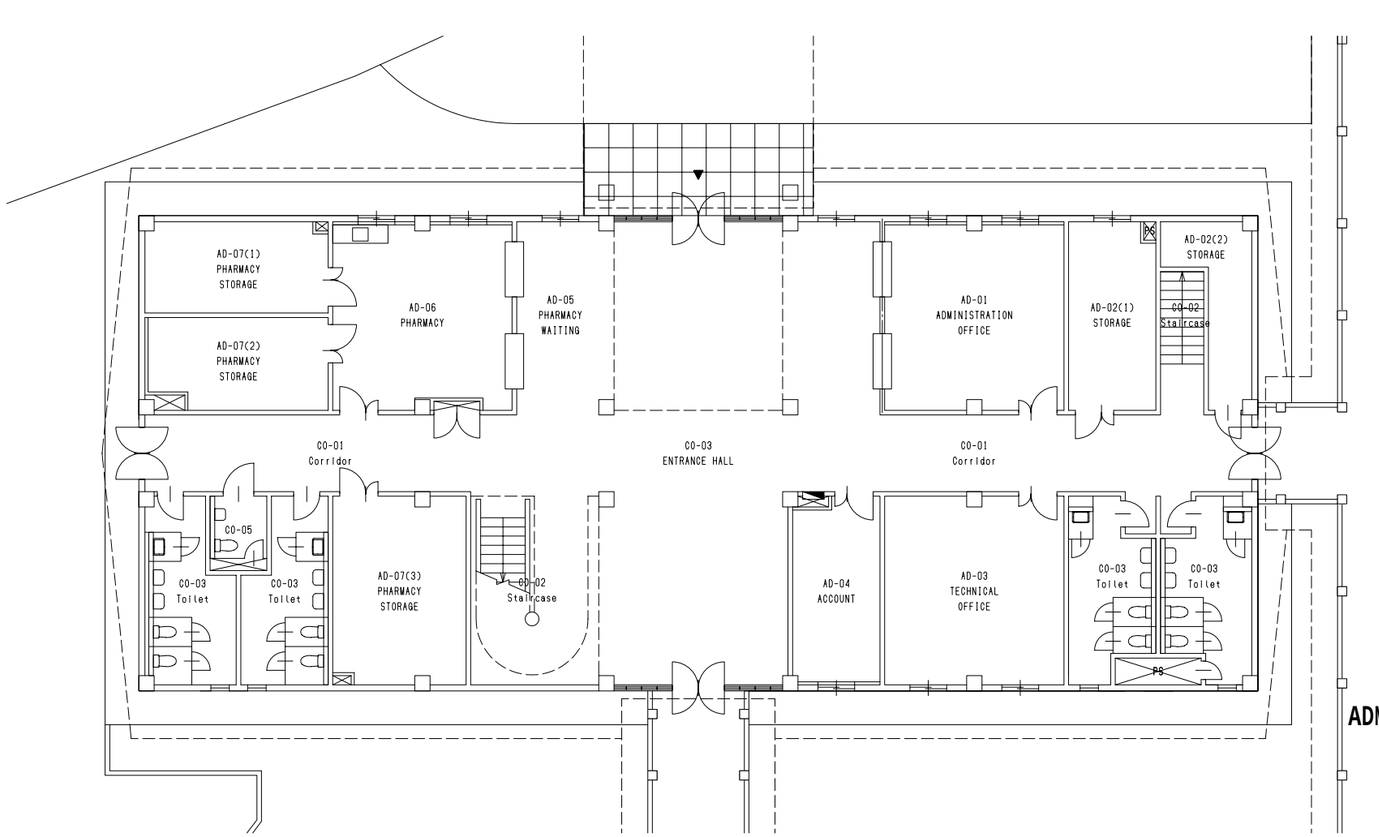
		PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME	DRAWING No. A — 1
		SITE PLAN	Scale A3:1/2000 A1:1/1000 / Date JAN 2013	JOB No.



PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME		DRAWING No. A — 2
GROUND FLOOR & 1ST FLOOR PLAN	Scale A3:1/500 A1:1/250	Date JAN 2013	JOB No.



ADMINISTRATION BLDG.
FIRST FLOOR



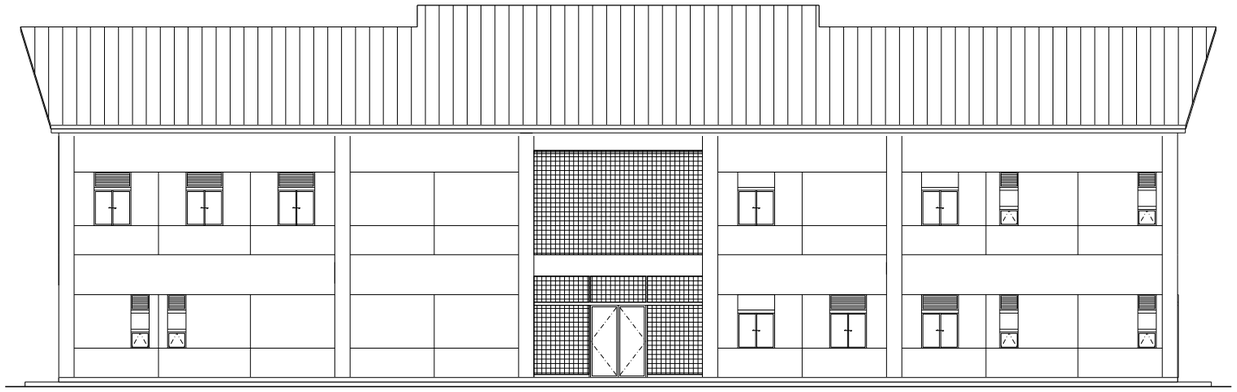
0 10m
5m

ADMINISTRATION BLDG.
GROUND FLOOR

LEGEND
CO-01:Corridor
CO-02:Staircase
CO-03:Toilet
CO-04:Toilet with Shower Room
CO-05:Handicapped Toilet
CO-06:Private Toilet
CO-07:Staff Toilet
CO-08:Utility

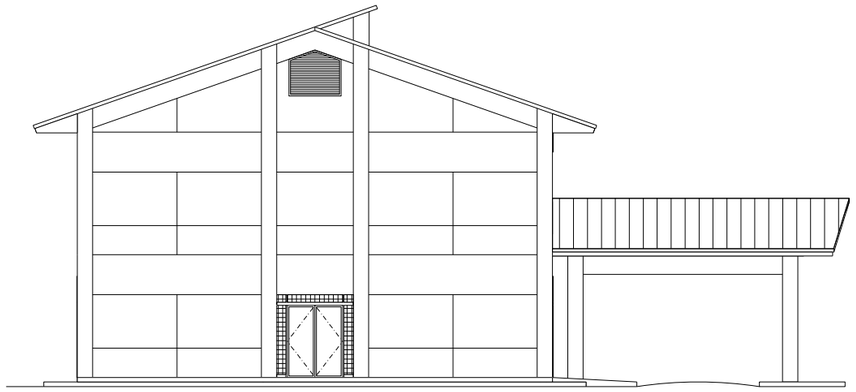
N

PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME ADMINISTRATION BUILDING		DRAWING No. A — 3
GROUND FLOOR AND FIRST FLOOR PLAN	Scale A3:1/200 A1:1/100	Date JAN 2013	JOB No.



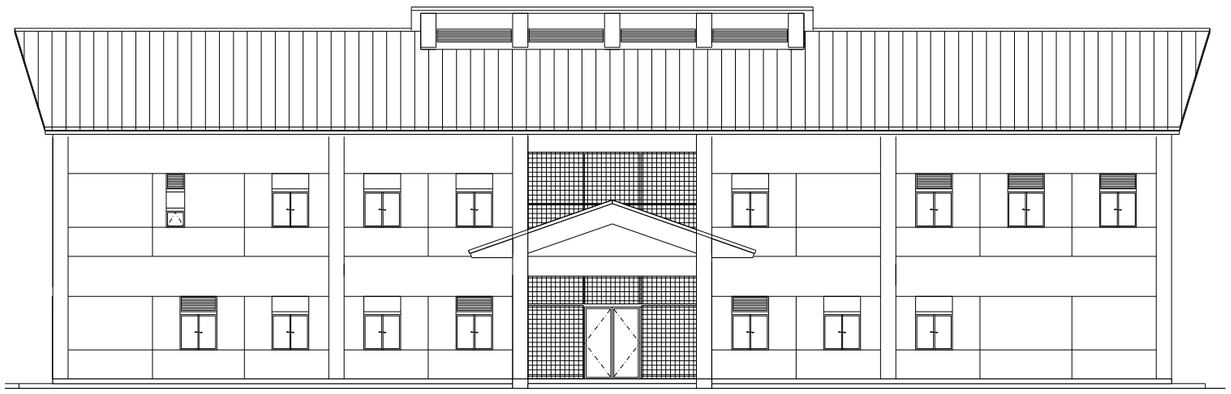
ADMINISTRATION BLDG.

AD SOUTH ELEVATION 1:200



ADMINISTRATION BLDG.

AD EAST ELEVATION 1:200

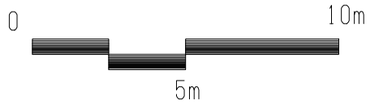


ADMINISTRATION BLDG.

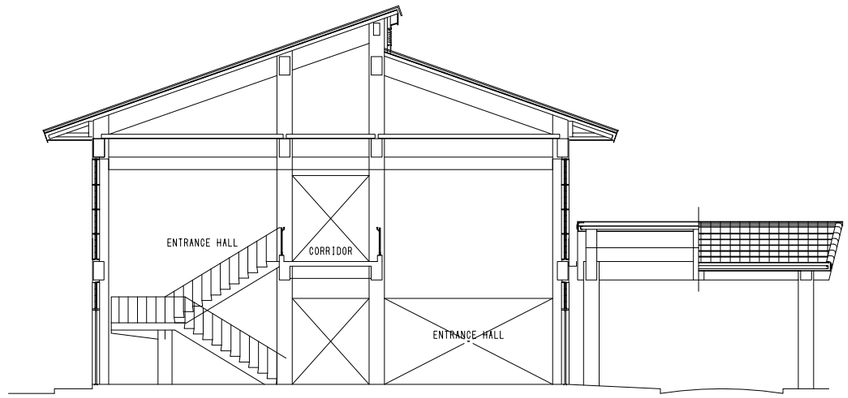
AD NORTH ELEVATION 1:200

ADMINISTRATION BLDG.

AD WEST ELEVATION 1:200



PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: ADMIN BLDG.		DRAWING No.: A — 4
ELEVATION	Scale: A3:1/200 A1:1/100	Date: JAN 2013	JOB No.



ADMINISTRATION BLDG.

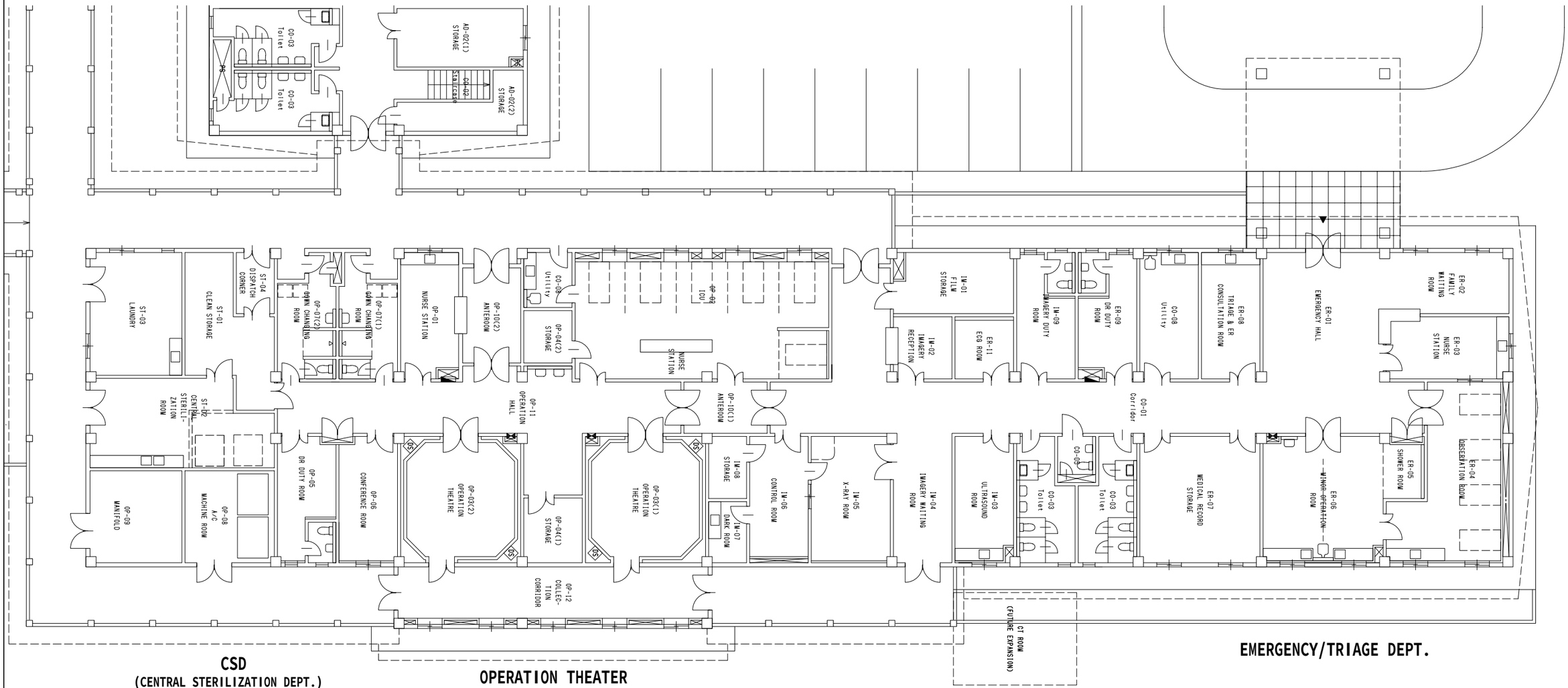
SECTION 1:200

0 10m

5m

AZUSA SEKKEI
Architects,Engineers & Consultants

PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME ADMIN BLDG.		DRAWING No. A — 5
SECTION	Scale A3:1/200 A1:1/100	Date JAN 2013	JOB No.



ER, IMAGERY & OPERATION BLDG.

LEGEND
CO-01:Corridor
CO-02:Staircase
CO-03:Toilet
CO-04:Toilet with Shower Room
CO-05:Handicapped Toilet
CO-06:Private Toilet
CO-07:Staff Toilet
CO-08:Utility

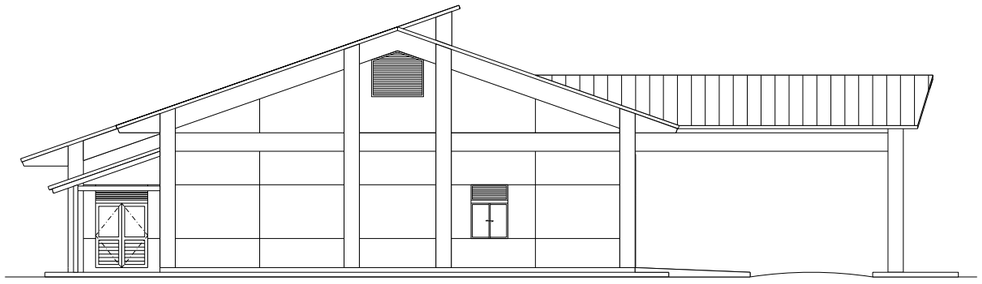
0 10m
5m

N

PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME ER, IMAGERY & OPERATION BLDG.		DRAWING No. A — 6
GROUND FLOOR PLAN	Scale A3:1/200 A1:1/100	Date JAN 2013	JOB No.

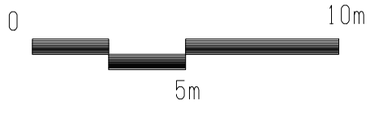
ER,IMAGERY & OPERATION BLDG.

ER/IM/OP SOUTH ELEVATION 1:200

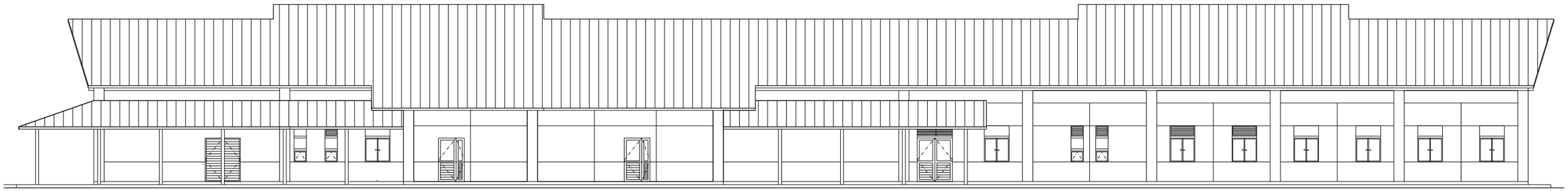


ER,IMAGERY & OPERATION BLDG.

ER/IM/OP NORTH ELEVATION 1:200

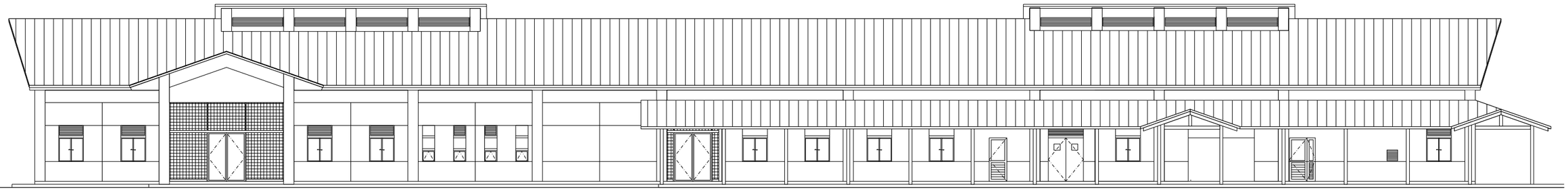


		PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: ER, IMAGERY & OP BLDG. / DRAWING No.: A — 7
		ELEVATION 1	Scale: A3:1/200 A1:1/100 / Date: JAN 2013 / JOB No.



ER,IMAGERY & OPERATION BLDG.

ER/IM/PO EAST ELEVATION 1:200



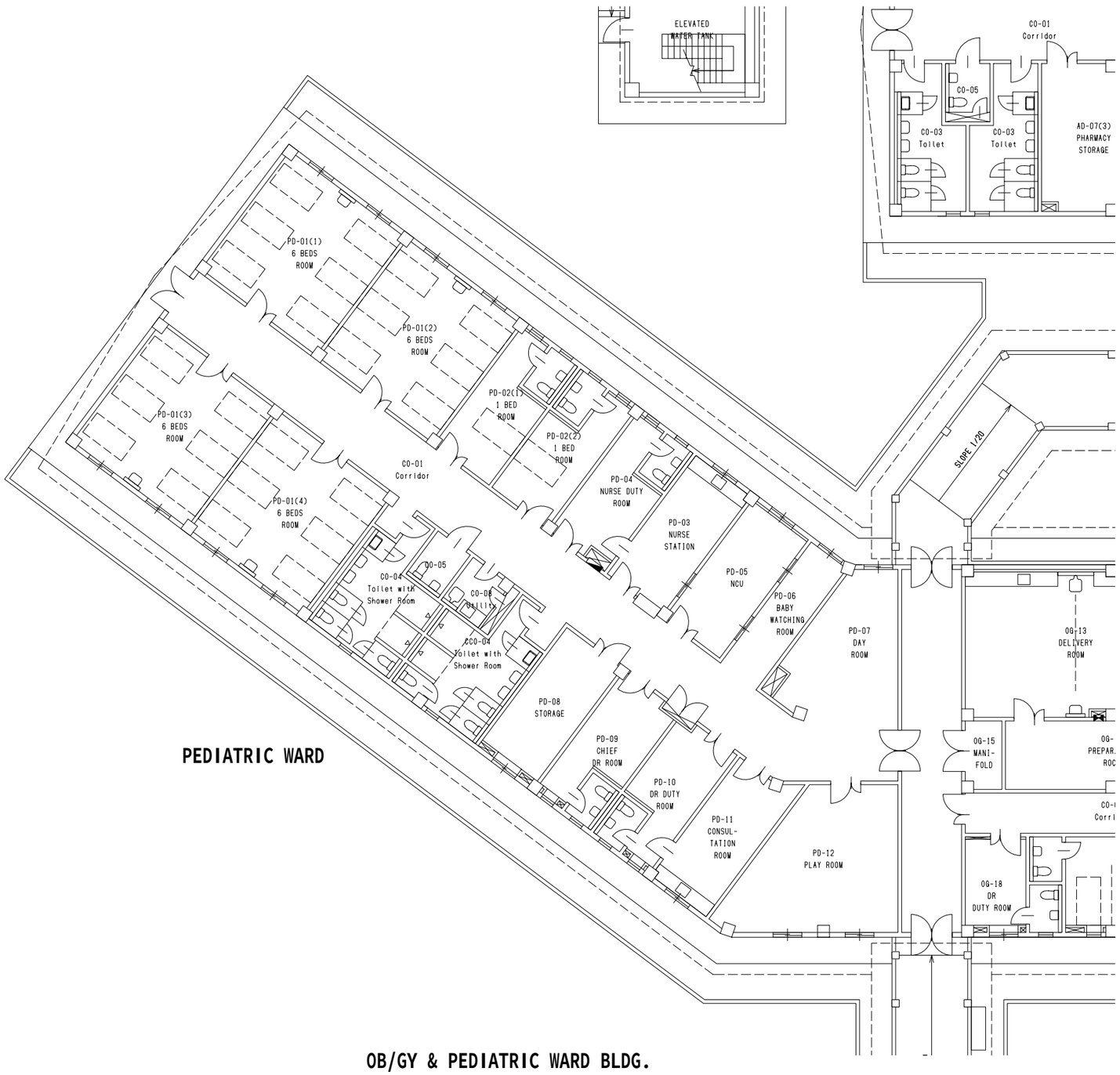
ER,IMAGERY & OPERATION BLDG.

ER/IM/OP WEST ELEVATION 1:200

0 10m

5m

		PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: ER, IMAGERY & OP BLDG. / DRAWING No.: A — 8
		ELEVATION 2	Scale: A3:1/200 A1:1/100 / Date: JAN 2013 / JOB No.



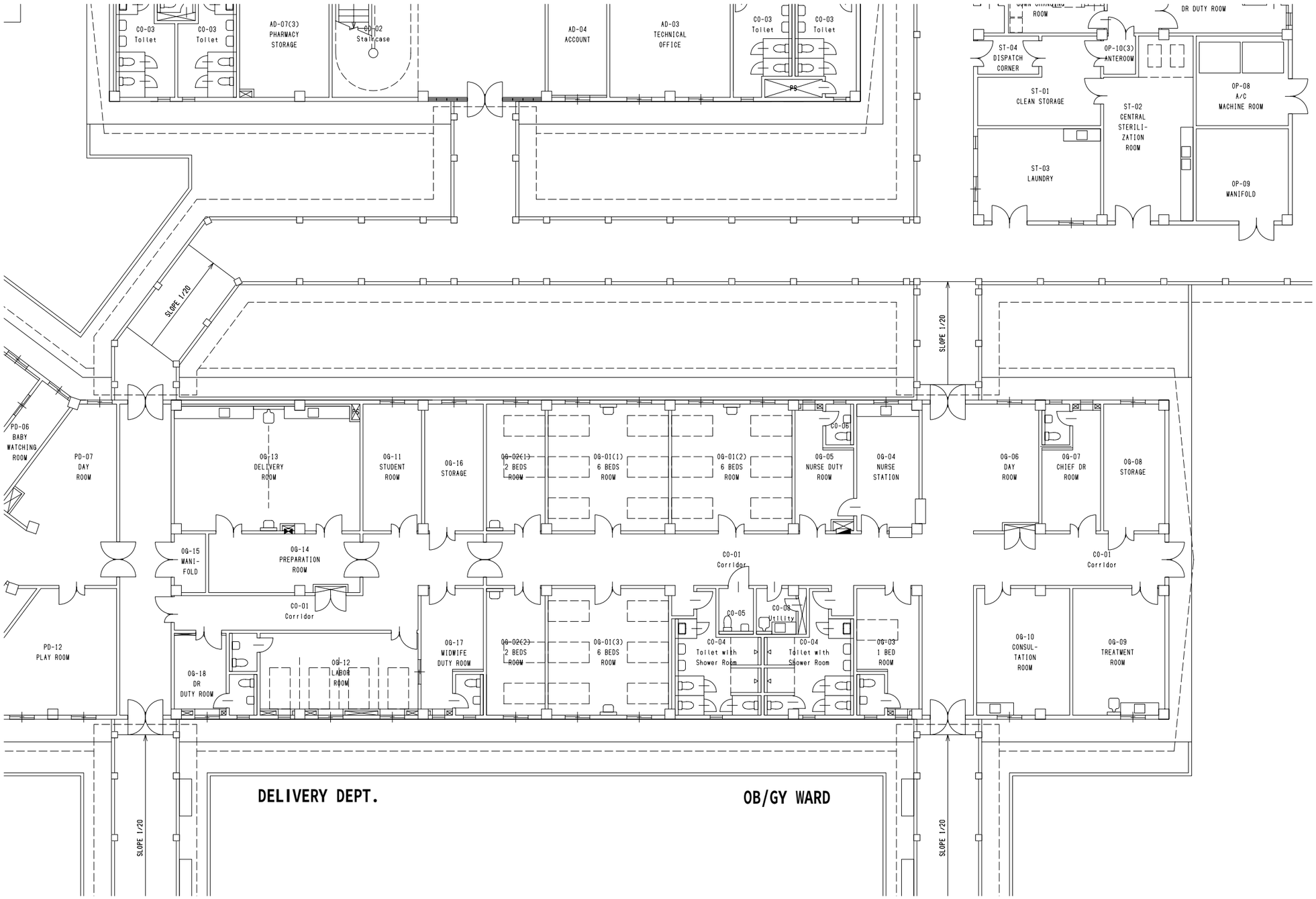
0 10m
5m

OB/GY & PEDIATRIC WARD BLDG.

LEGEND
CO-01:Corridor
CO-02:Staircase
CO-03:Toilet
CO-04:Toilet with Shower Room
CO-05:Handicapped Toilet
CO-06:Private Toilet
CO-07:Staff Toilet
CO-08:Utility

N

		PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: OB/GY & PEDIATRIC WARD BLDG. / DRAWING No.: A — 9
		GROUND FLOOR PLAN (1)	Scale: A3:1/200 A1:1/100 / Date: JAN 2013 / JOB No.



0 10m

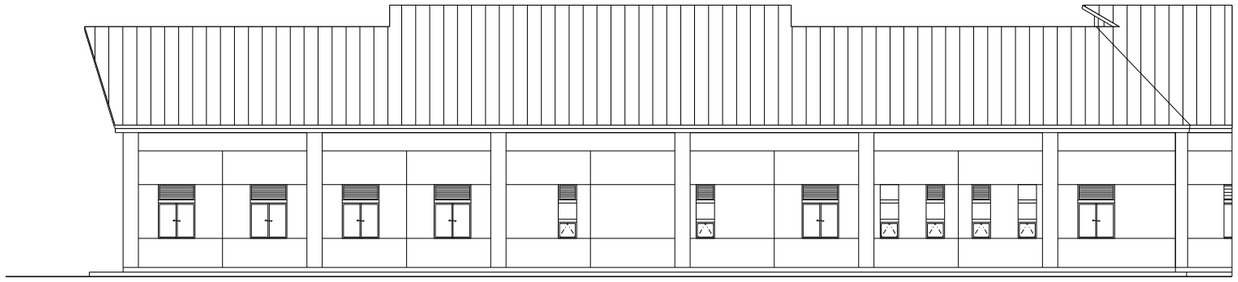
5m

OB/GY & PEDIATRIC WARD BLDG.

LEGEND
CO-01:Corridor
CO-02:Staircase
CO-03:Toilet
CO-04:Toilet with Shower Room
CO-05:Handicapped Toilet
CO-06:Private Toilet
CO-07:Staff Toilet
CO-08:Utility

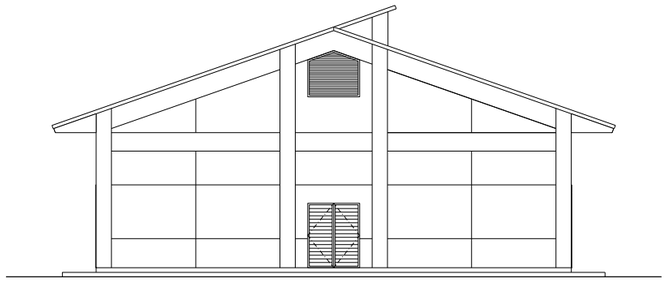
N

PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: OB/GY & PEDIATRIC WARD BLDG.		DRAWING No.: A — 10
GROUND FLOOR PLAN	Scale: A3:1/200 A1:1/100	Date: JAN 2013	JOB No.



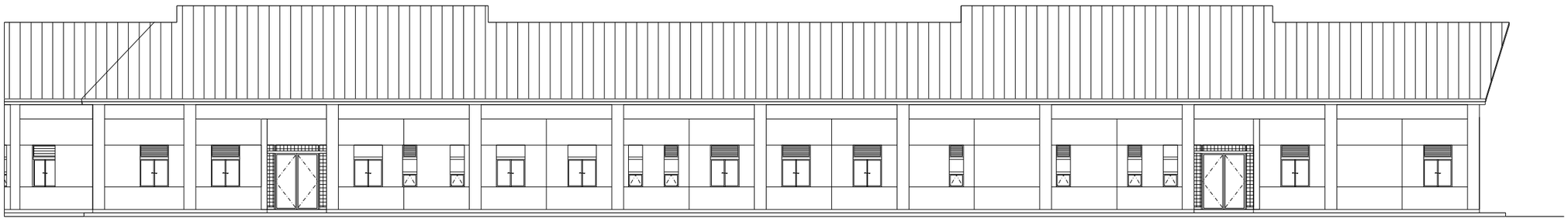
OB/GY & PEDIATRIC WARD BLDG.

OB/GY&PED SOUTH ELEVATION1　1:200



OB/GY & PEDIATRIC WARD BLDG.

OB/GY&PED EAST ELEVATION　1:200



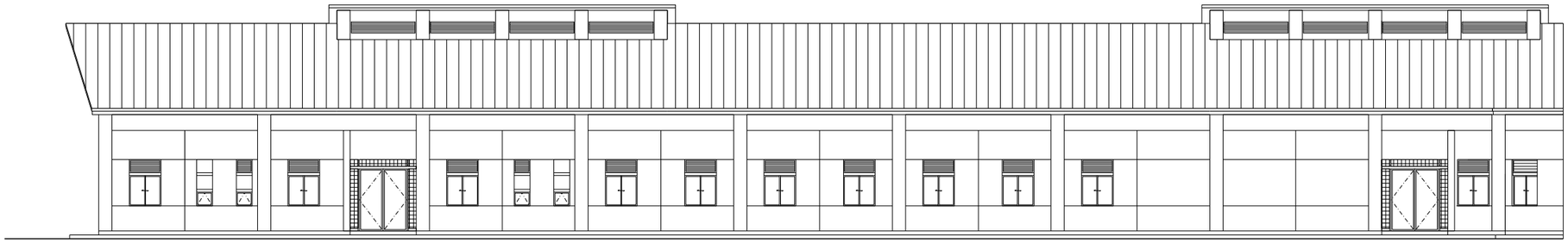
OB/GY & PEDIATRIC WARD BLDG.

OB/GY&PED SOUTH ELEVATION2　1:200

0　10m

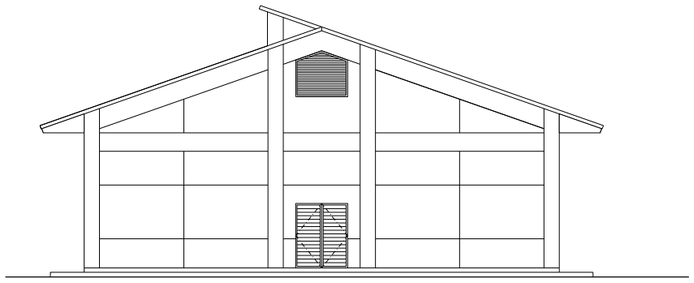
5m

		PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME OB/GY & PEDIATRIC BLDG.	DRAWING No. A — 11
		ELEVATION 1	Scale A3:1/200 A1:1/100 / Date JAN 2013	JOB No.



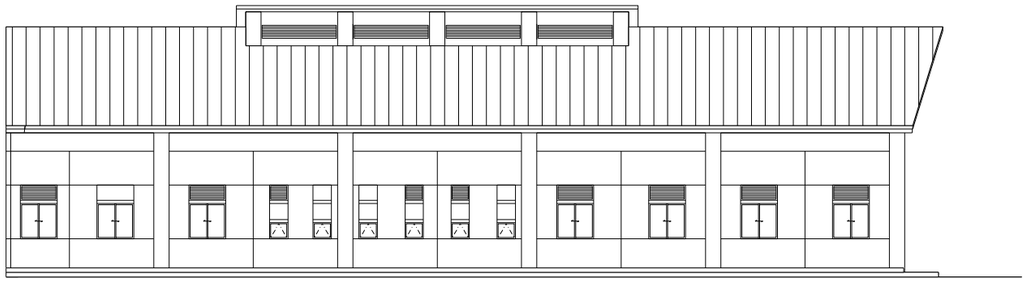
OB/GY & PEDIATRIC WARD BLDG.

OB/GY&PED NORTH ELEVATION2　1:200



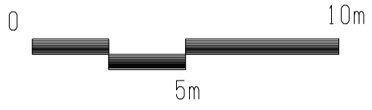
OB/GY & PEDIATRIC WARD BLDG.

OB/GY&PED WEST ELEVATION　1:200

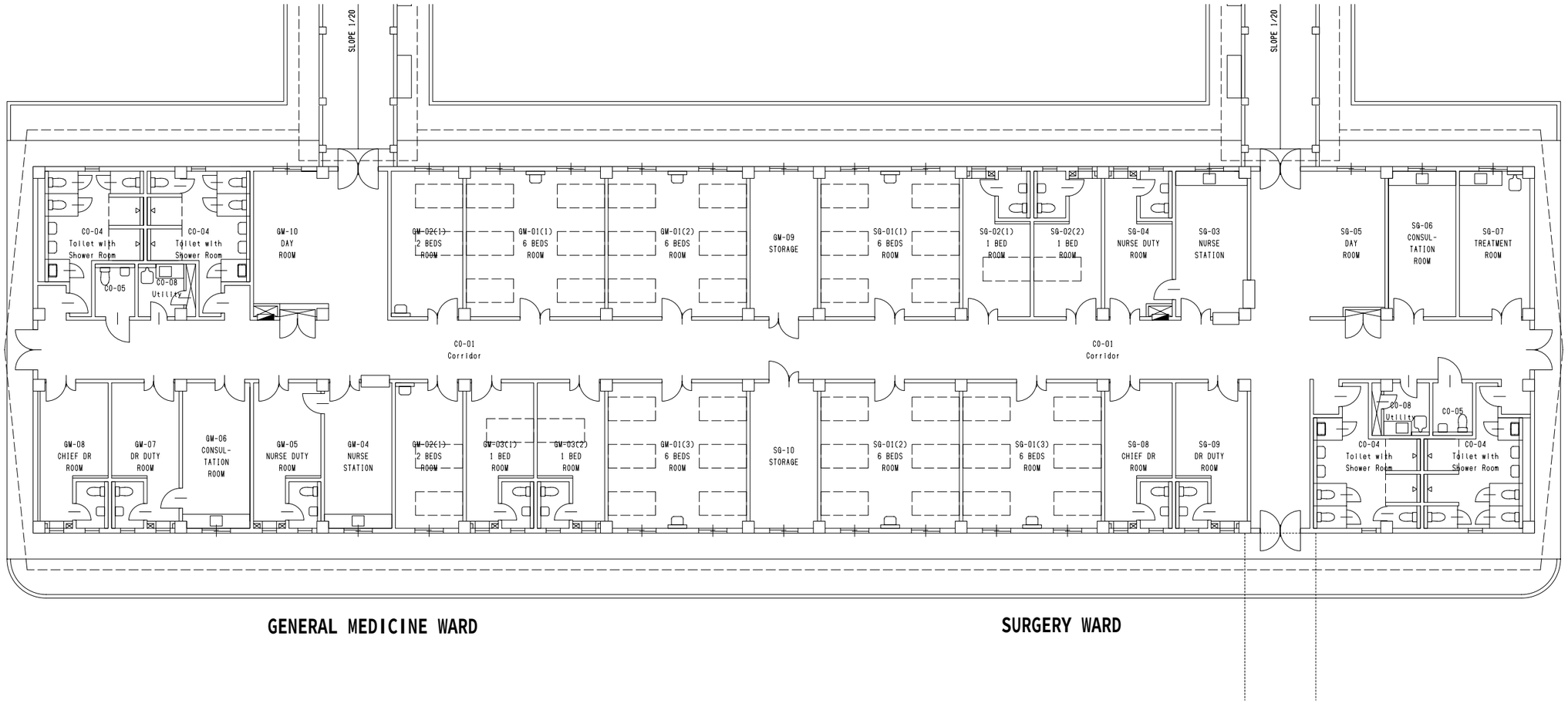


OB/GY & PEDIATRIC WARD BLDG.

OB/GY&PED NORTH ELEVATION1　1:200



PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME OB/GY & PEDIATRIC BLDG.		DRAWING No. A — 12
ELEVATION 2	Scale A3:1/200 A1:1/100	Date JAN 2013	JOB No.



GENERAL MEDICINE WARD **SURGERY WARD**

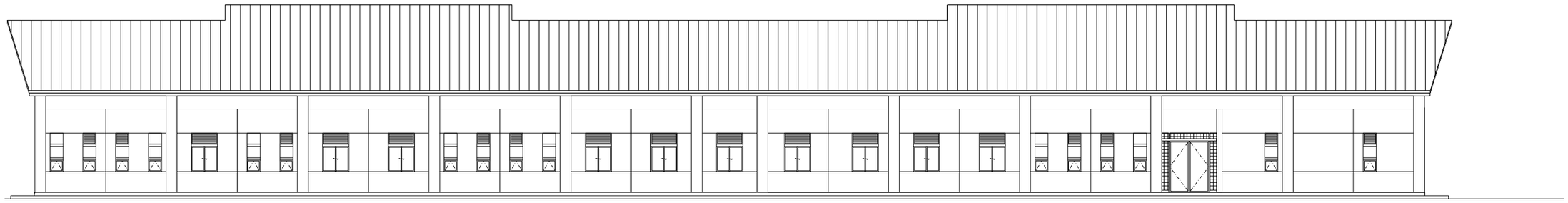
GENERAL MEDICINE & SURGERY WARD BLDG.

LEGEND
CO-01:Corridor
CO-02:Staircase
CO-03:Toilet
CO-04:Toilet with Shower Room
CO-05:Handicapped Toilet
CO-06:Private Toilet
CO-07:Staff Toilet
CO-08:Utility

0 5m 10m

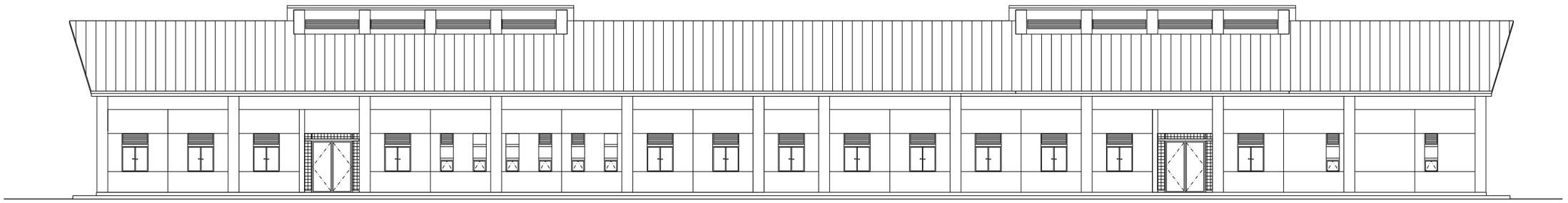
N

PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME GENERAL MEDICINE & SURGERY WARD BLDG.		DRAWING No. A — 13
GROUND FLOOR PLAN	Scale A3:1/200 A1:1/100	Date JAN 2013	JOB No.



GENERAL MEDICINE & SURGERY WARD BLDG.

SG&GM SOUTH ELEVATION 1:200



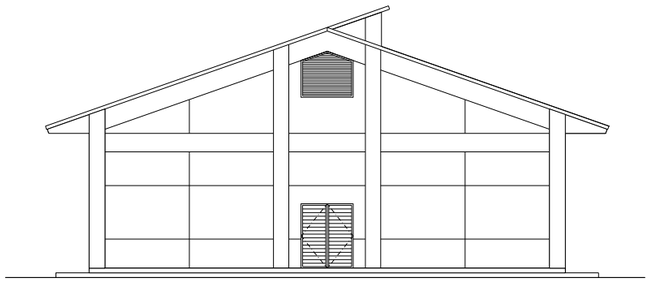
GENERAL MEDICINE & SURGERY WARD BLDG.

SG&GM NORTH ELEVATION 1:200

0 10m

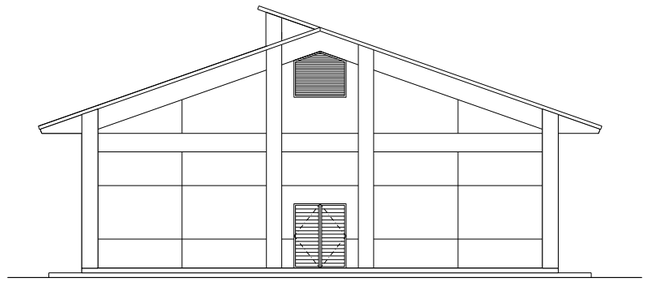
5m

	PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: GENERAL MED. & SURGERY BLDG.	DRAWING No.: A — 14
	ELEVATION 1	Scale: A3:1/200 A1:1/100 / Date: JAN 2013	JOB No.:



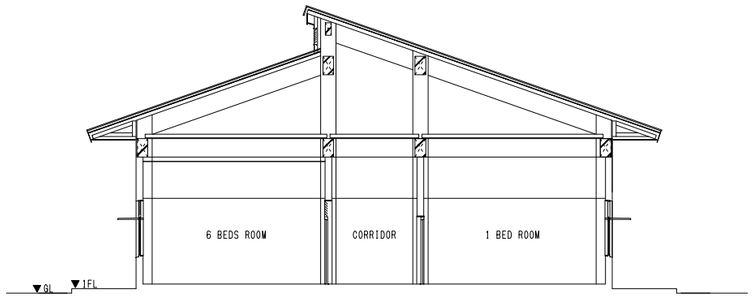
GENERAL MEDICINE & SURGERY WARD BLDG.

SG&GM EAST ELEVATION 1:200



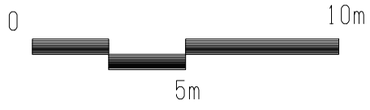
GENERAL MEDICINE & SURGERY WARD BLDG.

SG&GM WEST ELEVATION 1:200

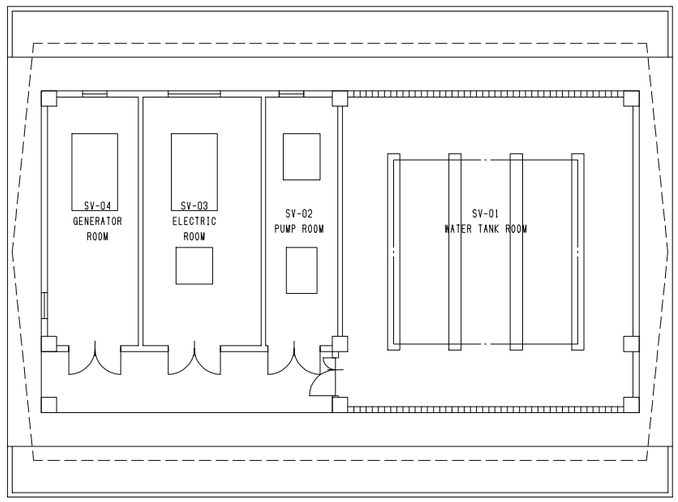


GENERAL MEDICINE & SURGERY WARD BLDG.

SG&GM SECTION 1:200

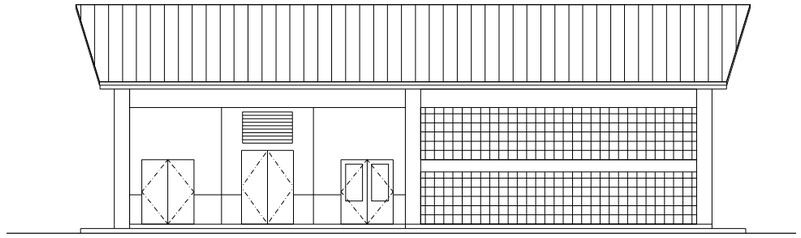


PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: GENERAL MED. & SURGERY BLDG.		DRAWING No.: A — 15
ELEVATION 2 & SECTION	Scale: A3:1/200 A1:1/100	Date: JAN 2013	JOB No.



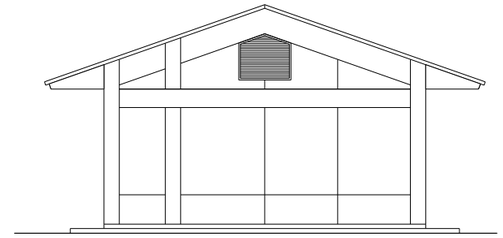
SERVICE BLDG.

SV PLAN 1:200



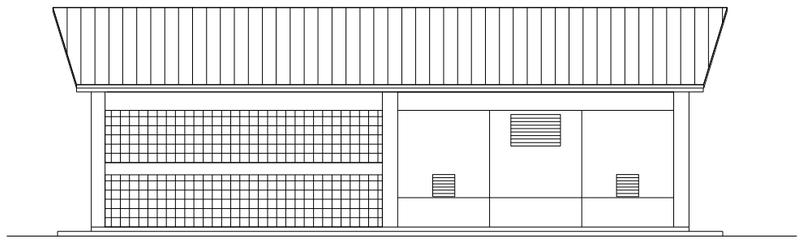
SERVICE BLDG.

SV SOUTH ELEVATION 1:200



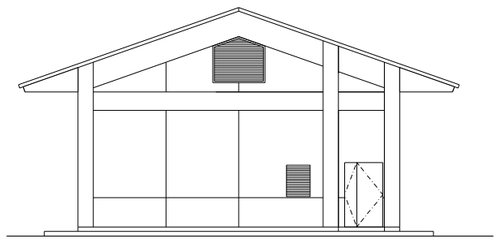
SERVICE BLDG.

SV EAST ELEVATION 1:200



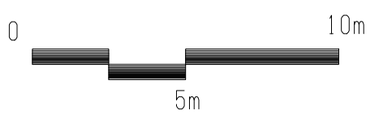
SERVICE BLDG.

SV NORTH ELEVATION 1:200

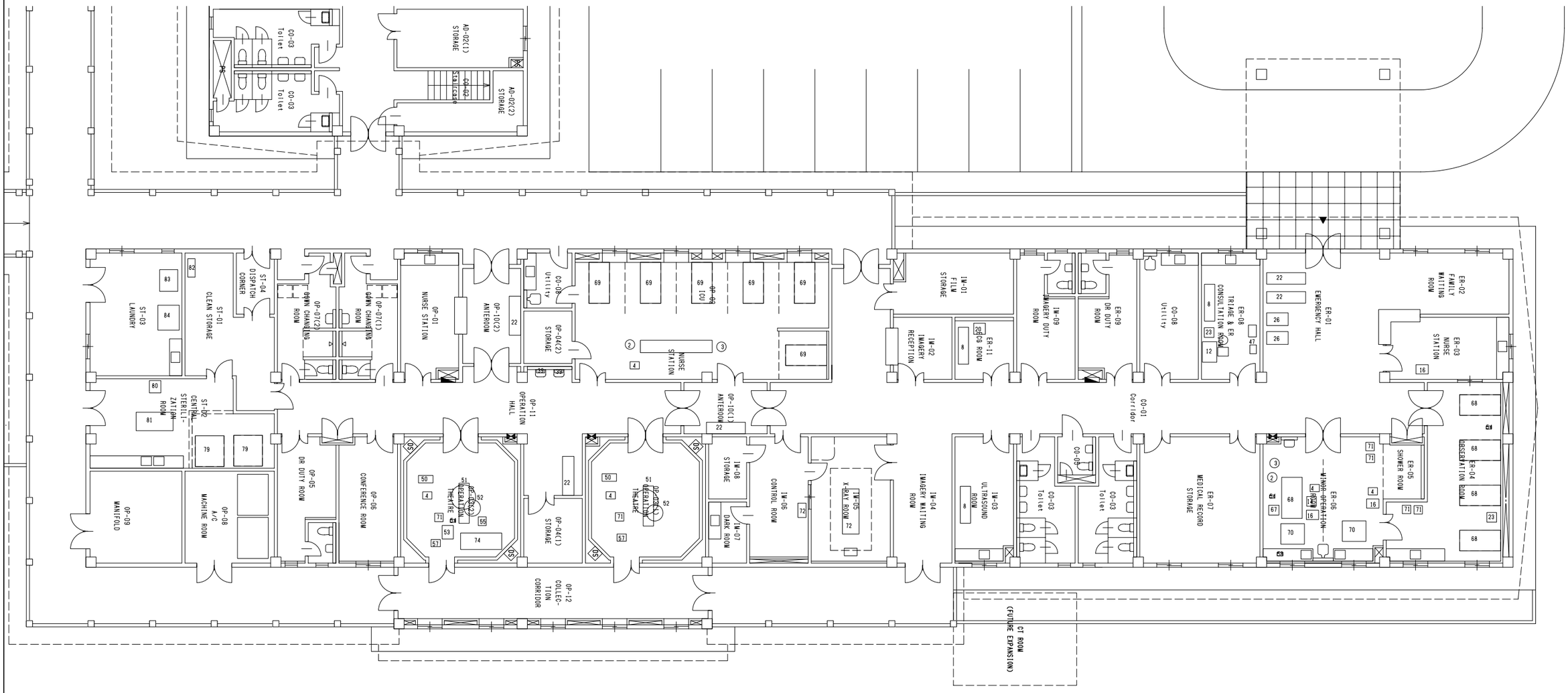


SERVICE BLDG.

SV WEST ELEVATION 1:200



PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: SERVICE BLDG.		DRAWING No.: A — 16
PLAN & ELEVATION	Scale: A3:1/200 A1:1/100	Date: JAN 2013	JOB No.



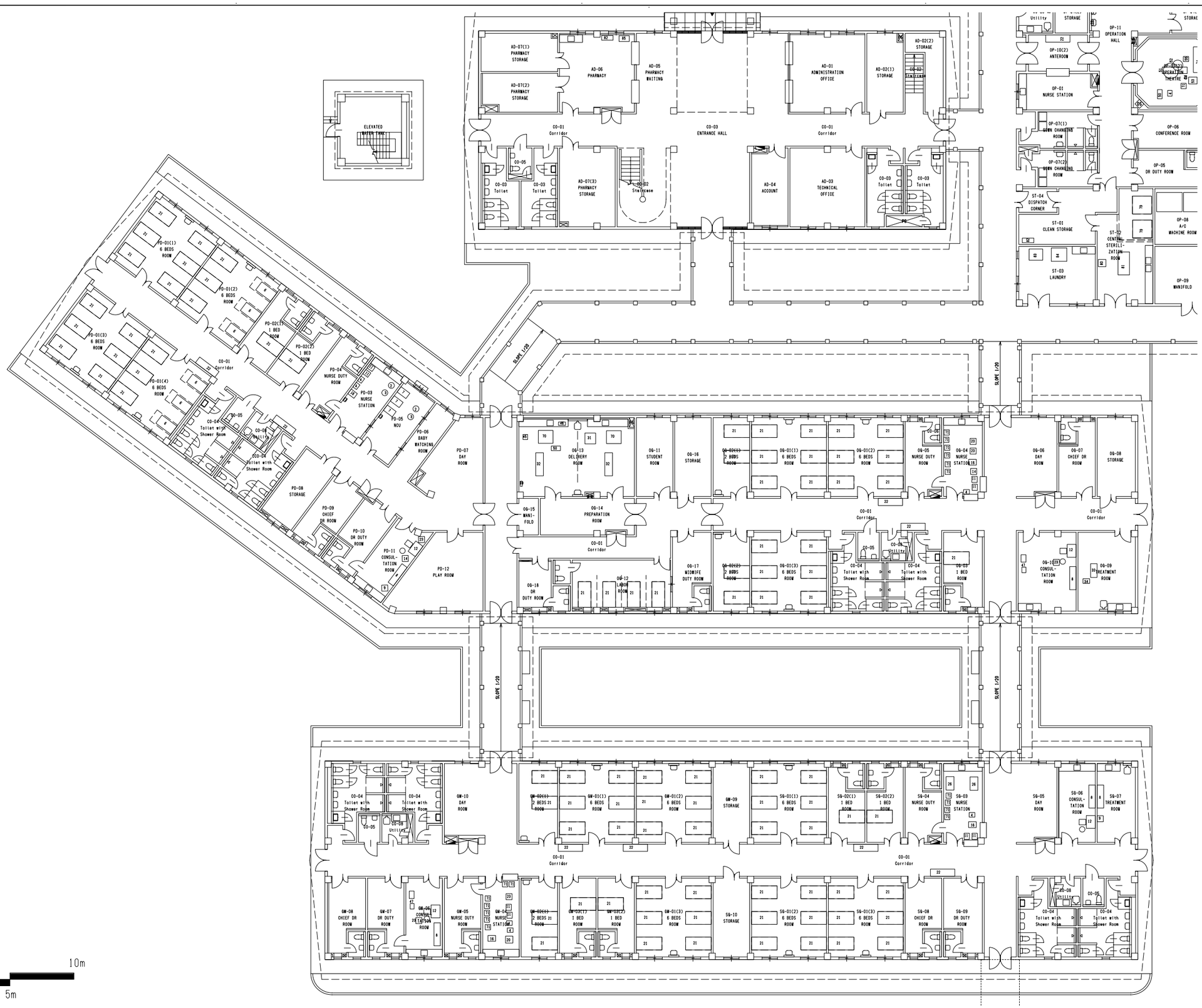
0 10m

5m

LEGEND
CO-01:Corridor
CO-02:Staircase
CO-03:Toilet
CO-04:Toilet with Shower Room
CO-05:Handicapped Toilet
CO-06:Private Toilet
CO-07:Staff Toilet
CO-08:Utility

N

PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME ER, IMAGERY & OPERATION BLDG.		DRAWING No. A — 17
MEDICAL EQUIPMENT LAYOUT PLAN (1)	Scale A3:1/200 A1:1/100	Date JAN 2013	JOB No.



LEGEND
CO-01:Corridor
CO-02:Staircase
CO-03:Toilet
CO-04:Toilet with Shower Room
CO-05:Handicapped Toilet
CO-06:Private Toilet
CO-07:Staff Toilet
CO-08:Utility

PROJECT FOR IMPROVEMENT OF SIHANOUK PROVINCE REFERRAL HOSPITAL IN THE KINGDOM OF CAMBODIA	BUILDING NAME: ADMIN. BLDG. WARD BLDGs		DRAWING No.: A — 18
MEDICAL EQUIPMENT LAYOUT PLAN (2)	Scale: A3:1/300 A1:1/150	Date: JAN 2013	JOB No.

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The elements of this project include facility construction work, supply and installation of equipment, and the scope of cooperation regarding to the project undertaken by the Japanese side will be implemented according to the framework of Japan's Grant Aid. Implementation of this plan shall be initiated officially only after it is approved by the Governments of both countries and the exchange of notes (E/N) and the grant agreement (G/A) is signed. Immediately after signing of the E/N and the G/A, the Cambodian organization that is responsible for implementation of this project and the Japanese consultant firms shall enter a contract and initiate the detail design work of the project. When the design is completed, the Japanese construction companies and equipment supply and installation companies participate in the tender for their works. The successful tenderers for construction of facilities and supply and installation of the equipment proceed to their work. The basic principles and items to be proposed for implementation of this project are described below.

1) Implementing Organizations

The implementing organization in the project is the Ministry of Health (MOH) in Cambodia, and the Preah Sihanouk Provincial Health Department (PHD) and the Sihanouk Province Referral Hospital will be responsible for operation and maintenance of the facilities and the equipment provided by Japan.

2) Consultant

After signing of the E/N and the G/A, the Japanese consultant firm and the Cambodian implementing organization enter a consultant contract according to the formal procedure for Japan's Grant Aid system. This consultant firm executes the following activities under this Contract.

① Implementation design of the project: To prepare the design documents (specifications and technical reference materials on the facilities and equipment included in the project).

② Tender: To cooperate in selection of the contractor(s) and supplier(s) through the tender and in transaction of procedures required under the contract.

③ Construction supervision: To supervise the instructions for the construction of the facilities and delivery, installation, operation and maintenance of the equipment.

In the detail design stage, the consultant determines the construction plan and the equipment supply plan in detail based on the Preparatory Survey of the project, and prepares the tender documents which include specifications of the plans, tender terms and conditions, and draft of the contracts regarding construction work and procurement of equipment.

Cooperation to the tender procedure means to observe selection of the contractor(s) and the supplier(s) through the tender conducted by the implementing organization and to help them transact the formal procedures required for execution of their contracts and preparation of the reports to be submitted to the government of Japan.

Construction supervision means to check whether or not the contractor and the supplier implement their works as specified in their contracts to make sure that the contents of their contracts are implemented appropriately. In addition, to promote smooth implementation of the project, the

consultant shall, in the neutral position, provide related parties with advice and guidance and serve as a coordinator among them. Listed below are major items in the scope of the construction supervision work.

①Procedures required for verification and approval of the work implementation plan, implementation drawings, equipment specifications and other documents submitted by the contractor(s) and supplier(s).

②Inspection and approval prior to shipment of qualities and performances of the construction materials and equipment to be supplied.

③Confirmation of instructions for supply, installation and handling of the construction materials and equipment.

④Checking and reporting the progress of the construction.

⑤Observation of handing over the completed facilities and equipment.

The consultant shall execute above items and report to the related authorities of the government of Japan about the progress of this project, the payment procedure and handover.

3) Contractor(s) and Supplier(s)

The contractor(s) and the supplier(s) shall be selected through the open tender for the Japanese corporations that are qualified to the specific requirements. In principal, contracts will be made between the MOH and the contractor(s) and the supplier(s) that proposed the lowest price and succeed in the subsequent negotiations.

The contractor(s) and the supplier(s) shall construct the facilities, procurement, deliver and install necessary construction materials and equipment according to the contracts, as well as provide technical guidance for operation, maintenance and management of the procured equipment to the Cambodian side. Furthermore, the contractor(s) and supplier(s) provide guidance for securing a supply system where suppliers, manufacturers and agencies supply spare parts and supplies needed for continuous use of the equipment after procured, as well as support to make it possible to receive services such as gratis repair during the period of guarantee, paid repair after the period of guarantee, and technical guidance, etc.

4) Japan International Cooperation Agency

The Japan International Cooperation Agency shall give due advice to the consultant so that the project is implemented in conformity with the Grant Aid system. Also, it shall hold consultations with the implementing organizations of this project as necessary for untroubled implementation of the project.

5) Preparation for Implementation Plan

The representatives of the implementing organization on the Cambodian side and the consultant shall review the implementation plan during the detail design period. They shall make clear the scopes of the construction work of which Japanese and Cambodian sides take charge, confirm through consultations the starting time and the method of each work and discuss so that all the works will be carried out smoothly according to the implementation schedule in this report. In particular, attention should be paid to some works which must be carried out by the Cambodian side at its own expense before commencement of the facility construction work, such as to secure and prepare the land, to demolish the existing buildings.

2-2-4-2 Implementation Conditions

Described below are those items to be noted for implementation of the project. They should be fully taken into consideration when making the implementation plan.

1) Schedule Management

Since the project site is in a region where it rains frequently throughout the year, sufficient time should be allocated to excavation and groundwork. Also, allocating enough curing time for each finishing task will ensure finish quality of the buildings. Therefore, the project will fully take the construction schedule into consideration.

2) Dispatch of Technicians for Equipment Installation

It is extremely important to impart knowledge and skills regarding appropriate operation and maintenance of the equipment so as to contribute to medical services through continuous proper operation of the procured equipment after implementation of the project. That being the case, technicians who are thoroughly familiar with the operation of the each piece of equipment will be selected as the equipment installation technicians, and sufficient time will be allotted for them to explain operation thereof (operation techniques, simple repair techniques, inspection methods, etc.) and to make sure that those concerned on the receiving side acquire sufficient understanding concerning its operation and maintenance.

3) Safety Control

Taking into consideration the character of the project that construction will be implemented in the site of an operating hospital, great attention shall be paid to safety control which includes installing temporary enclosures on the border of the hospital and allocating guides at the site.

2-2-4-3 Scope of Works

It is mutual cooperation between Japan and Cambodia that makes implementation of this project successful. If this project is implemented under the Japan's grand aid, the scopes of works undertaken by the governments of both countries shall be as described below.

1) Undertakings Borne by the Government of Japan

The government of Japan bears cost to undertake consultation of this project and the works related to construction of the facilities, procurement and installation of equipment as described below.

① Consultation

i To prepare detail design documents for the facilities and equipment subject for this project and their tender terms documents.

ii To cooperate in selecting the contractor(s) and supplier(s) as well as executing contracts for the project.

iii To supervise the instructions for the construction of the facilities and delivery, installation, operation and maintenance of the equipment.

iv To conduct soft component (technical assistance) for effective management and maintenance of the medical equipment

② Construction of facilities, supply and installation of the equipment

i To construct facilities subject to this project.

ii To procure construction materials and equipment subject to this project, transport and deliver them to the site.

iii To instruct installation of the equipment subject to this project, conduct a trial run and make adjustments.

iv To explain and instruct operation and maintenance methods for the equipment subject to this project.

2) Undertakings Borne by the Cambodian Side

The Cambodian side will bear and implement the following tasks concerning land development of the construction site, clearance of the existing facilities, piping/wiring and equipment installation to draw utilities into the construction site, procedures for tax exemption, etc.

① Preparation of the Construction Site

i To secure and prepare the land for the construction and the temporal works

ii To clear the existing facilities and trees at the project site

iii To secure and prepare the project site

iv To draw electricity into the project site, set up a leading-in pole, and make applications

v To draw water supply and sewerage line into the project site and make applications

② Exterior Works

i Planting

③ To purchase or transfer medical equipment, furniture and appurtenances to be procured by the Cambodian side

④ To exempt customs duties, internal taxes and other fiscal levies which may be imposed in Cambodia with respect to the supply of the products, services, and equipment necessary for the project.

⑤ To ensure prompt unloading and customs clearance at the points of disembarkation and internal transportation for the equipment and materials to be exported from Japan and other foreign countries according to the approved contracts

⑥ To provide arrangements necessary for entrance and stay to those Japanese who enter and stay in Cambodia to carry out their roles for the project

⑦ To issue approvals and permissions required for implementation of this project

⑧ To pay all the necessary expenses other than those borne by the government of Japan

2-2-4-4 Consultant Supervision

1) Construction Supervision Policy

Under Japan's Grant Aid policy, the consultant forms, based on the concept of the outline design, a team that is consistently responsible to execute the project including preparation of the detail design to achieve smooth and successful implementation. The construction supervision policy for this project is outlined below.

① To keep close contact with those who are in charge of the project representing related organizations of both countries so that construction of the facilities and installation of equipment will be completed without delay.

② To provide quick and appropriate advice and suggestions from the neutral standpoint to the contractor(s), supplier(s) and others concerned.

③ To provide appropriate guidance and suggestions regarding suitable equipment layout and adjustment of tie-in with facilities as well as operation and management after handing over. And to confirm that construction has been completed and terms of each contract are fulfilled, to observe handing over the facilities and equipment and obtain an approval of receipt from the Cambodian side.

2) Construction Supervision Plan

As the types of construction works involved in this project are versatile, a resident supervisor (in charge of construction) is appointed and the following engineers are dispatched from time to time, keeping step with the progress of the construction works.

① Manager of general affairs (Overall coordination, process control)

② Engineer in charge of construction (Confirmation of construction methods, design concept, construction drawings, specifications of materials, etc.)

③ Engineer in charge of structure (Confirmation of the ground conditions, foundation work, framework)

④ Engineer in charge of electrical installation (Power supply and distribution equipment, power receiving and transforming equipment, etc.)

⑤ Engineer in charge of mechanical installation (Utility supply and processing system, air conditioning, water supply, drainage and hygiene system, etc.)

⑥ Engineer in charge of equipment (Supervision of equipment installation, adjustment with the facility, confirmation of operation instructions, etc.)

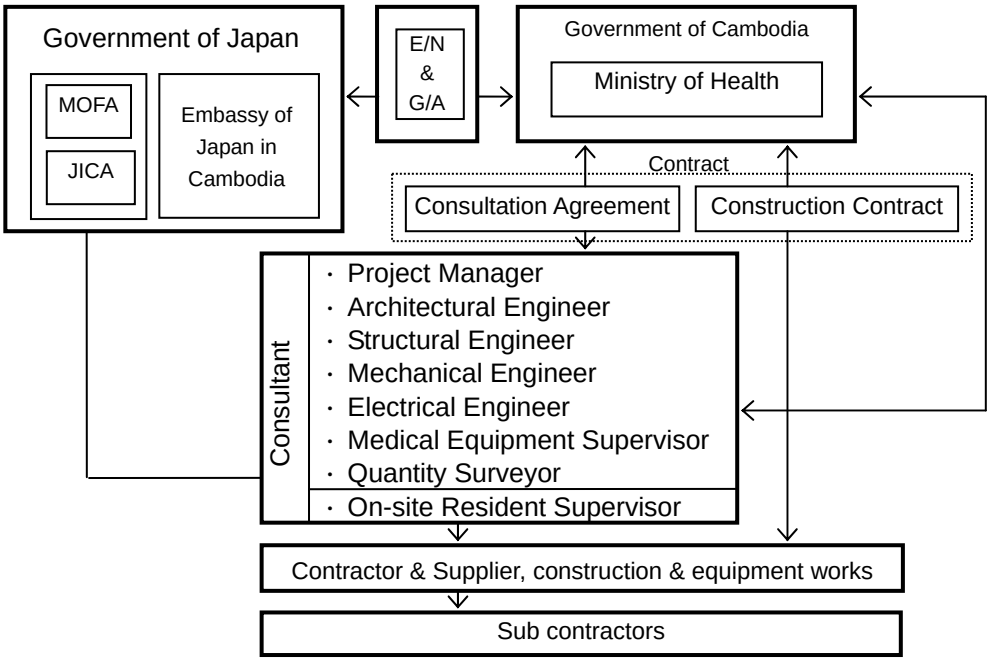


Fig. 2-11 Construction Supervision System

2-2-4-5 Quality Control Plan

1) Quality Control Plan of the Facilities

The Contractor(s) will submit the documents of construction plans in advance to the consultant

according to the construction contract (drawings, specifications, etc.). The consultant will, prior to the commencement of construction, verify the adequacy of the construction plan by specifically setting inspection items and frequency to secure high level of quality control.

Major items to supervise are listed below.

① Material

On-site resident supervisor will implement the inspection of receiving construction materials.

i Reinforcing mill sheets, results of tension strength tests and manufacturers names

ii Analysis tables of cement material identification, tables of test results and manufacturers names

iii Analysis of salt components in sands/gravels, size distributions, specific gravities and percentages of absorption

iv Reinforced concrete

iv-1 Verification of Mixing Plans

Confirmation and determination of the sands/gravels quantity, slump, cement-water ratio, air quantity and salt components through test mixings

iv-2 Compression Tests

Determination of the standard control values from analysis of result tables

iv-3 Control of material quantity measures and complete control of material storage

iv-4 Prior submittals of concrete casting plans

② Standards of Control

The consultant will carry out the construction supervision with certain standards of control based on the approved construction schedule plans. The standards of control will be basically governed by the standards of Japan.

③ Soil Bearing Capacity

Confirmation of the soil bearing capacity will be carried out with the presence of on-site resident supervisor on the site by implementing plane table loading tests.

2) Quality Control Plan of Equipment

Ready-made medical equipment to be procured for this project will be selected from the equipment that complies with JIS, UL, IEC, ISO and other international standards. The consistencies between the equipment to be procured and the contents of the contract will be confirmed at the inspections carried out before shipment together with the inspections carried out by the third agencies for the components of shipment and containers.

2-2-4-6 Procurement Plan

1) Construction Materials

It is not easy to obtain construction materials around Sihanouk-Ville. Aggregates such as sand and gravel are not available around Sihanouk-Ville because of lack of aggregate pit. An aggregate pit is located in a place 130km away from Sihanouk-Ville in the direction toward Phnom Penh, while all of the other materials need to be brought from the capital Phnom Penh. For selection of materials, it is essential to comprehensively discuss usage purpose, durability, economic efficiency, etc., and conduct detail planning with full consideration for maintenance of not only primary structures but also finishing and facility equipment. For this reason, the project should procure as many materials capable of local

maintenance as possible.

Taking into account that Preah Sihanouk Province has only few Cambodian engineers and skilled engineers need to be dispatched from Phnom Penh, the labor situation is not good. It is therefore essential to dispatch Japanese staff to supervise the site in accordance with the progress of the project.

Table 2-16 Procurement of Construction Materials

Materials	Procurement from			Remarks
	Cambodia	Japan	Third Countries	
Cement	○			
Sands/ Gravels	○			
Plywood form	○			
Brick	○			
Reinforcement Bar	○			
Structural Steel	○			
Lumber	○			
Roofing materials	○			
Ceramic tile	○			
Paintings	○			
Heat insulation materials	○			
Aluminum D&W frames	○			
Steel D&W frames	○			
Glass	○			
D&W hardwares	○			
Wooden furniture	○			
Distribution panels	○			
Lighting equipment	○			
Electricity wirings	○			
Wiring accessories	○			
Incoming panel	○			
Transformer	○			
Light electrical appliances	○			
PVC pipe	○			
Plumbing fixtures	○			
Pump	○			
Water receiving tank	○			

2) Equipment

To address procurement prices and availability of equipment with appropriate specifications, the planned equipment will be basically procured from Japan or locally.

2-2-4-7 Operational Guidance Plan

Given that the planned equipment is basically consistent with the activities of the hospital concerned, and that the hospital personnel have enough operational experience, initial usage and operational guidance will be specific to procured equipment. Also, since equipment will be procured, in principle, from manufacturers that have distributors in Cambodia, technicians of these distributors will provide installation/initial usage/operational guidance.

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

As described above, since basic equipment is mainly planned to be procured in this project, basically it is assumed that any problems regarding operation and maintenance will not occur. However, for the equipment which have not used in the hospital before or have necessity of building system for operation, the both side of Japan and Cambodia confirmed the necessity of technical assistance with soft component

as described below in this project to promote more effective utilization of procured equipment during field survey.

- CR system (component of general X-ray machine)

Initial usage instruction and operational guidance by the supplier(s) will be enough for use. Guidance of digital process techniques will, however, enable more effective operation as well as provide effectiveness in maintenance aspect including troubleshooting.

- Central sterilization equipment

This project calls for the sterilization department currently managed in the operation department to be strengthened to reorganize it as the central sterilization department. The target hospital, however, does not have enough operational experience for centralization. It is anticipated that technical guidance with soft component will improve the central sterilization department in terms of operation system and maintenance technique.

- Training of clinical techniques (emergency operation : OB/GY, abdominal surgery and orthopedic surgery fields)

Although medical personnel in the target hospital have enough education taken through training processes as well as experience of basic use of equipment procured in this project, in order to utilize those equipment effectively, it is important to obtain not just how to use those equipment but also clinical knowledge and techniques such as an appropriate condition to use each equipment and diagnosis skills. Therefore, the effectiveness of the project will increase through effective and efficient operation of the equipment to be procured in this project by reeducation of clinical knowledge to the medical personnel. Especially medical personnel involved with the fields with extremely high priority, that is emergency operation regarding OB/GY, abdominal surgery and orthopedic surgery fields, will receive technical guidance in this project with the purpose of reeducation of clinical techniques.

2-2-4-9 Implementation Schedule

1) Project Implementation Schedule

Following the tendering and contract signing concerning construction and equipment procurement after the exchange of notes (E/N) and the grant agreement (G/A), which were signed between the two countries for implementation of the project under Japan's Grant Aid system, facility construction, equipment procurement and installation will be implemented within a single fiscal year. The following Table 2-17 shows approximate time needed for detail design, tendering and construction/procurement/installation:

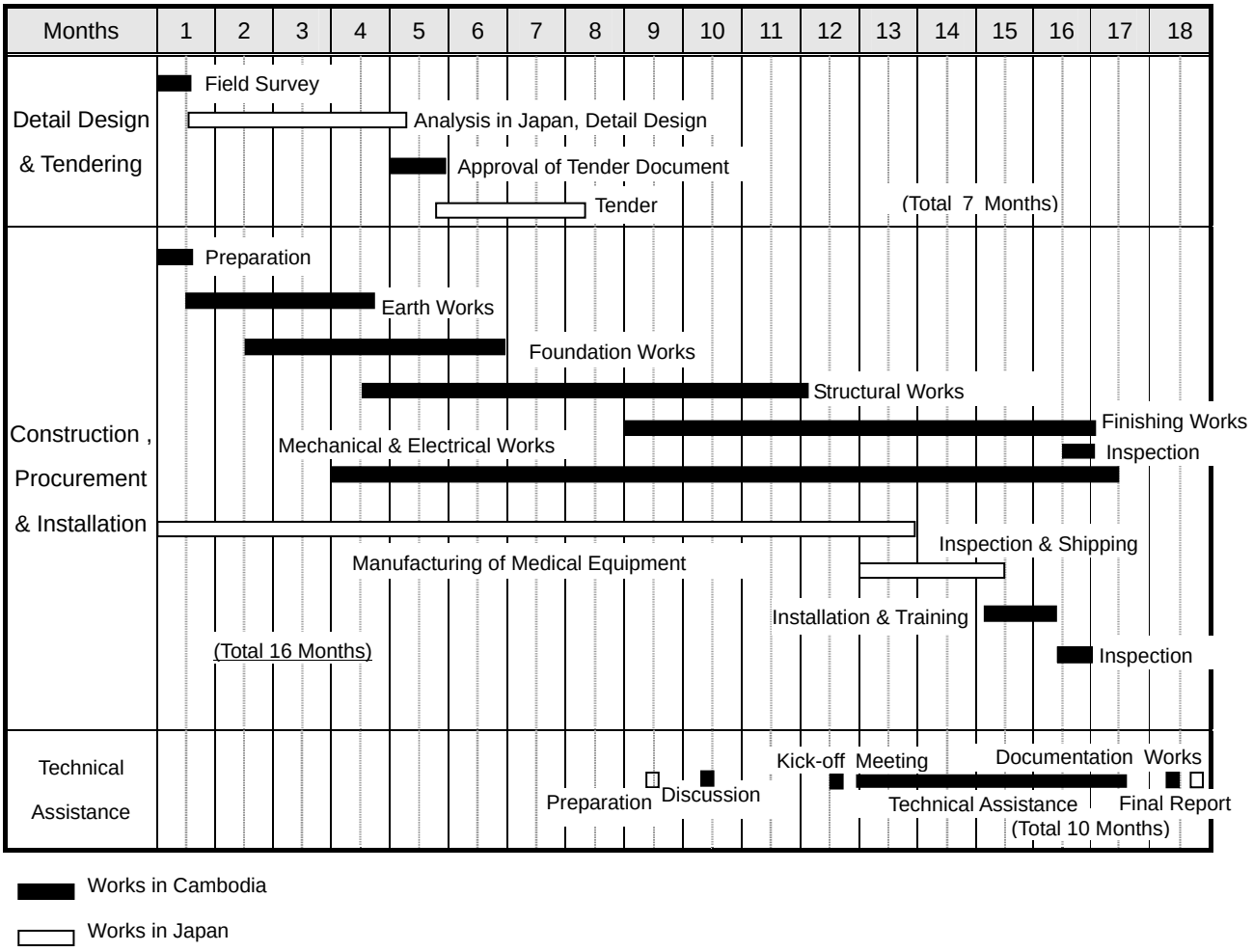
Table 2-17 Project Implementation Schedule

	Time Period	Total
Detail Design Stage (including field survey)	4.0 months	23.0 months
Tender Stage	3.0 months	
Construction/ Procurement & Installation Stage	16.0 months	
Technical Assistance (soft component)	10.0 months	10.0 months

2) Implementation Schedule

The following Table 2-18 shows the implementation schedule of this project.

Table 2-18 Implementation Schedule



2-3 Obligations of Recipient Country

The scope of work under the plan is described in "2-2-4-3 Scope of Works." The following describes overview of work borne by Cambodia.

(1) Process-Related

1) Land acquisition

The project site is under the property of MOH of Cambodia.

2) Tax exemption

If Japanese firm(s) and construction firm(s) engaged in the project procure construction materials and equipment inside Cambodia during the construction period to implement the project, or import them from overseas, it is necessary to make an arrangement to exempt from Japanese firm(s) and construction firm(s) customs, consumption tax, other tax-inclusive pricing or charges. An arrangement for unloading procedure involved with swift import clearance is also required.

3) Arrangements for equipment/materials imported from Japan or third countries

MOH shall make arrangements which will be needed for swift clearance and inland transportation procedures for materials and equipment imported from Japan or third countries.

4) Acquisition of land use permission

There is no need to undergo procedures to apply for building permits regarding the project, but required documents must be submitted to the Ministry of Land Management, Urban Planning and Construction through the MOH and land use permission must be granted.

5) Banking Arrangement and issuance of Authorization to Pay

MOH will become a contact institution for this plan to promptly handle Banking Arrangement and issue Authorization to Pay based on the consultant agreement and contractor/suppliers' contracts.

(2) Work Borne by the Cambodian Side

The following is an overview of the Cambodian scope of work, which is essential for smooth implementation of the plan.

1) Clearance of obstacles and land development at the project site

The project site has the OD pharmacy (building E), mortuary (building G), kiosk, and trees, which should be cleared or transferred. The project site is basically flat, or mildly sloped in the direction from southeast to northwest. Prior to the construction, the Cambodian side needs to clear the existing buildings and trees, and complete land development in line with the ground conditions designed for the project site.

All the constructions above do not cost much and require special techniques. Therefore, it is not difficult for the Cambodian side to bear them.

2) Infrastructure improvement

① Electric power

22 kV power lines from an electric distribution company (EDC) are buried beneath the sidewalk on the north end of the property. Diverter housing stands to the side of the hospital entrance, so the plan calls for power lines to be diverted there and power to be distributed from on the property. A 380V/220V step-down transformer will be built in the service building to supply electricity to the new hospital. A Cambodian EDC will handle construction in the zone from the diverter housing to the primary side of the transformer, and the Japanese side will handle construction for all that remains, including transformer installation.

② Water supply

Water mains run under the sidewalk at the northern end of the property. Cambodian side shall be responsible for installation work from the water main to the water supply meter to be installed around the border with the road.

③ Drainage

Sewage and miscellaneous drainage from inside buildings leaves the buildings in separate pipes, merges together in the first sump outside the building and is carried via natural slope to a simple septic tank. Although public sewerage main is installed on the property, direct connection is impossible because buildings of illegal occupants are densely situated. As a result, Cambodia shall implement work for connection to the main pipe from the last tank on the property through the sidewalk in the northern part.

④ Medical gas

Cambodian side needs to supply oxygen tanks regularly in the manifold rooms in order to supply oxygen to the operation theatres, ICU, minor operation room, observation room and delivery room.

3) External Works (Planting)

Construction site is currently full of greenery, likewise in the whole Sihanouk Province Referral Hospital property. Cambodian side shall plant trees and bushes at the entrance and around the new building to enhance the patient habitat after the completion of the project.

4) Relocation of existing equipment and furniture

The Cambodian side will be in charge of relocation of the existing equipment and furniture in the existing facilities as well as purchasing of the required equipment. Since relocation of the existing equipment and furniture can be done by the hospital staff without professional moving services, the Cambodian side will not bear any costs.

Timing of the relocation will be determined in accordance with the progress of the construction, but it will take place soon after the construction is complete.

2-4 Project Operation Plan

2-4-1 Operation Plan

(1) Operation structure and organization

Although the MOH of Cambodia is the supervisory and executing body of the project, PHD of Preah Sihanouk Province and Sihanouk Province Referral Hospital are responsible for its operation and maintenance after the delivery. The purpose of the project is to improve the medical services of the hospital whose health care services are deteriorating qualitatively and quantitatively. However, because it is the maintenance of current departments with no establishment of new department, the operation organization can be succeeded with no change of the current structure.

(2) Personnel Plan

Although the project is planned to increase the number of beds from 100 to 130, the increase in workforce shall be minimum at its opening because they have no new function and thus no huge increase of workforce is needed. Increased workforce shall be assigned to the following sections:

- Emergency Services (including triage) and ICU: Emergency services medical staff members are taking care of patients of the department including the ICU. Medical staff members in the operation department also see the patients in ICU. The project clarifies the original function of ICU and states that the medical staff in the operation department is in charge of the ICU and the emergency services department shall become independent. Thus, the medical staff members in the emergency services department who have been in charge of ICU shall be included in the operation department and new staff shall be allocated to the emergency services department. Additional staff is also needed for the central sterilization room that is newly established as a function of the operation department. The new operation department shall become the following organization: 2 anesthetists, 1 nurse anesthetist, and 7 nurses from the former operation department and 2 doctors and 7 nurses from the former emergency services department, with 2 newly assigned nurses responsible for the central sterilization room. 2 doctors and 7 secondary nurses shall be allocated newly to the new emergency services department.
- OB/GY Department: Currently, there are 10 midwives with no nurse. 5 secondary nurses (3 for day shift and 2 for night shift) shall be newly assigned because a consultation room and treatment room are newly established in the project in addition to the current delivery room.
- General Medicine, Surgery and Pediatric Departments: Although beds are increased, each nurse shall be responsible for the same number of beds as they are currently and thus additional nurses shall be allocated. The newly assigned nurses shall be regular nurses. If 1 secondary nurse and 2 primary nurses are added, there will be 2 nurses in the general medicine department, 8 in the surgery department and 6 in the pediatric department.
- EENT: Although there is no nurse currently, 2 secondary nurses will be allocated because operation device for such illnesses as empyema is procured and nasal sinus operation can be performed.
- Administration department: There are 2 employees solely in charge of administration. Medical staff members are also responsible for personnel, equipment management, drug inventory

management, sanitation management and mortuary management in addition to their medical services. Although human resources to take care of these duties are also needed, there will be no increase because there is no significant expansion of the scale of the hospital.

- Maintenance department: There are 2 contract workers in charge of facility maintenance. As they have no expertise knowledge on piping or electricity, even minor repair work is outsourced. As the current facility maintenance structure is insufficient, 2 building maintenance engineers will be hired to establish a maintenance structure. As the equipment maintenance and management structure, the Medical Equipment Management Working Group (MEM-WG) is formed, consisting of deputy director, administrative manager and 3 other members. However, the working group consisting of doctors and nurses has no expertise knowledge on equipment maintenance or repair and thus repair work is outsourced. As the current equipment maintenance structure is insufficient, 1 equipment maintenance engineer will be hired to enhance the maintenance system after the plan.
- The MOH of Cambodia is revising the CPA Guideline and the workforce to be allocated in the hospital is also subject to the revision. The personnel allocation shall be planned in accordance with the revision.

Table 2-19 Human Resource Allocation Plan of Sihanouk Province Referral Hospital

(Number of Personnels)

Position	Current (2012)	Addition	Total (2015)	CPA3 Guideline	Remarks
Doctor	28	+2	30	≧23～40	Additional 2 Doctors for Emergency Dept.
Dentist	5		5	≧2～3	
Pharmacist	3	+3	6	≧6～8	According to CPA guideline
Medical Assistant	7		7		
Physiotherapist	1		1		
Secondary Nurse	43	+14	57	≧50～80	7 for Emergency, 5 for OB/GY, 2 for ENT
Secondary Midwife	31		31	≧12～14	
Secondary Lab Technician	5	+3	8	≧8～10	According to CPA guideline
Primary Nurse	11	+18	29	≧16～22	2 for General Medicine, 8 for Surgery, 6 for Pediatric, 2 for Central Sterilization Dept.
Primary Midwife	5		5	≧2～4	
Administration Officer	2		2	≧2～4	
Building Maintenance Engineer	0	+2	2	≧5～7	New engineer necessary
Medical Equipment Maintenance Engineer	(3)	+1	(3)+1		1 engineer (concurrently serving as a doctor) and 2 nurses form a MEM-WG at present.
Others	14		14		
Total	155	+43	198		

2-4-2 Maintenance Plan

(1) Facilities

For maintenance of the buildings, activities of the following items in Table 2-20 are needed:

Table 2-20 Building Maintenance Items

Item	Frequency	Details
Power receiving and transforming equipment	Daily	Visual inspection
	Annually	Inspection and maintenance by a technician
Generator	Daily	Visual inspection
	Annually	Inspection and maintenance by a technician
Lighting fixture	When needed	Bulb replacement
Guidance lighting/ emergency light equipment	Weekly	Lighting test
Air-conditioner	Weekly	Visual inspection
	Quarterly	Filter cleaning/ replacement
	Annually	Air vent cleaning
Ventilation equipment	Monthly	Visual inspection, Fan belt adjustment
	Annually	Air vent cleaning
Water receiving tank	Weekly	Visual inspection
	Annually	Inner tank cleaning
Elevated water tank	Weekly	Visual inspection
	Annually	Inner tank cleaning
Feed-water pump	Daily	Visual inspection of the equipment
Chlorine sterilization	Weekly	Inspection of the amount of the remaining solution
Drainage equipment	Daily	Visual inspection of the drainage equipment
Sanitary equipment	Weekly	Water flow inspection
Fire hydrant pump	Daily	Visual inspection of the equipment
	Bimonthly	Hydrant flow testing
Septic tank	Daily	Visual inspection of inner tank, garbage cleaning, disinfectant replenishment
	Every 4 months	Sludge extraction
Oxygen supply equipment	Daily	Visual inspection of the manifold and alarm system
	When needed	Oxygen cylinder replacement
	Annually	Inspection and maintenance by a technician

(2) Equipment

The medical equipment requires the following maintenance activities:

1) Start-up inspection

Currently, equipment is inspected by the staff responsible for each of the items at any given time, and minor failures are also handled by the responsible staff. However, given that inspection is expected to be done on a daily basis, it is now recommended that the staff inspect the equipment at the beginning of work every day.

2) After-work cleaning/inspection

Although the hospital staff does not currently conduct regular cleaning and inspection for the medical equipment, it is important to clean each of the equipment at the end of work and to inspect failures to keep it in a good condition. Hence, if this plan is implemented, it is recommended that a technician for installation of the equipment provide the staff with cleaning/inspection instructions at the time of the delivery.

3) Calibration

For measurement accuracy, measurement devices need to be calibrated at a certain interval, but no such activity is currently conducted. Therefore, a technician for installation of the equipment requiring

regular calibration will provide the staff with instructions for calibration at the time of the delivery.

4) Repair in the event of failure

Currently, there is no section or engineer with the capacity to repair medical equipment at PHD or the hospital. As a result, the National Workshop Team(NWT) in the NMCHC or representative offices are requested for the repair work under the supervision of the MOH. It is recommended to establish a system that enables quick response to failures as well as the use of operation manual (in English and Khmer) to provide technical education to perform repair work.

5) Inventory management of supplies

Implemented on an as-needed basis, current procurement of supplies cannot effectively respond to urgent shortages. Hence, it is recommended that, after the above maintenance department is established, the department carry a certain stock of supplies to ensure adequate inventory management.

2-4-3 Financial planning

(1) Budget of MOH and PHD of Preah Sihanouk Province

Table 2-21 below shows the budget of MOH and PHD of Preah Sihanouk Province. The MOH budget has increased by around 15% to 25% annually, excluding 2011. Although it decreased slightly in 2011, the budget has increased steadily, with an increase of more than 980% in 13 years from 2000 (81 billion riel) to 2012.

The budget of PHD of Preah Sihanouk Province has also increased at the similar rate as the MOH. Of the total MOH budget, that of PHD of Preah Sihanouk Province accounts for 0.5%. The budget is allocated to the budget of Sihanouk Province Referral Hospital, health centers and health posts from the budget of PHD of Preah Sihanouk Province.

Table 2-21 Budget of MOH and PHD of Preah Sihanouk Province

	2008	2009	2010	2011	2012
MOH Budget (million Riel)	448,306.0	554,180.0	645,211.5	694,331.4	794,213.5
Increasing rate (%)	21.7	23.6	16.4	7.6	14.4
PHD Budget (million Riel)	2,337.0	2,575.0	3,014.0	3,186.0	3,686.0
Increasing rate (%)	32.0	10.2	17.0	5.7	15.7
Percentage of PHD budget to MOH Budget (%)	0.5	0.5	0.5	0.5	0.5

MOH Questionnaire

(2) Operation of Sihanouk Province Referral Hospital

The hospital income has increased by around 10% for the last 5 years. The allocation from PHD of Preah Sihanouk Province has increased at the rate of 10% to 20%. The income from medical services is on the rise although there are some fluctuations. The ratio of allocation from PHD to income from medical services is 7:3. Currently, there is no private room in any department, partly because of the limited space. Private rooms to contribute to income increase are planned in the project. Because there is demand for private rooms to be installed at the hospital in Cambodia, it is expected to lead to increase in income from medical services. Of income in 2012, that from PHD is the actual figure for the year and that from medical services is an estimate based on the actual figure, 424,101,000 riel, for 6 months from January to June. The income from medical services includes that from the Health Equity Fund, accounting for 50% to 60%.

Of expenditures, that for salaries for the staff has increased at the rate of 14% to 18% annually. It accounts for 40% to 50% of expenditures due to annual pay raise and increase in the number of staff. Hospital management expense that is the second biggest after the salaries accounts for approx. 30% and it is also on the rise. Other items of expenditures that include medicine expenses, food stuff expenses, medical equipment expenses, maintenance expense for ME and maintenance expense for building fluctuate, excluding the utility charge, and there is no certain tendency. The utility charge includes power charge only and it has been stable excluding the estimate for 2012.

Table 2-22 Income and Expenditure of Sihanouk Province Referral Hospital

		2008		2009		2010		2011		2012 (Jan～Jun)	
		Amount (Riel)	Ratio (%)	Amount (Riel)	Ratio (%)	Amount (Riel)	Ratio (%)	Amount (Riel)	Ratio (%)	Amount (Riel)	Ratio (%)
Income	Allocation from MOH	1,102,822,211	77.1	1,213,478,696	70.2	1,389,019,862	72.4	1,534,800,000	73.1	1,889,300,000*1	69.0
	Increasing rate (%)			10.3		14.5		10.5		23.1	
	From patient (user fee)	327,557,800	22.9	514,632,100	29.8	530,610,400	27.6	564,058,200	26.9	848,202,000*2	31.0
	Increasing rate (%)			57.1		3.1		6.3		50.4	
	Total income	1,430,380,011	100.0	1,699,228,696	100.0	1,919,630,262	100.0	2,083,571,200	100.0	2,737,502,000	100.0
	Increasing rate (%)			18.8		13.0		8.5		31.4	
Expenditure	Salary	530,314,211	37.1	652,939,996	38.4	843,418,258	43.9	896,853,920	43.1	1,265,140,000	54.9
	Increasing rate (%)			23.1		29.2		6.3		41.1	
	Medicine expenses	150,747,542	10.5	225,896,519	13.3	200,836,500	10.5	177,204,800	8.5	108,775,500	4.7
	Increasing rate (%)			49.9		-11.1		-11.8		-38.6	
	Food stuff expenses	25,704,000	1.8	13,800,000	0.8	15,000,000	0.8	42,100,000	2.0	11,000,000	0.5
	Increasing rate (%)			-46.3		8.7		180.7		-73.9	
	Medical equipment expenses	100,000,000	7.0	82,860,000	4.9	42,600,000	2.2	0	0	30,000,000	1.3
	Increasing rate (%)			-17.1		-48.6		--		--	
	Maintenance expense for ME	4,000,000	0.3	10,000,000	0.6	10,000,000	0.5	10,000,000	0.5	7,000,000	0.3
	Increasing rate (%)			150.0		0		0		-30.0	
	Maintenance expense for Building	34,000,000	2.4	23,747,000	1.4	45,325,000	2.4	25,700,000	1.2	26,000,000	1.1
	Increasing rate (%)			-30.2		90.9		-43.3		1.2	
	Utility charge (Electricity Bill) *3	122,000,000	8.5	105,412,000	6.2	100,520,000	5.2	113,324,000	5.4	250,000,000	10.9
	Increasing rate (%)			-13.6		-4.6		12.7		120.6	
	Hospital management expense	463,614,258	32.4	584,573,181	34.4	661,930,504	34.5	818,388,480	39.3	605,856,500	26.3
	Increasing rate (%)			26.1		13.2		23.6		-26.0	
	Total Expenditure	1,430,380,011	100.0	1,699,228,696	100.0	1,919,630,262	100.0	2,083,571,200	100.0	2,303,772,000	100.0
	Increasing rate (%)			18.8		13.0		8.5		10.6	
Balance		0		0		0		0		433,730,000*4	

Answer from Sihanouk Province Referral Hospital Questionnaire

＊1 Budget allocation for whole 1 year.

＊2 User fee estimation for whole 2012. Actual fee income from Jan to Jun is 424,101,000 Riel.

＊3 Hospital does not use gas supply and uses undergroundwater. Therefore, there is no charge for gas and water, and the amount is only for electricity.

＊4 The income and expenditure for 2012 does not balance as the amount include estimation.

(3) Financial planning

1) Policy

With improvement of the capacity and services of Sihanouk Province Referral Hospital, its operational costs are expected to increase significantly. In order to cover this increase, all Sihanouk Province Referral Hospital can do is either to expect PHD to increase budget allocations or to increase the income of its own medical services. The PHD budget of Preah Sihanouk Province is allocated from the national coffers and it has been around 0.5% of the MOH budget. Approximately 50% of the PHD budget is allocated to the Sihanouk Province Referral Hospital (see Table 2-23 below). When the MOH budget increases, PHD budget also increases and so does the budget of the hospital. However, the

opposite scenario can happen and thus it is difficult to have great expectations of the budget increase of the hospital allocated from PHD of Preah Sihanouk Province. Hence, it is important that Sihanouk Province Referral Hospital will make efforts to increase income from its services, and manage the income-expenditure balance to at least cover operating expenses.

Table 2-23 Budget Allocation from PHD to Sihanouk Province Referral Hospital (million Riel)

	2008	2009	2010	2011	2012
Total Budget of PHD	2,337.0	2,575.0	3,014.0	3,186.0	3,686.0
Budget allocation from PHD to Sihanouk Province Referral Hospital	1,102.8	1,213.5	1,389.0	1,534.8	1,889.3
Ratio	47.2%	47.1%	46.1%	48.2%	51.3%

2) Income Projection

Of the income, it is difficult to estimate the allocation from PHD of Preah Sihanouk Province because it is affected by the MOH budget fluctuations as described above. However, still, the ratio of that to income from medical services is estimated to be 7:3, as it is on the rise.

The income from medical services in 2018 is estimated based on the actual income from medical services of each department in 2010 and the population growth estimated in Table 2-6. That is, the income in 2018 will be estimated by multiplying 39.1% to the actual income in 2010.

Table 2-24 Population Growth Estimate of 2018

	2010	2018
Population	188,001	261,552
Growth		39.1%

The income from medical services in each section in 2018 is calculated based on the population growth rate because no medical service function is added excluding the wards where beds are increased. Because the number of beds is increased to 130 in wards, seven 1-bed rooms and 23 general beds are added in the income estimate. The unit price for the 1-bed room is assumed to be 100,000 riel (per hospitalization).

Table 2-25 Estimation of the Number of Inpatients Stay in 1 Bed Room Ward

	No. of 1 Bed Rm (a)	Average length of stay (b)	No. of Patients per room per year (c)=365 days/(b)	Total No. of Patients (d)=(a)x(c)	Planned BOR (d)x82.45%
General Medicine Ward	2	5.97 days	61.1	122.2	100.8
Surgery Ward	2	6.08 days	60.0	120.0	98.9
OB/GY Ward	1	3.01 days	121.2	121.2	99.9
Pediatric Ward	2	4.18 days	87.3	174.6	144.0
Total No. of Patients Stay in 1 Bed Room Ward / year					443.6

Table 2-26 Hospitalization Fee Income Estimation (thousand Riel)

	2010	No. of Bed	Income per Bed	Population Growth x 39.1%
Hospitalization Fee	256,153	100	2,562	3,564
Total Hospitalization Fee	General Ward: 3,564 x 123 beds = 438,372 1 Bed Room Ward: 100 x 7 beds x 443.6 patients =310,520 Total 748,892 thousand Riel			

Based on the above, the income from medical services in 2018 is estimated as following Table 2-27:

Table 2-27 Estimation of User Fee in 2018

	Actual Amount in 2010 (thousand Riel)	Growth	Estimation in 2018 (thousand Riel)
Out Patient Dept.	53,261	x 39.1%	74,086
Dental Clinic	13,710		19,070
Laboratory	27,386		38,094
Imagery Dept.	11,354		15,793
Operation Dept.	43,540		60,439
Delivery Dept.	125,280		174,264
Wards	256,153	According to Table 2-26	748,892
Others	17	x 39.1%	23
Total	530,701		1,130,661

Because the ratio of income from PHD of Preah Sihanouk Province and medical services is 7:3, as mentioned above, the income is estimated as Table 2-28 below. The estimate is 1.37 times as much as that of 2012.

Table 2-28 Income Estimation of 2018

	Ratio	Estimated Income (thousand Riel)	
From PHD	7	2,638,209	Estimated from Ratio
User Fee	3	1,130,661	According to Table 2-27
Total	10	3,768,870	

3) Expenditure estimate

One feature of the expenditure items of Sihanouk-Ville Referral Hospital is that labor cost and hospital management expense account for approx. 70% to 80% of total expenditures, which is followed by medicine expenses at around 10%. Although the medical equipment expenses increases in the year when new ME is purchased, food stuff expenses, maintenance expense for ME and building account for a small portion less than 2.5%. The labor cost varies in accordance with the fluctuation of workforce and pay raise. The utility charge includes electricity charge only because no gas or city water is used. It has been stable excluding that in 2012. The table 2-29 below shows the estimate of 2018. Details of each item are shown in 2-5-2 Operation and Maintenance Cost.

Table 2-29 Expenditure Estimation in 2018

Item	Actual Amount of 2011 (thousand Riel)	Estimate of 2018 (thousand Riel)	Increase rate (%)	Remarks
Salary	896,854	1,963,455	218.9%	
Medicine Expenses	177,205	374,354	211.3%	
Food Stuff Expenses	42,100	41,646	98.6%	Decreased because the amount of 2011 is prominently high.
Medical Equipment Expenses	0	129,595	---	No expense of ME is recorded in 2011.
Maintenance Expense for ME	10,000	49,770	497.7%	
Maintenance Expense for Building	25,700	48,857	190.1%	
Utility Charge	113,324	251,938	236.7%	
Hospital Management Expense	818,388	1,090,043	133.2%	
Total	2,083,571	3,949,658	190.4%	

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

With the conditions of expenditure projection in (3) below, breakdowns of the expenditures borne by Cambodia under the said classification can be estimated as follows:

(1) Projection of Expenditures to be Borne by Japan Side

Confidential until the verification of the construction/ procurement contract.

(2) Projection of Expenditures to be Borne by Cambodian Side

Table 2-30 Initial Cost Estimation to be Borne by Cambodian Side

Items	Draft Cost Estimation	
	(US$)	Converted amount (thousand JPY)
1) Demolition of Existing Buildings	10,406.00	844
2) Removal of Existing Trees	13,300.00	1,078
3) Backfilling of Soil	63,412,50	5,142
4) Land Preparation	7,500.00	608
5) Relocation of Existing Electricity Line	1,800.00	146
6) Electricity Receiving Fee	4,299.00	349
7) City tap water incoming line to the site	1,450.00	118
8) Sewage line connection fee and connection works	2,713.00	220
8) Relocation and Procurement of Furniture & curtains	72,180.00	5,853
9) Planting of Trees	18,500.00	1,500
10) Banking Commissions	16,105.56	1,306
Total	211,666.06	17,164

(3) Condition of Expenditure Projection

1) Period of Cost Estimation

September 2012

2) Exchange Rate

US$ 1 = 81.09 JPY (Average from March 2012 to August 2012)

3) Construction Period

It is estimated that the project would be implemented in a single fiscal year, and the period of detailed design, construction and procurement of equipment is identified in the implementation schedule.

4) Others

The project cost is estimated on the basis of the system of the Grant Aid Assistance by the Government of Japan.

2-5-2 Operation and Maintenance Cost

Each expenditure item is examined in this section to estimate the expenditures in 2018, 3 years after the project delivery. The price increase rate is assumed to be 7.2%, average of the last 5 years in Cambodia (source: IMF, consumer price index 2012). It is estimated based on 2011 figures because figures given by Cambodia are actual figures for the first half year of 2012 and estimated figures.

(1) Salary

Salary has accounted for the biggest portion of the expenditures at around 40% since 2008. It has increased every year from 2008 to 2012. The main reasons for the increase are believed to be increased workforce and pay raise.

The labor cost consists of basic salary and various allowances and the former is decided in 4 groups of hospital workers. The basic salary has been raised since 2008, excluding that of Group IV.

Table 2-31 Annual Raise of the Basic Salary

	Position		2008	2009	2010	2011	2012
I	Doctor, Dentist, Pharmacist, Medical Assistant	(thousand Riel)	3,555	4,026	4,592	5,410	6,367
		Increase rate (%)		13.70	13.61	17.81	17.69
II	Secondary Engineer, Secondary Midwife, Secondary Lab Technician	(thousand Riel)	1,294	2,022	2,528	3,160	3,950
		Increase rate (%)		56.26	25.02	25.00	25.00
III	Primary Nurse, Primary Mdiwife, Administration Officer, Engineer	(thousand Riel)	1,125	1,406	1,758	2,198	2,748
		Increase rate (%)		24.98	25.04	25.03	26.66
IV	Driver, Hospital Worker	(thousand Riel)	1,872	1,872	1,872	1,872	1,872
		Increase rate (%)		0	0	0	0

The average increase rate of each group (excluding significantly high increase rate) is 16.0%. The ratio of basic salary to various allowances is nearly fifty-fifty. Because the amount of allowances is mostly fixed, half (8.0%) of the increase rate of the basic salary raise is assumed to be the increase rate of overall labor cost. Because additional doctors, nurses and engineers need to be hired after the delivery, the labor cost is estimated based on no increase until its completion and 198 employees, which is a total of workforce after 2016 increase for the estimated figure in 2018.

Table 2-32 Estimation of Salary Expense

	2011	2012	2013	2014	2015	2016	2017	2018
No. of Staff	155	155	155	155	155	198	198	198
Total Salary (thousand Riel)	896,853	968,601	1,046,089	1,129,776	1,220,159	1,638,347	1,818,014	1,963,455
Ave. Salary per Staff (thousand Riel)	5,786	6,249	6,749	7,289	7,872	8,502	9,182	9,916
Increase Rate (%)	3.6%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%

(2) Medicine expenses

Although the total medicine expenses hit the peak in 2009 and has decreased thereafter, it has been around 10% of all expenditures, excluding in 2012. It is likely to increase in accordance with the increase in health care services. Thus, the increase rate is estimated to be 10% based on the actual figure of 2011 and the increase of beds from 2016 after the project delivery is also taken into consideration for the estimate of medicine expenses in 2018.

Table 2-33 Estimation of Medicine Expense

	2011	2012	2013	2014	2015	2016	2017	2018
Medicine Expense (thousand Riel)	177,205	194,926	214,418	235,860	259,446	293,174	331,286	374,354
Increase Rate (%)	3.6%	10.0%	10.0%	10.0%	10.0%	11.3%	11.3%	11.3%

(3) Food stuff expenses

The food stuff expenses refer to meal fees for patients. It fluctuates every year and there is no specific tendency. Its reason is considered that there is a custom of patients' family preparing for meals for them

in the hospital and it fluctuates in accordance of the fluctuation of such families. It accounts for less than 2.0% of all expenditures with no specific tendency. Thus, the food stuff expenses in 2018 are estimated based on the price increase rate of 7.2% and the addition of the number of beds from 2016 after delivery based on the average from 2008 to 2011.

Table 2-34 Estimation of Food Stuff Expense

	Average	2012	2013	2014	2015	2016	2017	2018
Food Stuff Expense (thousand Riel)	24,151	25,890	27,754	29,752	31,894	34,861	38,103	41,646
Increase Rate (%)		7.2%	7.2%	7.2%	7.2%	9.3%	9.3%	9.3%

(4) Medical equipment expenses

The medical equipment expenses refer to the expenses of small basic medical equipment used regularly, including stethoscope and surgical knife. It fluctuates in accordance of the purchased amount of inexpensive medical equipment. Relatively a lot of medical equipment is likely to have been purchased in 2008, whereas no such equipment was purchased in 2011. It accounts for 2.0% to 7.0% of all expenditures, excluding 2011, and no specific tendency is observed. Thus, the medical equipment expenses in 2018 are estimated based on the price increase rate of every year as 7.2% and the addition of the number of beds from 2016 after delivery based on the past average.

Table 2-35 Estimation of Medical Equipment Expense

	Average	2012	2013	2014	2015	2016	2017	2018
Medical Equipment Expense (thousand Riel)	75,153	80,564	86,365	92,583	99,249	108,476	118,568	129,595
Increase Ratio (%)		7.2%	7.2%	7.2%	7.2%	9.3%	9.3%	9.3%

(5) Maintenance expense for ME

The maintenance expense for ME accounts for around 0.5% of all expenditures and it has been fixed, excluding in 2008. Although the expense originally refers to the expense for purchasing parts for ME maintenance and repair and maintenance contract fees for representative offices in Phnom Penh, a fixed amount is used as actual figure. However, in consideration of introduction of new equipment after the completion of the project, the expense is estimated to double in 2016 and thereafter.

Expensive equipment, lifesaving equipment and precision equipment that are essential to ensure proper operation and maintenance of equipment purchased in the project require maintenance service contract to be concluded with local agent 1 year after the completion of the warranty period. The expense for the contract shall be borne by the recipient. Such maintenance contract with local agent are recommended for the following 4 pieces of equipment in Table 2-36.

Table 2-36 Maintenance Service Contract Estimation for ME

Equipment	Q'ty	Annual Contract Cost (1000 riel)
CR System	1	22,000
Anesthesia Machine	1	10,000
Respirator Set	1	8,000
Hematology Analyzer	1	4,000
Total		44,000

It is added to the maintenance expense for ME as the hospital has no experience in concluding such maintenance contract on its own expense.

Table 2-37 Maintenance Expense Estimation for ME

	2011	2012	2013	2014	2015	2016	2017	2018
ME Maintenance Expense (thousand Riel)	10,000	10,000	10,000	10,000	10,000	20,000	20,000	20,000
Maintenance Service Contract (thousand Riel)	---	---	---	---	---	44,000	44,000	44,000
Sub Total (thousand Riel)	10,000	10,000	10,000	10,000	10,000	64,000	64,000	64,000

(6) Maintenance expense for building

The maintenance expense for building is also for repair and maintenance of facilities, same type of expense as maintenance expense for ME. Because there is no engineer at the hospital, repair work is outsourced even it is minor repair. The budget is requested to PHD for minor repair in every 1.5 months and the budget for major repair is requested annually. The expense accounts for 1.2% to 2.4% of overall expenditures and there is no specific tendency as it fluctuates. The expense up to 2018 is estimated based on the average from 2008 to 2011 and the price increase rate of every year as 7.2%. Because each departments will move to the new facility in 2016, major renovation of the existing buildings that will be vacated is assumed to be carried out in the year.

Table 2-38 Maintenance Expense Estimation for Building

	Average	2012	2013	2014	2015	2016	2017	2018
Maintenance Expense for Building (thousand Riel)	32,193	34,511	36,996	39,659	42,515	948,000	45,576	48,857
Increase Rate (%)		7.2%	7.2%	7.2%	7.2%	—	7.2%	7.2%

(7) Utility charge

No gas is used and city water is not used either because groundwater is used in the hospital. Thus, the utility charge includes electricity charge only. The annual rise of the electricity charge of EDC in Preah Sihanouk Province from 2005 (720 riel/kWh) to 2010 (820 riel/kWh) is 2.3% in average. Therefore, the utility charge expense up to 2015 is estimated by multiplying 2.3 % every year to the average utility charge from 2008 to 2011. After the hospital function moved into the new building under this project in 2016, the utility charge, including electricity, telephone, water, sewerage and medical gas, is estimated as shown in Table 2-39 with the multiplication of 2.3% every year as well.

Table 2-39 Estimation of Utility Charge

	Average	2012	2013	2014	2015	2016	2017	2018
Utility Charge (thousand Riel)	110,314	112,851	115,447	118,102	120,818	240,737	246,274	251,938
Increase Rate (%)		2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%

(8) Hospital management expense

The hospital management expense includes maintenance expense, fuel cost, expense for office supplies, cleaning expense and supplies expense. It accounts for 35% to 40% of all expenditures, the second biggest item next to the labor cost. Although there is no specific tendency, it is on the rise. The expense is estimated based on the average from 2008 to 2011 and the price increase rate of every year as 7.2%. The increase in the number of beds is added from 2016 after the project delivery to estimate the expense of 2018.

Table 2-40 Estimation of Hospital Management Expense

	Average	2012	2013	2014	2015	2016	2017	2018
Hospital Management Expense (thousand Riel)	632,127	677,640	726,430	778,733	834,801	912,438	997.925	1,090,043
Increase Rate (%)		7.2%	7.2%	7.2%	7.2%	9.3%	9.3%	9.3%