MONGOLIA
THE MINISTRY OF
EDUCATION AND SCIENCE

PREPARATORY SURVEY REPORT

ON

THE PROJECT FOR CONSTRUCTION OF

MONGOLIA -JAPAN

TEACHING HOSPITAL

IN

MONGOLIA

OCTORBER, 2014

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CONSORTIUM OF

YAMASHITA SEKKEI INC.

AZUSA SEKKEI INC.

CDC INTERNATIONAL CORPORATION

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Summary

1. Overview of the Country

Mongolia neighbors Russia, China and Kazakhstan. It has a total land area of 1,564 thousand km^2, (approximately four times the size of Japan), with population of about 2,931,300 (2013 Mongolia national Statistics Committee (hereafter referred to as “NSC”). Ulaanbaatar, the capital, is located in in a basin at an altitude of approximately 1,300 m, and is one of the coldest capitol in the world with average annual temperature below zero.

After changing from a socialist system to a democratic market economy in 1990, Mongolia is now experiencing rapid economic growth as a result of steady expansion in the mining and resources field Disparity of wealth has risen with this economic growth, but the poverty ratio has dropped. Government of Mongolia has implemented sustainable growth policy with such measures as price stabilization policy in 2012, and deregulation of foreign investment policy in October 2013. The education sector of Mongolia has high university entrance rate. Especially this rate for women is very high at 72.83%. More than hundred thousand Mongolian students are currently studying abroad, and 1,157 students are studying in Japan (2012). This is the fourth largest figure after Korea, Russia and USA.

2. Background to History and Overview of the Project

In the healthcare sector, infant mortality (per 1000 births) has been reduced from 76 in 1990 to 23 (2012), the death rate of infants less than 5 years old (per 1000 births) has been reduced from 107 to 27.5, and the maternal death rate (per 100,000 births) has been reduced from 120 to 63 (all the above, UNICEF). Mongolia is likely to achieve its Millennium Development Goals in the healthcare sector.

On the other hand, improvement of healthcare facilities in suburban area of Ulaanbaatar and in rural areas has been delayed. Shortage of doctors working in these areas and its technologically low service are still major issues of the health sector. The Mongolian Government is now implementing strategies to improve the training system of doctors and to upgrade secondary healthcare facilities.

The National University of Medical Sciences established in 1942, is the only national medical institute in the country, and is under the jurisdiction of the Ministry of Education and Science. There are 7 health technology departments such as the medical department, nursing department, midwifery department, clinical testing department, etc.. It is located in the center of the capital city, Ulaanbaatar, and has 3 branch schools in the provinces. The total number of students is about 10,000 (2012), and it is the largest health education base producing 95% of the healthcare personnel in Mongolia. Since 2008 it has become obligatory to work for 2 years in the rural areas after graduation, in order to resolve the shortage of doctors at the primary level. After these obligatory rural services, post-graduate training is carried out. The National University of Medical Sciences has no clinical training facilities, so the graduates are dispersed to tertiary hospitals (3 general hospitals, 13 specialist hospitals and specialist medical treatment centers) at 16 locations within the city that are contracted to the National University of Medical Sciences to receive training. These hospitals are are not developed as educational facilities, and improvement of clinical training, both in content and in facilities, is the

major issue of healthcare training system in Mongolia.

Approximately half of the population is concentrated in Ulaanbaatar City. The suburban areas of the city contains the poorest segment of the population, and there is a great need to provide district hospitals in these areas. The tertiary hospitals in the city, are inundated with patients including those with only light symptoms. There is no properly functioning referral system within the city.

Following issues were pointed out at the "Mongolian Health Sector fact finding and confirmation survey" implemented from March 2012.

- The medical service provided at secondary and tertiary level is generally poor and patient satisfaction ratio is low. More and more people at middle to high-income level are going abroad for medical treatment.
- Secondary level healthcare facilities are not equipped with equipments such as CT, endoscopy, etc., necessary for increasing demand for diagnosis and treatment of malignancies.
- The technical level of doctors working at secondary level differs since the postgraduate training period is only one and half years.
- Post graduate training (training to become specialists) are done at 28 health institutes including private facilities. Each hospital is in charge of the training, and therefore the training content is not consistent with other specialties. For example the training period differs among the courses. There is a strong tendency to become a specialist, and there only 20% of the doctors are general practitioners.

In August 2012, the Mongolian Government requested Grant Aid from the Japanese Government. The objectives of the project is to build a teaching hospital affiliated to the National University of Medical Sciences, that will respond to the needs of the suburban area, provide a place of practical clinical training for doctors, and contribute to improving the quality of healthcare not only in Ulaanbaatar, but also in the rural areas. The requested hospital facility has a total floor area of 9,000m^2, one basement and 5 floors above ground, an internal medicine department, a pediatric department, an obstetrics and gynecology department, an infectious diseases department, a neurology department, a surgical department, treatment rooms, testing rooms, accommodation facilities (150 to 200 beds), and lecture facilities, etc. In addition, the request includes the procurement of 314 items of equipment for diagnosis, treatment, hospitalization, and education, etc.

Table i Content of the Request by the Government of Mongolia

Facility	Total effective floor area : 9,000 m^2 Building Size: (1 basement, 5 floors above ground) (basement floor) Laundry, medical waste room, viewing room, etc., total 12 types (1st floor) Reception, waiting area, examination/procedure rooms, EU rooms, etc., total 28 types (2nd floor) Specialist departments, etc., total 40 types (3rd floor) Operation rooms, etc., total 10 types (4th floor) Faculty rooms, etc., total 7 types
Medical Equipment	Equipment necessary to the above-noted facilities.

3. Summary of Survey Results and Content of the Project

(1) Summary of Survey Results

On the basis of the above, from September 2013 JICA dispatched a Preparatory Study Team, the Team implemented fact-finding surveys at the existing hospitals and examined priority of project site in Field Survey I in September 2013, and the Mongolia side proposed a part of the Amgalan Botanical Garden as the construction site. The Team implemented selection of project site and establishment of priority of facilities and equipment components in Field Survey II in December 2013 and January 2014. The Environmental and Social Considerations Study Team was dispatched from March to April 2014. As the result of the survey, it was ascertained that the rare plant species are existing in the part of the project site. The Ministry of Education and Science and National University of Medical Sciences discussed with the Amgalan Botanical Garden, and it was approved that the rare plant species will be transplanted to the suitable place. The Study Team compiled a Facility Plan and an Equipment Plan, and in August 2014 an explanation of the summary of the results of the Preparatory Study was given in Mongolia, and the Preparatory Study Report was drawn up.

(2) Overview of the Project

The objective of the Project is to construct a teaching hospital with the status of tertiary hospital and to procure equipment for improving quality of post-graduate training and providing tertiary healthcare services/specialized consultative healthcare services of high priority at national level and secondary healthcare services in the city of Ulaanbaatar.

Table ii Outline of the Scope of the Project

Facility

(1) Building outline

Item	Floor Area (m^2)
Main Building: 3 story building with 1 basement level ① Outpatient Departments (Surgery, Traumatology, Ophthalmology, ENT, Internal Medicine, Neurology, Obstetrics and Gynecology, Pediatrics, Infectious Diseases), Imaging Diagnosis Department, Endoscopy Department, Emergency Unit, ICU Department, Surgery Department, Examination Department, Pharmacy Department, CDDS, Kitchen Department, Administration Department, Education Department (lecture rooms, conference rooms, library), Medical Records Department, Morgue, General Service Department (medical equipment repair, laundry, medical waste) ② Inpatient Ward (104 beds)	15,730 m^2
Boiler Building (single story)	775 m^2
Total	16,505 m^2

(2) Building service outline

- Electrical facilities: Power-supply equipment (incoming/substation/power distribution), emergency power generation system, lights, outlets, communication equipment, fire alarm system, lightning protector
- Mechanical facilities: Air conditioning and ventilation system
- Water supply/discharge and hygiene facilities: Sanitary fixtures, water and hot water supply system, wastewater discharge system, fire-fighting equipment
- Special facilities: Medical gas equipment, elevator system

Medical Equipment

(1) Image diagnosis/treatment equipment
MRI, CT scanner, Angiography, X-ray fluoroscopy unit, General X-ray unit, Mammography, Ultrasound diagnostic equipment, Video-endoscopy system, etc.

(2) Bio-information monitoring/measuring equipment
Patient monitor, Electrocardiograph(ECG), Electroencephalograph(EEG), Electromyograph (EMG), Spirometer, Fatal monitor, etc.

(3) Operation/treatment equipment
Operating table, Operating light, Electrosurgical unit, Anesthesia equipment, Ventilator, Laparoscope operating unit, Microsurgery scope, etc.

(4) Laboratory equipment
Automatic biochemistry analyzer, Automatic immunoassay analyzer, Blood cell counter, Blood gas analyzer, Urine sediment analyzer, Coagulation measuring system, Blood culture apparatus, Fluorescence microscope

(5) Central sterilization and supply department equipment
Large autoclave, Medium autoclave, etc.

(6) PACS（Picture archiving and communication system）
Component: Image report server system, Image interpretation terminal, RIS terminal, Reference PACS terminal, etc.

(7) Other's equipment
Equipment for Out-patient , Equipment for ENT, Equipment for Ophthalmology, Equipment for Emergency, Equipment for Pharmacy, Morgue refrigerator, etc.
Total 272 items

4. Construction Period of the Project and Project Cost Estimation

Taking into account the scale of the facilities, local construction conditions, the budgeting systems of the governments of both countries, preparation of the project site, etc., the construction period needed for the implementation of this project is expected to be approximately 36 months (detailed design and tenders, approximately 8.5 months; construction of the facilities approximately 25.5 months; installation of equipment and inspection, 2 month). The project cost by the Government of Mongolia is estimated to be 453 million yen.

5. Evaluation of the Project

(1) Relevance

This Project is deemed to be appropriate as the cooperation project using the Japan's grant aid from the following views:

The patient catchment area of the Mongolia-Japan Teaching Hospital is Bayanzurkh District having the population of 250,000. In addition, the 1,290,000 citizens of Ulaanbaatar are also the beneficiary population of this Project because the advanced medical equipment including MRI, CT and angiography will be introduced in this Project in this country where until now only several sets have been installed.

The Mongolia-Japan Teaching Hospital will be the first teaching hospital in Mongolia and function as the place of clinical training of all the medical graduates in the country. Therefore, this Project will contribute to the improvement of national medical service in Mongolia.

The construction site is located near the central area of Ulaanbaatar City and has the sufficient area to ensure the future expansion. It is also an appropriate selection as a grant aid project to construct a hospital having a secondary care level clinical department with the most advanced equipment and to provide the medical graduates with the opportunity of clinical training and experience.

It is the upper level plan of Mongolia that this Project will contribute to the improvement of the primary and secondary medical services in Mongolia, and its priority is high.

(2) Effectiveness

The effects that are expected in implementation of this Project are shown in Table iii.

1) Quantitative Effects

Table iii Quantitative Effects

Index	Target Value	Description
Number of resident doctors	Approx. 150 resident doctors per year	There are 116 resident doctors in Mongolian National University of Medical Sciences at present and there are approximately 150 to 200 applications.
Number of image diagnoses	CT: Approx. 5,700 cases per year	CT: The average number of inspections per day is 20 cases, taking 5 to 25 minutes per case. 20 cases×24 days/month=480 cases/month 480 cases/month×12month ≒ 5,700 cases
	MRI: Approx. 2,800 cases per year	MRI: The average number of inspections per day is 10 cases, taking 20 to 30 minutes per case. (*5) 10 cases×24 days/month=240cases/month 240 cases/month×12month ≒ 2,800cases
	Angiography: Approx. 1,200 cases per year	Angiography: The average number of inspections per day is 5 cases. (*6) 5 cases×20 days/month=100 cases/month 100 cases/month×12month=1,200 cases
Number of Operations	Approx. 2,060 cases per year	It is estimated that 2 cases/day before and after noon are operated in 3 operating rooms at full capacity, on the basis that the operations made will be mainly planned operations. 2 cases×3 rooms×20 days/month=120 cases/month 120 cases/month×12month=1,440 cases (*1) The number of emergency operations is estimated to be about 30% of the total number of operations. (*2) 1,440 cases÷0.7≒Approx. 2,060 cases (Total of operations) 2,060 cases×0.3≒Approx. 620 cases (Number of emergency operations)
Number of outpatients	Approx. 600 persons per day	15 consultation rooms are provided to make 6 to 7 hours of diagnosis per day. The diagnostic time is 10 minutes per patient. 15 rooms×360 – 420 minutes /10 minutes ≒ 600 people/ days
Number of inpatients	Approx. 4,300 persons	104 beds are provided. The general bed occupancy rate of 90% in hospitals in Mongolia and 8 days of hospitalization on average are assumed. (*3,4) 104 beds×365 days×90%÷8 days ≒ 4,300 people

2) Qualitative Effects

・The quality of postgraduate education will improve.

・The congestion at other tertiary hospitals in Ulaanbaatar will be relieved.

Contents

[Appendices]

1. Member List of the Study Team
2. Study Schedule
3. List of Parties Concerned in Recipient Country
4. Minutes of Discussions
5. References

Location Map

Figure ⅰ：Country Surroundings Map

Figure ⅱ：Project Site Map

Perspective

Figure ⅲ : Image of Mongolia-Japan Teaching Hospital

Figure ⅳ : Image of Mongolia-Japan Teaching Hospital (Entrance Image)

List of Figures & Tables

Abbreviations

ADB	Asian Development Bank
AD	Analog-to-Digital
ALC	Autoclaved Light Weight Concrete
CICU	Coronary Intensive Care Unit
CPU	Central Processing Unit
CT	Computed Tomography
DICOM	Digital Imaging and Communication in Medicine
DSA	Digital Subtraction Angiography
ECG	Electrocardiogram
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
FHC	Family Health Center
G/A	Grant Agreement
GDP	Gross Domestic Product
GNI	Gross National Income
HEPA	High Efficiency Particulate Air
HRCT	High Resolution CT
HWC	Handicap Water Closet
IBP	Invasive Blood Pressure
IC	Integrated Circuit
ICU	Intensive Care Unit
IEE	Initial Environmental Examination
ISO	International Organaization of Standardization
IUCN	International Union for Conservation of Nature and Natural Resources
IVR	Interventional Radiology
JICA	Japan International Cooperation Agency
LAN	Local Area Network
MCA	Millennium Challenge Account
MDG	Millennium Development Goals
MEGD	Ministry of Environmental and Green Development
MGHNSG	the Mongolian General Hospitals National Standard Guideline (dated July 19, 2013)
MRI	Magnetic Resonance Imaging
NICU	Neonatal Intensive Care Unit
NSC	National Statistical Commitee
PACS	Picture Archiving and Communication Systems
PICU	Pediatric Intensive Care Unit
RF	Radio Frequency
SHC	Soum Health Center
Tg	Tugrug
UNESCO	United Nations Educational,Scientific and Cultural Organization
UNFPA	United Nations Population Fund
UNICEF	United Nations Children’s Fund
VAT	Value Added Tax
WHO	World Health Organization
XTV	X-ray television

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Background of the Project and Request from the Recipient Country

Ulaanbaatar city population is increasing dramatically and almost 50% of the total population is living in Ulaaanbaatar. This demography has created shortage of primary and secondary hospitals in the city, while the qualities of these facilities have not been improved. This has lead to the high self-referral and bypassing of primary and secondaty level care, resulting in overload at tertiary level hospitals. Post graduate training of doctors are currently done at these 16 tertiary level hospitals. The training environment does not meet the current requirements, and some doctors are poor. Health Science University of Mongolia HSUM (currently called Mongolian National University of Medical Science) , is the only state medical institute, providing about 95% of health professionals in Mongolia. The HSUM has almost 898 medical staff and 10 schools in health sciences (2012). However, it does not have a university-affiliated hospital, and does not have proper clinical training facilities for both undergraduates and for postgraduates.

Thus, in August 2012, the Mongolian Government requested Grant Aid from the Japanese Government for the construction of a new hospital facility.

Outline of the facility requested

Total effective floor area: 9,000 m^2
Building Size: (1 basement level, 5 floors above ground)
Configuration:
(basement floor) Laundry, medical waste room, services room, viewing room, etc., total 12 types
(1st floor) Reception, waiting area, examination / procedure rooms, EU rooms, etc., total 28 types
(2nd floor) Specialist departments, etc., total 40 types
(3rd floor) Operation rooms, etc., total 10 types
(4th floor) Faculty rooms, etc., total 7 types
(5th floor) Lecture hall, clinical skill laboratory rooms, library, etc., total 9 types
Number of hospital beds 150 to 200.

1-2 Natural conditions

Ulaanbaatar city is situated at 1,300m above sea level. The climate in Ulaanbaatar is a typical continental climate, with a low amount of rainfall in the summer, and dry winters with extremely low temperatures. The average temperature for about half of the year is below freezing. In addition, there is torrential rainfall at certain times, which often results in floods. The wind blows in various directions due to the influence of the terrain, but the wind during the winter in Ulaanbaatar basin generally blows along the basin from the northwest towards the east. In Ulaanbaatar, the maximum recorded temperature is 39.1 °C, the minimum recorded temperature is -49.0 °C, the maximum rainfall in one day is 75 mm, and the maximum wind speed is 40 m/sec.

Table 1-1 Ulan bator Weather Data (Source: FORECA)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Average/Total
Ave. Max. Temp. (°C)	-16	-10	-1	8	17	22	24	22	16	7	-6	-14	5.8
Ave. Min. Temp. (°C)	-26	-22	-14	-4	3	10	12	10	3	-5	-16	-23	-6.0
Rainfall (mm)	1.9	1.9	2.8	6.4	14.6	36.7	46.5	46.1	22.6	5.3	4.8	3.5	193.1

Epicenters of earthquakes are concentrated in the western part of Mongolia, but small earthquakes occur sporadically in the eastern part of the country. Epicenter in Mongolia are relatively shallow, with a maximum underground depth of approximately 33 km. Ulaanbaatar is approximately 300 km away to the east from the nearest epicenter. The largest recorded earthquake in Mongolia was a magnitude 8.1 earthquake that occurred in December 1957 approximately 600 km west-southwest from Ulaanbaatar. In addition, an earthquake with a magnitude of 7.8 occurred in 1967 approximately 300 km to the west from Ulaanbaatar and an earthquake with a magnitude of 7.0 occurred 15 days after that, but there are no records of damage caused by the earthquakes in Ulaanbaatar.

The first field study was subcontracted to a local geological survey company, and consisted of the following content.

- Standard penetration test: 8 locations (Approx. 90 m equal intervals on overall site)
- Boring depth: 15 m
- Geological survey range: 11.8 hectares (As shown by map issued by Mayor of Ulan Bator on September 6, 2013)

An outline of the survey results is described below.

1. The elevation of the site is between 1,311.12 m – 1,313.57 m, with a difference in height on the overall site of about 2.5 m.
2. The site is located on the west side of the Tuul River basin, and while there is groundwater at a depth between 9.0 m – 10.0 m, a solid sand-gravel layer extends to a depth of 15.0 m from the surface, and it can be expected that the allowable bearing capacity is 30 t/m^2.
3. The depth of frost penetration is 2.55 m – 3.65 m.

1-3 Environmental social consideration

The target site for this project is the Amgalan Botanical Garden (32 ha) which was established in accordance with ministerial meeting resolutions in 1964 and 1975. This botanical garden conducts comprehensive research and investigations in order to transplant, cultivate and protect native Mongolian plant species, foreign ornamental foliage plants, beneficial plant species (medicinal herbs, etc.), as well as rare and very rare plant species defined in the redbook. The botanical garden has preserved and protected 41 types of native plant species and ornamental foliage plants, as well as 21 types of rare and very rare plant specifies, has a gene bank containing 21 items, and was cultivating 80,282 plants as of October 2013.

(1) Environmental Impact Assessment (EIA)

According to the Ministry of Environmental and Green Development (MEGD) in Mongolia, since the EIA law (version revised in 2012) applies to this project which is a “Service business with 50 beds or more”, we obtained a response that both an Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) must be performed. Generally, there are the following two types of IEE / EIA.

・General Evaluation (IEE)
・Detail Evaluation (EIA)

For a general evaluation, the MEGD can simply perform the evaluation itself. For a detail evaluation, the evaluation is subcontracted to a company certified by the MEGD and performed by that company. An expert committee is established within the MEGD to review and evaluate the results. No costs are incurred for a general evaluation, but evaluation subcontracting costs are incurred for a detail

evaluation in the form of fees to be paid to the certified company.
Normally, 14 days are needed to perform a general evaluation. An EIA is conducted when the judgment is made that implementation of an EIA is needed during the general evaluation. The period for the evaluation after the request is submitted to MEGD and other related authorities, is within 18 days.
MEGD adviced to first start general evaluation procedures since the detail evaluation requires a longer period. After the approval of the evaluation by the national study team, MEGD shall basically respect the evaluation and will not request a change or issue other request.

(2) Scoping

Scoping concerning the target site for this project (Approx. 8ha in Amgalan Botanical Garden is described in the table below.

Table 1-2 Scoping for Project Site

	Impact Item		Evaluation		Reason for Evaluation
			Before/ During Work	After Placed in Service	
Social and Environmental	1	Resident Resettlement / Site Acquisition	D	D	There will be no resident resettlement since the site is in the botanical garden. Regarding site acquisition, the land usage permit was transferred from the city of Ulan Bator to the Health Sciences University last year.
	2	Local Economy	D	D	There will be no impact since there are no retail stores or other businesses.
	3	Land Use / Resource Utilization	C	C	There will be impact consisting of cutting of trees located in the target site → An evaluation will be conducted for animals and plants / any rare species.
	4	Local Social Structure, etc.	D	D	There are no residential areas in the botanical garden, so it is expected there will be no impact.
	5	Existing Infrastructure	D	B+	The target site is along a major highway, so it is expected that hospital access will be improved after the facility is placed in service.
	6	Poor / Ethnic Minorities	D	D	Expected that construction will not have an impact.
	7	Uneven Distribution of Harm and Benefits	D	D	Expected that construction will not have an impact.
	8	Cultural Assets	D	D	There are no cultural assets within target site.
	9	Conflict of Interest in Area	D	D	There are no residential areas in the botanical garden, so it is expected there will be no impact.
	10	Water Use / Use Rights	D	D	There are no residential areas in the botanical garden, so it is expected there will be no impact.
	11	Accidents	D	D	Possibility of impact due to increase in vehicles during construction, but it is expected that impact can be minimized by taking countermeasures.
	12	Public Health	D	B+	Building of new hospital is expected to improve access after facility placed in service.
	13	HIV / Infectious Diseases	D	B+	No impact since the project is not construction of infectious treatment facilities. It can be expected to improve access to health care after hospital is placed in service.
Natural Environm	14	Topography / Geology	D	D	Construction will not result in large scale change to topography, so expected it will not have a negative impact.
	15	Soil Erosion	D	D	Target site is flat for the most part. Therefore, it is

	Impact Item		Evaluation		Reason for Evaluation
			Before/ During Work	After Placed in Service	
					expected project will not have an impact.
	16	Groundwater	D	D	Will not be pumping out large volume of groundwater. Therefore, there will no impact.
	17	Flow of Lakes / Rivers	D	D	Since there are no lakes or rivers on target site, there will be no impact.
	18	Coast / Ocean Area	D	D	There is not an ocean area on the target site.
	19	Flora, Rare Species	A–/B–	B–/C	There is a protected zone, cultivation preparation fields and a larch forest with 80 types of trees and herbs which have been planted numbering 44,796 in the site (8 ha). A review needs to be conducted to obtain a concrete grasp of the impact of project implementation (cutting), and such measures as transplanting and planting need to be considered.
	20	Weather	D	D	The project scale is limited, and will not have an impact on the weather.
	21	Scenery	D	D	Impact can be eliminated by taking appearance into consideration in the design.
	22	Global Warming	D	D	There will be no impact on global warming since the scale of the project is limited.
Pollution	23	Air Pollution	B–	D	There will be a negative impact during construction due to higher emissions caused by the expected increase in the use of construction vehicles / equipment.
	24	Water Pollution	D	D	There will be no negative impact since there are no rivers flowing through target site.
	25	Soil Contamination	B–	D	It can be expected there may be a negative impact due to leakage of oil / other contaminants from construction equipment.
	26	Waste	B–	C	There is the possibility of a negative impact since it is expected there will be waste during construction. Measures also need to be implemented to properly dispose medical waste after hospital is placed in service.
	27	Noise / Vibration	B–	D	It can be expected noise / vibration will be generated during construction due to use of construction vehicles / equipment, and this will have a negative impact.
	28	Ground Subsidence	D	D	It can be expected there will not be an impact since there are no plans to pump out a large volume of groundwater.
	29	Bad Odor	B–	D	There will be a negative impact during construction due to higher emissions caused by the expected increase in the use of construction vehicles / equipment.
	30	Sediment Contamination	D	D	There will be no negative impact since there are no rivers flowing through target site.

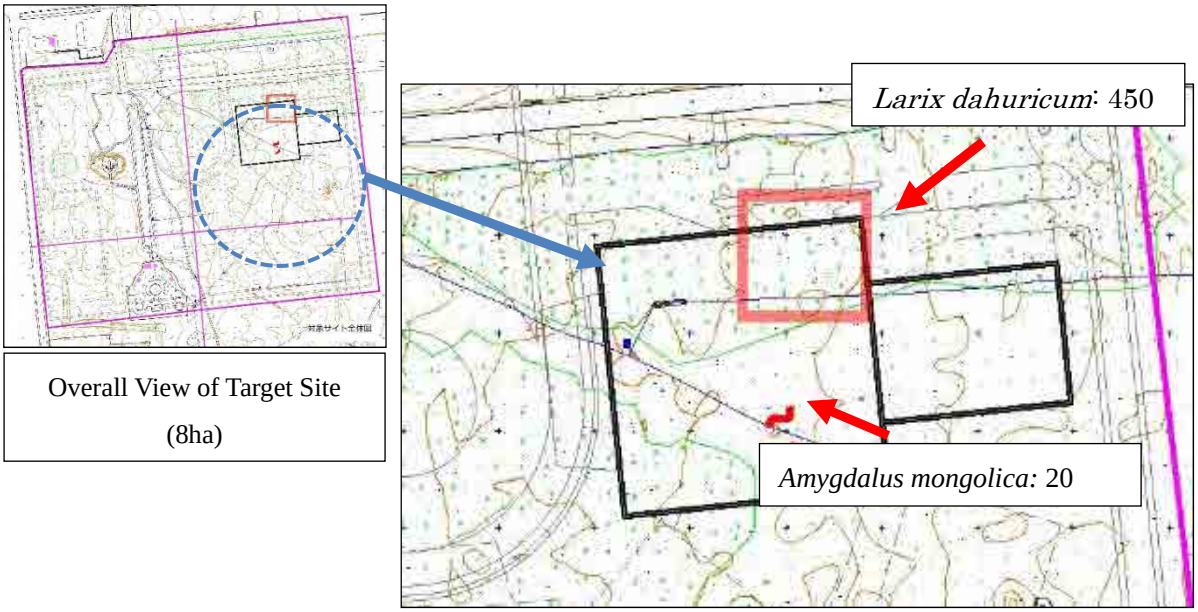
A+/－: Significant positive/negative impact expected　B+/－: Certain extent of positive/negative impact expected
C: Impact at present time unknown　D: No impact or extremely low impact

(3) Prediction of Impact / Evaluation

A total of 30 types of trees numbering 11,760 are growing on the target site (8 ha), and it has been verified that two types are rare species specified in the 1997 Red Book of Mongolia. One of these

types has also been classified as “Endangered” in the IUCN Red List. The locations where the said rare species are growing and an outline of the two species are shown in Fig. 2-2 and Table 2-5.
The Ministry of Education and Science has set up working group for transplantation of these species including experts from the Faculty of agriculture. Method and timing for transplantation was discussed, and was concluded to transplant in October 2014.

Fig. 1-1 Location of Rare Species



Overall View of Target Site (8ha)

Table 1-3 Outline of Rare Species

Scientific Name	*Amygdalus mongolica*	*Larix dahuricum*
English Name	Mongolian Almond (Rosaceae, Amygdalus)	Dahurian Larch (Pinaceae, Larix)
Mongolian Book and IUCN Red List Evaluation	Rare* / Endangered	Rare
Number of Trees in the Target Site	20	450
Indigenous Habitat	Altai Mountain Range	Ereen Range, along the Tsenhermandal, Batshireet and Balj Rivers (Northeastern Mongolia)
Image		

Source: Mongolian Red Book 1997
*There are two types of evaluations in the Red Book: Very Rare and Rare.

Chapter 2 Contents of the Project

Chapter 2. Contents of the Project

2-1 Basic Concept of the Project

(1) Overall Goals and Project Objectivities

The Government Platform 2012-2016 of Mongolia states: “The key objective of the health sector is to provide opportunity for each individual citizen to receive medical diagnostics, treatment and services of the highest quality based on fair competition and selectivity”. As for the education sector, it states “The key objective of the education sector is to educate and prepare Mongolians who are the future of the country’s further development by providing them with an opportunity to domestically receive an education characterized by unique features of Mongolia, in line with international standards and entailing the highest chances of versatility, and to find an employment that suits his/her acquired knowledge and professional skills.”

This Project is directly related to above objective of health sector, “Provide every opportunity to receive quality diagnostics and treatment in the country‟s medical institutions”, and education sector, “Give priority to improvement of not the quantity but the quality of university education, and improve their quality by bringing into practice new education standards.”

The objective of the Project is to construct a teaching hospital with the status of tertiary hospital and to procure equipment for improving quality of post-graduate training and providing tertiary healthcare services/specialized consultative healthcare services of high priority at national level and secondary healthcare services in the city of Ulaanbaatar.

(2) Overview of the Project

In order to achieve the above objectives, this Project is to construct the first teaching hospital in Mongolia. It is expected to provide facility for postgraduate training of the medical staff, and to improve its quality. It is also expected to provide secondary and tertiary medical service to the much-needed local area. The Project will construct the Hospital building and procure equipment as outlined in Table 2-1.

Table 2-1 Outline of the Project

Facility

(1) Building outline

Item	Floor Area (m^2)
Main Building: 3 story building with 1 basement level ① Outpatient Departments (Surgery, Traumatology, Ophthalmology, ENT, Internal Medicine, Neurology, Obstetrics and Gynecology, Pediatrics, Infectious Diseases), Imaging Diagnosis Department, Endoscopy Department, Emergency Unit, ICU Department, Surgery Department, Examination Department, Pharmacy Department, CSSD, Kitchen Department, Administration Department, Education Department (lecture rooms, conference rooms, library), Medical Records Department, Morgue, General Service Department (medical equipment repair, laundry, medical waste) ② Inpatient Ward (104 beds)	15,730 m^2
Boiler Building (single story)	775 m^2
Total	16,505 m^2

(2) Building service outline

- Electrical facilities: Power-supply equipment (incoming/substation/power distribution), emergency power generation system, lights, outlets, communication equipment, fire alarm system, lightning protector
- Mechanical facilities: Air conditioning and ventilation system
- Water supply/discharge and hygiene facilities: Sanitary fixtures, water and hot water supply system, wastewater discharge system, fire-fighting equipment
- Special facilities: Medical gas equipment, elevator system

Medical Equipment

(1) Image diagnosis/treatment equipment
MRI, CT scanner, Angiography, X-ray fluoroscopy unit, General X-ray unit, Mammography, Ultrasound diagnostic equipment, Video-endoscopy system, etc.

(2) Bio-information monitoring/measuring equipment
Patient monitor, Electrocardiograph(ECG), Electroencephalograph(EEG), Electromyograph (EMG), Spirometer, Fatal monitor, etc.

(3) Operation/treatment equipment
Operating table, Operating light, Electrosurgical unit, Anesthesia equipment, Ventilator, Laparoscope operating unit, Microsurgery scope, etc.

(4) Laboratory equipment
Automatic biochemistry analyzer, Automatic immunoassay analyzer, Blood cell counter, Blood gas analyzer, Urine sediment analyzer, Coagulation measuring system, Blood culture apparatus, Fluorescence microscope

(5) Central sterilization and supply department equipment
Large autoclave, Medium autoclave, etc.

(6) PACS（Picture archiving and communication system）
Component: Image report server system, Image interpretation terminal, RIS terminal, Reference PACS terminal, etc.

(7) Other's equipment
Equipment for Out-patient , Equipment for ENT, Equipment for Ophthalmology, Equipment for Emergency, Equipment for Pharmacy, Morgue refrigerator, etc.

Total 272 items

2-2 Outline Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Policy for Facility Design

(1) Facility Level

The objective of the Project is to improve quality of post-graduate training and providing tertiary healthcare services/specialized consultative healthcare services of high priority at national level and secondary healthcare services in the city of Ulaanbaatar. Planning will be based on the provision of secondary healthcare services, but will consider some tertiary healthcare services. The Project design is based on assumption that this teaching hospital by the Project shall be recognized as a tertiary hospital for post-graduate training.

Doctors are sent to work in regional healthcare facilities for the first two years after they graduate from college. Then they receive postgraduate training currently at tertiary level Hospitals, and then work at healthcare facilities including primary and secondary facilities. The development of a secondary healthcare service facility will enhance the level of postgraduate training since it will be the same level with the health care facilities they will be sent after the training. It will also improve the healthcare system in Ulaanbaatar suburban district, which has a high level of need for secondary healthcare facilities because of the influx of population.

In addition, non-infectious diseases have been increasing in Mongolia in recent years. Also, there are 33 diseases in Mongolia for which diagnosis and treatment are difficult according to the Ministry of Health (The document defining these 33 diseases is attached in the minutes of 27th November 2013). This facility with tertiary healthcare services will be beneficial to these patients.

(2) Hospital Clinical Departments

The Hospital will be formulated with a focus on the seven essential clinical departments for a secondary hospital in Mongolia (Internal Medicine, Pediatrics, Surgery, Obstetrics and Gynecology, Traumatology/Orthopedic, Neurology and Infectious Diseases).

(3) Features of Facility Functions

One of the objectives of this Project is to enhance the relationship between Mongolia and Japan. Therefore, the facility will be planned as a hospital with Japanese hospital features. Specifically, this consists of planning efficient lines of movement by staff in areas such as the outpatient clinics and emergency unit, planning to ensure safety and convenience by adopting sliding doors, eliminating level differences, etc., and a facility configuration based on image diagnosis digital system.

(4) Number of Facility Beds

The facility will be planned with the minimum required number of beds after verifying the facility standards in Mongolia for the needs concerning the number of patients for the planned clinical departments, as well as the functions and scale of healthcare facilities in the surrounding area. On

the other hand, the layout and facility plans will take into consideration expansion of the facility to enable the level of healthcare and healthcare education in Mongolia to be maintained in a sustainable manner along with the development of medical science around the world.

2-2-1-2 Medical Equipment Selection Policy

Selection of medical equipment will be performed based on the provision of secondary healthcare services, and also for some tertiary healthcare services in accordance with the policy for the Hospital facility level.

Plans for equipment design will be formulated in accordance with the policy for the clinical departments at the facility. In addition to the seven basic departments, Ophthalmology and ENT (Ear, Nose and Throat) will be provided since they are essential for a secondary care hospital. The medical equipment for this Hospital will be selected considering the standard equipment list for secondary hospitals prepared by the government of Mongolia, and the planned equipment list of the Asia Development Bank (ADB) for the development of secondary hospitals in the city.

Sophisticated equipment that is necessary for tertial health care shall also be considered for departments such as the emergency unit and diagnostic imaging department. These equipment are used at acute care hospitals in Japan, and will enable the capability to diagnose and deal with diseases which is currently difficult in Mongolia.

2-2-1-3 Policy for Natural and Environmental Conditions

(1) Considerations for Temperature / Solar Radiation

The planned construction site in this Project is located in Ulaanbaatar which is called “the coldest capital city in the world” where the daily temperature fluctuation is in excess of 20 °C, and the annual temperature range and daily temperature range are both large. Due to the facts that heating is needed for 8 months of the year, the fundamental approach for the facility design is to have top priority for good insulation. Specifically, exterior thermal insulation will be adopted for the roof and walls, double-glazed glass will be adopted for the windows and other openings, and other features will be exhaustively incorporated in order to reduce heating load. The design will also deal with condensation and prevention of heat bridges.

There are only few hours of sunshine during the winter, so the natural daylight will be fully utilized to illuminate the rooms. Openings in the building will be limited in order to achieve a comfortable warm environment where people spend most of their time, but a large opening will be incorporated at corridors and halls to have natural light reach deep into the building.

(2) Considerations for Rainfall / Floods

Since the amount of annual rainfall is low at less than 300 mm, and 70% of the annual precipitation consists of rainfall during the three months of summer (from June to August), the air is dry most of the time, so dusts are the major issue in building design. Therefore, an exterior material that is resistant to the adherence of dirt will be selected in order to prevent degradation of the facility.

On the other hand, climate change has been taking place in recent years, and there was a flood in Ulaanbaatar in 2009 for the first time in 40 years due to intense rainfall. According to the Emergency Management Office in Bayanzurkh District, there have been no reports of flooding in

the planned construction site for this Project, but there have been reports of flood damage in the area on the east side of the site. Consequently, floor-zoning plans call for the major departments such as the imaging diagnosis department and medical examination department where expensive medical equipment is installed to be not located in the basement.

(3) Considerations for Earthquakes

The northern part of Mongolia along the border with Russia has a fault line that separates Europe from Asia, and earthquakes with a magnitude of approximately 8 have been recorded that can cause considerable damage to buildings. In addition, earthquakes which cannot be felt have been on the increase in Ulaanbaatar since 2005, and have been increasing rapidly especially since 2009. Furthermore, it was determined by a survey conducted in 2010 (Caracterisation des effects de sites dans le basin d'OulanBator, Docteur de l'Universite de Strasbourg) that the Ulaanbaatar city region is surrounded by four faults, and it has been pointed out that there is the possibility an earthquake with a magnitude of 7 may occur. In consideration of these facts, this Project will adopt an antiseismic structure based on earthquake-resistance standards in Japan to ensure the Hospital function in the event of an earthquake.

2-2-1-4 Policy for Social and Economic Conditions

(1) Facility Plan Based on Latest Case Study

The development of facilities at public hospitals in Mongolia has been a level that is not adequate up until now, but the renovations of the CSSD and Surgery Department at the First National Hospital, a tertiary level hospital, in recent years, as well as the privately funded International Medical Center which is now under construction and other such facilities has brought the level of facilities to one that is close to developed countries. In addition to the latest situation as described above, the fact that Mongolia expect hospital design and operation concepts from Japan to be introduced will be taken into consideration and the latest case studies for standard secondary care hospitals in Japan will be followed for the level of the facilities.

(2) Selection of Finish Materials with durability

Where there is a heavy usage such as the halls and corridors, terrazzo flooring will be used to minimize maintenance expenses, and PVC sheeting will be used as the floor material for the main rooms to maintain hygiene conditions. The walls, ceilings, and exterior walls are to be paint finish for easy repair and maintenance.

2-2-1-5 Policy for Construction Conditions and Equipment Procurement Conditions

(1) Architectural Regulations / Building Permit Procedures

Mongolia has legal procedures for building permissions. The design of the buildings will follow the local laws and regulations, and will be designed to acquire local building permits. Building permit procedures can be roughly divided into four stages; (1) Obtain a land usage permit (development permit) and technical condition permit at the basic design stage; (2) Undergo a detailed design

review by the Construction Agency, Fire Department and Heating Department in Ulaanbaatar; (3) Obtain a groundbreaking permit from the Construction Agency after the contractor has been selected during the bidding stage, and (4) Undergo inspections 2 – 3 times by an inspector from the Construction Agency during the construction process and obtain a usage permit after the completion of construction.

(2) Procurement of Construction Materials

Mongolia does have their individual industrial standards for construction materials. Russian standards and ISO standards have been adopted for some of the construction materials used. Currently, products imported from China are generally used. For this Project, Japanese hospital design features will be considered for spaces that require high level of technology, such as the operation theaters, radiation protection, electromagnetic shields, and other shield related items, medical gas related facilities, fire extinguishing equipment and others. However, local or Chinese materials that are normally used in Mongolia, and can be easily obtained will be used for other areas. This will lower the construction cost and also maintenance cost of the building.

(3) Procurement of Medical Equipment

The market in Mongolia depends on the import of medical equipment from abroad, with almost no medical equipment being manufactured in the country. The local agents that handle products of major Japanese and European manufacturers have been confirmed, and the general rule will be to procure these products from Japan.

2-2-1-6 Policy Concerning Utilization of Local Companies (Construction Companies, Consultants)

Many facilities are constructed in Mongolia by public agencies or the private sector by utilizing local construction consultants and construction companies. In addition, local construction consultants and construction companies are utilized for many assistance projects, including those implemented by Japan. Thus, local companies will be utilized for this Project.

2-2-1-7 Policy for Operation and Maintenance

The operation and maintenance cost of the buildings will be optimized by a comparative study of the building materials used at similar healthcare facilities in the country. Building material and medical equipment will be selected considering the ease of obtaining consumables and maintenance parts required for routine maintenance. Medical equipment that has local agents in Mongolia will be selected.

The appropriate maintenance contracts are indispensable for MRI, CT, angiography and other advanced medical equipment. Therefore, maintenance contracts for advanced medical equipment will be included for certain period after opening of the Hospital.

2-2-1-8 Policy for Construction Schedule

The climate in Ulaanbaatar consists of a long winter, which lasts from October to mid-May, and a short summer season of about 4 months. Since the average temperature during the winter is below 0 °C, measures against freezing damage need to be taken when performing painting work, block stacking work, and other work outdoors where water is used. Also the structural framework construction must be done during summer period. Since the ground is frozen from October until around April, earthwork cannot be started during this period. Consequently, in consideration of these conditions, a construction schedule with enough time needs to be planned.

2-2-2 Basic Plan (Building Plan and Medical Equipment Plan)

2-2-2-1 Building Plan

(1) Hospital Level

The content of the initial request in August 2012 was for the university teaching hospital with district hospital (secondary level) functions. Discussions were conducted with the Ministry of Education and Science, Mongolian National University of Medical Sciences, the Ministry of Health, and other related agencies in Mongolia during the preparatory survey. Both sides agreed in the minutes of the preparatory survey in January 2014 to position this t university eaching hospital with the status of tertiary hospital in consideration of the need to provide the ability to deal with diseases that are currently difficult to diagnose and treat in Mongolia. This university teaching hospital will also serve as secondary healthcare services in the city of Ulaanbaatar. The Hospital level will be planned in accordance with this agreement.

(2) Hospital Clinical Departments

The content of the initial request in August 2012 contained a diverse range of departments. A review of the seven clinical departments required as a minimum for a secondary hospital by the Ministry of Health of Mongolia (Surgery, Traumatology/Orthopedic, Internal Medicine, Neurology, Infectious Diseases, Pediatrics and Obstetrics and Gynecology) was conducted during the preparatory survey in accordance with the policy for hospital level, and in the minutes of the preparatory survey of January 2014, ophthalmology and ENT which are generally provided at secondary healthcare hospitals were added to these seven departments. An agreement was reached to have the departments listed below, excluding the departments agreed to have only C level priority.

Table 2-2 Proposed Clinical Departments

Departments	Hospital Department	Priority	Remarks
	Emergency Unit Including emergency delivery, observation wards	A	
Surgery Traumatology	Operation Theaters (Rooms) Including recovery ICU	A	
	Surgical Clinic Surgery, Traumatology, Orthopedic	A	
	Ophthalmology	A	
	ENT	A	
Internal Neurology Infectious Diseases	Medical Clinic Internal Medicine, Neurology, Infectious Diseases	A	Doctors in following departments will cooperate: Cardiology, Respiratory, Digestive Organs, Kidney, Endocrinology, Hematology and Dermatology.
Obstetrics, Gynecology and Maternity/ Pediatric Clinic	Obstetrics, Gynecology and Maternity /Pediatric Clinic	A	
	Radiology Department	A	
	Clinical Laboratory	A	
	Morgue	A	
	Pharmacy	A	
	Ward Department	B	Diagnosis department will be given priority over number of beds.
	Rehabilitation Department	C	It should be a rehabilitation center that offers occupational and other training, but this is outside the scope of this Project.
	Traditional Medicine Department	C	Compartmentalization will be performed to facilitate recuperation at existing hospitals in the region
	Internal Medicine Intensive Care Department	C	Excluded since NICU, PICU, CICU etc. consist of tertiary health care.
	Delivery Department	C	Since there are maternity hospitals in the region, normal delivery will not be performed at this hospital. Emergency deliveries will be handled by the Emergency Unit.
	Dentistry	C	Excluded from scope since it is not directly related to Medical Teaching Hospital.
	Cancer Department (Radiation Therapy, etc.)	C	Excluded from scope since radiation and other such therapy consists of advanced medical technology.
	Psychiatry	C	Excluded from scope since type of patients differs.

(3) Number of Hospital Beds

The initial request in August 2012 was for 150 to 200 beds. In the preparatory survey in January 2014, discussions were conducted for the minimum required bed numbers, taking into consideration the Hospital level and clinical departments. It was discussed that Mongolia can expand the wards in

the future by themselves. This resulted in the decision to plan 104 beds (86 general ward beds, 10 emergency unit beds, and 8 ICU beds) as shown in Table 2-3 below.

Table 2-3 Proposed Number of Hospital Beds

Department		Number of Beds	Remarks
General Ward	Internal Medicine	24 (36)	6 rooms with 4 beds each (6 beds can be placed in a 4-bed room)
General Ward	Surgery	24 (36)	6 rooms with 4 beds each (6 beds can be placed in a 4-bed room)
General Ward	Obstetrics, Gynecology Pediatrics	32(48)	8 rooms with 4 beds each (6 beds can be placed in a 4-bed room) The number of obstetrics inpatients is low since childbirth delivery will not be normally done in this Hospital. It is placed in the same floor with Pediatrics wards, so that the wardrooms can be flexibly designated to each speciality area.
Isolation Rooms		6 (12)	6 rooms with 1 bed each (2 beds can be placed in a 1-bed room)
	Sub-Total	86 (132)	
Emergency Unit	Observation Wards	8	2 rooms with 4 beds each
	Isolation Rooms	2	2 rooms with 1 bed each
ICU	General	6	
	Isolation	2	
	Total	104 (150)*	

*The number of beds in brackets are when maximum number of beds are put into each wardroom.

There is a large fluctuation in the number of inpatients in Mongolia depending upon the season, and Mongolian side pointed out that at these times the number of beds 104 maynot be sufficient. At such time, the space for 150 beds can be provided by placing 6 beds in the 4-bed rooms. The Medical Service Act of Japan stipulates that an area of 6.4 m^2 or more is required per hospital bed. In Mongolia, the old standard required only 4.3 m^2 per bed, and most of the existing hospitals is based on this old standard. The size of 4-bed hospital rooms in Japan in recent years is generally 32 m^2 or more (8.0 m^2/bed), which allows 6 beds to be placed in the room according to the old standard of Mongolia. Although Mongolia initially requested to have 150 to 200 beds, both sides agreed to have only 104 beds with sufficient space for 150 beds according to the old standard, when there is large seasonal fluctuation in demand of beds.

(4) The Size of the Hospital

The initial request of August 2014 was for a five-story facility with one basement level, with a total floor area of 9,000 m^2. During the preparatory survey, it was evaluated that this total consists of the total area of rooms in each department, but does not include the area for corridors, stairs, elevators, machine rooms etc.

Based on the plans for the Hospital level, clinical departments and number of beds, the size of the Hospital was reviewed by narrowing down the medical departments in the initial request as well as adding the functions, which were lacking (ICU department, kitchen department, emergency power generation facilities, fire prevention equipment, etc) as a secondary hospital. This resulted in a hospital with floor area of approximately 15,000 m^2 for the required rooms and departments. Furthermore, a boiler system will also be planned. The local heating supply system is not adequate to supply enough heat to this Hospital, and there were no definite plans to increase the capacity of the local heating supply system.

(5) Project Site

The building site was not defined in the initial request documents in August 2012. Mongolian side submitted a site measuring 8 ha in the northwestern portion of the Amgalan Botanical Garden (botanical garden belonging to the Institute of Botany of the Mongolian Academy of Science under the Ministry of Education and Science in Mongolia) in the 12th Khoroo of the Bayanzurkh District in November 2013.

The project site is located approximately 6 km to the east of The Mongolian National University of Medical Sciences (which is currently located in the center of the city). The site consists of an 8 ha area in the northwestern portion of the botanical garden. It takes approximately 20 minutes by car from the center of the city to the site. There is currently a yurt housing area (гэр хороо) in the surrounding area, but many housing complexes are being developed. This area will be developed rapidly in the near future.

There is no railway station currently near the site, and the only means of transportation to the site is bus, taxi or automobile. However, the Metro Project (subway / elevated railway) approved in March 2013 by city of Ulaanbaatar will construct a station next to the site.

The Ulaanbaatar City Land Management Office issued a land use authorization (specifying that The Mongolian National University of Medical Sciences is the responsible authority) on November 14, 2013. The land use authorization is valid for five years, and update proceedings for the right of possession. is necessary after this period.

There is a solid sand-gravel layer from the surface of the site, and the spread foundation method can be adopted below the frozen depth, according to the natural condition survey that was conducted during this study. Therefore, special provisions such as pile foundations are not necessary when constructing buildings in this site.

The project site currently does not have hot water supply lines in Ulaanbaatar city from the central thermal power plant. A new power plant is under construction in the Bayanzurkh District to the northeast of the botanical garden, and is scheduled for completion in December 2014. It may be possible to receive a supply of hot water from this power plant, but the permission procedure for connection was not completed by the time design was conducted. Therefore, it was decided to be appropriate that this Project will include a coal boiler system within the project.

For the water supply and discharge, there is a main pipeline on the opposite side of the arterial highway on the north side of the site and there are water supply and discharge lines on the south side of the project site.

For electricity, there are multiple electrical power lines that are connected to the botanical garden, and there are electrical power lines and power poles within the project site and in the surrounding residential district.

Therefore, this site is suitable for building of this Hospital from the perspectives of the legal procedures for ownerships, shape of the site, infrastructure and other details.

(6) Site / Facility Configuration Plan

The site is connected to the arterial highway from the center of Ulaanbaatar on the north side of the site. Public buses and trolley buses are operated on the arterial highway on the north side, and since a new Metro station will be constructed, there is a high probability that the main access to the site by pedestrians will be from the arterial highway on the north side.

On the other hand, there is a yurt housing area on the west side of the site. Redevelopment of this west side area is already decided with plans to widen the road on the west side. It is practical to have the access gate of the new Hospital in this new west side road with traffic lights for safety in the future.

The Hospital site plan will be designed with access gates from the north side and designed so that it can be approached from the west side in future. These two gates will make easy access for the Hospital visitors.

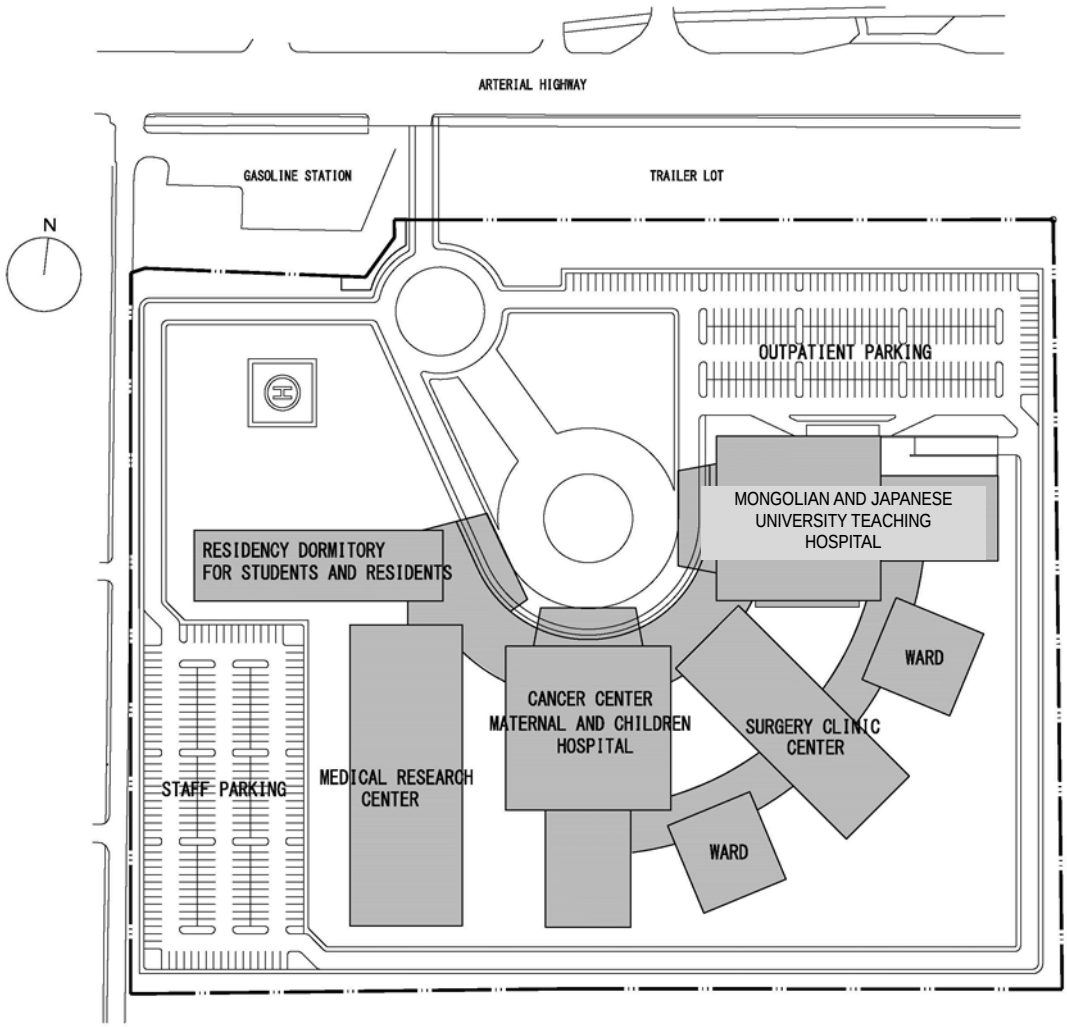


Fig. 2-1 Master Plan Layout

A sub-rotary is planned at the north side connection with the arterial highway. This rotary will enable access from both the north side and the west side. Another main rotary is designed in the center of the site, with the outpatient parking lot placed in the northeastern part of the site. This will separate the flow of automobiles dropping off and picking up passengers from the flow of automobiles headed for the parking lot, and the main facility located on the south side. An example of the layout plan according to the master plan by the University is shown in Fig. 2-1. Consolidated placement of this facility on the east side of the site enables the facility to be sequentially expanded along the main rotary in the future. Furthermore, the peripheral road around the site boundary is planned so that the flow of people is clearly separated from the flow of service vehicles.

The site plan for this Project is shown in Fig. 2-2. Only one main gate at the facility is planned for security, and it is connected to the sub-rotary. The flow of pedestrians, ordinary vehicles, service vehicles, and emergency vehicles will all be channeled through the sub-rotary.

Services vehicles will use the peripheral road around the site boundary, accessing the Hospital from the east side. It is designed to separate clearly the flow of ordinary vehicles from service vehicles in order to prevent mixed flow of these vehicles.

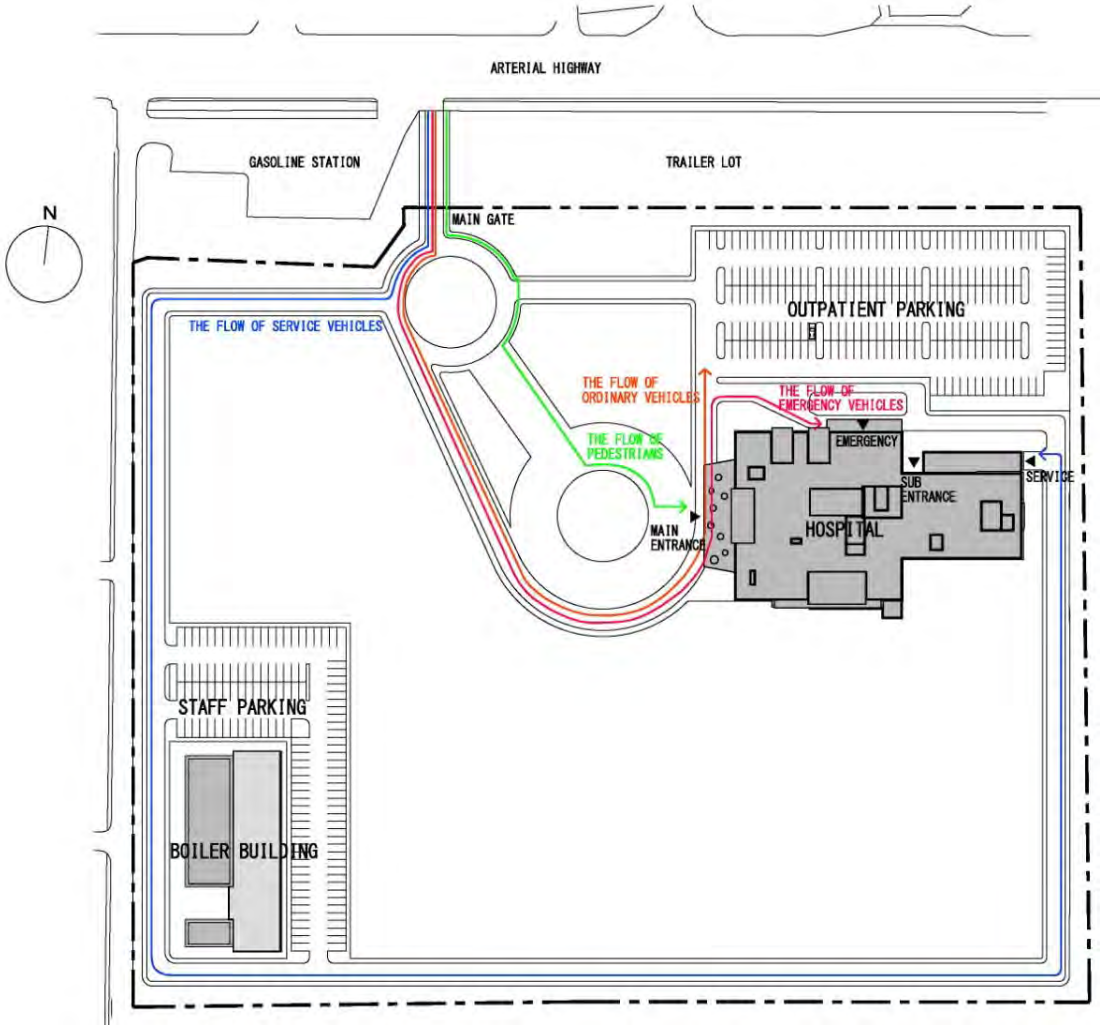


Fig. 2-2 Hospital Site Plan

The planned capacity of the outpatient parking lot on the northeast side of the site is approximately 220 vehicles. This Project estimates that there will be 720 outpatients per day. It is expected that outpatients will be dispersed into morning and afternoon hours, and that about half of the outpatients will be brought by family or friends, and the other half will use public transportation, resulting in an outpatient parking lot size capable of accommodating approximately 180 cars. It is projected that people visiting patients in the Hospital will amount to about 1/3 of the 104 beds, which is approximately 35 cars, and people visiting surgery patients will use about 5 parking spaces, for a total parking lot capacity of 220 cars. Planned access to the outpatient parking lot will consist of both direct access from the sub-rotary and access from the porch in front of the main entrance, making it easy for patients to access to the Hospital building.

A porch for the ambulances is planned on the north side of the Hospital so that the flow of ordinary patients is not mixed with the flow of emergency vehicles.

The boiler building for heat supply to the facility and staff parking lot is located in the southwestern area of the site so as not to interfere when the Hospital is expanded in the future.

(7) Floor Planning

1) Zoning

Since construction work on the building frame cannot be performed during the long harsh winter in Mongolia, a building design with many floors leads directly to longer construction period. Basements are generally provided to prevent freezing of the foundation in Mongolia. Therefore, a three-story structure design with one basement for this Hospital is adopted to shorten the construction time and for structural safety. The Hospital is designed considering efficient flow of patients and staff, and flexibility for future layout modifications.

First, the clinical departments and the wards are zoned into separate buildings. This Project is planned with 104 beds. By separating the buildings, ward buildings can be added in the future by the Mongolian side when the number of patients increases.

With these zoning principles, following items are designed;

- Consolidate outpatient departments on the 1st floor for easy approach by the patients.
- The Emergency Unit located on the 1st floor to make it easy for ambulances to bring in patients, and provide a medical elevator close by to provide easy access to the operation theaters and Imaging Diagnosis Department on the 2nd floor.
- Consolidate Surgery Department, ICU, Imaging Diagnosis Department, and Endoscopy Department on 2nd floor to enable advanced medical services to be offered on one floor.
- Locate CSSD, Morgue, and kitchen / laundry department, which use a large volume of water in the basement in order to minimize the danger of damage due to accidental water leakage.
- Locate medical records, library and other departments that have a large structural load in the basement to maximize structural efficiency.

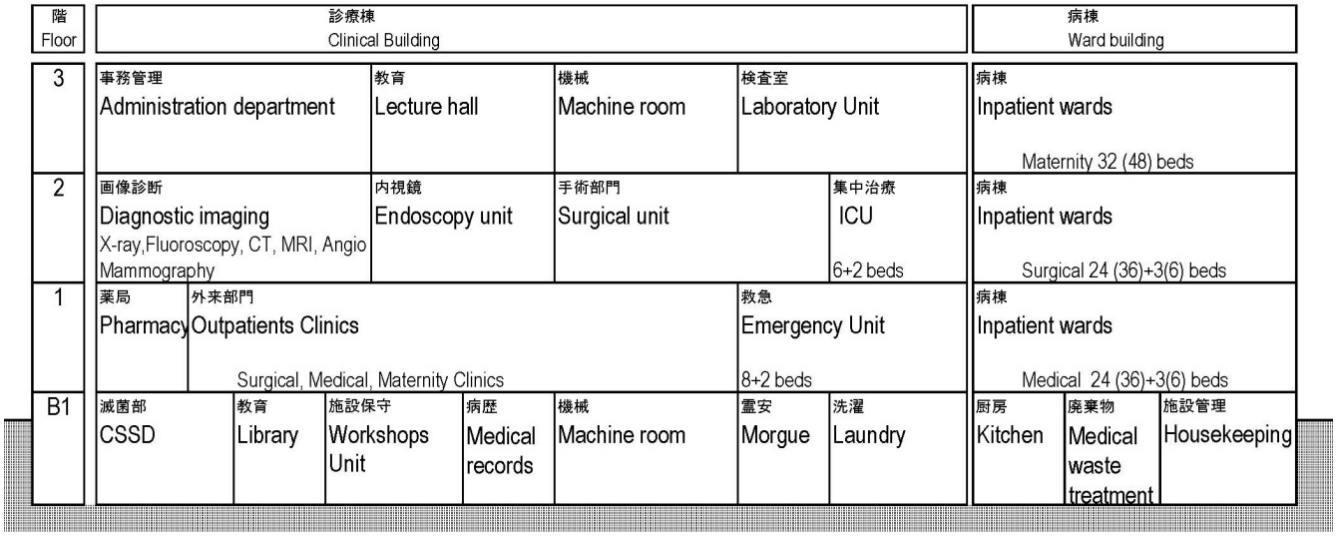


Fig. 2-3 Facility Floor Zoning

2) Design Concepts for Planning of Respective Facility Departments

[1st Floor]

The following hospital functions are planned on the 1st floor.

- Out-patient departments

- Emergency Unit
- Pharmacy department
- Inpatient ward department (internal medicine)
- Other departments (OPD administration, accounting, entrance hall, guardian's room, dress deposit, storage, etc.)

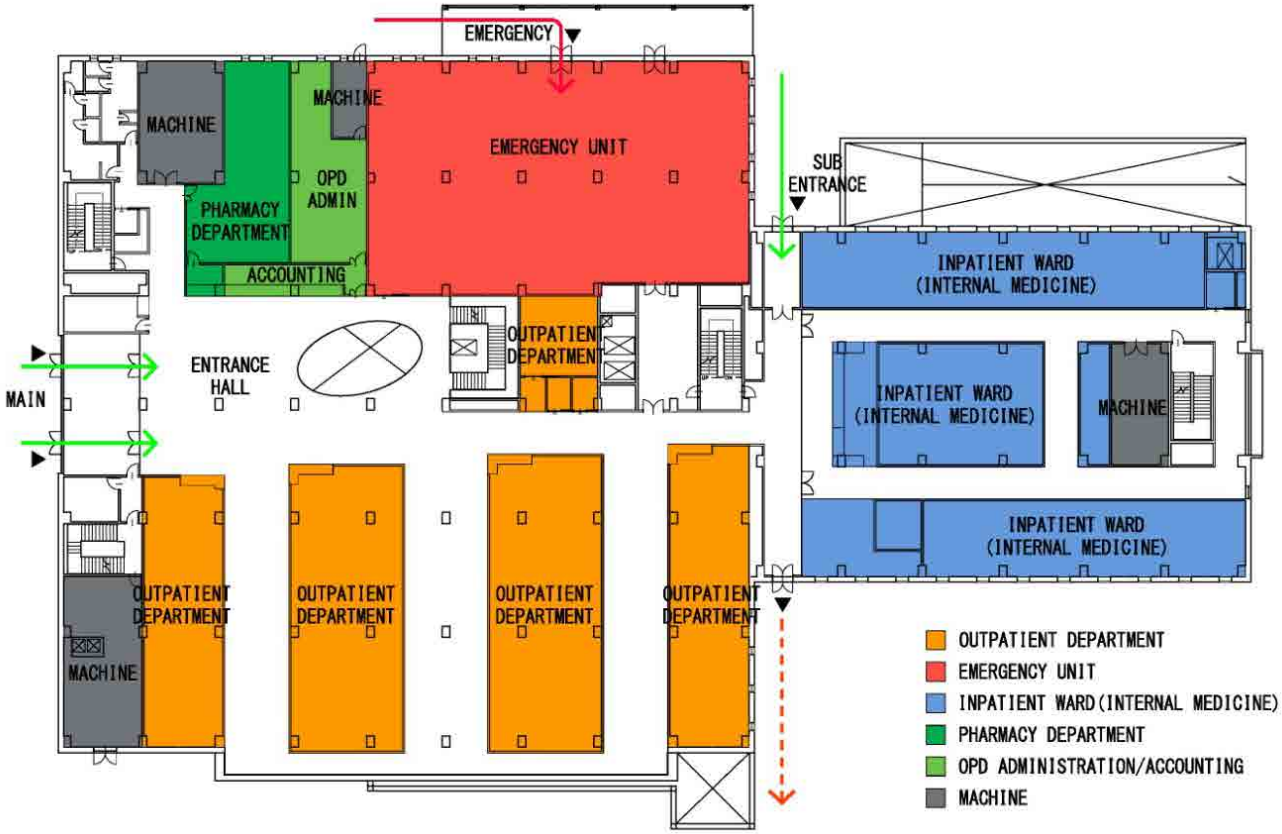


Fig. 2-4 1st Floor Plan

The main entrance hall is located on the west side, with a sub-entrance provided very close to the ward building, and a passageway between the clinical building and ward building. The passageway can be extended if modification or expansion of medical service becomes necessary in the future to cope with advancement of medical technologies, allowing additions to be made to the ward building from that location. The departments planned in this Project will be sustainable, since this future expansion will not detract their functions. It is expected that people visiting patients in the inpatient ward will use the sub-entrance, which will prevent the flow of these people from being mixed with outpatients, and providing a pathway for the families of patients in the inpatient ward after hours when the outpatient area is closed.

The outpatient department is placed on the south side facing the open area of the site plan. This location will give flexibility for any future modification of the department, without disturbing the function of the Emergency Unit on the north side (Refer to Fig. 2-4).

A) Outpatient Clinics

There is the Mongolian General Hospitals National Standard Guideline (dated July 19, 2013)

defining the structure, functions and content of activities (hereby mentioned as “the MGHNSG”). This MGHNSG specifies the minimum number of staff that is required at general hospitals. The clinical departments of this Hospital are shown in Table 2-4. The population of the Bayanzurkh District is 304,323 (as of 2013), and the minimum required number of doctors applicable for this facility is shown in the far right column in the table.

Table 2-4 Minimum Permitted Number of Doctors at General Hospital (Excerpt)

Type of Doctor	Clinical	Outpatient		
		Up to population of 50,000	For population of 50,000 – 100,000	For population of 100,000 or more
Surgeon	1 per 6 – 7 beds	1	1 – 2	3
Trauma Surgeon	1 per 6 – 7 beds	1	1 – 2	3
Internist	1 per 10 beds	3 – 4	5 – 6	7
Neurologist	1 per 10 beds	1	2	4
Ophthalmologist	1 per 9 – 10 beds	1	1 – 2	2 – 3
ENT Doctor	1 per 10 beds	1 – 2	2 – 3	4
Obstetrician and Gynecologist	1 per 6 – 7 beds	2 – 3	4 – 5	6 – 7
Pediatrician	1 per 6 – 7 beds	2	3 – 4	5 – 6
Infectious Disease Doctor	1 per 8 – 10 beds	1 – 2	2 – 3	3 – 4
Total		13 – 17	21 – 29	37 – 41

The MGHNSG does not specify the number of required examination rooms, but the number of rooms can be determined from the required number of doctors. For example, regarding calculation of the number of surgeons, since this Project includes a traumatology department in the surgical clinic, the minimum required number of surgeons and trauma surgeons amounts to 3 surgeons + 3 trauma surgeons = 6. When the fact that the doctors will work in the inpatient ward in addition to the outpatient clinics is taken into consideration, and the assumption is made that there will be 2 shifts per week for the doctors at the outpatient clinic, the required number of examination rooms is: 6×1/2 = 3. When the required number of examination rooms is compiled based on this way of thinking (Table 2-5), it results in 20 rooms. Plans will be formulated for the number of respective rooms required for actual examination using this value as an indicator.

Table 2-5 Number of Required Examination Rooms at This Hospital

Clinical Department	Minimum Required No. of Doctors	No. of Exam Rooms	Remarks
Surgery / Traumatology	6	3 rooms	Assumed to be 2 shifts/week
Internal Medicine / Neurology	11	6 rooms	Assumed to be 2 shifts/week
Ophthalmology	2	1 room	Assumed to be 2 shifts/week
ENT	4	2 rooms	Assumed to be 2 shifts/week
Obstetrics and Gynecology	6	3 rooms	Assumed to be 2 shifts/week
Pediatrics	5	3 rooms	Assumed to be 2 shifts/week
Infectious Diseases	3	2 rooms	Assumed to be 2 shifts/week
Total		20 rooms	

The system where doctors are not assigned to a room will be adopted (called “Free Address” system in Japan) in order to allow changes in the clinical department configuration to be easily made in the future, based on the standard room size for hospitals in Japan (width of 3,000 mm x depth of 3,500 mm). A dedicated area for staff will be provided to the rear of the examination rooms, preventing the flow of outpatients and flow of staff from being mixed.

The MGHNSG stipulates an examination room size of 12 m^2 – 18 m^2/room (8 m^2 – 22 m^2/room for surgery and traumatology). In this Hospital, the examination room size itself will be smaller than this standard. However, it will have sufficient space since there will be a separate staff area at the back of each room as explained above.

Furthermore, the group of examination rooms will be divided into four blocks, and a reception desk will be provided for each block in order to reduce the time patients need to wait at the reception desk. An opening will be provided at the end of the waiting area to make it bright and pleasant.

The plan for the respective rooms is shown in Table 2-6 below.

Table 2-6 Various Rooms Planned for Outpatient Clinics

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Exam Room	8	11	6 exam rooms (internal medicine/neurology) + 2 exam rooms (infectious diseases) are assumed. Layout will include wash basin, medical desk, and other items.
Ophthalmology Exam Room	1	11	Layout will include wash basin, medical desk, slit lamp, refractometer, tonometer, ultrasonic biometer and other items.
ENT Exam Room	2	11	Layout will include wash basin, medical desk, nasopharyngeal mirror, coagulator, nebulizer and other items.
Ob/Gyn Exam Room	2	11	Two or three required exam rooms will be planned, with 1 exam room allocated as treatment room. Layout will include wash basin, medical desk, instrument cart, internal examination chair, colposcope and other items.
Pediatric Exam Room	2	11	Two or three required exam rooms will be planned, with 1 exam room allocated as treatment room. Layout will include wash basin, medical desk, examination couch and other items.
Procedure Room	6	11	Plan to have 3 rooms for surgery/traumatology, 1 room for obstetrics/gynecology and 2 rooms used by internal medicine as space for intravenous drip. Layout will include wash basin and sink, medical desk, patient couch, instrument cart and other items.
Injection Room	2	11	Planned as connection space for injection drugs used by outpatient clinic. Provide wash basin and sink.
Plastering Room	1	11	Used to make casts. Provide floor drainage and sink.
Ophthalmologic Procedure Preparation Room	1	11	Layout will include wash basin and sink, medical desk, patient couch, instrument cart and other items.
Ophthalmologic Procedure Room	1	11	Layout will include wash basin and sink and green light laser.
Visual Field Test Room	1	11	Layout will include wash basin and eyesight analysis device.
Dilation Sub-waiting Room	1	11	Have patients wait in this room until pupil(s) dilate before treatment.
Audiometry Booth	1	11	Provide hearing exam booth.
Vestibular Test Room	1	16	Conduct examination of balance functions. Layout will include wash basin.
Pediatric Treatment Room	1	11	Layout will include wash basin, sink, medical desk, patient couch, instrument cart, nebulizer, aspirator, syringe pump, drug infusion pump and other items.
Counseling Room	1	11	Used to provide explanations to patient families.
EMG Room	1	16	Layout will include electromyograph, medical desk, examination couch and other items.
EEG Room	1	11	Layout will include electroencephalograph, medical desk, patient bed and other items.
Spirometer Room	1	11	Layout will include spirometer, medical desk and other items.

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Ultrasound Room	1	11	Layout will include ultrasound Doppler apparatus, medical desk, examination couch and other items.
Echo Cardiograph Exam Room	1	11	Layout will include 3D/4D ultrasound echo apparatus, medical desk, examination couch and other items.
ECG Room	1	11	Layout will include electrocardiograph, Halter ECG, treadmill, ergometer, examination couch and other items.
Technician Room	1	11	Room for physiological examination technicians
Phlebotomy & Specimen Room	1	40	Used for collection of urine sample cups and blood samples. Layout will include blood sampling booth, experiment table, centrifuge and other items.
HWC (Outpatient)	2	5	HWC for urine collection.
Staff Passageway	4	45 – 65	Layout will include sink, waste material sink, medical cabinet and other items, and passageway will be wide enough to allow staff to come and go.
Staff Lounge (Outpatient)	1	10	Break room for medical staff.
Staff Toilet (Outpatient)	2	3	Toilet for medical staff.
Outpatient Waiting Area		450	Waiting chairs will be located in the center, and the aisles on both sides will be of adequate width to allow wheelchairs and walking people to pass each other.
Outpatient Reception	4	10 – 14	One reception desk will be planned for each block in order to disperse patient reception.
Billing Counter	1	29	Will handle receiving of payment, reception of patient introduction letters, patient admission/discharge and other procedures.
Administration Office	1	50	Standard office size in Japan is 8 – 12 m^2/person. Will provide work space for at least 6 people. If practices at general secondary care hospitals in Japan are followed, a minimum of 6 staff will be required to handle outpatient account calculation, preparation of documents and hospital admission/discharge procedures.
Staff Pantry	1	11	Hot water supply room shared by outpatient staff.
Conference Room (Administration)	1	21	Standard conference room size in Japan is 2 – 3 m^2/person. Envision room will accommodate 7 – 10 persons.

B) Emergency Unit

This department will perform examination and treatment of after-hours outpatients and emergency patients. Patients that require hospitalization after treatment will be taken to the respective inpatient ward, and patients requiring surgery will be taken to the surgical department on the 2nd floor.

Two means of access will be provided: From the entrance hall and ambulance porch. Dedicated reception space for ambulances will be provided. In addition, plans will be made to allow direct access to the surgical department from the emergency treatment room using the medical elevator in consideration of coordination with the operation theaters. Furthermore, due to the fact that the MGHNSG stipulates that isolation rooms must be provided, the isolation rooms and dedicated infectious exam rooms will be placed in a location where they will not mix with the flow of other persons in order to deal with possible outbreaks of infectious diseases.

The respective rooms required for an Emergency Unit by the MGHNSG are described in Table 2-7 below.

Table 2-7 MGHNSG (Emergency Unit)

Room Name	Standard figures
Reception	10 m^2
Waiting Area	1.2 m^2 per patient 12 m^2 or more
Emergency Unit Office	8－12 m^2
Exam Room	12 m^2
Exam Result Confirmation Room	12 m^2
Isolation Room (provided with toilet)	12－18 m^2 Need to provide number of beds equal to 1% or more of total number of hospital beds
Emergency Exam Room	12 m^2
Procedure Room	18 m^2
Hospital Room	12－18 m^2 Need to provide number of beds equal to 4% or more of total number of hospital beds for emergency treatment Need to provide number of beds equal to 1% or more of total number of hospital beds for resuscitation and life saving
Clean Zone Entrance	6－10 m^2
Resident-on-call	10 m^2
Nursing Station	16 m^2
Relatives Waiting Room	－

The total number of beds planned in this Project is 104 beds (maximum 150beds), but this is due to budgetary constraints, and that priority was given to clinical areas. It was also considered that the wardroom can be increased systematically, but increasing the clinical area is physically difficult. Therefore, the total number of beds used for calculation of the number of beds in the emergency unit will be 200 beds, considering following reasonings.

This Project is to have a hospital with Japanese features, so the number of beds used for calculation of the scale of the clinical departments needs to be determined in accordance with the practical scale of secondary healthcare hospitals in Japan. According to May 2014 statistics from the Ministry of Health, Labor and Welfare in Japan, the average number of beds in hospitals in Japan as a whole is approximately 184 beds, with national hospitals having an average of approximately 398 beds, prefectural hospitals approximately 272 beds and municipal hospitals approximately 213 beds. The average number of beds is low because of hospitals established by individual practitioners, thus the minimum required number of beds for a secondary healthcare hospital should be 200 beds or more. The fact that the number of beds for general inpatients is assumed at approximately 200 in a project of ADB for the construction of secondary hospitals in Mongolia also supports the appropriateness of the scale assumed for the Hospital.

Therefore, the minimum number of beds in the Emergency Unit required in this facility will be as follows: Isolation beds: 200 beds x 0.01 = 2 beds, Emergency treatment beds: 200 beds x 0.04 = 8 beds, Resuscitation and lifesaving: 200 beds x 0.01 = 2 beds.

Based on the above information, the facility is designed with the added respective rooms that are actually required for examination (Table 2-8).

Table 2-8 Respective Planned Rooms for Emergency Unit

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Emergency Procedure Room	1	176	Three emergency beds for resuscitation and lifesaving will be provided. Layout will allow easy observation of all beds from nursing station.
Triage Room	1	37	Severity of patient condition will be judged when multiple patients are received, and priority of treatment assigned. Extra space will be provided since it would be dangerous to have patients wait outside during the harsh winters in Mongolia.
Wash-up Room	1	10	Dirty patients will be washed.
Soiled Room (Emergency)	1	9	Sink for soiled waste and ordinary sink provided.
Equipment Room (Emergency)	1	11	Adequate space will be provided for equipment required for emergency treatment (3D/4D ultrasound echo, electro-cardiograph, artificial respirator, dialysis machine, defibrillator, patient monitor, syringe pump, drug injection pump, etc.) and medical cabinet s.
Emergency Exam Room	2	11	Will use same layout as outpatient clinic exam rooms. Treatment will be performed in emergency treatment room if deemed necessary by examination.
Emergency Reception	1	35	One room will serve as reception and Emergency Unit office.
Emergency Waiting Area	1	50	Will provide space for both patients and family members that accompany patient.
Infectious Disease Exam Room	1	11	Exam room for infectious diseases. Will plan location with direct access from outside area via air lock. Layout will be the same as emergency exam rooms, with negative pressure used to prevent the escape of air.
Infectious Disease Isolation Room	2	20	Plan will include 2 rooms with 1 bed each as isolation rooms. Will have a toilet, and have negative pressure.
Air Lock 2	1	8	Provided to maintain negative pressure of infectious disease exam room and isolation rooms.
Air Lock 3	1	14	Provided to maintain negative pressure of infectious disease exam room.
Observation Room	2	32	Two rooms for emergency treatment will be planned with 4 beds each, for a total of 8 beds.
HWC	3	4, 6	HWC for patients. 4 m2: 2 rooms. 6m2: 1 room.
Resident-on-call (Emergency)	1	8	Duty room for doctors.
Conference (Emergency)	1	8	Room for emergency department staff and training space.
Staff Lounge (Emergency)	1	12	Break room for Emergency Unit staff.
Staff Toilet	2	3	Toilet for Emergency Unit staff.
Police Room	1	9	Room for police

C) Pharmacy

The Pharmacy will be located adjacent to the Outpatient Department to enhance convenience for outpatients. The pharmacy will perform management of medicine, preparation of prescriptions and making of medicines. The MGHNSG does not include any regulations for the required number of rooms or area for pharmacies. Therefore, the various rooms required for the above work has been planned and compiled in Table 2-9below.

Table 2-9 Pharmacy Respective Planned Rooms

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Distribution Counter	1	8	Distributes prescription medicines.
Dispensing Pharmacy	1	37	Layout will include wash basin, sink, medical refrigerator, medicine rack and working table.

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Aseptic Room	1	10	Formulation of medicines performed.
Change Aseptic	1	6	Staff change clothes and wash hands in order to enter aseptic room.
Pharmacist Room	1	11	Office for pharmacy manager.
Staff Toilet	1	3	Staff toilet for pharmacy department.
General Storage	1	20	Medicines are stored in this room.
Unpacking Area	1	17	Delivered medicines are unpacked in this area.

D) Inpatient Ward Building

One nursing unit will be provided on each floor (a nursing unit is group of beds that one nursing team is responsible for). There will be one nursing unit in charge of 27 beds on the internal medicine ward floor (6 rooms with 4 beds each + 3 rooms with 1 bed each), one nursing unit in charge of 27 beds on the surgical ward floor (6 rooms with 4 beds each + 3 rooms with 1 bed each) and one nursing unit in charge of 32 beds on the obstetrics and gynecology / pediatrics ward floor (7 rooms with 4 beds each + 2 rooms with 2 beds each).

Most secondary care hospitals in Japan have a 7 to 1 patient-nurse ratio, but in consideration of the fact that enhancing the level of nursing staff to a patient-nurse ratio of 5 to 1 is more appropriate since the objective of this facility is to serve as a teaching hospital and to increase the level of nursing, and due to the fact that approximately 60 nurses (outpatient nurses, surgery nurses) are currently expected when the facility is opened, which is the required number of nurses that the MGHNSG stipulates, the judgment is made that the above patient-nurse ratio is appropriate. In addition, since there will be cases in which 6 beds are placed in rooms which normally have 4 beds, this will increase the number of beds on the internal medicine ward to 42 beds, the number of beds on the surgical ward to 42 beds, and the number of beds on the obstetrics and gynecology / pediatrics ward to 48 beds, at which time the patient to nurse ratio will approach 7 to 1.

The twin-corridor design will be adopted for the ward building because this provides a good view of each hospital room, and this design reduces the distance of nurses need to travel. The nursing station and other rooms required for the nurses will be consolidated in the center and the Hospital rooms on the outer wall side. The nursing station will have an open counter to provide a good view of the corridor, and will face the entrance/exit to the ward building to create an environment in which people entering or leaving the ward building can be checked. The width of corridors in ward buildings is set at 2,400 mm or more, which is the national standard in Mongolia. This will provide an environment in which it is easy to conduct bed control.

The standard in Japan for rooms with multiple beds at secondary care hospitals is 4 beds per room and this standard will be followed. One toilet is provided in each room with one bed, but the dispersed toilet design is adopted for rooms with multiple beds, with one toilet provided per 8 beds. The toilets for multiple bed rooms are HWC type so that they can be used by patients in wheelchairs, and located on the opposite side of the ward corridor. This prevents any noise made in the toilet from being directly related to the Hospital room, allowing patients to use the toilet without worrying about disturbing other patients.

An elevator will be provided in the ward building for the delivery of meals, directly connecting with the kitchen in the basement. This will create an environment that is easy for staff to work because it reduces the time required to deliver meals and pick up the trays after meals. A pantry will be provided beside the meal delivery elevator, allowing staff to delay meal delivery when necessary.

A day room will be provided on the south side of the ward building, and a day corner with a view of the botanical garden will be provided on the east side of the building, achieving a comfortable recovery environment for patients in the Hospital by providing multiple locations where they can spend time.

The surgical wards will be located on the 2nd floor of the ward building to facilitate coordination with the surgery department, and the obstetrics and gynecology / pediatric wards will be located on the 3rd floor to enhance the level of security for children by separating them from the outside.

The respective required rooms in the ward building as stipulated by the MGHNSG are shown in Table 2-10 below.

Table 2-10 MGHNSG (Ward Building)

Room Name	Standard figures
General Ward Rooms	7 m^2 per bed (it was 4.3m^2 in the old standard)
Pediatric Ward Rooms	6.5 m^2 per bed (it was 4.3m^2 in the old standard)
Passageway	2.4 m
Rest Room	6 m^2
Doctor's Office	10 m^2
Treatment Room	12 m^2
Dayroom	1.2 m^2 per person
Toilet	1 for every 10 women, 1 for every 15 men
Shower	3－6 m^2
Playroom	16 m^2
Staff Lounge	10 m^2
Staff Toilet	3 m^2

The required respective rooms and space required for nursing care have been added to plans while satisfying the above standard, resulting in the respective required planned rooms in the ward building of this facility, and have been compiled in Table 2-11 – Table 2-13 below.

Table 2-11 Planned Respective Rooms in Ward Building (Internal Medicine)

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
4-bed room	6	35	Layout will include 4 beds, with a bedside cabinet by each bed and locker for each bed. A washbasin will be provided at the entrance to each room. When the patient demand rise and 6 beds are placed in the room, it will meet the old standard of 4.3m2 per bed.
1-bed room	3	20	A toilet and wash basin will be provided in each room.
Nursing Station	1	28	Will be situated in location from which hospital rooms for which nursing care is provided can be viewed, and provided with counter, hanging cabinets, storage racks and wash basin.
Clean Utility and Medication Room	1	8	Preparations for co injections and other such work will be performed in this room. Layout will include wash basin, sink, medical refrigerator, medical cabinet and other items.
Examination Room	1	16	Used to change bandages and provide simple treatment such as simple sutures.
Consultation Room	1	17	Use to make explanations to patients and patient families.

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Resident-on-call	1	13	Duty room for doctors.
Rest Room	1	12	Rest room for nurses where they can have a sleep.
Head Nurse's Room	1	9	Head nurse's office
Doctor's Office	1	16	Doctor's office.
Assisted Patient Bathroom	1	15	Bathroom for patients requiring assistance to bathe. Space will be provided so that patients can be bathed on a stretcher.
Equipment Store Room	1	8	Adequate space will be provided to store wheelchairs, stretchers, medical cabinet s and other items.
Conference Room	1	20	Space to hold conferences for staff in ward building and conduct training.
Staff Lounge	1	10	Ward building staff break room.
Soiled Work Room	1	8	Used to dispose of medical waste from exams, treatment and hospital rooms (excrement, vomit, etc.).
Changing Room	1	5	Changing room for patients that can stand up by themselves when bathing.
Shower	1	6	Shower for patients that can stand up by themselves when bathing.
Pantry	1	20	Provided with sink, hot water supply etc. Used as temporary storage space when patients want meal delayed. Also accommodates tray carts and other items.
Linen Store Room	1	4	Space provided to accommodate required spare linens (bed sheets, pillow covers, etc.), which is about the same as the number of beds.
Cleaning Store Room	1	4	Used to store cleaning implements and supplies. Provided with sink.
Day Room	1	36	Space where patients and family members can eat. Layout will include wash basin, sink, table and chairs.
HWC	3	4	HWC for hospitalized patients.
WC	2	3	Toilet for families of patients.
SWC	2	3	Staff toilet
Food EV Hall	1	7	Air lock will be provided in front t of the food elevator.
Ward Building Corridor		273	Adequate width will be provided to allow beds to pass each other.

Table 2-12 Planned Respective Rooms in Ward Building(Surgery)

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
4-bed room	6	35	Layout will include 4 beds, with a bedside cabinet by each bed and locker for each bed. A wash basin will be provided at the entrance to each room.
1-bed room	3	20	A toilet and wash basin will be provided in each room.
Nursing Station	1	28	Will be situated in location from which hospital rooms for which nursing care is provided can be viewed, and provided with counter, hanging cabinets, storage racks and wash basin.
Clean Utility and Medication Room	1	8	Preparations for co injections and other such work will be performed in this room. Layout will include wash basin, sink, medical refrigerator, medical cabinet and other items.
Examination Room	1	16	Used to change bandages and provide simple treatment such as simple sutures.
Consultation Room	1	17	Use to make explanations to patients and patient families.
Resident-on-call	1	13	Duty room for doctors.
Rest Room	1	12	Rest room for nurses where they can have a sleep.
Head Nurse's Room	1	9	Head nurse's office
Doctor's Office	1	16	Doctor's office.
Assisted Patient Bathroom	1	15	Bathroom for patients requiring assistance to bathe. Space will be provided so that patients can be bathed on a stretcher.
Equipment Store Room	1	8	Adequate space will be provided to store wheelchairs,

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
			stretchers, medical cabinet s and other items.
Conference Room	1	20	Space to hold conferences for staff in ward building and conduct training.
Staff Lounge	1	20	Ward building staff break room.
Soiled Work Room	1	8	Used to dispose of medical waste from exams, treatment and hospital rooms (excrement, vomit, etc.).
Changing Room	1	5	Changing room for patients that can stand up by themselves when bathing.
Shower	1	6	Shower for patients that can stand up by themselves when bathing.
Pantry	1	20	Provided with sink, hot water supply etc. Used as temporary storage space when patients want meal delayed. Also accommodates tray carts and other items.
Linen Store Room	1	4	Space provided to accommodate required spare linens (bed sheets, pillow covers, etc.), which is about the same as the number of beds.
Cleaning Store Room	1	4	Used to store cleaning implements and supplies. Provided with sink.
Day Room	1	54	Space where patients and family members can eat. Layout will include wash basin, sink, table and chairs.
HWC	3	4	HWC for hospitalized patients.
WC	2	3	Toilet for families of patients.
SWC	2	3	Staff toilet
Food EV Hall	1	7	Air lock will be provided in front t of the food elevator.
Ward Building Corridor		300	Adequate width will be provided to allow beds to pass each other.

Table 2-13 Planned Respective Rooms in Ward Building (Obstetrics and Gynecology / Pediatric)

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
4-bed room	7	35	Layout will include 4 beds, with a bedside cabinet by each bed and locker for each bed. A wash basin will be provided at the entrance to each room. When the patient demand rise and 6 beds are placed in the room, it will meet the old standard of 4.3m2 per bed.
2-bed room	2	20	A toilet and wash basin will be provided in each room.
Nursing Station	1	28	Will be situated in location from which hospital rooms for which nursing care is provided can be viewed, and provided with counter, hanging cabinets, storage racks and wash basin.
Clean Utility and Medication Room	1	8	Preparations for co injections and other such work will be performed in this room. Layout will include washbasin, sink, medical refrigerator, medical cabinet and other items.
Examination Room	1	16	Used to change bandages and provide simple treatment such as simple sutures.
Consultation Room	1	17	Use to make explanations to patients and patient families.
Resident-on-call	1	13	Duty room for doctors.
Rest Room	1	12	Rest room for nurses where they can have a sleep.
Head Nurse’s Room	1	9	Head nurse’s office
Doctor’s Office	1	16	Doctor’s office.
Assisted Patient Bathroom	1	15	Bathroom for patients requiring assistance to bathe. Space will be provided so that patients can be bathed on a stretcher.
Equipment Store Room	1	8	Adequate space will be provided to store wheelchairs, stretchers, medical cabinet s and other items.
Conference Room	1	60	Space to hold conferences for staff in ward building and conduct training.
Staff Lounge	1	20	Ward building staff break room.
Soiled Work Room	1	8	Used to dispose of medical waste from exams, treatment and hospital rooms (excrement, vomit, etc.).

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Changing Room	1	5	Changing room for patients that can stand up by themselves when bathing.
Shower	1	6	Shower for patients that can stand up by themselves when bathing.
Pantry	1	20	Provided with sink, hot water supply etc. Used as temporary storage space when patients want meal delayed. Also accommodates tray carts and other items.
Linen Store Room	1	4	Space provided to accommodate required spare linens (bed sheets, pillow covers, etc.), which is about the same as the number of beds.
Cleaning Store Room	1	4	Used to store cleaning implements and supplies. Provided with sink.
Day Room	1	23	Space where patients and family members can eat. Layout will include wash basin, sink, table and chairs.
Playroom	1	18	Space for child patients to play.
HWC	4	4	HWC for hospitalized patients.
WC	2	3	Toilet for families of patients.
SWC	2	3	Staff toilet
Food EV Hall	1	7	Air lock will be provided in front t of the food elevator.
Ward Building Corridor		322	Adequate width will be provided to allow beds to pass each other.

[2nd Floor]

The following hospital functions are planned for the 2nd floor.

- Imaging Diagnosis Department
- Endoscopy Department
- Surgical Department
- ICU
- Inpatient Ward (Surgery)

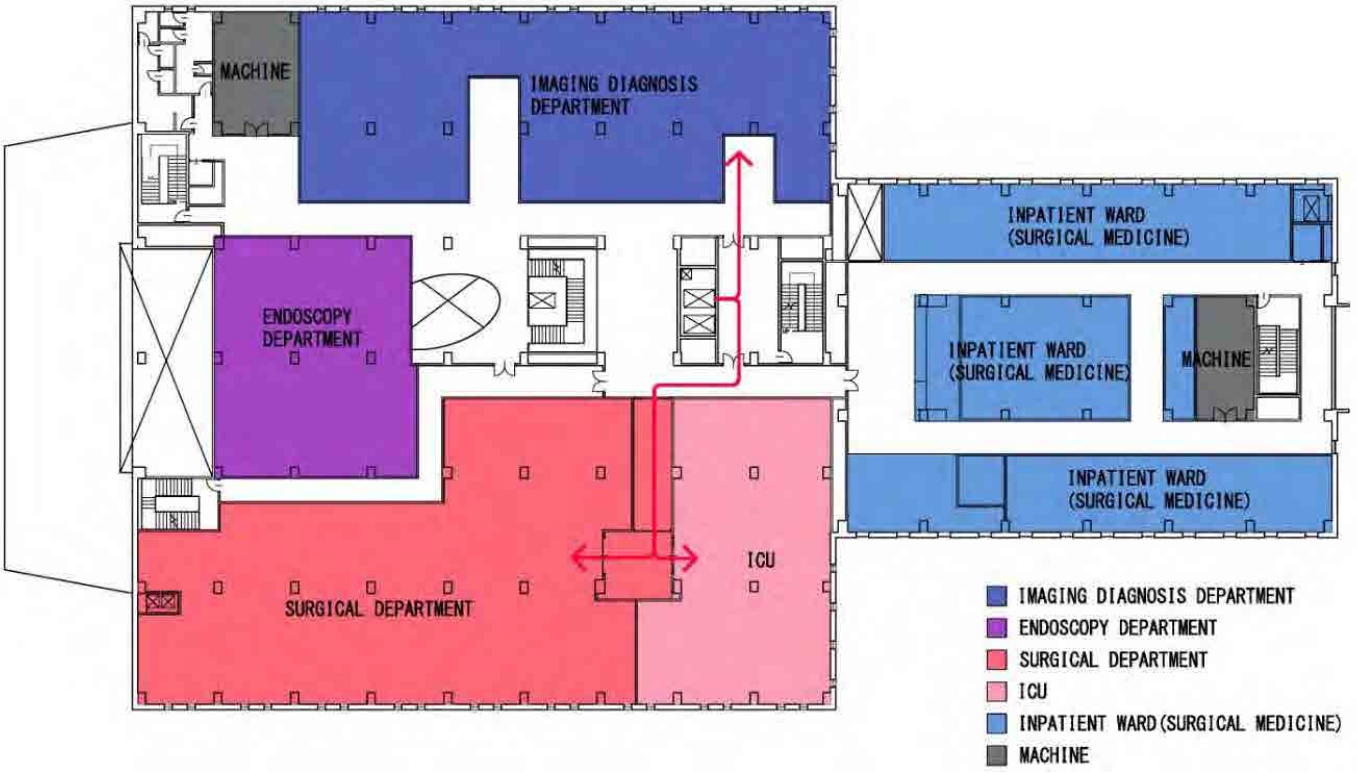


Fig. 2-5 2nd Floor Plan

The main medical examination departments will be consolidated on the 2nd floor to allow advanced medical examinations to be conducted (Refer to Fig. 2-5).

The surgical department and ICU will be planned so they are adjacent to each other in order to allow staff to directly come and go between these departments. In addition, the surgical unit and ICU department will be placed on the south side facing the open area of the site. This will enable the surgical unit and the ICU to be easily modified in the future.

The imaging diagnosis department will be consolidated on the north side of the building, with the outpatient area situated on the north side across from the core in the center where the elevator hall and stairs are located, preventing the flow of patients transported by ambulance / inpatients from being mixed with the flow of outpatients.

The endoscopy department will be located in the center, and will be mainly be used by outpatients, but its location will enable patients to be quickly moved to the surgical department in an emergency.

E) Imaging Diagnosis Department

The respective required rooms for a Imaging Diagnosis department according to the MGHNSG are shown in Table 2-14 below.

Table 2-14 MGHNSG (Imaging Diagnosis Department)

Room Name	Standard figures
General X-Ray Room	34 m^2
Control Room	10 m^2
Radiologic Interpretation Room	6 m^2
Radiologist Room	10 m^2
Barium Preparation Room	4 m^2
Toilet	3 m^2
Changing Room	2.5 m^2
Ultrasound Diagnosis Room	18 m^2

The planning for this facility includes procurement of equipment to perform angiography, MRI, CT, Fluoroscopy X-ray apparatus, Conventional X-ray apparatus, mammography and ultrasound exams. Planning of this facility will be based on the standard layout concepts used for secondary care hospitals in Japan.

The angiography room, MRI room and CT room will be located near the medical elevator to facilitate coordination with the Emergency Unit. On the other hand, planning will be performed so that the MRI room is located 10 meters or more away from the elevator and mechanical rooms since it is subject to influence from magnetic fields.

In addition, the respective imaging rooms will be connected by means of a control corridor on the rear side, preventing the flow of staff movement from being mixed with the flow of patients and in turn enhancing efficiency. The plan is compiled in Table 2-15.

Table 2-15 Respective Planned Rooms for Imaging Diagnosis Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Angiography Room	1	60	Required space will be provided for installation of angiography device. Radiation protection will be provided. The cleanliness class will be 10,000.
Air Lock (Angiography)	1	12	Room provided in front to ensure cleanliness of room.
Preparation Room (Angiography)	1	12	Used to store apparatus required to perform angiography procedures.
CPU (Angiography)	1	10	CPU required for angiography device installed here.
MRI Room	1	45	Required space will be provided to allow installation of MRI device. Magnetic shield will be provided.
Air Lock (MRI)	1	19	Waiting space for patient for which imaging is to be performed next.
Changing Room (MRI)	1	4	Changing space for patients for which MRI imaging is to be performed.
HWC (MRI)	1	4	Toilet for patients waiting for imaging to be performed.
CPU (MRI)	1	9	CPU required for MRI device installed here.
Contrast Media Preparation Room	1	11	Space in which contrast agent required for angiography and CT imaging is injected into patient.
CT Room	1	32	Required space will be provided for installation of CT. Radiation protection will be provided.
General X-Ray Room	1	27	The room is smaller than MGHNSG. Actual installation and layour of the equipment has been checked, and evaluated as appropriate space. In addition, compared to Japanese Hospital, it is considered to have enough space. Radiation protection will be provided.
Changing (General X-Ray)	1	3	Changing space for patients for which general X-ray is to be taken.
XTV Room	1	29	The same evaluation of space was done as “general X-ray room”.
Changing (XTV)	1	4	Changing space for patients for which XTV imaging is to be performed.
WC (XTV)	1	3	Toilet for patients waiting for imaging to be performed.
Ultrasound Room	2	14	Required space will be provided for installation of ultrasound device.
WC (Ultrasound)	2	3	Toilet for patients waiting for ultrasound to be performed.
Mammography Room	1	15	Required space will be provided for installation of mammography device.
PACS Room	1	12	Devices required for PACS will be installed.
Control Room	1	142	Control desks for each imaging devices will be provided. Layout will allow access to all imaging rooms from staff side through the control room.
Quality Control Room	1	22	Interpretation of radiograms and other images is performed here.
Technician’s Office	1	25	Office for radiologists and radiation technicians.
Reception	1	17	Reception desk for Imaging Diagnosis department.
Store Room	1	9	Room where devices for portable radiography and other devices are stored.

F) Endoscopy Department

The respective required rooms for an endoscopy department according to the MGHNSG are shown in Table 2-16 below.

Table 2-16 MGHNSG (Endoscopy Department)

Room Name	Standard figures
Endoscope Store Room	18 m^2
Preparation Room	10 m^2
Cystoscopic Exam Room	24 m^2
Colonoscopic Exam Room	12 m^2
Sterilization Room	6 m^2

Since it is expected that the demand for examinations using an endoscope will increase in the future, the same scale of facility will be planned as for standard secondary care hospitals in Japan. Plans will be made for one upper gastrointestinal endoscope rooms and two lower gastrointestinal endoscope rooms, for a total of three rooms. A dedicated staff corridor will connect with the rear of each room to facilitate easy movement by staff. The respective planned rooms are described in Table 2-17.

Table 2-17 Respective Planned Rooms for Endoscopy Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Upper Gastrointestinal	1	20	Upper gastrointestinal exams are conducted.
Lower Gastrointestinal	2	20	Lower gastrointestinal exams are conducted.
Changing (Endoscope)	3	5	Changing room for patients to be examined.
Sub-waiting Area	2	6, 9	Waiting space for patients immediately before exam.
Waiting (Endoscope)	1	51	Waiting space for patients that will have endoscope exam.
Administration Office (Endoscope)	1	11	Reception for Endoscopy Department.
Exam Room (Endoscope)	1	10	Meeting space for doctor and patient.
Procedure Room (Endoscope)	1	13	Room where procedures before exam are performed.
Prep/ Recovery Cubicle	1	13	Room where procedures after exam are performed.
Recovery (Endoscope)	1	40	Room where patients rest after exam. Space for 3 beds will be provided.
Scope Washing	1	48	The endoscope is washed and stored in this room. It connects with the respective exam rooms, facilitating easy movement by staff.
HWC	1	5	Toilet for patients that are to have endoscope exam.

G) Surgical Department

There will be three operation rooms for planned surgery, one of which will be a negative pressure operation room for surgery on patients with an infectious disease, and another one will be an operation room for orthopedic surgery and other such operations that is provided with radiation protection. In addition, there will be one operation room that is always kept available to handle emergency operations for patients that may come in from the Emergency Unit, for a total of four rooms.

The supply corridor design will be adopted for the Surgical Department at the request of the Mongolian National University of Medical Sciences, and planning will be performed to clearly separate the clean area and contaminated area. The rear of each operation room (theater) will be connected to the supply corridor, through which equipment used for surgery will be supplied. Used equipment will be collected from the surgery hall side and temporarily stored in the soiled utility room. It is transported to the CSSD in the basement by a small freight elevator, and transported to the supply corridor side after sterilization. The cleanliness of the surgery hall and recovery area will

be class 100,000, and the cleanliness of the operation rooms (theaters) will be class 10,000. The staff lockers will be provided on the clean area boundary to maintain cleanliness inside the surgical department.

The respective required rooms for a surgical department according to the MGHNSG are shown in Table 2-18 below.

Table 2-18 MGHNSG (Surgical Department)

Room Name	Standard figures
Operation Room (Theater)	36 m^2
Air Lock for Surgery	15 m^2
Bandage Room	22 m^2
EU Observation Room	10 m^2
Surgical Instrument Cleaning Room	10 m^2
Head Surgical Nurse Office	10 m^2
Non-Dirty Item Store Room	4 m^2
Removed Substance Temporary Store Room	4 m^2
Surgical Nurse/ Nurse Anesthetist	10 m^2
Instrument Storage	12 m^2

The above respective required rooms and area is planned for operation theatre system layout that does not separate the clean supply. In thie Project, a clean supply system for the operation theatres will be adopted, and therefore the required rooms and area will be provided by referring to the standard designs for secondary care hospitals in Japan.

The planned respective rooms are compiled in Table 2-19 below.

Table 2-19 Respective Planned Rooms for Surgical Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Operation Room (Theater)	2	35	Will have cleanliness class of 10,000. One room will be for planned surgeries and one will be for emergency surgeries.
Infectious Disease Operation Room	1	32	Will have cleanliness class of 10,000. Will be under negative pressure since surgeries may be performed for patients with infectious diseases.
Special Operation Room	1	48	Will have cleanliness class of 10,000. Radiation protection will be provided so that radiological equipment can be used during surgeries.
Air Lock for Infectious Disease Operation Room	1	15	Provided to maintain negative pressure in infectious disease operating room.
Operation Hall	1	97	Will have cleanliness class of 100,000. Surgery wash basin will be provided, and there will be space to allow smooth movement of beds.
Recovery (Surgery)	1	52	Recovery space for patients immediately after surgery. Space for 4 beds will be provided.
Air Lock 1 (Surgery)	1	21	Will also serve as ICU air lock. Space will be provided to allow patients to be transferred.
Reception (Surgery)	1	19	Reception for surgical department. Used to perform monitoring of each operation room.
Nursing Station (Surgery)	1	16	Space for nurses in surgical department.
Equipment (Surgery)	1	26	Space for storage of surgical instrument sets, portable devices, laparoscopes, operation microscopes, incubators, infant warmer and other devices.
Staff lockers male (Surgery)	1	46	Shared by male staff in surgical department. Lockers for 35 persons, 2 toilets and 2 shower provided.
Staff lockers female	1	55	Shared by female staff in surgical department.

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
(Surgery)			Lockers for 35 persons, 2 toilets and 2 shower provided
Doctors' Lounge	1	15	Lounge for doctors that perform operations.
Office- Anesthetist	1	17	Waiting room for anesthetists.
Store, Anesthesia	1	17	Store room for anesthetics.
Store, Medical gases	1	10	Store room for medical gases other than central piping.
Soiled Work (Surgery)	1	18	Temporary storage space for items after being used during surgery.
Clean Supplies	1	78	Storage space for sterilized items to be used for surgery.
Air Lock 2 (Surgery)	1	13	Room provided to divide clean area from dirty area.
Air Lock 3 (Surgery)	1	18	Room provided to divide clean area from dirty area.

H) ICU

The nursing station will be situated in a location all of the beds can be seen so that the condition of patients requiring intensive care can be easily observed. In addition, plans call a direct connection to the surgery unit through an air lock, allowing patients to be quickly moved to the surgery unit in the event of a sudden change in patient condition. The respective required rooms for an intensive care unit (ICU) according to the MGHNSG are shown in Table 2-20 below.

Table 2-20 MGHNSG (ICU)

Room Name	Standard figures
Intensive Care Unit (ICU)	13 m^2 per bed A number of ICU beds equal to 3% or more of the total number of beds needs to be provided. A number of isolation beds equal to 1% or more of the total number of beds needs to be provided.

Regarding the determination of the number of beds in the ICU, the total number of hospital beds for this Project was determined to be 104 beds, but as in the above calculation for the EU, 200 beds was used as the number of total beds for calculation of the number of beds in the ICU.

Accordingly, the minimum required number of beds for the ICU is 200 beds x 0.03 = 6 beds, and the minimum required number of isolation beds is 200 beds x 0.01 = 2 beds.

The respective required rooms for actual medical care will be added when formulating the plan based on the above standard. The respective planned rooms are compiled in Table 2-21 below.

Table 2-21 Respective Planned Rooms for ICU Rooms

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
ICU	1	136	There will be 6 beds. The space between beds will be 3m, and adequate space will be provided around the beds so that staff can easily treat patients. The width of access aisles in the room will also be 3m for beds with life support and other equipment attached to allow them to smoothly move past each other. The cleanliness class will be 10,000.
Infectious Disease Isolation Rooms	2	15	There will be 2 beds. The cleanliness class will be 10,000, with negative pressure.
Air Lock (ICU)	1	16	The air lock is provided to maintain negative pressure in the infectious disease isolation rooms.
Nursing Station (ICU)	1	12	Will be planned in a location with a view of each bed, and provided with a counter, hanging cabinets, storage racks and

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
			wash basin.
Clean Utility & Medication (ICU)	1	16	Used for preparation of co injections and other such work. Will be provided with wash basin and sink.
Equipment Storage (ICU)	1	24	Space for storage of wheelchairs, stretchers, medical equipment racks and other items.
Resident- On-Call (ICU)	1	19	Duty room for doctors and nurses.
Doctor's Office (ICU)	1	12	Doctor's office.
Conference (ICU)	1	30	Used by doctors, trainee doctors and nurses to hold conferences.
Soiled Utility (ICU)	1	5	Used to dispose of soiled items (excrement, vomit, etc.) from patients exams or treatment.

[3rd Floor]

The following hospital functions are planned for the 3rd floor.

- Laboratory unit
- Administration department
- Lecture hall
- Inpatient wards (Obstetrics and Gynecology / pediatrics)

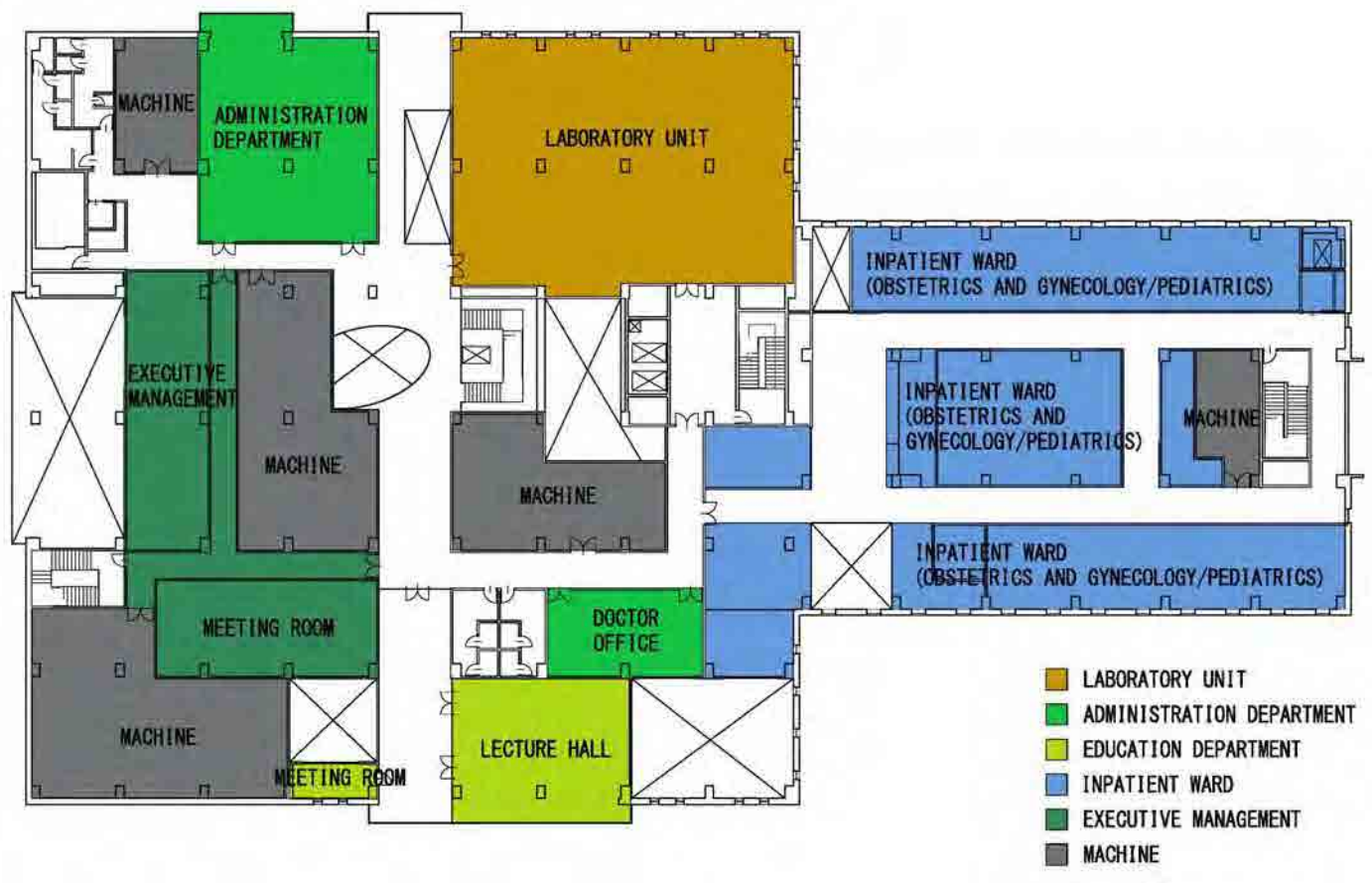


Fig. 2-6 3rd Floor Plan

This floor will be planned as a staff zone, excluding people who are coming to visit patients in the ward building. Winters in Mongolia are extremely severe, it is impossible for staff and trainee doctors to spend time outside during their breaks. Accordingly, a portion of the hall and foyer will be utilized

as a staff lounge, and a view will be provided by making a large opening, creating an environment in which it is easy for staff working at the Hospital to have a change of pace. Several atriums and skylights will be provided in order to reduce the overall floor area and bring natural light into the areas on the lower floors.

Regarding the mechanical rooms, since coordination between the clinical departments on the 2nd floor will be given priority in the layout, the plan will be formulated with space for air conditioning equipment located on the 3rd floor (Fig. 2-6).

I) Laboratory Unit

This unit will have a chemistry lab, microbiology lab and pathology lab. Blood and urine samples will be taken on the 1st floor, and the samples will be transported to the 3rd floor by a small freight elevator, where they will be analyzed. The chemistry lab will be planned as a large room, with a layout that reduces the amount of movement by staff and minimizes usage of space by lab equipment.

Pathology samples will be transported from the surgical department by means of the medical elevator or stairs. The pathology lab will be planned as one with a layout that reduces the amount of movement by staff and minimizes usage of space by lab equipment. Autopsies and necropsies will be conducted in the basement.

The microbiology lab will also be planned as one room, and an air lock will be provided to maintain negative pressure in the room. The respective required rooms for a laboratory unit according to the MGHNSG are shown in Table 2-22below.

Table 2-22 MGHNSG (Laboratories)

Room Name	Standard figures
Examination Room /Exam Result Notification Room	8 m^2
Decontamination Room	12 m^2
Preparation Room (Clinical Lab)	18 m^2
Centrifuge Room (Clinical Lab	6 m^2
Technician's Room (Clinical Lab)	10 m^2
Blood Test Room (Biochemical Lab)	12 m^2
Urinalysis Room (Biochemical Lab)	12 m^2
Centrifuge Room (Biochemical Lab)	6 m^2
Measurement Room (Biochemical Lab)	4 m^2
Analysis Room (Biochemical Lab)	8 m^2
Sample Reception (Microbiology)	5 m^2
Preparation Room (Microbiology)	18 m^2
Air Lock (Microbiology)	6 m^2
Autoclave Room (Microbiology)	10 m^2
Bacteriological Lab (Microbiology)	21 m^2
Culture Fluid Preparation Room (Microbiology)	8 m^2
Cleaning Room (Microbiology)	12 m^2
Toilet (Microbiology)	3 m^2
Doctor's Office (Other)	10 m^2
Immunology Lab (Other)	12 m^2
Clinical Physiology Lab (Other)	12 m^2

The above respective required rooms will be multiple small rooms, but they will share lab tables and equipment, and will be planned as a large room to facilitate efficient utilization and allow the layout

modifications in the future. The respective planned rooms are compiled in Table 2-23 below.

Table 2-23 Respective Planned Rooms for Laboratory Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Chemistry Lab	1	205	Lab tables will be provided.。
Pathology Labs	1	44	Lab tables will be provided.
Microbiology Lab	1	34	Lab tables and a safety cabinet will be provided. The lab will be under negative pressure.
Air Lock (Lab)	1	8	Provided to maintain negative pressure in the microbiology lab.
Autoclaves / Wash-up	1	12	Autoclaves will be provided.
Cold Store	1	17	Specimens requiring refrigeration will be stored here.
Duty Staff Bedroom	1	20	Duty bedroom for doctors and technicians.
Office	1	60	Office for lab technicians.
Storage	1	16	Store room for laboratory unit.
Conference Room (Lab)	1	20	Used by doctors, trainee doctors and technicians to hold conferences.

J) Administration Department

The entire administration department, excluding the OPD administration section, will be consolidated on the 3rd floor. The administration department will be planned as a large room, with a layout that maximizes efficient use of the limited space by personnel. The zone for executive management will be situated so that the flow of persons does not mix with other staff, and planned to help maintain security. The respective planned rooms are compiled in Table 2-24 below.

Table 2-24 Respective Planned Rooms for Administration Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Hospital Director's Office	1	40	Provided with toilet. Will also serve as reception space, and will use same design as at general secondary care hospitals in Japan.
Deputy Director's Office	1	26	As above
Secretary's Room	1	19	Will use same design as at general secondary care hospitals in Japan.
Medical Director's Office	1	19	Will use same design as at general secondary care hospitals in Japan.
Head nurse's Office	1	18	Will use same design as at general secondary care hospitals in Japan.
General Manager	1	21	Will use same design as at general secondary care hospitals in Japan.
Finance Manager	1	21	Will use same design as at general secondary care hospitals in Japan.
Administration Office	1	127	Standard office area in Japan is 8 – 12 m2 per person, and this standard will be applied. Adequate office space will be provided for 12 or more people. If the same configuration as general secondary care hospitals in Japan is used, the required sections will consist of administration, accounting, planning and medical care coordination, and if 3 persons is deemed the minimum required number in each section, there will be a minimum of 12 people.
Copy Room	1	14	Large copy machine and printer will be provided.
Document Store	1	15	Document store room.
Doctor's Office	1	68	Standard office area in Japan is 8 – 12 m^2 per person, and this standard will be applied.

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
			Office space will be provided for 7 or more doctors. Plan to allocate office space to one doctor each in 7 departments (Surgery/Traumatology, Internal Medicine / Neurology, Ophthalmology, ENT, Obstetrics and Gynecology, Pediatrics, Infectious Diseases).

K) Education Department

The education department consists of a lecture hall and a library. The lecture hall will be located on the 3rd floor to provide natural light, and the library will be located in the basement in consideration of the load of the books on the facility.

In consideration of the fact that staff will be going back and forth to undergo clinical training in various areas of the Hospital, the lecture hall will be located near the central core of the clinical building. It will be planned next to the foyer to allow the flow of a large number of people to be efficiently handled. This foyer will normally function as space for staff and trainee doctors to take breaks. In addition, the conference rooms will be located near the lecture hall, which will normally be used by staff at the Hospital to hold conferences, but will be planned so that they can be used for small- to medium-sized lectures depending upon circumstances. The respective planned rooms are compiled in Table 2-25 below.

Table 2-25 Respective Planned Rooms for Education Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Lecture Hall	1	190	The standard size of a lecture hall in Japan is 1.6 m^2 per person, and this standard will be applied. The hall will accommodate approximately 100 people.
Conference Room (3rd Floor)	2	40, 70	Will normally be used by staff at the Hospital to hold conferences. Can also be used as small- to medium-sized lecture rooms.
Conference Room (Basement)	3	36	Will normally be used by staff at the Hospital to hold conferences. Can also be used as small- to medium-sized lecture rooms.
Medical Library	1	75	Will use same design as at general secondary care hospitals in Japan.
Library Store	1	86	
Librarian Booth	1	19	

[Basement]

The following hospital functions are planned for the basement.

- Teaching department
- CSSD
- Morgue
- Pathology lab
- General service department for the Hospital (kitchen, laundry, medical device management and maintenance, housekeeping management, waste treatment)

This floor, excluding some parts of the areas, consists of the service department. The hall in the center will function as waiting space for patient families who cannot be accommodated in the outpatient

waiting area on the 1st floor. It will have a foyer, creating bright waiting space by allowing in natural light from the sky lights of the top floor. Zoning of the respective service sections will be performed in an appropriate manner, with a plan formulated so that the flow of ordinary patients is not mixed with the flow of service personnel (Fig. 2-7).

Fig. 2-7 Basement Floor Plan

L) CSSD

The CSSD sterilizes equipment and supplies it mainly to the surgical department, emergency unit, outpatient clinics and inpatient ward building. The CSSD will be planned by referring to secondary hospitals in Japan with a scale of 200 beds, in the same manner as calculations for the emergency unit described earlier.

A dedicated small freight elevator will be installed for the surgical department so that contaminated items and items to be sterilized can be directly transported to the CSSD. The staff will use the medical elevator and a dedicated passageway to transport items from other units. Planning will be performed so that the dirty (contaminated) area and clean area are clearly separated. The respective planned rooms are compiled in Table 2-26 below.

Table 2-26 Respective Planned Rooms for CSSD

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Decontamination Area	1	73	Will use same design as at general secondary care hospitals in Japan. A work table, sink and other items will be provided.
Clean Work & Packing	1	42	Will use same design as at general secondary care hospitals in Japan. A work table will be provided.
Central Supply Mechanical Room	1	20	High pressure steam CSSD will be installed.
Sterilizers	1	50	Will use same design as at general secondary care hospitals in Japan. A work table, sealer and other items will be provided.
Issue / Dispatch	1	10	Will use same design as at general secondary care hospitals in Japan. Sterilized item storage racks, carts and other items will be provided.
Staff Lockers male (CSSD)	1	11	Lockers for 9 persons can be installed.
Staff Lockers female (CSSD)	1	11	Lockers for 9 persons can be installed.
Staff's Lounge (CSSD)	1	33	Break room that is shared by staff in CSSD.
Air Lock (CSSD)	1	20	Room provided to separate clean area from contaminated area.
Administration Office (CSSD)	1	21	Performs reception of equipment and management work. Office space will be provided for 2 – 3 persons.

M) Morgue

Plans will be formulated with the Morgue located near the medical elevator so that the flow of any patients that pass away in the emergency unit, surgical clinic or inpatient ward do not cross with the flow of general patients and other persons as a consideration for the privacy of the families of patients that pass away. It will also be close to the service yard so that bodies can be transported in a prompt manner. The respective planned rooms are compiled in Table 2-27 below.

Table 2-27 Respective Planned Rooms for Morgue Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Autopsy Room	1	48	Provided with autopsy table and corpse refrigerator. Washing of corpses is also performed in this room.
Morgue	1	13	Space where corpses are kept.
Office and Record for Morgue	1	12	Reception and management of corpses is performed here. Office space will be provided for 2 persons.
Family Waiting Room (Morgue)	1	15	Waiting space for patient families until the hearse arrives.
Air Lock 1 (Morgue)	1	20	Dedicated passageway for staff.
Air Lock 2(Morgue)	1	20	Space where ceremonies are held.
Changing Room (Morgue)	1	3	Changing room for staff who conduct autopsies.
SW (Morgue)	1	3	Shower for staff who conduct autopsies.

N) Medical Records Department

This department will be located near the stairs, and will be planned to make it easy for personnel in the OPD Administration Section on the 1st floor to come and go. The respective planned rooms are shown in Table 2-28 below.

Table 2-28 Respective Planned Rooms for Medical Records

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Case Note Sorting Area	1	44	Space to view medical records and perform work.
Registration / Documentation	1	18	Office for Medical Records Department Office. Space will be provided for 2 persons.
MR Main storage	1	59	Medical records store room.

O) General Service Department

This department will consist of the kitchen that provides meals for hospital in patients and staff, laundry that washes linens used in the Hospital, medical device management and maintenance that performs maintenance of medical equipment used in the Hospital, housekeeping unit that performs cleaning in the Hospital, temporary storage space for medical waste generated in the Hospital, main locker room for staff, and central monitoring room that performs management of the air conditioning and electrical facilities. The respective planned rooms are shown in Table 2-29 below.

Table 2-29 Respective Planned Rooms for General Service Department

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Main Cooking	1	120	Will be planned using scale at 300-bed secondary care hospital in Japan as reference since the number of beds is expected to be increased in the future, and the kitchen is a facility that cannot be easily expanded. Cooking and placement of meals on trays will be performed here.
Distribution Room	1	33	Space to accommodate tray service carts.
Dish Washing (Kitchen)	1	33	Washing of dishes and tray service carts performed here.
Dry goods Storage	1	19	Store room for dry goods.
Checking Room	1	44	Checking of delivered food ingredients performed here.
Cold Room	1	15	Refrigerates food ingredients.
Freezer Room	1	9	Freezes food ingredients.
Cold Prep	1	18	Preparation of ingredients and food that is not cooked performed here.
Kitchen Office	1	20	Office space provided for 4 persons.
Staff Lockers Male (Kitchen)	1	18	Toilet and shower provided. Lockers for 12 persons can be installed.
Staff Lockers Female (Kitchen)	1	18	Toilet and shower provided. Lockers for 12 persons can be installed.
Air Lock 1 (Kitchen)	1	13	Room to separate clean area from dirty area.
Staff Dining	1	94	Seating for 24 persons will be provided.
Washing Drying Area/ Finishing Area	1	91	Planned for 300-bed scale with expectation number of beds will be increased in the future.
Dirty Linen Reception	1	27	Receives and sorts dirty linen.
Infected Washing	1	9	Infected linen is washed here.
Linen Inspection Mending	1	32	Space to inspect, mend and dispense linens.
Clean Linen Storage	1	11	Storage space for clean linens.
Staff Lockers male Washing	1	13	Shower provided. Lockers for 12 persons can be installed.
Staff Lockers female Washing	1	13	Shower provided. Lockers for 12 persons can be installed.
Staff Lounge (Washing)	1	12	Break room shared by staff in laundry.
Laundry Office	1	19	Space for handling of linen reception and management work. Office space provided for 2 persons.

Room Name	No. of Rooms	Floor Area (m^2/room)	Area Determination, Function
Biomedical Workshop	1	30	Will use same design as at general secondary care hospitals in Japan.
Equipment Receipt	1	11	Space to handle loaning and return of medical equipment.
Engineer's Office	1	13	Management work for medical equipment performed here. Office space provided for 2 persons
Equipment Store	1	6	
HK Storage	1	21	Room for cleaning staff.
HK Office	1	11	Office space provided for 2 persons
HK Main Storage	1	11	Store room for cleaning tools and supplies.
Staff Lockers male (HK)	1	11	Lockers for 12 persons can be installed.
Staff Lockers female(HK)	1	11	Lockers for 12 persons can be installed.
Medical Waste Collection & Sorting	1	54	Sorting of medical waste and ordinary waste performed here.
Medical Waste Treatment & Compacting	1	22	Compacting of waste performed here.
Medical Waste Storage	1	21	Temporary storage of medical waste performed here.
Medical Waste Dispatch	1	26	Dispatching of waste performed here.
Staff Main Lockers Male	1	50	Toilet and shower provided. Lockers for 54 persons can be installed.
Staff Main Lockers Female	1	50	Toilet and shower provided. Lockers for 54 persons can be installed.
Central Monitoring Room	1	63	Provided with short sleep room and shower. Space where maintenance and monitoring of air conditioning equipment and electrical facilities is performed. Office space provided for 8 persons

(8) Elevation / Section Planning

1) Elevation Planning

Outside natural light is fully incorporated to maintain a bright interior environment even during the few hours of winter sunlight in Mongolia. A large window for natural light into the outpatient waiting area, entrance hall, elevator hall, ward building corridors and other areas is designed. This natural light will comfortably illuminate the patients and visitors. On the other hand, priority will be given to medical function for rooms for the surgical department, imaging diagnosis department and other such departments that do not need windows. The windows are designed considering the well balance between walls and windows.

2) Section Planning

Cross-section planning of the building will be performed with a focus on providing thermal insulation properties. In particular, a high level of insulation will be provided by using external thermal insulation specifications for the roof, exterior walls and around the outside of the foundation to prevent the heat bridge phenomenon.

A ceiling height of 3,000 mm is needed in the respective rooms for the surgical department and imaging diagnosis department. In addition, there are air conditioning ducts, medical gas piping, hot

water supply piping for heating and waste water discharge piping facilities above the ceiling. Piping and ducts are not passed through beams in Mongolia, and local contractors do not have the level of technology required to perform this work. Therefore, an effective height is needed to pass the above piping beneath the beams. The thickness of the slab is 150 mm, the beam depth is 900 mm, the ceiling finish thickness is 50 mm, and the effective height for the air conditioning duct / electrical duct space is 900 mm, resulting in minimum height of 2,000 mm is required above the ceiling. Consequently, since the height below the ceiling is 3,000 mm and the height above the ceiling is 2,000 mm, the standard floor height is 5,000 mm. Machinery that is normally installed on the roof will be planned on the 3rd floor in order to minimize the overall height of the building.

(9) Structural Design

In order to guarantee the safety of the healthcare facility, it will be planned with a structure that has high resistance to earthquakes. An outline of the structure is described below.

Main Buildings

No. of Floors : One basement, three floors above ground, one rooftop structure
Floor Height : Basement: 4.5m, 1st Floor: 5.0m, 2nd Floor: 5.0m, 3rd Floor: 4.8m
Spacing of Main Pillars: 6.0m x 9.0m (Clinical Building), 6.4m x 9.0m (Ward Building)
Structural Classification : Reinforced concrete structure
Foundation : Spread foundation

Boiler Building

No. of Floors : One floor above ground
Floor Height : 1st Floor: 7.0m
Spacing Between Main Pillars : 6.0m x 7.5m
Structural Classification : Reinforced concrete structure
Foundation : Spread foundation

1) Foundation Design

The geological survey resulted in the determination that there is a solid sand-gravel layer from the surface of the site to the depth of 15 m, which can be expected to have a soil bearing capacity of 30 t/m^2. The freezing depth is 3.65 m. There is an extremely gentle slope upwards from the west towards the east, and there is a difference in height in the east-west direction on the overall site of approximately 2 – 2.5 m.

In order to reduce the amount of excavation work required, the foundation bed on the high side of the site will be planned 7.3m from the ground level, and a spread foundation will be used. A pit will be planned for the extremely large number of drain pipes due to the application of this building as a hospital.

The foundation bed on the low side of the site for the boiler building will be planned 3.7 m from the ground level, and a spread foundation will be used.

2) Structure Frame Design

Above ground building frame structure will be reinforced concrete structure considering factors such as durability, local natural conditions, construction experience and economic efficiency. A rigid-frame structure consisting of pillars and beams is adopted for seismic structure.

3) Load and External Forces

The load of each room will be based on the Building Standards Act of Japan. The load of the main rooms is described below.

Office rooms: 2,900 N/m^2 General hospital rooms: 1,800 N/m^2

Operation/radiography rooms: 4,000 N/m^2 Mechanical rooms: 5,000 N/m^2

Since there are no relevant data concerning seismic force for building structure design in Mongolia, the Building Standards Act of Japan will be applied for structural calculations. There have been few earthquakes in the city of Ulaanbaatar up until now, but in consideration of the fact that earthquakes may occur, the same level of seismic activity as for the Okinawa region will be used. This will consist of a design for which the building does not sustain damage for a seismic force of 150 gal, and for which the building will not collapse for a seismic force of 300 gal.

4) Main Materials Used

Concrete: Specified design strength: 30 N/mm2 for main buildings, 24 N/mm2 for boiler building

Rebar: SD290, D29 or larger for main buildings and boiler building (pillars, footing beams, girder main reinforcement)

SD345, D19 – 25 (joists, main rebar, pressure plates)

SD295A, D16 or less (walls, slabs, beam/pillar shear strengthening rebar)

(10) Electrical Facility Design

1) Electrical Service Drop system

An electrical service drop for the new buildings will be connected to the 3Φ3W11kV underground lines in the site's frontal road. (Refer to Fig. 2-8)

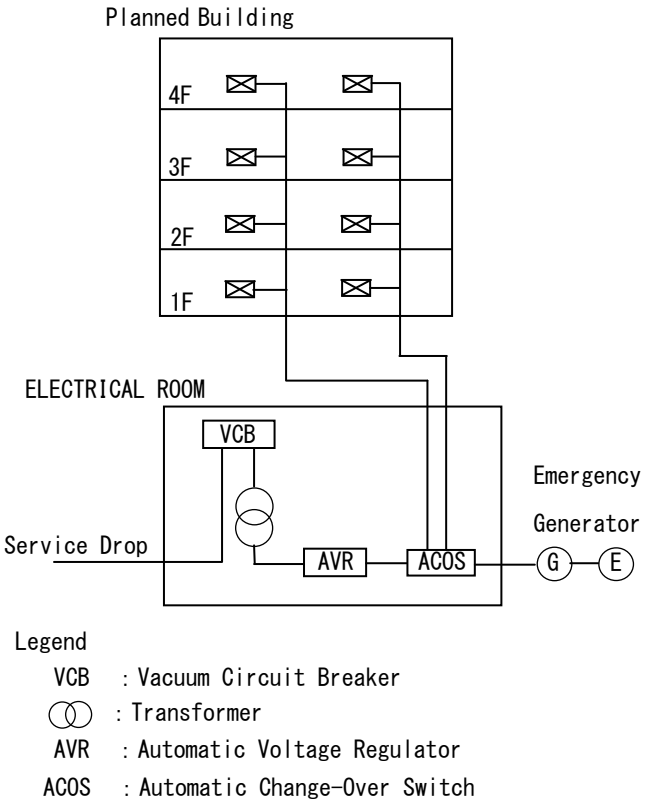


Fig. 2-8 Electrical Power System Diagram

2) Transformer system

Transformer system to drop the 11kV voltage to 380V-220V will be installed in the electrical room on B1.

3) Emergency Generator system

Plan the installation of emergency generator system to ensure power supply specified in following table 2-30..

Table 2-30 Emergency Generator Power Supply Loads

Equipment/Facilities Supplied	Load
OR・ICU	Power for medical equipment, lighting, AC, etc.
ER	Power for medical equipment, lighting
Hospital Ward Rooms	Power for medical equipment, lighting
Management Rooms（Offices, etc）	Lighting, outlets, etc.
Medical Equipment	Radiation equipment, medical refrigeration, etc.
Shared Facilities	Pumps, elevators, medical Gas Equipment

4) Uninterruptible power supply system

For the purposes of avoiding a loss of equipment functionality until the emergency generator can start following a blackout, install uninterruptible power supply (UPS) equipment for the medical equipment, etc. required for the Hospital to function.

5) Main Line and Power system

Install main line cables to deliver electrical power from the substation equipment to the Hospital's distribution boards and switchboxes. Wire the switchboxes to the power equipment in order to deliver power to them.

6) Electrical Lighting and Outlet system

Install lighting fixtures with lighting levels appropriate for the use of each room in the Hospital, and electrical outlets. Install emergency lighting and guidance lighting to allow safe evacuations during blackouts and disasters.

7) Surge Protection system

Install surge protection system to prevent damage from lighting strikes.

8) Communications system

Install phone and networking equipment for the Hospital LAN in order to allow internal and external communication.

9) Broadcast system

Install broadcast equipment for hospital broadcast announcements and emergency evacuation guidance broadcasts.

10) Nurse Call system

Install nurse call system to serve as a means of communication between hospital rooms and the staff stations.

11) Intercom system

Install intercom equipment in order to improve the efficiency of administrative work, medical work, and hospital maintenance.

12) TV Reception system

Install a roof-mounted antenna, and install coaxial cable outlets in the required location in each room.

13) Automatic Fire Alarm system

In order to secure the safety of hospital users, staff, and employees, install automatic fire alarm system.

14) Security Camera system

Install security cameras to maintain safety inside the Hospital.

(11) Water Supply / Wastewater Discharge Facility Plan

1) Water supply system

The water is taken from city water and kept in the water reservoir tank. And the water is distributed to the points where the water is needed. The water piping is single line which is potable water. The water pipe for the boiler building is connected directly to city water line. (Refer to Fig. 2-9)

The estimate water consumption in this hospital is shown in Table 2-31 bellow.

Table 2-31 The Estimate Water Consumption

Objects	The number of person	Water consumption per person (L/person・day)	Water consumption per day
Patient	150	1,000	150,000

Note) The number of patients includes the increase in the future.

The capacity of the water reservoir tank is 50% of the day water consumption.

150,000L×50%＝75,000L→ 80 m^3

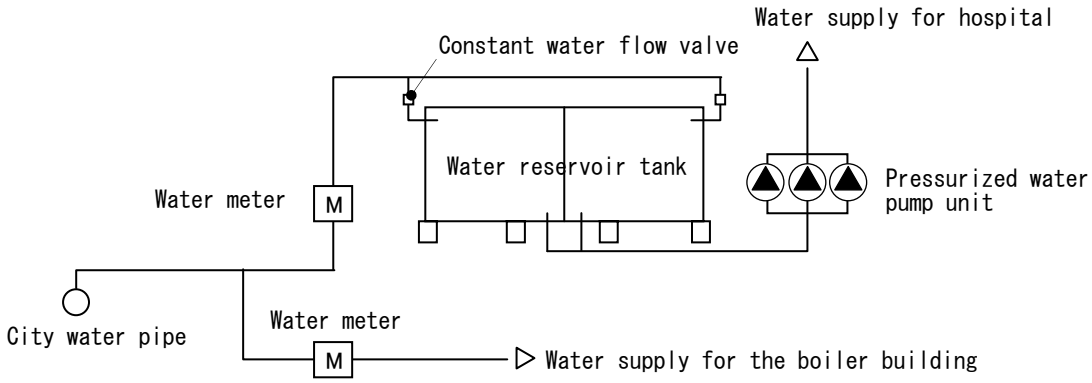


Fig. 2-9 Water Supply System

2) Domestic hot water supply system

The domestic hot water is supplied from the hot water generator system. The hot water tanks are installed in the machine room and boil the water by hot water from boiler building. Besides the hot water tanks have the backup electric heater for boiler maintenance. The hot water circuit is closed circuit system and supplies the hot water by the pressure of the water pump. In order to reduce idle time for hot water flow at each faucet, the circulation pumps are installed on the hot water line and they can prevent falling hot water temperature. (Refer to Fig. 2-10)

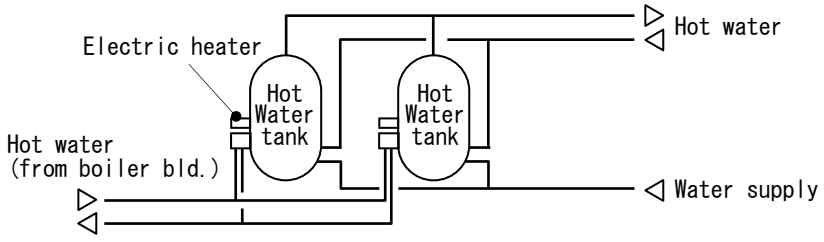


Fig. 2-10 Domestic Hot Water Schematic Flow

3) Sanitary fixture

Install the water closet, urinal, lavatory, wash basin etc. where they are needed.

4) Drainage system

The drainage pipes are separated to soil water and waste water. Both drainage water are kept in the some tanks on the pit floor. The drainage water are gathered into a drainage tank by pumps, then sent to a basin near the boiler building. After that the drainage water is discharged to the public sewer line by gravity flow.

5) Waste treatment system

Two waste treatment systems are installed. One of them is examination drainage and the other is infection drainage. The examination drainage from a sort of pathology labs is neutralized by acid and alkali, then it is discharged to the public sewer line. The infection drainage is chlorinated, then it is discharged to the public sewer line.

6) Firefighting system

The installation of the fighting system depends on Japanese standard. The standpipe pump and the sprinkler pump are installed in the fire pump room. And they send the water to all hose cabinets and sprinkler heads. The judgment whether if the sprinkler heads are installed or not depends on Japanese standard. In order to avoid damage of concrete tank by freezing, the stainless steel tank is installed on the basement floor.

(12) Air Conditioning / Ventilation Plan

1) Air conditioning system

The coal boilers which are installed in the boiler building make hot water and distribute to hospital. The Hospital accepts the hot water through the heat exchanger. Hot water is circulated in the building and heat s all the rooms by panel heaters or air handling units. (Refer to Fig. 2-11)

The heating systems are makeup outdoor air handling units with panel heaters for general rooms. The air handling units and single duct systems are installed for entrance hall and operation rooms which have big space or need clean atmosphere.

The makeup outdoor air handling units are installed in the mechanical rooms. They make the outdoor air cool or warm appropriately then supply the air to each room. The two heating coils are installed in the air handling unit to avoid freezing and pre-electric heater is installed in the air intake duct. Due to reducing environmental load, make the ice by cold outdoor air in the ice room in winter, then it make the hot outdoor air cool in summer and the air is sent to each room as the flesh air. (Refer to Fig. 2-12)

The air cooled packaged air conditioners are installed in each room for indoor room heat load. The air conditioners are multi type and the outdoor units are installed on the roof floor.

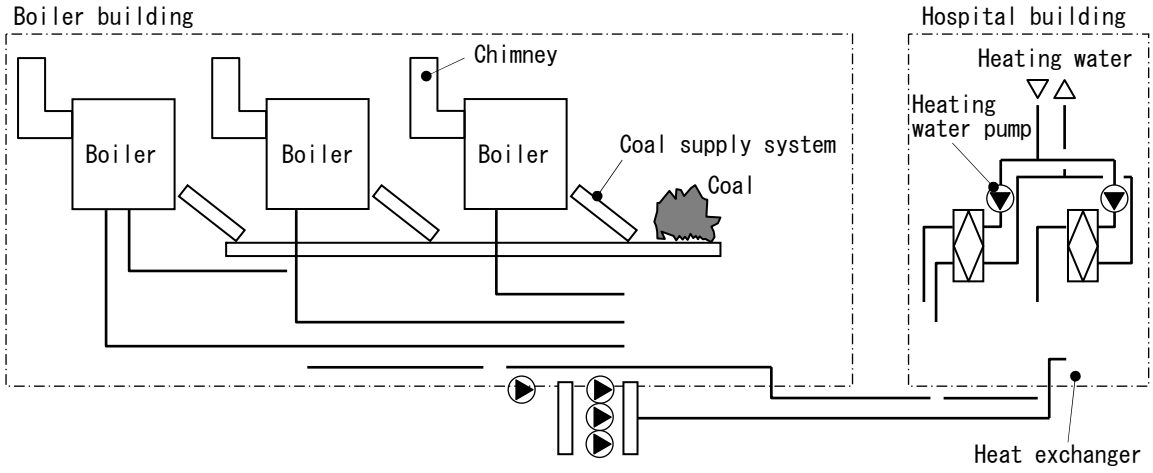


Fig. 2-11 Heat Source Diagram

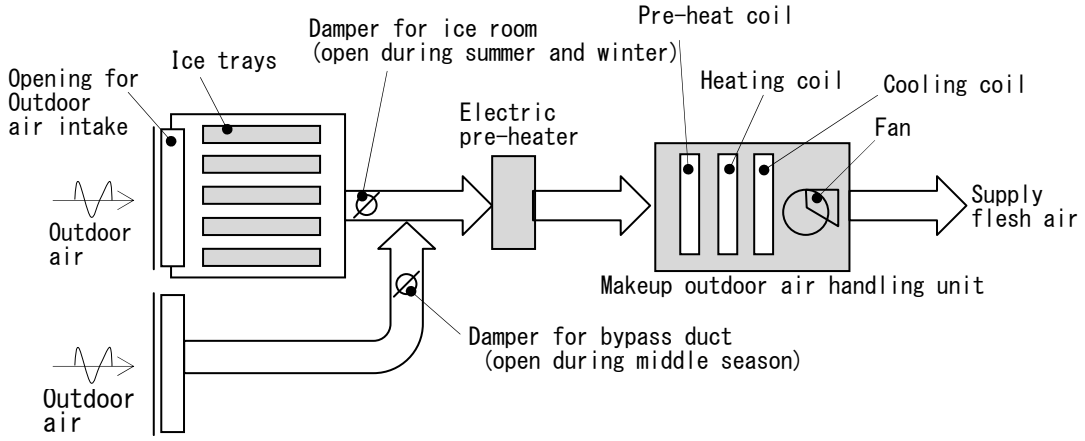


Fig. 2-12 Outdoor Air Intake Diagram

2) Ventilation system

The ventilation systems which have exhaust duct or both exhaust and supply duct are installed in the each room. In order to prevent occurring accident to drop the icicles, each exhaust air is integrated at roof floor then discharge to outdoor.

The electricity room and so on need much quantity of outdoor air. Two exhaust systems are installed in these rooms. One system has much exhaust air and the other has less exhaust air to prevent freezing in these rooms in winter.

(13) Medical Gas Plan

1) Oxygen supply system

The oxygen is supplied to each room from the medical gas room. The CE oxygen tank is not installed on this site because the liquid oxygen is not circulated in Mongol. Therefore two blocks of oxygen cylinders are installed in the medical gas room and the switcher system selects the bank

automatically.

2) Compressed air supply system

The compressor is installed in the medical gas room and distributes the air to each room.

3) Vacuum system

The vacuum machine is installed in the mechanical room and the vacuum outlets are installed in each room.

4) Vacuum system (infection zone)

The vacuum line which is installed in the infection rooms and autopsy room should be independent system. The vacuum machine is installed exclusively in the medical gas room and the outlets are installed in each infection rooms.

5) Nitrous oxide gas system

The nitrous oxide gas cylinders are installed in the medical gas room. The outlets are installed in the operation room and so on, the gas is distributed. The cylinders are separated two banks and selected automatically.

6) Carbon dioxide gas system

The carbon dioxide gas cylinders are installed in the medical gas room and the gas is distributed to the rooms like operation theatres. The cylinders are separated two banks and selected automatically.

7) Nitrogen gas system

The nitrogen gas cylinders are installed in the medical gas room and the gas is distributed to the rooms like operation room. The cylinders are separated two banks and selected automatically.

(14) Construction Material Plan

The local climate and natural conditions, required performance, construction period, construction costs, supply volume, maintenance and management requirements and other such factors will be taken into consideration when selecting the construction methods and materials used in each part of the building.

1) Exterior finishing materials

The main exterior finishing materials are shown in the table below.

Table 2-32 Exterior Finishing Materials

Part	Material Used	Remarks
Exterior Walls	ALC block + thermal insulation, + mortar over lath + paint finish	Focus on reducing construction period
Roof	Thermal insulation + waterproof asphalt	Highest level of waterproof performance can be expected when local waterproofing material is used for flat roof.
Exterior Fittings	Steel doors, aluminum windows, double glazed windows	Superior durability, waterproofing properties and thermal insulation properties.

2) Interior finishing materials

The interior finishing materials used in the main rooms are shown in the table below.

Table 2-33 Interior Finishing Materials

Floor	Room Name	Floor	Wall	Ceiling	Remarks
Ward Bldg., Common	Hospital rooms (4-bed/1-bed rooms)	Vinyl sheet flooring	Paint finish + Spandrel wall panel	Plaster board + paint finish	Durability and easy cleaning
	Ward building corridor	Vinyl sheet flooring	Paint finish + Spandrel wall panel	Plaster board +Paint finish	Durability and easy cleaning
1st Floor	Entrance Hall	Terrazzo tile	Paint finish, marble in some areas	Plaster board +Paint finish	Durability and easy cleaning
	WC	Ceramic tile	Ceramic tile	Calcium silicate board +Paint finish	waterproofing, easy cleaning
1st Floor	OPD Examination Room	Vinyl sheet flooring	Paint finish	Plaster board +Paint finish	Durability and easy cleaning
	EU Infection Rooms	Vinyl sheet flooring	Calcium silicate board + Paint finish	Plaster board +Paint finish	Hygiene and easy cleaning
	EU Resuscitation	Vinyl sheet flooring	Calcium silicate board + Paint finish	Plaster board +Paint finish	Durability and easy cleaning
	EU Observation Ward	Vinyl sheet flooring	Calcium silicate board + Paint finish	Plaster board +Paint finish	Durability and easy cleaning
2nd Floor	Imaging Diagnosis X-ray	Vinyl sheet flooring	Paint finish + Spandrel wall panel	Plaster board +Paint finish	Radiation protection
	Imaging Diagnosis MRI	Vinyl sheet flooring	Paint finish + Spandrel wall panel	Plaster board +Paint finish	Electromagnetic shield
	Endoscopy Dept. Upper gastrointestinal Lower gastrointestinal	Vinyl sheet flooring	Paint finish	Plaster board +Paint finish	Hygiene and easy cleaning
	Surgery Dept. Operation Rooms	Vinyl sheet flooring	Aluminum enamel Steel panel	Aluminum Panel Baking finish	Hygiene and easy cleaning
	Surgery Dept. Operation Hall Other Rooms	Vinyl sheet flooring	Calcium silicate board + Paint finish	Plaster board +Paint finish	Hygiene and easy cleaning
	ICU Rooms	Vinyl sheet flooring	Calcium silicate board + Paint finish	Plaster board +Paint finish	Hygiene and easy cleaning
3rd Floor	Laboratory Dept. Rooms	Vinyl sheet flooring	Paint finish	Plaster board +Paint finish	Durability and easy cleaning
	Administration Dept. Office Rooms	Carpet tile	Paint finish	Plaster board +Paint finish	Durability and easy cleaning
	Lecture Hall	Natural wood flooring	Paint finish	Plaster board +Paint finish	Durability and easy cleaning
Basement	CSSD Rooms	Vinyl sheet flooring	Calcium silicate board + Paint finish	Plaster board +Paint finish	waterproof / ease of cleaning
	Morgue Dept. Rooms	Paint finish	Calcium silicate board + Paint finish	Plaster board +Paint finish	waterproofing, easy cleaning
	Laundry Dept. Rooms	Vinyl sheet flooring	Calcium silicate board + Paint finish	Calcium silicate board +Paint finish	waterproofing, easy cleaning
	Kitchen Dept. Rooms	Vinyl sheet flooring	Calcium silicate board + Paint finish	Calcium silicate board +Paint finish	Durability and easy cleaning
	Medical Waste Treatment Dept. Rooms	Dust proof paint	Calcium silicate board +Paint finish	Calcium silicate board +Paint finish	Focus on ease of cleaning

2-2-2-2 Equipment Plan

The initial request of August 2012 contained a diverse range of equipment. The priority ranking of equipment was made and the equipment was narrowed down based on a review of the facility level, clinical departments, functions and other details during the preparatory survey, which resulted in a request received from Mongolia for the following equipment in the minutes of the preparatory survey of January 2014.

Table 2-34 List of Necessary Equipment

Note: All items below are necessary for the Teaching Hospital.
Priority means consideration by the Japanese grant aid project.
A: High priority
B: Medium priority
C: Low priority. Basically these items are to be provided Mongolian side.

Department	Name of Equipment	Priority
Out-patient Area		
Consultation Room		
Common Package	Negatoscope, wall type	A
	Otorhinolaryngo-ophthalmoscope universal set	A
	Family doctors' examination instrument set	B
	Sphygmomanometer	B
	Stethoscope	B
	Height scale	B
	Weight scale	B
	Examination couch	B
	Medical cabinet	B
	Medical desk	B
	Patient chair	B
	Instrument cart	B
	Stretcher	B
	Wheel chair	B
Ob/Gyn	Gynecology examination table	A
	Stethoscope, infant	A
	Colposcopy	A
	Cryotherapy apparatus	C
	Coagulation apparatus for gynecology	C
	Medical reception table	C
ENT	ENT treatment cabinet	A
	Otolaryngology chair	A
	Surgical Side lamp	A
Treatment Room		
Common Package	Examination couch	B
	Medical cabinet	B
	Medical desk	B
	Patient chair	B
	Instrument cart	B
Internal Medicine	Binocular microscope	A
	Magnifying glass	A
	Laser cautery	A
Surgery	Electro-surgical unit for plaster	A

Department	Name of Equipment	Priority
	Imaging bone ultrasonometer	C
	Ultrasound bone densitometer	C
	Cystometry	C
	Uroflowmeter	C
Pediatrics	Stethoscope, infant	A
	Nebulizer	A
	Aspirator	A
	Syringe pump	A
	Infusion pump	A
	Pulse oximeter	A
	Bilirubin meter	A
	Airway scope	A
	Vein viewer	A
Pulmonology	Nebulizer	A
Endocrinology	ECG, 1ch	A
	Insulin pump	A
	Diabetic foot treatment kit	A
ENT	Audiometer	A
	Tympanometry	A
	Flexible nasopharyngoscopes	A
	Coagulation apparatus	A
	Nebulizer	A
	Stroboscopy	C
	Tympanostomy U-tube	C
	Otologic drill	C
	Head lights	C
	Surgical burrs	C
	Mirror warmers	C
Ophthalmology	Slit lamp	A
	Refract meter	A
	Tonometer	A
	Retinoscope	A
	Visual glass kit	A
	Visual field analyzer	A
	Fully completed green light laser apparatus with accessories	B
	Ultrasonic biometer	B
Instrument Set	Cardiovascular surgical instrument set	B
	Pulmonary surgical instrument set	B
	Gastro surgical instrument set	B
	Gall bladder and liver surgical instrument set	B
	Tracheostomy surgical instrument set	B
	Bone surgical instrument set	B
	Abdominal surgery instrument set	B
	Brain surgical instrument set	B
	Eye surgical instrument set	B
	ENT surgical instrument set	B
	Neurosurgical instrument set	C
Emergency Room	Ultrasound apparatus 3/4D	A
	ECG	A

Department	Name of Equipment	Priority
	Ventilator, CPAP	A
	Ventilator	A
	Dialyzer	A
	Defibrillator	A
	Patient monitor	A
	Fatal monitor	A
	Nebulizer	A
	Pulse oximeter	A
	Airway scope	A
	Syringe pump	A
	Infusion pump	A
	Suction unit	A
	Otorhinolaryngo-ophthalmoscope universal set	A
	Ambulatory manual breathing unit	A
	Negatoscope, wall type	A
	Medical refrigerator	A
	Stretcher, slide type	A
	Medical instrument cart	A
	Examination couch	B
	Medical cabinet	B
	Medical desk	B
	Patient chair	B
	Wheel chair	B
Pharmacy	Dispenser	A
	Medical refrigerator	A
	Counter, tablets, manual	A
	Medical cabinet for Pharmacology	A
	Shelf	B
	Working table	B
Diagnosis Area		
Physical Diagnosis		
ECG Room	ECG	A
	Holter ECG	A
	Treadmill	A
	Ergometer	A
	Examination couch	B
	Screen	C
Ultrasound Room	Ultrasound apparatus 3/4D	A
	Ultrasound apparatus, doppler	A
	Examination couch	B
	Examiner's desk	B
	Examiner's chair	B
	Cart	B
EMG Room	EMG	A
	Examination couch	B
	Examiner's desk	B
	Examiner's chair	B
	Cart	B
EEG Room	EEG	A

Department	Name of Equipment	Priority
	Patient bed	A
	Examiner's desk	B
	Examiner's chair	B
	Cart	B
Spirometer Room	Spirometer	A
	Examiner's desk	B
	Examiner's chair	B
	Cart	B
Imaging Diagnosis		
Radiology Department	MRI	A
	CT scanner	A
	Fluoroscopy X-ray apparatus	A
	Conventional X-ray apparatus	A
	Mobile X-ray apparatus	A
	Mammography	A
	Film developer	A
	Mixer, Barium	A
	Apron, protective, set (small, medium, large)	A
	aprons, protection, gonads, set	A
	position aids, x-ray, Set	A
	Negatoscope, stand type	A
	PACS	A
	Medical cabinet	B
	Cart	B
	Screen	B
	Examiner's desk	B
	Examiner's chair	B
Angiography Room	Angiography	A
	Universal operation table	A
	Instrument cart	B
	Medical cabinet	B
Endoscopy Room	Gastroscopy (flexible type), adult and child	A
	Colonoscopy (flexible type)	A
	Endoscopy light source system	A
	Endoscopy cameras	A
	Endoscopy video processor	A
	Ultrasonic cleaner	A
	Auto endoscope reprocessor	A
	Endoscopy storage cabinet	A
	Bronchoscope	B
	Duodenoscope	B
	Instrument cart	B
	Medical cabinet	B
	Examiner's desk	B
	Examiner's chair	B
	Cart	B
	Endoscopy ultrasound probes	C
Clinical Laboratory		

Department	Name of Equipment	Priority
Common Usage	Centrifuge	A
	Micro centrifuge	A
	Capillary centrifuge	A
	Binocular microscope	A
	Binocular microscope, group teaching system	A
	Safety cabinet	A
	Clean bench	A
	Incubator	A
	pH Meter	A
	Stirrer, hotplate, electric	A
	Stirrer, magnetic	A
	Pipettes, multi volume	A
	Balance	A
	Water distiller	A
	Water bath	A
	Medical refrigerator	A
	Freezer, -20C	A
	Deep freezer, -70C	A
	Medical cabinet for dangerous drug	A
	Medical shelf for dangerous drug	A
	Burner, Bunsen	B
	Stopwatch	C
	Timer, 60 min	C
Biochemistry	Biochemical analyzer (automated)	A
	Blood gases analyzer	A
	Electrolyte analyzer	A
	Therapeutic drug monitoring	A
	ELISA	A
	Hemoglobin meter	A
	Bilirubin meter	A
	Glucometer	A
Hematology	Blood cell counter	A
	Coagulation measuring system	A
	Blood group typing, set	A
	Rotator, blood specimen	A
	Staining apparatus	A
Immunology	Blood sedimentation unit, ESR-Western	A
	Vertical Shaker	A
	Sensitivity disc, applicator	B
Bacteriology	Urine test strips analyzer	A
	Urine sediment analyzer	B
Microbiology	Blood culture apparatus	A
	Anaerobic culture apparatus	A
	C02 Incubator	A
	Incubator	A
	Roller Tubes Incubator	A
	Dry oven	A
	Autoclave	A
	Microwave	A

Department	Name of Equipment	Priority
	Microbiology instrument set	A
Pathology	Cryostat	A
	Automatic tissue processer	A
	Embedding center	A
	Paraffin oven	A
	Stretching hotplate	A
	Paraffin block humidifier	A
	Cytocentrifuge	A
	Fluorescence microscope	A
	Organ photo table	A
	Microtome	A
	Microtome knife	A
	Automatic microtome knife sharpener	A
	Shaker	A
	Staining set	A
	Cabinet, storage, slides and wax block cassettes	A
Washing room	Laboratory washing apparatus	A
	Autoclave	A
	Dry oven	A
	Pipette washer	A
Medical Supportive Area		
Morgue	Morgue refrigerator with 2 place	A
	Morgue table	A
CSSD	Large autoclave	A
	Medıum autoclave	A
	Water-jet pump to clean pipettes	A
	Basket, instruments	A
	Sealer, heat, manual, bags and pouches, bench top	A
	Trolley, CSSD packs transport, stainless steel	A
	Cart, Loading, Sterilizer	A
	Needle Destroyer	A
	Bedpan Washer	A
	Sterilizer (boiling type, for instruments)	C
Laundry	Washing machine	B
	Drying machine	B
	Ironing machine	B
	Delivery cart	B
Kitchen	Refrigerator	B
	Water boiler	B
	Boiling pan	B
	Cabinet, cutlery	B
	Cart, food dispensing	B
	Cart, trays, self service	B
	Cooking range	B
	Counter self service	B
	Dish washer	B
	Oven, pastry	B
	Pots and pan kitchen, medium, 100beds set	B
	Freezer	B

Department	Name of Equipment	Priority
	Soup pot, electric	B
	Main menu pot, electric	B
	Cabinet for glass, etc.	B
	Furniture for food shopping	C
	Chopping block, with chopper	C
	Hose with handle for washing kitchen utensils	C
	Industrial blender	C
	Kitchen machine, universal	C
	Kitchen tools, medium,100beds general hospital set	C
	Meat mincer, heavy duty	C
	Meat saw, electric	C
	Microwave oven, low power range	C
	Milk heater	C
	Food mixer	C
	Planetary mixer	C
	Slice, gravity feed	C
	Table ware100beds set	C
	Trays, roll rack	C
	Vegetable mincer	C
Maintenance Room	Dust extraction unit, workshop	B
	Equipment for bio-medical workshop	B
	Equipment for carpenter workshop	B
	Equipment for electrical workshop	B
	Equipment for mechanical workshop	B
	Cabinet, workshop, open, with shelves	C
	Drill, floor standing	C
	Drill, hand	C
	Ladder	C
	Light, inspection	C
	Oscilloscope	C
	Pipe bender	C
	Spray cleaning, compressed air	C
	Power supply for weak currents	C
	Electronic tool sets	C
	Simulator, Multi-parameter patient	C
	Soldering station	C
	Test unit, electric safety	C
	Carpenter tool set	C
	Electrician tool set	C
	Trolley, transport equipment, heavy duty	C
	Welding unit, autopen, with gas bottle	C
	Welding unit, electric	C
	Workbench, workshop	C
In-patient Area		
Ward/ common	Patient bed	A
	IV pole	A
	Flow meter, medical air with humidifier, wall outlet connection type	A
	Flow meter, oxygen with humidifier, wall outlet connection type	A

Department	Name of Equipment	Priority
	Medical cabinet	B
	Instrument cart	B
	Chart holder, bed mounting	B
	Refrigerator	B
	Bedside table	B
	Bedside shelf	B
	Stretcher	B
	Wheel chair	B
Internal Medicine	Nebulizer	A
	Aspirator	A
Surgery	Traction table (fixed height)	A
	Traction set Cervical (wall mounting)	A
	Walker rollator	A
Ob/Gyn	Baby cot	A
Pediatrics	Syringe pump	A
	Infusion pump	A
	Nebulizer	A
	Aspirator	A
Curative Area		
Operation Theater	Operation ceiling lump	A
	Universal operation table	A
	Operation table	A
	Negatoscope, stand type	A
	Operation camera	A
	C-arm X-ray apparatus	A
	Anesthesia machine	A
	Ventilator	A
	Laparoscope set	A
	Microsurgery scope	A
	Patient monitor	A
	Pulse oximeter	A
	Coagulation apparatus	A
	Defibrillator	A
	Incubator	A
	Infant warmer	A
	Fatal monitor	A
	Suction unit	A
	Syringe pump	A
	Infusion pump	A
	Ambulatory Manual Breathing Unit	A
	Airway scope	A
	Instrument cart	A
ICU/Recovery Room	Patient Bed	A
	Negatoscope, wall type	A
	Ultrasound apparatus 3/4D	A
	ECG	A
	Ventilator	A
	Ventilator, CPAP	A
	Patient monitor	A

Department	Name of Equipment	Priority
	Pulse oximeter	A
	Defibrillator	A
	Nebulizer	A
	Suction unit	A
	Syringe pump	A
	Infusion pump	A
	Ambulatory Manual Breathing Unit	A
	Airway scope	A
	Otorhinolaryngo-ophthalmoscope universal set	A
	Medical refrigerator	A
	Medical cabinet for ICU	A
	Medical instrument cart for ICU	A
	ICU Stretcher	A
	Wheel chair	B
Administration Area		
Administration	Shelf, patient record	B
	Ambulance car	B
	IT server, PC desktops, related accessories	C
	IT program service, related accessories	C
	Medical cabinets and wardrobes with hanger, with locker, chairs, mirrors	C
	Toilets with automatic regulates water, washstands and automatic hand dryer	C
	Wardrobe with hanger, cloth keeping cabinets with locker, chairs	C
	Wardrobe with hanger, cloth keeping cabinets with locker, chairs	C
	PC desktop, printers, medical cabinets and wardrobes, with locker, chairs, clocks, file cabinet, telephones	C
	Office furniture, washable and cleanable, PC desktop, notebooks, printers, telephones, TV and video monitors	C
	Long chairs with 3-6 places	C
Conference Room	AV system set	B
Non-medical equipment	Patient area waiting chairs and sofas	C
	Administration office furniture	C
	Lecture room, meeting room, training room furniture	C
	Library furniture	C
	Books in the library	C
	Linen (bed sheets, gowns, etc.)	C
	Curtain for windows	C
	Building cleaning items (mops, vacuum cleaners, etc.)	C
	Administration computer system (hardware and software)	C
	Accounting computer system (hardware and software)	C
	Patient management computer system (hardware and software)	C
	Medical record management computer system (hardware and software)	C
	Notice boards and sign boards	C

Planning will be performed with the following policy based on this equipment list.

(1) Criteria for Selecting Equipment

Equipment specifications that are appropriate for the Mongolian health workers shall be decided by analyzing their skill levels and capabilities to operate and maintain the equipment. Appropriate types and grades shall be selected by taking into consideration particularly the ease of operation and maintenance, as well as by referring to the equipment models that are widely distributed and used in Mongolia's medical sector. Equipment items that require post-sales services (repair work, supply of spare parts and consumables), including such diagnostic/therapeutic imaging apparatuses as MRI, CT scanners, angiography, ultrasound apparatus, and endoscopy video systems, as well as laboratory test equipment, shall be selected by taking into account the technical/service/supply capabilities of the local agents of their respective manufacturers.

In determining the equipment content, the "principles of high priority and rejection" as listed in the table below shall be applied. Items that are already possessed by the university and can be shared with the new hospital shall be subtracted from the quantity required for this Project.

Table 2-35: Principles of High Priority and Rejection

Item	Principles of High Priority	Principles of Rejection
Basic principles	① Necessary for secondary care	① Requires high O&M cost
	② Necessary for clinical education	② Expected benefits and needed quantity are limited.
	③ Conforms to equipment guidelines	③ Cost effectiveness is low.
	④ Easy to operate and maintain	④ More suitable for academic research than for clinical practice.
	⑤ Will bring about significant benefits	⑤Low durability and hard to operate/maintain
	⑥ Has high cost effectiveness	⑥ Could cause environmental damage due to wastes, etc.
	⑦ Has proven medical usefulness	⑦ Its medical usefulness has not been proven.
	⑧ Durable and easy to operate and maintain	⑧ To be used for private purpose of medical staff.
		⑨ The quantity is more than minimally required.
		⑩ Already owned by the university and can be shared with the Hospital.
Additional principles based on the result of field survey	① Can be operated at the current skill level.	① Replacement parts and consumables are not easily available in Mongolia.
	② Target hospital can secure sufficient maintenance personnel.	② Cannot be operated at the current skill level.
	③ Matches the needs of local patients.	③ Target hospital cannot secure sufficient maintenance personnel.
	④ Cooperation and coordination with other donors can be expected.	④ Does not match the needs of patients.
	⑤ Replacement parts, consumables, and technical services are locally available.	⑤ Would require substantial investment in infrastructure construction.
	⑥Commonly used among testing/emergency facilities.	⑥ Can be covered by the existing items if they are used more efficiently.
		⑦Space for properly installing the equipment cannot be secured.
		⑧ Cannot be constructed/installed with the current technical capacities of local personnel.
		⑨ Not compatible with the existing medical instruments or those commonly used in Mongolia.

(2) Determination of Equipment Quantity and Specifications

The quantity of each item shall be minimized by promoting equipment sharing among each speciality as much as possible. However, since this Project also serves as a teaching hospital, the quantity shall include the quantity needed for caring patients as well as that used for training. The quantity and specifications of each item shall be determined by taking into account the frequency of training, as well as possible equipment failures that may be caused by inexperienced trainees.

(3) Plan for Spare Parts and Consumables

This Project will provide consumables that would cover the first six months of operation. The new hospital will normally overcome within this time, the initial glitches in administration, personnel deployment, budgeting, etc.

Spare parts needed for repairing failure equipment during the initial period immediately after the opening of the Hospital will be provided by the equipment manufacturers under a 1-year warranty effective from the purchasing date of the equipment. This Project will provide some initial spare parts that will be periodically necessary after the expiration of this warranty. Following is list of major such spare parts.

- Ventilator: humidifier modules, patient respirator modules
- Central monitor: ECG nodes, IBP transducers
- Pulse oximeter: finger probes
- Clean cabinet: HEPA filters
- Analyzer: various sensors
- Autoclave: door seals, heaters
- Anesthesia machine: patient modules
- Coagulation apparatus: electrodes, blades,etc
- Suction unit: suction bottles

A full maintenance contract with the manufacturer is necessary for proper operation of advanced medical equipments. The Project procurement package will include full maintenance service for certain initial period (refer to section 2-9-2).

(4) Advanced Medical Equipment Plan

This Project will introduce some advanced high-tech equipment, which can diagnose or treat some of the diseases that are difficult to handle with Mongolia’s current medical capacity, in response to the strong request from the Mongolian side. This Project will also include digital systems for these advanced equipment that is integrated into the Picture Archiving and Communication System (PACS), for the purpose of streamlining the image data storage, medical test, and other procedures. The stored image data and other medical information can be effectively utilized and shared with other people in remote areas and overseas via the Internet.

Angiography, CT scanner, and MRI are among the high-tech medical equipment requested for this Project, each of which is outlined and examined below.

1) Angiography

Angiography is characterized by its abilities to examine the courses, shapes, distribution, and other conditions of blood vessels to obtain basic information needed for diagnosis and treatment, as well as by its applicability to IVR (intervention radiology), in which the same catheter can be used for treating and obtaining the images of diseased vessels. It can also be used to inject an anticancer or thrombolytic drug directly to the affected part through an artery.

(Applications)

Angiography examines blood vessels and organs for any abnormalities in shape or function. Tumors are analyzed to determine whether they are malignant or benign.

Disorders that can be diagnosed or treated by angiography:

① Brain

Vascular disorders: aneurysm, angioma, vascular malformation, vascular occlusion, arteriosclerosis, subarachnoid hemorrhage, intradural/epidural hematoma, brain infraction

Tumor: brain tumor

Trauma: head injuries due to traffic accident, etc.

② Chest / Abdomen

Lungs: lung cancer, lung infraction, bronchial disorders, mediastinal tumor

Liver/pancreas: hepatic cirrhosis, hepatic tumor, portal hypertension, pancreatic tumor

Other: kidney, urinary tumor, uterine cancer, bone tumor

③ Angiostenosis of limbs

④ IVR (vascular and interventional radiology)

(a) Angioplasty (balloon catheterization)

(b) Sealing of varicose veins using a coil

(c) Stent dilation of carotid aneurysm

(Main Specifications)

① Applicable body parts: circulatory organs and the head

② Type: biplane (floor-mounted and ceiling-suspended C-arm systems)

③ Features: DSA, 3D imaging, CT

④ Image storage: DISCOM compatible

2) CT Scanner

Advantages of CT scanners can be concisely described by its abilities to scan wider areas in a relatively short time. X-ray CT scan takes only 10 to 30 minutes and thus is less stressful for the examinee. The large gantry aperture makes it easier to observe a patient. X-ray CT can not only cover wider areas but also acquire clearer images of body parts that are hard to distinguish from the surrounding organs and tissues with general X-ray apparatus.

CT scanners can examine patients with pacemakers, bolts, or other metal implants, as they do not use magnets as MRI machines do.

(Applications)

As X-ray CT produces tomographic images representing “slices” of the body, it can acquire a large volume of information on the interior of the body, including not only the diseased lesions but also the functions and shapes of surrounding organs. Because of its ability to scan any body parts, it is suitable for whole body examination. If used in combination with a contrast medium, it can take even clearer images, enabling more diagnosis that is accurate.

① Head

Head trauma: epidural hematoma, subdural hematoma, cerebral contusion, etc.

Cerebrovascular: subarachnoid hemorrhage, cerebral hemorrhage, cerebral infraction, etc.

Head disorder : brain tumor, angioma, cerebrovascular malformation, cerebral aneurysm, etc.

② Head to Neck

Ear/acoustic nerve: acoustic nerve tumor and other neoplastic diseases

Eye: ocular and orbital disorders, etc.

Nose: nasal and sinus disorders, etc.

Mouth/throat: adenoidal/pharyngeal/oral disorders, salivary gland tumor, etc.

Other: cervical disorders

③ Chest

Circulatory: aortic aneurysm, dissecting aneurysm of aorta, etc.

Respiratory: lung cancer, mediastinal tumor, pleural lesion, tuberculoma, etc.

Other: esophageal cancer, etc.

④ Abdominal Region

Gallbladder/liver: hepatic cancer and other liver diseases, gallbladder cancer, gallstone, etc.

Pancreas: pancreatic cancer, cystic tumor, islet cell tumor, pancreatitis, etc.

Kidney: polycystic kidney, kidney cancer, renovascular myolipoma, renal pelvic cancer, etc.

Other: abdominal aneurysm, abnormalities in the size or shape of organs, etc.

(Main Specifications)

① Type: whole body, 64-slice scanner

② No. of detector rows: 64+

③ Applications: dynamic scan, coronary angiogram, HRCT

④ Image data: DICOM compatible

(3) MRI (magnetic resonance imaging)

Unlike X-ray CT and other X-ray apparatus, MRI can acquire cross-sectional images of body parts from many different angles without irradiating patients. Because of this feature, MRI can take images of parts hidden behind other organs that are difficult to capture with X-ray apparatus. In addition, MRI can generate high-resolution images of the liver and other water-rich organs and

soft tissues, detect small lesions, and provide information on blood flow. Because bones hardly contain any water and emit only a very weak MR signal, they do not obstruct the views of other organs, etc.

Contrast agents sometimes used in MRI do not contain iodine, unlike those used in X-ray imaging, and thus are less likely to cause adverse side effects (except for bronchial asthma). One of the shortcomings of MRI is that it takes longer to acquire images and can sometimes fail to capture still images of vigorously moving organs.

(Applications)

The advantages of MRI include that it can acquire cross-sectional images of the body from any angle, which makes it possible to closely examine the conditions and shapes of organs, lesions, and other internal structures. MRI is almost always used in the examination of the head, especially when patients have such symptoms as headache, vertigo, hearing impairment, eyeball movement disorder, dementia, and epilepsy, in which cases MRI tests are conducted.

Diseases and conditions that can be diagonized by MRI:

① Head

Cerebrovascular: cerebral infraction, cerebral hemorrhage, moya-moya disease, angioma, cerebrovascular malformation, Wallerian degeneration, dissecting aneurysm, subarachnoid hemorrhage, etc.

Other head diseases: brain tumor, hemochromatosis, diabetes inspidus, lymphocytic hypophysitis, facial spasm, trigeminal neuralgia, head trauma, etc.

② Head to Neck

Acoustic nerve: acoustic nerve tumor and other neoplastic diseases

Eye: ocular and orbital disorders, etc.

Other: nasal and sinus disorders, adenoidal/pharyngeal/oral disorders, salivary gland tumor, etc.

③ Chest

Circulartory: aortic aneurysm, dissecting aneurysm of aorta, etc.

Lung: lung cancer, mediastinal tumor, pleural lesion, tuberculoma, etc.

④ Abdominal Region

Gallbladder/liver/pancreas: hepatic cancer and other liver diseases, gallbladder cancer, gallstone, choledocholith, pancreatic cancer, cystic tumor, islet cell tumor, pancreatitis, etc.

Kidney: polycystic kidney, kidney cancer, renovascular myolipoma, renal pelvic cancer, etc.

Other：abdominal aneurysm, abnormalities in the size or shape of organs

⑤ Pelvic Region

Bladder cancer and other bladder diseases, uterus myoma, uterine cancer, etc.

⑥ Spinal Column

Herniated disk, vertebral fracture, vertebral and spinal cord tumor, etc.

⑦ Limb

Bone fracture, etc.

(Main Specifications)

① Gantry System

: 1.5T superconducting magnet system

: Cooling system (liquid helium)

: Variable-speed patient positioning table

② Image processing control system

: Digital RF architecture

: High-speed A/D converter

: Image reconstruction speed: over 1200 images per second

③ Various patient support systems

④ Surface coils optimized for:

(a) whole body, (b) head, (c) spine, (d) neck, (e) trunk/heart

(f) limb, (g) multi-purpose, (h) shoulder and other joints (i) finger/breast

⑤ Image data: DICOM compatible

4) Statuses of Use of the Above Equipment and Technical Level of Mongolia

The table below shows the quantity of the above-mentioned three types of equipment that are currently operating in Mongolia. Though in small numbers, these machines have already been introduced to secondary and tertiary-level hospitals and are gradually spreading. In addition, the number of physicians that can operate these machines and perform diagnostic imaging, who have been trained overseas and have returned to Mongolia, is also increasing.

Table 2-36: Quantity of High-Tech Equipment Currently in Operation in Mongolia

	Public Hospitals	Private Hospitals
Angiography	3	1
CT scanner	19	8
MRI	3	4

5) Procurement and Maintenance of Equipment

Reliable manufacturers that can deliver the above equipment to Mongolia are from Japan and the United States. They have local agents in Ulaanbaatar staffed by radiology technicians, who are already providing maintenance/inspection/repair services for radiology equipment. Since these local agents do not have an extensive track record in supplying the high-tech equipment to Mongolian customers, they will be given technical training by the manufacturers in their respective manufacturing countries in time for the scheduled delivery dates. In addition, technicians from the manufacturing countries will provide OJT during the installation work and, if necessary, may stay for the startup.

6) Result of evaluation

Introduction of the high-tech equipment through this Project will benefit the recipient country in a number of ways. The target hospital will become able to provide more in-depth and a wider range of diagnosis and treatment options than regular secondary-level hospitals, which will greatly contribute to the community and help ease the load of the tertiary referral hospital. The equipment will also help establish the Teaching Hospital as the most important center for education and training of advanced medicine in Mongolia.

The results of this survey indicate that the manufactures and their local agents have sufficient capabilities to supply and maintain the equipment selected for this Project. Sustainable development will also be possible by ensuring that the recipient side will allocate sufficient budget for the operation and maintenance and continue to improve their medical techniques.

(5) Equipment List

As a result of the above considerations, the equipment items to be procured through this Project were finalized and listed in the table below.

Table 2-37 Equipment List

Department	No.	Name of Equipment	**Unit**
Out-patient Area			
Consultation Room			
Common Package	1	Negatoscope, wall type	**14**
	2	Otorhinolaryngo-ophthalmoscope universal set	**14**
	3	Family doctors' examination instrument set	**8**
	4	Sphygmomanometer	**14**
	5	Stethoscope	**14**
	6	Height scale	**12**
	7	Weight scale	**12**
	8	Examination couch	**16**
	9	Medical cabinet	**17**
	10	Medical desk	**17**
	11	Patient chair	**17**
	12	Instrument cart	**17**
Ob/Gyn	13	Gynecology examination table	**3**
	14	Colposcopy	**2**
ENT	15	ENT treatment cabinet	**1**
	16	Otolaryngology chair	**1**
	17	Surgical Side lamp	**1**
Treatment Room			
Common Package	18	Examination couch	**8**
	19	Medical cabinet	**10**
	20	Medical desk	**11**
	21	Patient chair	**10**
	22	Instrument cart	**10**
Internal Medicine	23	Binocular microscope	**1**
	24	Magnifying glass	**1**

Department	No.	Name of Equipment	**Unit**
Surgery	25	Electro-surgical unit for plaster	**1**
Pediatrics	26	Stethoscope, infant	**2**
	27	Nebulizer	**1**
	28	Aspirator	**1**
	29	Syringe pump	**2**
	30	Infusion pump	**2**
	31	Pulse oximeter	**1**
	32	Bilirubin meter	**1**
	33	Airway scope	**2**
	34	Vein viewer	**1**
Pulmonology	35	Nebulizer	**1**
Endocrinology	36	ECG	**1**
ENT	37	Audiometer	**1**
	38	Tympanometry	**1**
	39	Flexible nasopharyngoscopes	**1**
	40	Coagulation apparatus (for ENT)	**1**
ENT	41	Nebulizer	**1**
Ophthalmology	42	Slit lamp	**1**
	43	Refract meter	**1**
	44	Tonometer	**1**
	45	Retinoscope	**1**
	46	Visual glass kit	**1**
	47	Visual field analyzer	**1**
	48	Fully completed green light laser apparatus	**1**
	49	Ultrasonic biometer	**1**
Instrument Set	50	Gastro surgical instrument set	**2**
	51	Gall bladder and liver surgical instrument set	**2**
	52	Abdominal surgery instrument set	**2**
	53	Eye surgical instrument set	**1**
	54	ENT surgical instrument set	**1**
Emergency Room	55	Operation light、ceiling and mobile	**1**
	56	Ultrasound apparatus 3/4D	**1**
	57	ECG	**1**
	58	Ventilator	**1**
	59	Defibrillator	**1**
	60	Patient monitor	**1**
	61	Fatal monitor	**1**
	62	Nebulizer	**1**
	63	Pulse oximeter	**3**
	64	Airway scope	**1**
	65	Syringe pump	**4**
	66	Infusion pump	**4**
	67	suction unit	**2**
	68	Otorhinolaryngo-ophthalmoscope universal set	**5**
	69	Ambulatory manual breathing unit	**2**
	70	Negatoscope, wall type	**2**
	71	Medical refrigerator	**1**
	72	Stretcher, slide type	**4**
	73	Medical instrument cart	**5**
	74	Examination couch	**3**
	75	Medical cabinet	**3**

Department	No.	Name of Equipment	Unit
	76	Medical desk	**3**
	77	Patient chair	**3**
	78	Wheel chair	**2**
Pharmacy	79	Dispenser	**2**
	80	Medical refrigerator	**2**
	81	Counter, tablets, manual	**2**
	82	Medical cabinet for Pharmacology	**2**
	83	Shelf	**2**
	84	Working table	**2**
Diagnosis Area			
Physical Diagnosis			
ECG Room	85	ECG (for stress test)	**1**
ECG Room	86	Holter ECG	**1**
	87	Treadmill	**1**
	88	Ergometer	**1**
	89	Examination couch	**1**
Ultrasound Room	90	Ultrasound apparatus 3/4D	**2**
	91	Ultrasound apparatus, doppler	**2**
	92	Examination couch	**4**
	93	Examiner's desk	**4**
	94	Examiner's chair	**4**
	95	Cart	**4**
EMG Room	96	EMG	**1**
	97	Examination couch	**1**
	98	Examiner's desk	**1**
	99	Examiner's chair	**1**
	100	Cart	**1**
EEG Room	101	EEG	**1**
	102	Patient bed	**1**
	103	Examiner's desk	**1**
	104	Examiner's chair	**1**
	105	Cart	**1**
Spirometer Room	106	Spirometer	**1**
	107	Examiner's desk	**1**
	108	Examiner's chair	**1**
	109	Cart	**1**
	110	Patient chair	**1**
Imaging Diagnosis			
Radiology Department	111	MRI	**1**
	112	CT scanner	**1**
	113	Fluoroscopy X-ray apparatus	**1**
	114	Conventional X-ray apparatus	**1**
	115	Mobile X-ray apparatus	**1**
	116	Mammography	**1**
	117	Film developer	**4**
	118	Mixer, Barium	**1**
	119	Apron, protective, set (small, medium, large)	**5**
	120	Aprons, protection, gonads, set	**5**
	121	Position aids, x-ray, Set	**2**

Department	No.	Name of Equipment	Unit
	122	Negatoscope, stand type	**3**
	123	PACS	**1**
		Image report sever system	**1**
		PACS terminal unit for reference	**20**
		PACS terminal unit for conference	**11**
		PACS terminal unit(for endoscope)	**3**
		PACS terminal unit (for ultrasound unit)	**4**
		terminal unit (for radiology)	**3**
		RIS terminal unit (for radiology)	**5**
Radiology Department	124	Medical cabinet	**1**
	125	Cart	**1**
Angiography Room	126	Angiography	**1**
	127	Instrument cart	**1**
	128	Medical cabinet	**1**
Endoscopy Room	129	Gastroscopy (flexible type), adult and child	**2**
	130	Colonoscopy (flexible type)	**1**
	131	Ultrasonic cleaner	**2**
	132	Auto endoscope reprocessor	**1**
	133	Endoscopy storage cabinet	**1**
	134	Instrument cart	**6**
	135	Medical cabinet	**3**
	136	Examiner's desk	**1**
	137	Examiner's chair	**1**
	138	Patient chair	**1**
Clinical Laboratory			
Common Usage	139	Centrifuge	**7**
	140	Micro centrifuge	**5**
	141	Capillary centrifuge	**2**
	142	Binocular microscope	**12**
	143	Binocular microscope, group teaching system	**2**
	144	Safety cabinet	**2**
	145	Clean bench	**2**
	146	Incubator	**2**
	147	pH Meter	**2**
	148	Stirrer, hotplate, electric	**3**
	149	Stirrer, magnetic	**4**
	150	Pipettes, multi volume	**28**
	151	Balance	**2**
	152	Water distiller	**2**
	153	Water bath	**6**
	154	Medical refrigerator	**2**
	155	Freezer, -20C	**2**
	156	Deep freezer, -70C	**2**
	157	Medical cabinet for dangerous drug	**4**
	158	Medical shelf for dangerous drug	**4**
	159	Laboratory table with sink, large	**8**
	160	Laboratory table with sink, medium	**3**
	161	Burner, Bunsen	**6**

Department	No.	Name of Equipment	Unit
Biochemistry	162	Biochemical analyzer (automated)	**1**
	163	Blood gases analyzer	**1**
	164	Electrolyte analyzer	**1**
	165	Immunology analyzer	**1**
	166	Hemoglobin meter	**1**
	167	Bilirubin meter	**1**
Hematology	168	Blood cell counter	**1**
	169	Coagulation measuring system	**1**
	170	Rotator, blood specimen	**2**
	171	Staining apparatus	**1**
Immunology	172	Blood sedimentation unit, ESR-Western	**2**
	173	Vertical Shaker	**2**
Bacteriology	174	Urine test strips analyzer	**1**
	175	Urine sediment analyzer	**1**
Microbiology	176	Blood culture apparatus	**1**
	177	Anaerobic culture apparatus	**1**
	178	CO2 Incubator	**1**
	179	Incubator	**1**
	180	Roller Tubes Incubator	**1**
	181	Dry oven	**1**
	182	Autoclave	**1**
Pathology	183	Cryostat	**1**
	184	Automatic tissue processer	**1**
	185	Embedding center	**1**
	186	Paraffin oven	**1**
	187	Stretching hotplate	**1**
	188	Cytocentrifuge	**1**
	189	Fluorescence microscope	**1**
	190	Organ photo table	**1**
	191	Microtome	**1**
	192	Shaker	**1**
	193	Staining set	**1**
	194	Cabinet, storage, slides and wax block cassettes	**1**
Washing room	195	Laboratory washing apparatus	**1**
	196	Autoclave	**1**
	197	Dry oven	**1**
	198	Pipette washer	**1**
Medical Supportive Area			
Morgue	199	Morgue refrigerator with 2 place	**1**
	200	Morgue table	**1**
CSSD	201	Large autoclave	**1**
	202	Medıum autoclave	**1**
	203	Basket, instruments	**15**
	204	Sealer, heat, manual, bags and pouches, bench top	**2**
	205	Trolley, CSSD packs transport, stainless steel	**8**
	206	Needle Destroyer	**1**
	207	Bedpan Washer	**4**
Kitchen	208	Refrigerator	**2**
	209	Freezer	**2**

Department	No.	Name of Equipment	Unit
In-patient Area			
Ward/ common	210	Patient bed	**97**
	211	IV pole	**56**
Ward/ common	212	Flow meter, oxygen with humidifier, wall outlet connection type	**52**
	213	Medical cabinet	**3**
	214	Instrument cart	**3**
	215	Refrigerator	**3**
	216	Bedside table	**86**
	217	Bedside shelf	**86**
	218	Stretcher	**3**
	219	Wheel chair	**6**
Internal Medicine	220	Nebulizer	**4**
	221	Aspirator	**4**
Surgery	222	Traction table (fixed height)	**2**
	223	Traction set Cervical (wall mounting)	**2**
	224	Walker rollator	**4**
Ob/Gyn	225	Baby cod	**4**
Pediatrics	226	Syringe pump	**4**
	227	Infusion pump	**4**
	228	Nebulizer	**2**
	229	Aspirator	**2**
Curative Area			
Operation Theater	230	Operation ceiling lamp	**4**
	231	Universal operation table	**3**
	232	Operation table	**1**
	233	Negatoscope, stand type	**4**
	234	C-arm X-ray apparatus	**1**
	235	Anesthesia machine	**4**
	236	Laparoscope set	**1**
	237	Microsurgery scope	**1**
	238	Patient monitor	**4**
	239	Pulse oximeter	**4**
	240	Coagulation apparatus	**4**
	241	Defibrillator	**2**
	242	Incubator	**1**
	243	Infant warmer	**1**
	244	Fatal monitor	**1**
	245	Suction unit	**4**
	246	Syringe pump	**4**
	247	Infusion pump	**4**
	248	Ambulatory Manual Breathing Unit	**4**
	249	Airway scope	**4**
	250	Instrument cart	**8**
ICU/Recovery Room	251	Patient Bed	**8**
	252	Negatoscope, wall type	**1**
	253	ECG	**1**
	254	Ventilator	**2**
	255	Ventilator, CPAP	**1**
	256	Patient monitor	**8**

Department	No.	Name of Equipment	Unit
ICU/Recovery Room	257	Central Monitor	**1**
	258	Pulse oximeter	**8**
	259	Defibrillator	**1**
	260	Nebulizer	**4**
	261	Suction unit	**4**
	262	Syringe pump	**8**
	263	Infusion pump	**8**
	264	Ambulatory Manual Breathing Unit	**2**
	265	Airway scope	**1**
	266	Otorhinolaryngo-ophthalmoscope universal set	**5**
	267	Medical refrigerator	**1**
	268	Medical cabinet for ICU	**2**
	269	Medical instrument cart for ICU	**4**
	270	ICU Stretcher	**2**
	271	Wheel chair	**2**
Administration Area			
Administration	272	Shelf, patient record	**10**

(6) Specifications and Intended Use of Main Equipment

Specifications and intended use of the main items on the equipment list are shown in the table below.

Table 2-38: Specifications and Purpose of Main Equipment Items

Equipment	Specifications or Configurations	Purpose
Fully completed green light laser apparatus	1.Laser wave length: 532nm 2.Maximum outlet power: Within 1.5 to 1.7W 3.Aiming laser: 635nm	Uses the thermal effect of laser to treat diseases of the retina, iris, ciliary body, and other eye parts by performing gonio-photocuagulation. Green laser emitted by this instrument is used mainly for the treatment of diabetic retinopathy.
Ultrasound apparatus 3/4D (for ER)	1.Display: 15 inches, LCD color monitor 2.Touch-panel type 3.Scanning method: Electronic Convex Sector, Electronic Phased Array Sector, Electronic Linear, etc. 4.Modes: B, M, B/M, CDI (Color Doppler), PWD (Pulsed Wave Doppler), 3/4D, etc.	Generally used to diagnose and treat diseases by sending a pulse of ultrasound into the body via a probe to display on a monitor the images of organs and tissues to check their conditions and the presence of tumors, inflammation, etc. Recently-developed color Doppler mode can display real-time images of moving organs, tissues, etc., as well as blood flowing in the heart. This model is to be used in the Emergency Unit for emergency patients with a wide range of conditions.
Ventilator	1.Type: For adult and pediatric 2.Flow delivery method: VCV, PCV and CPAP/PEEP 3.Mode: CMV and SIMV(IDV)	Used to provide the mechanism of breathing for post-surgery and critically-ill patients, who are unable to breathe or breathing insufficiently, to sustain their lives. A medical ventilator basically supports inhalation only, and the patient exhales passively due to the elasticity of the lungs and ribcage as in spontaneous breathing. This model is to be used for emergency patients in the Emergency Unit.

Equipment	Specifications or Configurations	Purpose
ECG (for stress test)	1.Type: A/D converter 2.Display:12inches, LCD color monitor 3.Channels:12 lead or more 4.Adaptation:Exercise ECG examination to treadmill and ergometer	A general model that can be linked to a treadmill or ergometer to measure patients' ECG under stress.
Holter ECG	1.Recording type: 24 hours continuous recording 2.Recording media: Memory card 3.Channels:3 channel or more	Used to monitor heart activity for an extended period to detect transient arrhythmia or other cardiac conditions that are difficult to identify in a short period of time. It is useful for diagnosing rest angina, evaluating the efficacy of an anti-arrhythmic drug, checking the operation of an artificial pacemaker, etc.
Ultrasound apparatus 3/4D (for OPD)	1.Monitor: 15 inch , LCD color monitor 2.Touch-panel type 3.Scanning method: Electronic Convex Sector, Electronic Phased Array Sector, Electronic Linear, etc. 4.Modes: B, M, B/M, CDI (Color Doppler), PWD (Pulsed Wave Doppler), 3/4D, etc.	Generally used to diagnose and treat diseases by sending a pulse of ultrasound into the body via a probe to display on a monitor the images of organs and tissues to check their conditions and the presence of tumors, inflammation, etc. Recently, it has become possible to view real-time images of moving organs, tissues, etc. This model will be used in the ultrasound room of the Outpatient Clinics and for diagnosing general/OB-GYN patients in the Diagnostic Imaging Department. 3D/4D scan modes are used to measure the size and determine the sex of a fetus, and detect multiple pregnancies. It is also used to check the position of the fetus when taking samples for amniocentesis or CVS, as well as for detecting ectopic pregnancy, tumors, cysts, and other abnormalities in the pelvic organs.
Ultrasound apparatus, Doppler (for Cardiology)	1.Monitor: 15 inch or more, LCD color monitor 2.Touch-panel type 3.Scanning method: Electronic Convex Sector, Electronic Phased Array Sector, Electronic Linear, etc. 4.Modes: B, M, B/M, CDI (Color Doppler), PWD (Pulsed Wave Doppler), 3/4D, etc.	Generally used to diagnose and treat diseases by sending a pulse of ultrasound into the body via a probe to display on a monitor the images of organs and tissues to check their conditions and the presence of tumors, inflammation, etc. Recently, it has become possible to view real-time images of moving organs, tissues, etc. This model will be used in the cardiac ultrasound room of the Outpatient Clinics and for general/cardiac patients in the Diagnostic Imaging Department to check the movement of heart valves, blood flow, and other functions shown in the color Doppler images.
EMG	1.Measuring items: EMG, NCS, SEP, VEP, ABR and others 2.Number of channels: 2 channels or more	Used to examine patients with possible SPMA, peripheral neuropathy, and other neuropathic changes in the area from anterior horn cell to peripheral nerve; neuromuscular junction diseases such as myasthenia gravis; diseases of muscle fibers such as muscular dystrophy and progressive muscular atrophy; disturbances of pyramidal tract such as cerebral hemorrhage and Parkinsonian syndrome; and extrapyramidal disorders.

Equipment	Specifications or Configurations	Purpose
EEG	1.Main unit with electrode junction box EEG inputs on electrode position layout: 25 or more 2.Photic stimulator Stimulation mode: Automatic and manual code Lighting function: Available	Widely used as a diagnostic support instrument for detecting abnormalities in the central nervous system such as epilepsy, brain tumor, cerebrovascular diseases, head trauma, and cerebral meningitis. Recently it is also used to help determine brain death and conduct polygraph test to diagnose sleep apnea caused by various factors during sleep.
MRI	1.Gantry ①1.5T superconductive magnet ②Cooling unit system (liquid He) 2.Control system 3.Patient support system 4.Surface coil: ①Whole body、②Head、③Spine、④Cervical、⑤Heart、⑥Leg、⑦Multipurpose、⑧Joint、⑨Finger、⑩Breast	MRI stands for magnetic resonance imaging. Unlike CT or other X-ray apparatus, MRI does not emit any ionizing radiation. It can generate cross-sectional images of the head and all other body parts to assist diagnosis. Generally, MRI machines use either superconductors or permanent magnets. This Project will employ the superconductor type.
CT scanner	1.Row number of detector: More than 64row mounted 2.Photography method : Conventional, Spiral 3.Adaptation: Dynamic scan, Angiography, Coronary angiography, H RCT	CT is a technology that uses a narrowly focused X-ray beam and a detector that circle around the body to measure the amount of X-ray absorbed at different points of the body to obtain computer-processed cross-sectional images of the body. This CT scanner will be used for general CT diagnosis, multiple-contrast agent imaging, 3D CT imaging, and other tests.
Fluoroscopy X-ray apparatus	1. Digital FPD system 2.Fluoroscopy table 3.Monitor: 15inches	An X-ray apparatus used to continuously observe the internal structures and functions of gastrointestinal tracts and cardiopulmonary organs without performing open abdominal or heart surgery. It is also useful in determining the position of a bronchoscope. This model adopts a digital camera system that can store and print out digital images unlike conventional X-ray apparatus that require development of films.
Conventional X-ray apparatus	1. Digital FPD system 2.X-ray tube support is ceiling-suspended 3.Related unit	Used to diagnose diseases of the lungs and peripheries (pneumonia, lung tumor, emphysema, atelectasis, pneumothorax, pleural fluid, etc.) as well as the rib and other chest wall abnormalities, as it can display vivid images of the contours of the heart and blood vessels. This model adopts a digital camera system that can store and print out digital images unlike conventional X-ray apparatus that require development of films.
Mobile X-ray apparatus	1.Type: Inverter system 2. FPD type 3.Colum rotation: Within ±90°	Used to take X-ray images of immobile patients in hospital ward, ICU, operating rooms, etc. This model adopts a digital camera system that can store and print out digital images unlike conventional X-ray apparatus that require development of films.
Mammography	1.Digital system (FPD) 2.Imaging modes:Conventional and Tomosynthesis	Used to take X-ray images of the breast. This model adopts a digital camera system that can store and print out digital images unlike conventional X-ray apparatus that require development of films.

Equipment	Specifications or Configurations	Purpose
Picture Archiving and Communication System (PACS)	1.Adaptation: For image diagnosis/treatment unit 2.Server（DICOM, Order, REPORT, Storage, Back-up） 3.Image report server license software 4.Image interpretation terminal unit 5.RIS terminal unit 6.PACS terminal unit	This equipment will be used to store, in the image database, digital images from MRI, CT scanner and other radiography apparatuses, ultrasound machines, and endoscopic systems. It also allows users to search images for distribution, display, or printing on an as-needed basis via a dedicated communication channel.
Angiography	1. Indications: cardiovascular system and the head 2. Biplane 3. Equipped with DSA 4. X-ray high voltage generator: inverter type	Used for cardiac and cerebral angiography and catheterization, as well as for cerebral vascular treatment using a coil or stent.
Gastroscopy (flexible type) for adults and pediatrics	1.Gastroscope: For adults and children videoscope 2.Light source: Xenon lamp	Used to observe ulcers, inflammation, polyps, cancerous tumors, etc. inside the esophagus and the stomach and take tissue samples using forceps for biopsy. It can also be used for therapeutic purposes, such as to destroy abnormal tissues or small tumors with an electrified wire and to cauterize bleeding vessels. It is also useful in treating pediatric GERD and removing ingested foreign bodies. This model incorporates a video system capable of capturing, storing, replaying, and printing out digital images.
Colonoscopy (flexible type)	1.Colonoscope: Videoscope 2.Light source: Xenon lamp	Used to observe ulcers, inflammation, polyps, cancerous tumors, etc. inside the rectum and the large intestine and take tissue samples using forceps for biopsy. It can also be used for therapeutic purposes, such as to destroy abnormal tissues or small tumors with an electrified wire and to cauterize bleeding vessels. This model incorporates a video system capable of capturing, storing, replaying, and printing out digital images.
Auto endoscope reprocessor	1.Cycle: Washing ⇒ disinfection 2.Washing capacity: 2 endoscopes or more /cycle	Generates vibrations to deep-cleanse endoscopes contaminated with tissues and bodily fluids. It will be used to cleanse gastroscopes and colonoscopes to be procured by this Project.
Biochemical analyzer (automated)	1.Test throughput: 400 tests/hour or more 2.Test menu: 40 or more 3.Auto sampler	Used to conduct biochemical tests with improved efficiency and accuracy. Generally, it can test over 40 items, which cover most of the daily biochemical tests. Recheck and accuracy control can be automated as well. This equipment will be installed in the test room as the most important item of the laboratory.
Immunology Analyzer	1.Maximum analysis parameters: 60 parameters or more 2.Analysis time: Within 30 minutes 3.Parameters: Thyroid, Cardiac, Hormones, Maternal care, Anemia, Tumor, Infectious disease, Bone, and others	Generally, immunoassay is conducted mainly to detect tumor markers, viral infections, allergies, and hormones to determine the presence of diseases. Among the different types of immunoassay instruments, this Project will employ a fully-automated type based on the chemiluminescence enzyme immunoassay principle, featuring ease of use, a reagent cooling function that simplifies preparatory work, and an accuracy control system. Its random-access capability allows the system to efficiently analyze each specimen according to request.

Equipment	Specifications or Configurations	Purpose
Blood cell counter	1.Mode: Full automatic 2.Measure item: At least 15 parameters(Whole blood mode) 3.Throughput: Minimum 50 samples per hour or more	Measures the number of red blood cells, white blood cells, hemoglobin, etc. in the blood. Used mainly in screening tests and for diagnosing/treating hematologic diseases.
Large autoclave	1.Door type: Two door type 2.Chamber capacity: Within 440 to 500 liter 3.Control system: Microprocessor control system	A large autoclave to be installed in the Central Sterile Supply Room for sterilizing surgical/diagnostic instruments, bed linens, and other supplies.
C-arm X-ray apparatus	1. X-ray high voltage generator: inverter, more than 20kHz 2.Digital type,	Used to verify the lesion and blood flow during surgery, check the conditions of patient at the end of surgery, determine the success or failure of bone formation, and see and utilize the images on an external viewer. It incorporates a digital camera system that allows storage and printing of digital images. It incorporates a digital camera system that allows storage and printing of digital images.
Anesthesia machine	1.Anesthesia machine Anesthesia circuit: Closed or semi closed type Flow meter: O2, N2O, Air Vaporizer: isoflurane, sevoflurane 2.Ventilator function	Used to administer anesthetic gases for total anesthesia. As it also serves as a ventilator, it can be used to support IV, spinal, and epidural anesthesia, as well as for emergency resuscitation.
Laparoscope set	Composition 1.Telescopes A and B 2.Trocar sleeve and spikes A and B 3.Suction-irrigation pump unit 4.Light source unit and light guide cable 5.Insufflation unit 6.CO2 cylinder	Laparoscopic surgery is one of minimally invasive endoscopic surgical techniques to operate inside the abdomen in lieu of the conventional open surgery. The surgical kit will be used in conjunction with an endoscopic video system, which allows monitoring of surgeries in progress, as well as replay and printing of digital images recorded.
Microsurgery scope	1. Type: Mobile floor stand type, binocular type 2. Application zoom: Surgery 3. Eyepiece magnification: 10x	Used to perform microsurgery on very small structures that cannot be operated on with naked eyes.
Ventilator (for general use)	1. Type: For adults and pediatric 2. Breath type: VCV, PCV, and CPAP/PEEP 3. Mode: CMV and SIMV(IDV)	Used to provide the mechanism of breathing for post-surgery and critically-ill patients, who are unable to breathe or breathing insufficiently, to sustain their lives. A medical ventilator basically supports inhalation only, and the patient exhales passively due to the elasticity of the lungs and ribcage as in spontaneous breathing. This model will be used for ICU patients.
Ventilator, CPAP (for Infant and ICU use)	1. Type: For adult and pediatric 2. Breath type: VCV, PCV and CPAP/PEEP 3. Mode: CPAP	Used to provide the mechanism of breathing for post-surgery and critically-ill patients, who are unable to breathe or breathing insufficiently, to sustain their lives. A medical ventilator basically supports inhalation only, and the patient exhales passively due to the elasticity of the lungs and ribcage as in spontaneous breathing. This model will be used for ICU patients.
Central monitor	1. Display: Color LCD, 19 inch or more 2. Sweep speed: 2 kinds or more, selectable 3. Waveform display items: ECG, Respiration wave, SpO2, IBP, CO2	Used to monitor the vital signs of critically-ill patients in ICU and CCU intensively and continuously.

2-2-3 Outline Design Drawings

The outline design drawings are as follows.

(1) Site plan

(2) 1st floor plan (Main building)

(3) 2nd floor plan (Main building)

(4) 3rd floor plan (Main building)

(5) Basement plan (Main building)

(6) East West elevation (Main building)

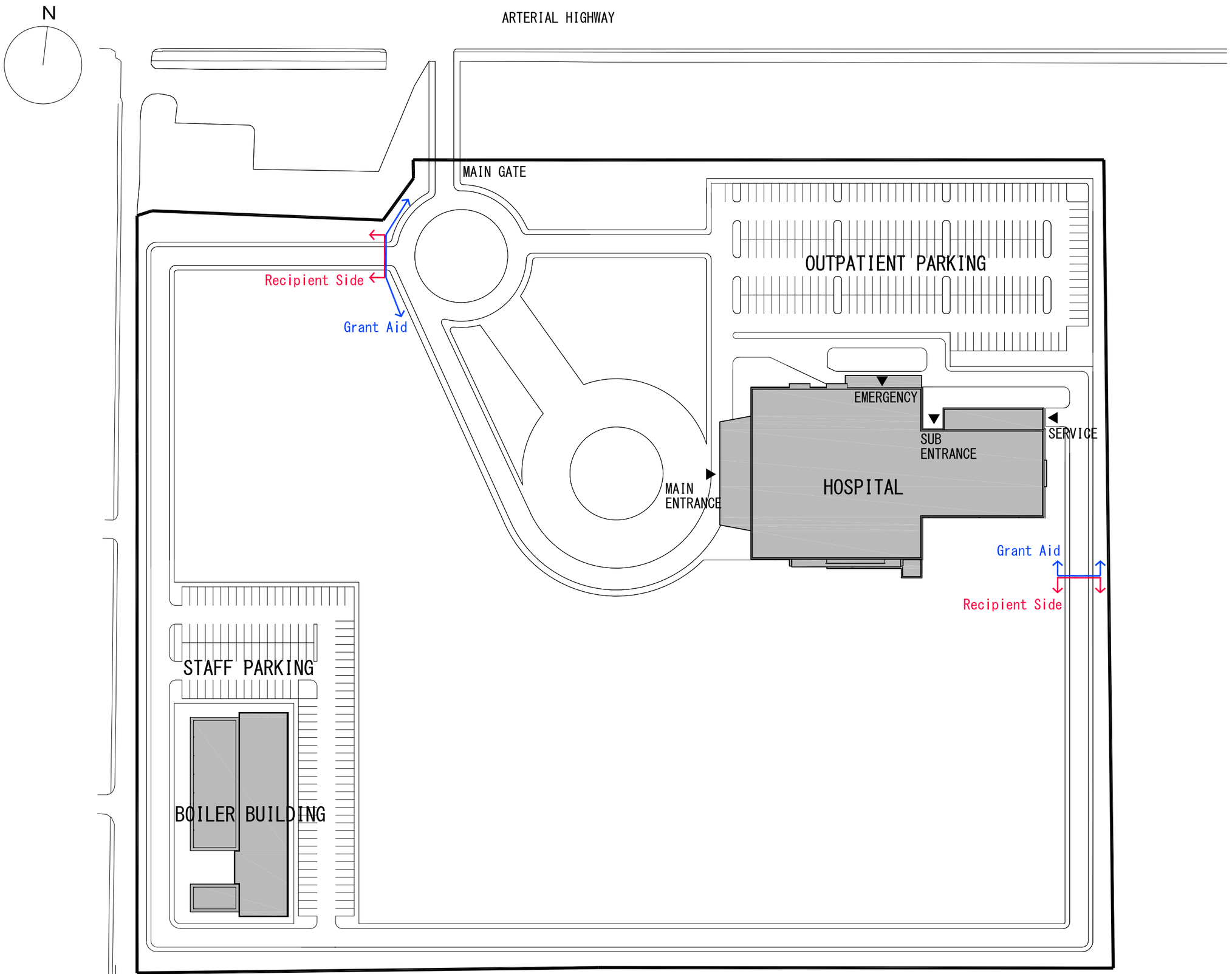
(7) South North elevation (Main building)

(8) Section (Main building)

(9) Plan (Boiler building)

(10) Elevation (Boiler building)

(11) Section (Boiler building)

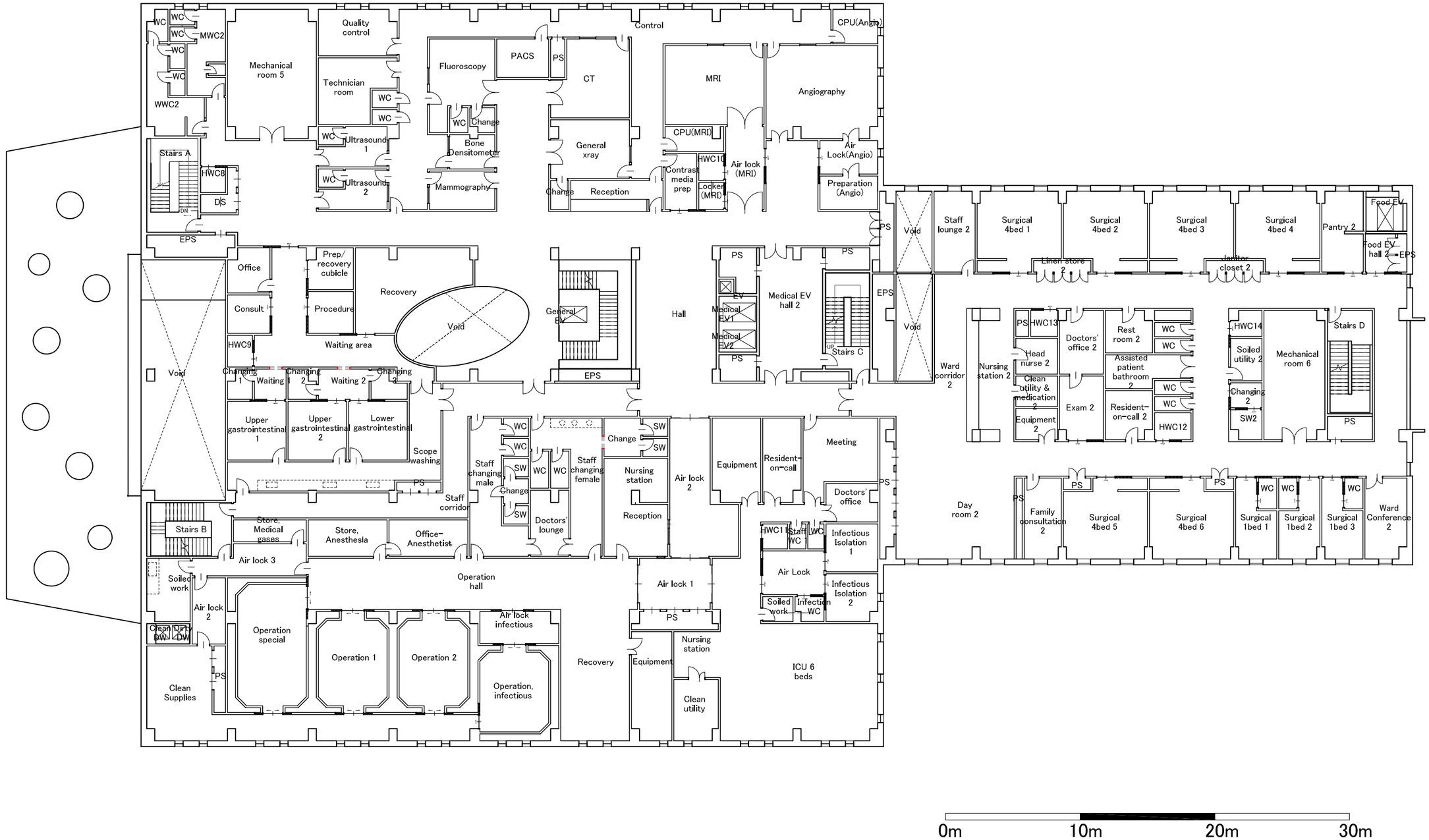


The Project for Construction of Mongolia-Japan Teaching Hospital

0m 10m 50m 100m SITE PLAN 1/1,200

The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

1st FLOOR PLAN 1/300

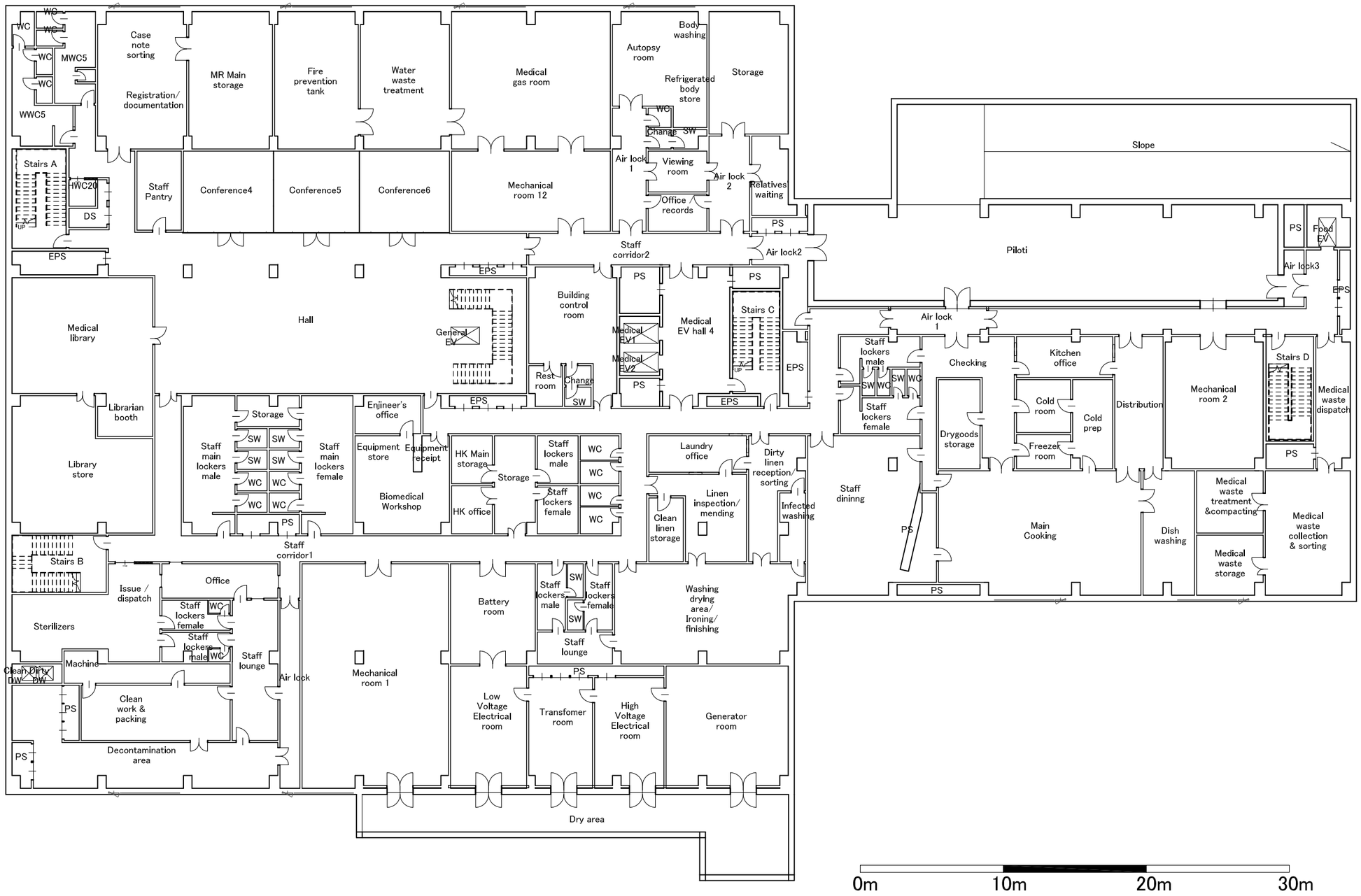


The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

2nd FLOOR PLAN 1/300

The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

3rd FLOOR PLAN 1/300

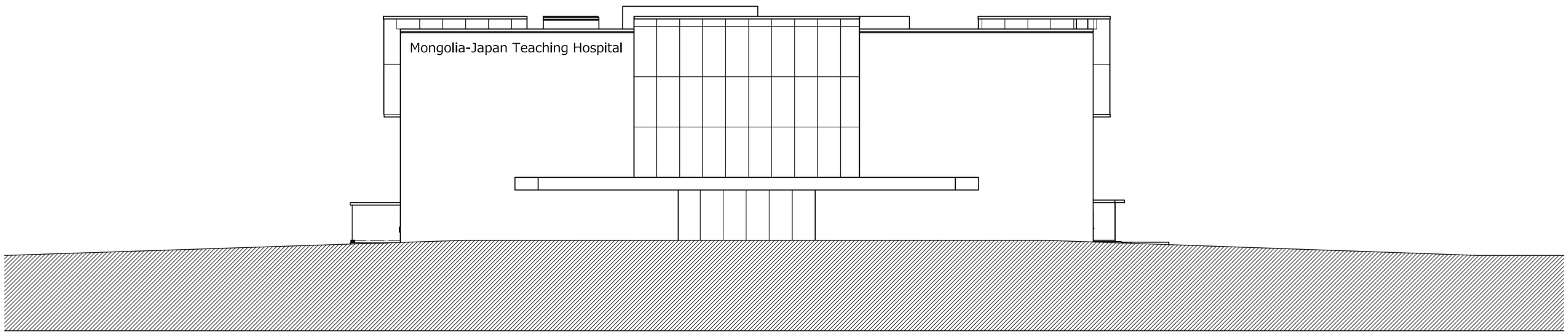


The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

BASEMENT FLOOR PLAN 1/300

EAST ELEVATION

0m 10m 20m 30m

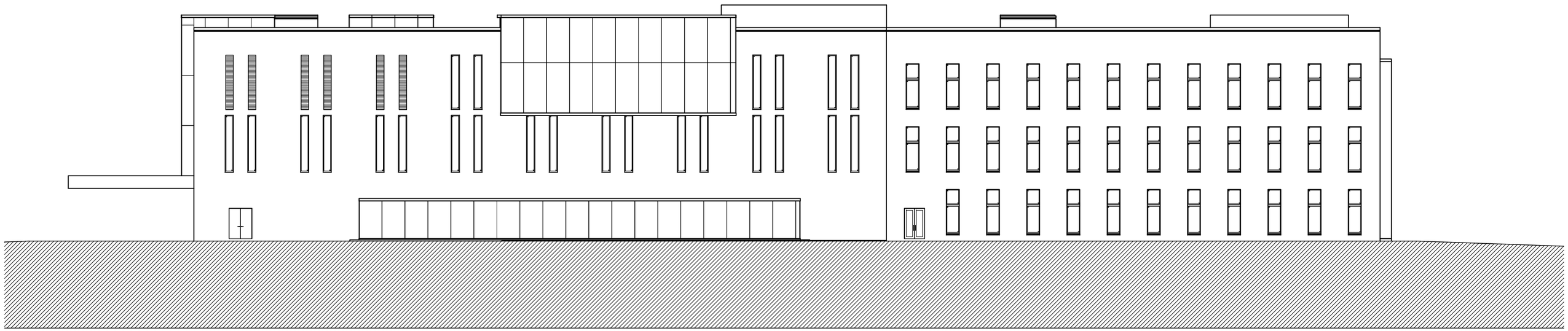


WEST ELEVATION

0m 10m 20m 30m

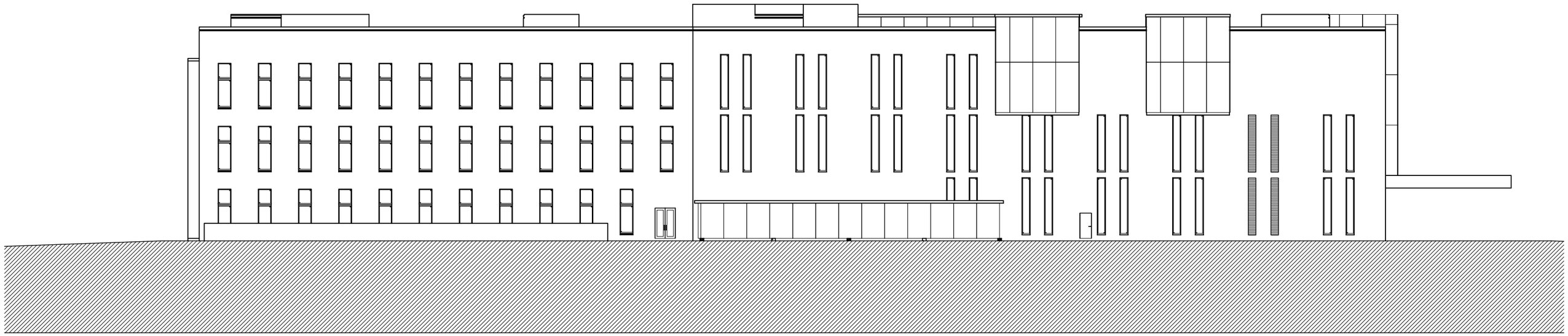
The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

EAST WEST ELEVATION 1/300



South Elevation

0m 10m 20m 30m

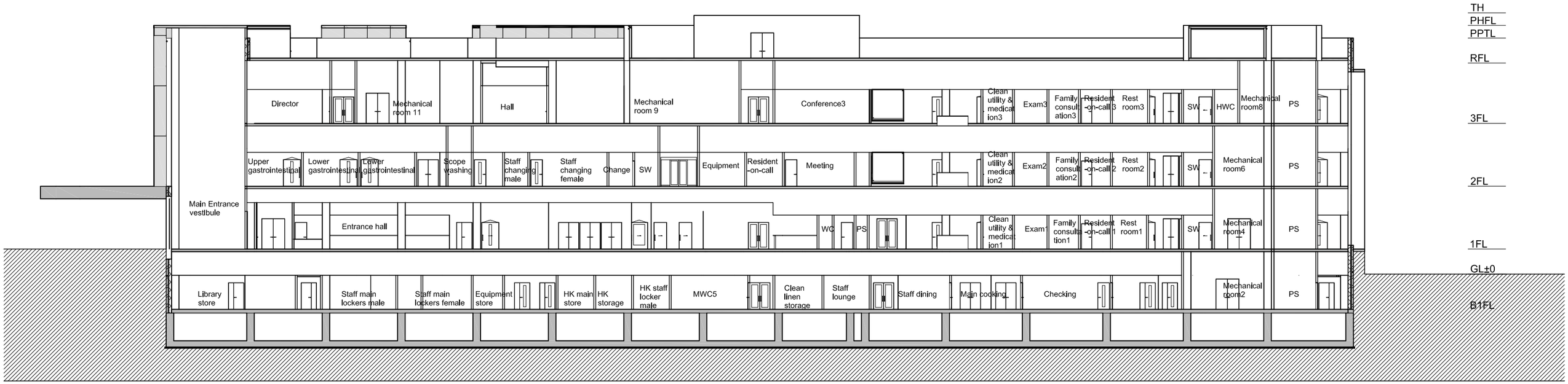


North Elevation

0m 10m 20m 30m

The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

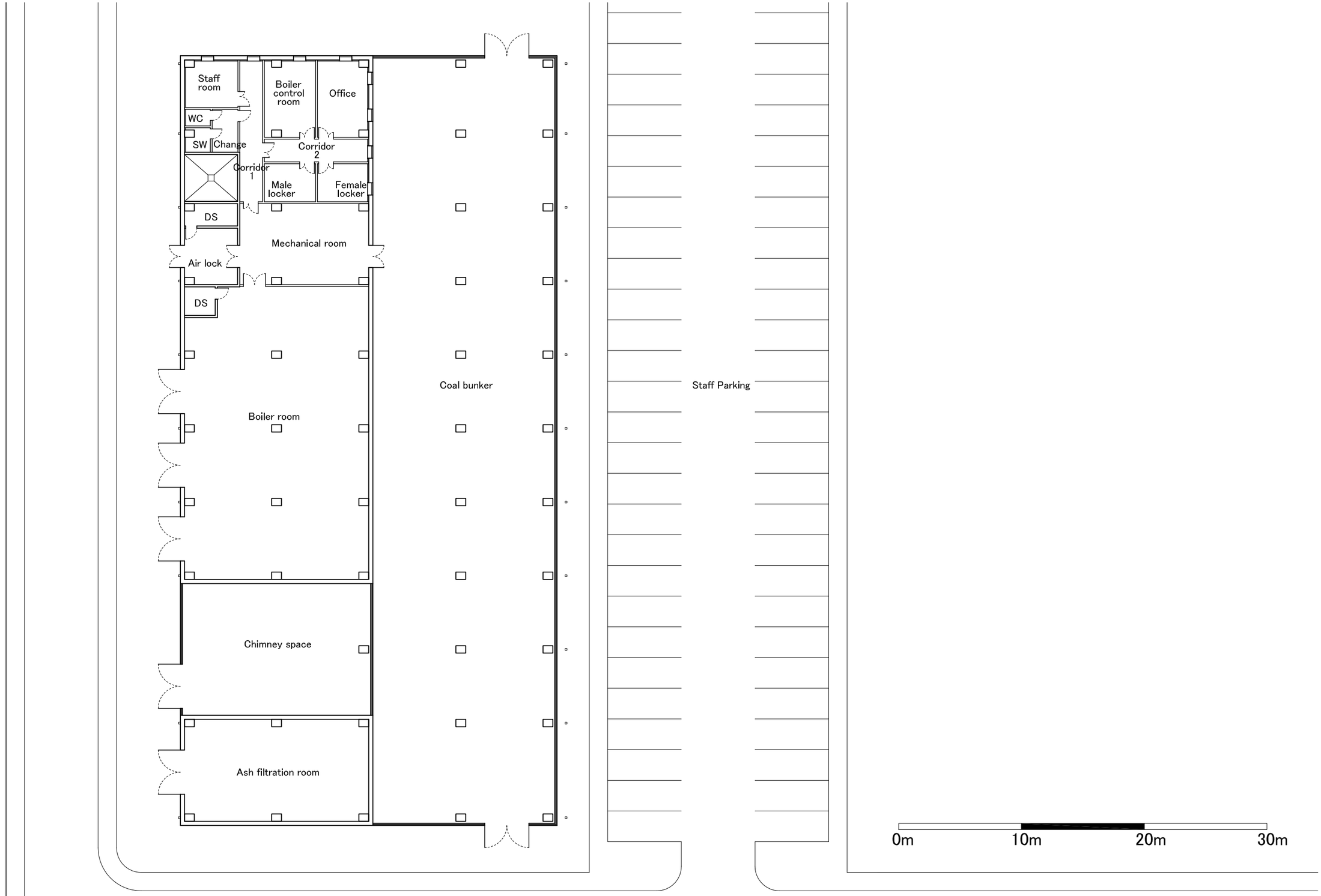
SOUTH NORTH ELEVATION 1/300



Section

The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

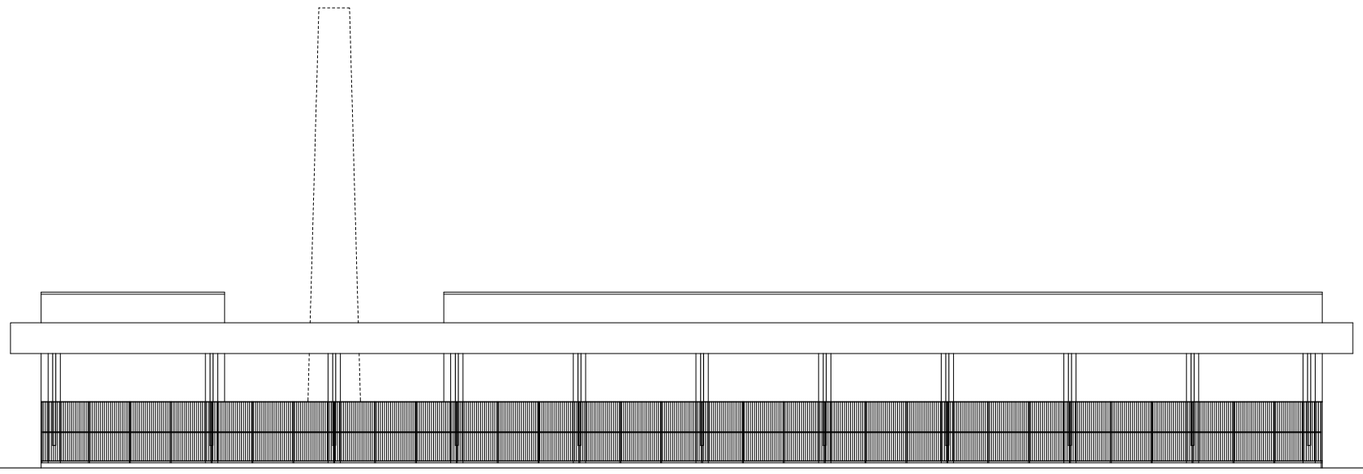
SECTION 1/300



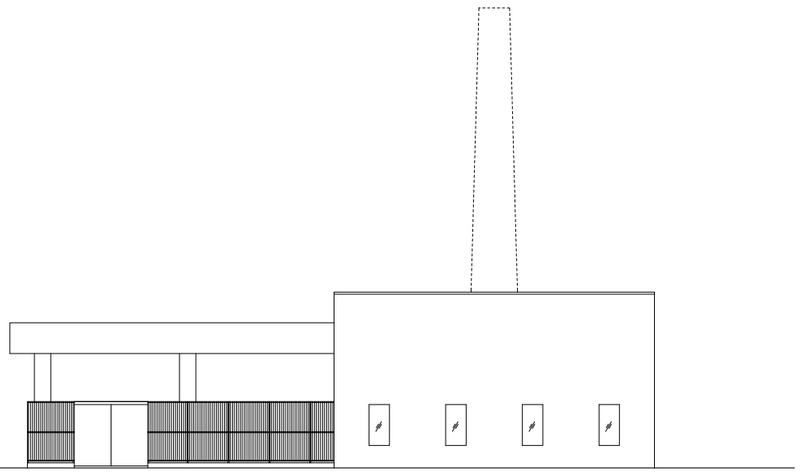
The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

Boiler Plant Plan 1/300

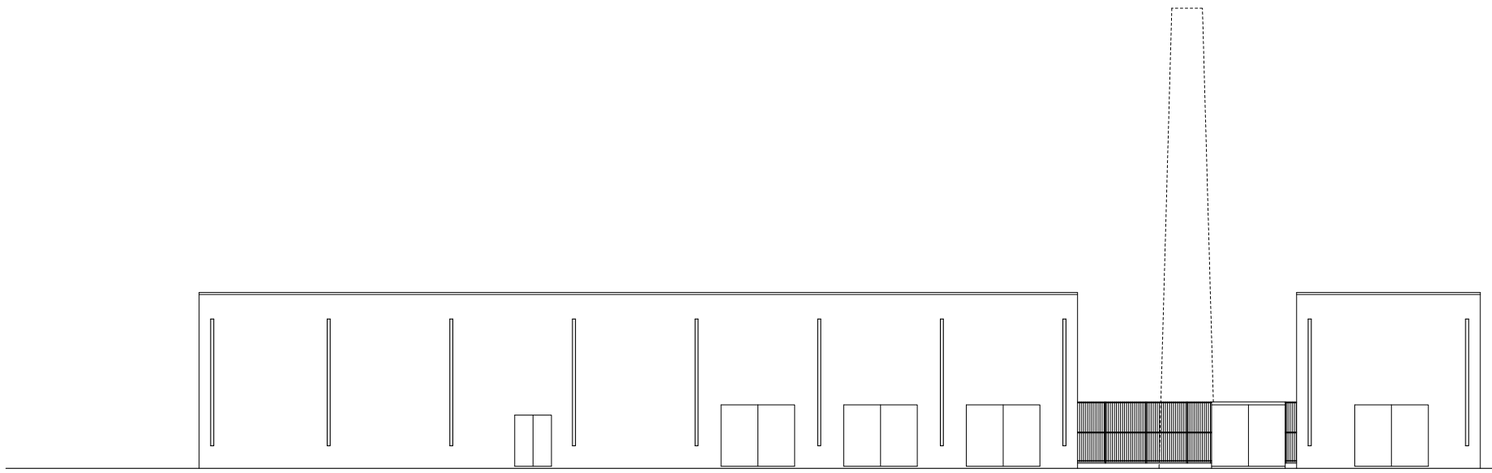
East Elevation



North Elevation



West Elevation

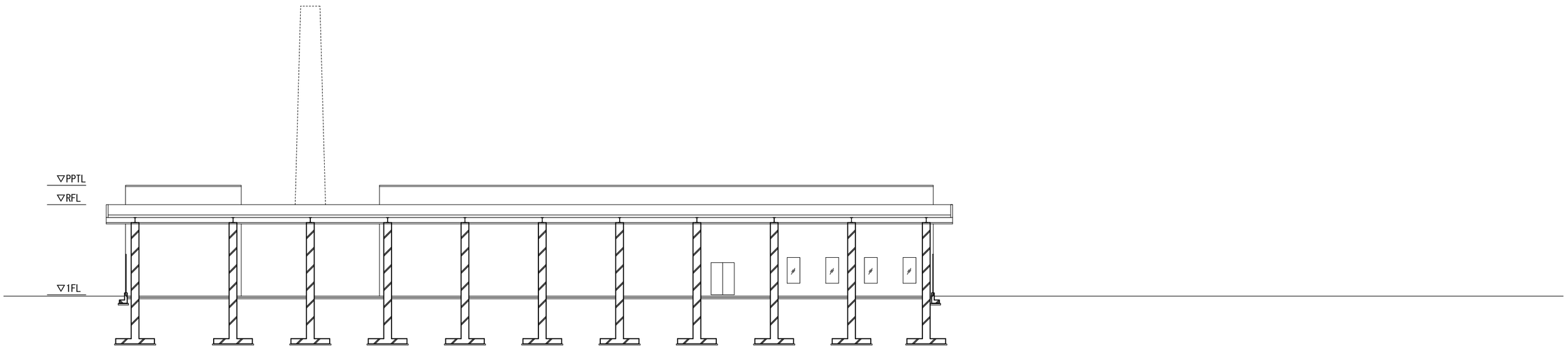


South Elevation

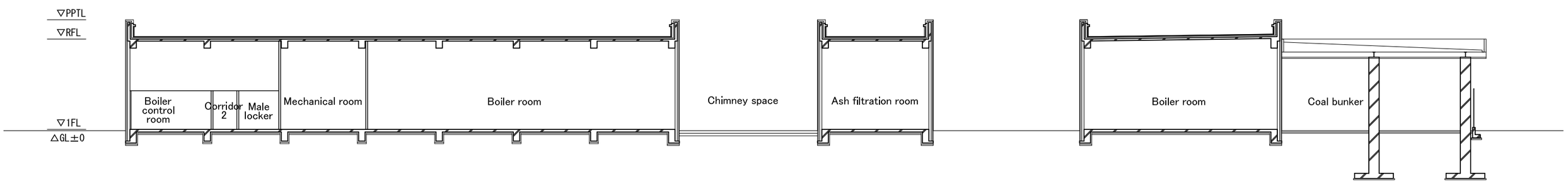
0m 10m 20m 30m

The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

Boiler Plant Elevation 1/300



Section 1



Section 2

Section 3

0m 10m 20m 30m

The Project for Construction of MONGOLIA-JAPAN TEACHING HOSPITAL

Boiler Plant Section 1/300

2-2-4 Construction Plan / Procurement Plan

2-2-4-1 Construction Policy / Procurement Policy

The Project will be implemented in accordance with the grant aid framework of Japan, with appropriate construction period, construction accuracy and quality assurance. Project implementation will be approved by the government of Japan, and an Exchange of Notes (E/N) and Grant Agreement (G/A) will be will be signed and agreed between both governments, after which implementation will commence. Following items are the basic items and special conditions of the Project.

(1) Project Implementation Responsibility of Mongolian side

The Ministry of Education and Science shall be the responsible agent of the Project, and will sign and agree the E/N & G/A, and all contract works during the implementation of the Project. The implementing agency will be the Mongolian National University of Medical Sciences, and will be responsible for the everyday works of the Project.

(2) Consultant

In order to facilitate smooth implementation of facility construction and equipment procurement under the Project, the Ministry of Education and Science shall contract a consultant from Japan for the design and supervision work of the Project. The Consultant will then conduct implementation design, construction supervision and equipment procurement management work related to the Project. The consultant will prepare the tender documents, and perform tender-related procedures for construction work on behalf of The Mongolian National University of Medical Sciences which is the main implementing agency. The consultant shall station a resident construction supervising architect (architectural engineer) during the construction period. This engineer shall supervise the construction including quality control and process management. The consultant will also supervise the procurement of equipment, including all processes from conducting equipment tender procedures to installation, test operation, operation instruction and delivery of equipment.

(3) Contractor

The Mongolian side shall select by public bidding system a contractor incorporated in Japan in accordance with the grant aid framework of Japan. The selected Japanese contractor will implement facility construction and procurement of materials and equipment for the Project. The construction period of the Project is estimated as 25.5 months after evaluating material procurement and construction environment in Mongolia. The contractor will be required to complete work within this construction period.

The contractor for facility construction must have similar experience, such as experience in Mongolia or in other cold regions, have adequate capabilities to ensure safety on the construction site, reliable construction capabilities and past performance, and appropriate ability for materials and equipment procurement.

The contractor for equipment procurement shall be required to study the Project construction site six months before the equipment is to be delivered in order to optimize the procurement schedule,

confirm the equipment delivery route, plan location for installation and electricity / water supply / discharge and other circumstances, and prepare and implement an equipment delivery / installation work time schedule. In addition, it is also important that the company provide logistic support based on cooperation with the manufacturer or agent so that spare parts and consumables can be supplied and technical assistance can be received for the main equipment on contract basis.

(4) Necessity to Dispatch Technical Personnel

Construction of the facility in this project consists of the procurement, transport and delivery of materials and equipment and the construction itself. A technical personnel who is independent from the contractor, will be dispatched from Japan for the supervision of the construction work.

It is estimated that the contractor shall deploy one construction work manager, two architectural engineers, one electrical engineer, one facility engineer and a person in charge of labor management. Technical interpreters, security guards, and others will be locally hired.

Furthermore, during construction works, Japanese experts (skilled craftsmen) shall be dispatched by the construction contractor, such as for the surgery panel work, electromagnetic shield work for the MRI room, radiation protection work and infectious waste disposal facility work for which special facilities and construction technology are required.

(5) Overall Organization for Project Implementation

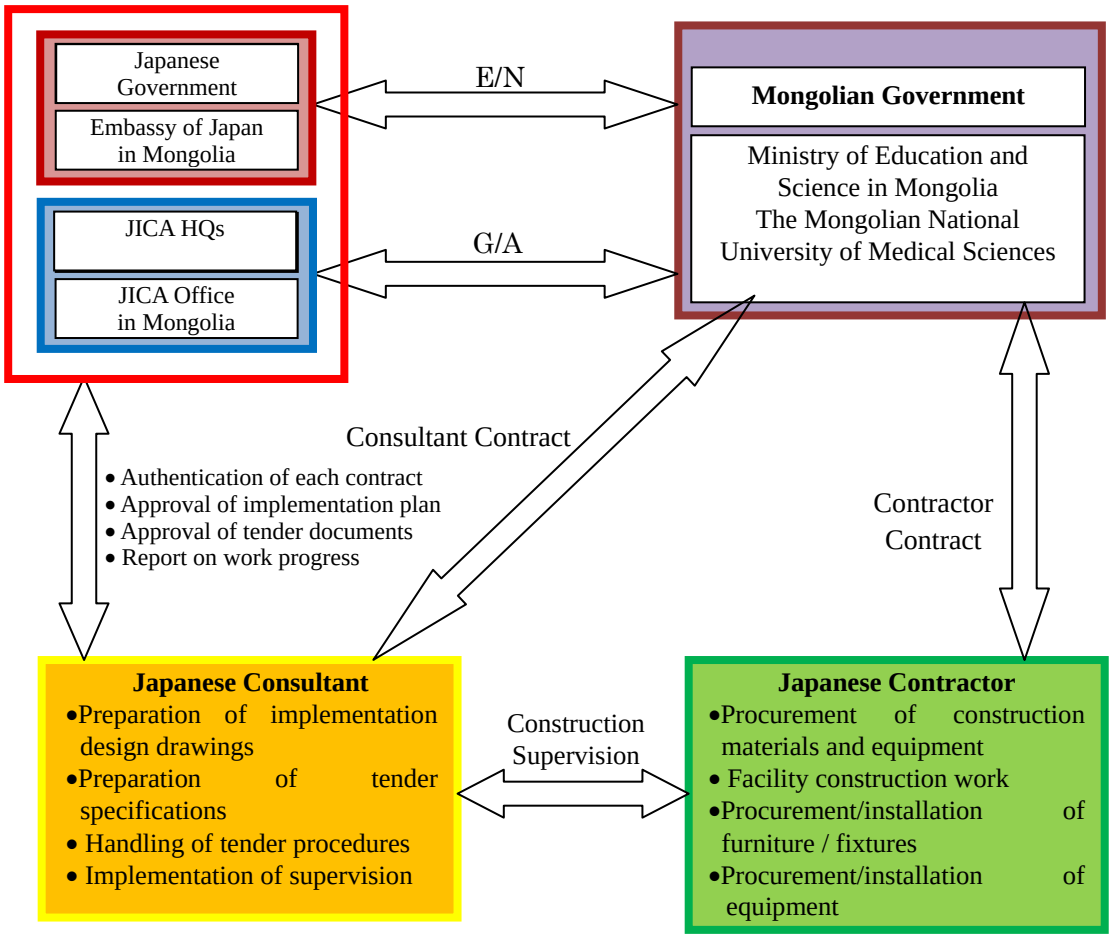


Fig. 2-13 Project Implementation Organization Diagram

The mutual relationship of the parties in charge of implementing this project is shown in Fig. 2-13, including construction supervision.

(6) Basic Policy for Construction

Safety management and process management shall be designated as priority policies, and quality control shall be certainly performed. In order to ensure that quality control / process management will be implemented, local contractors will be efficiently utilized that have extensive local construction experience, the capability to procure materials and equipment, as well as labor management capability. Attention will be paid to the amount of noise and vibration during construction, and measures will be taken to prevent personnel or construction materials from falling off when work is being performed at elevated locations.

(7) Procurement Policy

Fundamentally, construction materials that can be procured in the Mongolian market will be selected, but since materials and equipment procured in the local market are often imported items from a third country (China), a thorough procurement plan will be formulated in accordance with the construction plan, under which inventory levels will be checked and quality assurance will be provided. Furthermore, materials and equipment for which quality / function are important considerations for a hospital facility will be procured from Japan.

2-2-4-2 Construction / Procurement Related Considerations

(1) Construction

1) Construction Laws / Building Permit Procedures

Various standards have been established in Mongolia for facility planning and construction. After implementation design is completed, the implementing agency in Mongolia, The Mongolian National University of Medical Sciences, shall send planning notice to the office in charge of building permits before construction commencement. A document containing technical requirements will be issued after this notice. Construction materials, which comply with standards in Mongolia, will be adopted where fire prevention regulations apply.

2) Work Schedule Management

Mongolia has particularly harsh winters, construction work outside from October to March is expensive since the site needs to be covered and insulated. Therefore, construction work will be suspended in winter after commencement of works. In order to complete the facility on schedule, meetings will be periodically held between the Mongolian implementing agency, consultants and construction companies, and these restrictions of the site will be managed.

(2) Points to Note in Installing/Procuring the Equipment

1) Procurement Process

According to the procurement schedule of this Project, it will take nearly two years after the tender procedure before the installation of the equipment can begin because the construction work will be suspended for the harsh winter months, during which it is important for the consultant to continue supervision by keeping close contact with each equipment supplier to monitor the progress and coordinate the production, inspection, shipment, and other processes of the procurement work.

2) Installation Process

This project involves many large high-tech apparatuses, such as MRI, CT scanner, angiograph and other X-ray equipment, large/medium-sized autoclaves, and PACS (Picture Archiving and Communication System), which directly relates to building/facility construction. Therefore, it is important for the construction company, equipment suppliers (or manufacturers), and the consultant to have meetings to discuss and clarify the division of work, construction schedule, and other matters based on detailed installation drawings, etc.

2-2-4-3 Construction Division / Procurement and Installation Demarcation

The responsibilities for this project will be divided between the Japan side and Mongolian as shown in the table below. Furthermore, the cost of the main medical equipment will be covered by the Japan side, but the cost of general medical equipment, furniture, kitchen equipment, dishes, washing apparatus, office related equipment, furniture, linens, hospital operation IT system and other such equipment necessary for operation of the hospital are to be covered by Mongolia.

Table 2-39 Demarcation of responsibilities

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure a lot of land necessary for the implementation of the Project and to clear the site;		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the site		●
	3) a The patient parking lot	●	
	b. The staff parking lot		●
	4) The access road to the building within the site	●	
	5) The road outside the consruction site		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the sites		
	1) Electricity		
	a. The distributing power line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General medical equipment,		●
	Kitchen equipment, Washing equipment, Waste management equipment		●
	Administration equipment, Furniture, Laboratory glassware,		●
	Audio Visual equipment, IT system for hospital management and operation		●
	Linen/uniforms, Ambulances and other vehicles		●
	b. Major medical equipment	●	
	PACS	●	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Internal transportation from the port of disembarkation to the project site Issue of necessary documents for custom clearances, etc Internal transportation cost	 ●	●
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be borne by the Authority without using the Grant		●
6	To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●

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

● Indicates responsible for that item

2-2-4-4 Construction Supervision Plan / Procurement Supervision Plan

The consultant shall take into consideration the general meaning of the basic plan in accordance with the grant aid scheme of Japan, and create a consistent project team for implementation design work / construction supervision work and strive to facilitate smooth implementation of work. The consultant must make efforts to achieve an adequate recognition of the various circumstances at the planned target site and in Mongolia when performing construction supervision and equipment procurement supervision, and must maintain the consistency of work schedule management, quality control, performance control and safety management.

(1) Basic Policy for Construction Supervision / Procurement Supervision

The consultant shall supervise the progress of construction and material/equipment procurement work so that construction is completed within the designated schedule, and shall implement a basic policy of supervising / instructing the contractors to ensure the quality and working form and material/equipment delivery timing are as indicated in the contract, and work is safely performed at the site.

The main considerations for construction supervision / procurement supervision for this project are outlined below.

1) Work Schedule Management

In order to ensure work is completed within the schedule specified in the contract, the consultant shall compare the actual status of progress each week and each month with the planned implementation schedule specified when the contract was concluded with the contractor. In the event of a predicted delay in the schedule, the consultant shall notify the contractor, request the contractor to submit proposals to address the problem, and provide instruction to facilitate completion of construction and material/equipment delivery within the schedule specified in the contract.

The main items for which the planned schedule is to be compared with actual progress are outlined below.

1. Confirmation of work completed (material/equipment procurement status and work progress status)
2. Confirmation of material/equipment delivery (construction material/equipment/fixtures)
3. Confirmation of temporary work and construction machine preparation status
4. Confirmation of unit price and actual number of engineers, skilled craftsmen and workers

2) Safety Management

The consultant shall discuss / cooperate with the safety manager of the contractor and manage work in a manner to prevent accidents at the site during construction, as well as to prevent injuries or accidents involving third parties (neighborhood residents, etc.).

Considerations for safety management at the site are outlined below.

1. Establishment of safety management code and selection of supervisor
2. Prevent accidents by implementing periodic inspection of construction machines
3. Establishment of driving routes for work vehicles and transport machines, etc., and thorough implementation of driving safety rules
4. Installation and periodic inspection of safety equipment
5. Welfare measures for workers and supervision to encourage workers take designated days off

(2) Construction Supervision / Procurement Supervision System

Due to the fact that the work items to be performed under this project are diverse, one resident supervisor (in charge of construction) and one resident supervisor (in charge of facilities) shall be deployed, and the following technical experts shall be dispatched when appropriate.

- Work Manager : Overall supervision, process/quality control supervision
- Building Designer: Checking of general / work drawings, material specifications., explanation to client
- Facility Designer : Checking of general / work drawings, material specifications., explanation to client
- Structure Supervisor: Supervision of foundation work, seismic isolation device installation, etc.
- Facility Supervisor 1 (Machinery): Supervision of water supply/discharge sanitary facilities, air conditioning/ventilation facilities, intermediate/completion inspection
- Facility Supervisor 2 (Electrical): Supervision of conduit/wiring facilities, incoming power/transformer facilities, intermediate/completion inspection
- Equipment Planner 1: Preparation of tender documents describing tender requirements, promotion of work implementation
- Equipment Planner 2: Checking of machine specifications, connection between facilities, management of instruction manuals, etc.

2-2-4-5 Quality Control Plan

Construction supervision shall be implemented as a general rule as described in the table in accordance with codes and standards in Mongolia or Japan in order to secure the prescribed level of quality for construction work when construction work is supervised during this project.

Table 2-40 Quality Control Standards

Work Type	Supervised Item	Control Value	Inspection Method	Remarks
Earthwork	Slope angle	Within planned value	Gauge, visual	Consultant shall have contractor prepare construction manual in advance describing inspected items, target values, inspection content, test methods, curing method, construction methods etc., and shall check it.
	Bedding accuracy	Within +0 – -5 cm	Level, visual	
	Foundation height	Within +0～-3 cm	Same as above	
	Leveling concrete height	±1 cm	Same as above	
Reinforcing Bar	Rebar overlap	On ground: 30 mm Foundation connection: 60 mm Other: 40 mm	Visual, measured Same as above Same as above	Same as above
	Processing accuracy	Stirrup/hoops: ±5 mm Other: ±10 mm	Same as above Same as above	
	Tension test	Test of 2 test pieces for every 20 to of each rebar size (random check at site)	Witness inspection at work site	
Ready-mixed Concrete	Compressive strength	Design strength: 21 N/mm^2 or more	3 test pieces x 3 types each time concrete is poured and for every 150 m^3 (test witnessed)	Same as above
	Slump test value	15 cm ± 2.5 cm	Conducted each time concrete is poured and for every 150m^3 (test witnessed)	
	Chloride volume	0.3kg/m^3 or less	Same as above	
Masonry	Compressive strength	40 – 70 kg/cm^2	Witness inspection after manufacturer determined	Same as above
Plastering	Material/storage/ work/blending/ applied thickness /curing/work accuracy	In accordance with special specifications	Same as to the left	Same as above
Painting				
Roof Waterproofing		In accordance with special specifications	Same as to the left	Same as above
Fittings				
Water Supply / Discharge	Water supply piping	Leakage	1.75Mpa water pressure test for 60 min	Same as above, For each line when piping completed
	Discharge piping	Same as above	Full capacity test	
Electrical work	Wiring	Within specified value	Insulation test Burn-in test	Same as above, For each line when piping completed

The built facilities and manufactured/delivered equipment will be checked against the contract drawings to verify whether or not the items comply with the quality / working form requested. In the event the consultant makes the judgment as a result of the check process that there is the risk the quality or working form cannot be ensured, the consultant shall promptly request the contractor to revise, change or correct the item.

1) Checking of Construction Work Drawings and Specifications for Materials Used

Contractors shall be required to submit work drawings for the respective job before construction work is performed, and the content shall be checked. In addition, suppliers shall be requested to submit specifications and proof of purchase for materials that are delivered in order to implement quality assurance.

2) Checking of Drawings and Specifications for Fittings / Furniture / Fixtures

Suppliers shall be required to submit production drawings for fittings, furniture, fixtures and other items before these items are installed, and the content shall be checked. In addition, fittings, furniture, fixtures and other items will be checked against the specifications and production drawings when they are delivered.

3) Witnessing of Material Equipment Production/Production Site or Checking of Test Results

A witness inspection of the production facility / manufacturing and assembly facility shall be conducted as necessary for construction materials to be purchased, and quality verification documents / inspection certifications will be checked for building materials and raw materials.

4) Supervision / Confirmation of Working Form Quality and Finish Status

Technical instruction and witness inspections shall be performed at the construction site during each type and stage of construction, corrections shall be thoroughly implemented for any problems, and other corrective actions shall be implemented. In addition, items will be checked against the work drawings in the working form inspections.

2-2-4-6 Material/Equipment Procurement Plan

(1) Construction Work

1) Material/Equipment Procurement

Construction materials that are produced in Mongolia on a stable basis are limited to cement, concrete aggregate, rebar, and some other materials used to build structures. The predominant portion of other finishing materials, equipment and other construction materials are imported from Russia, China, Eastern Europe and other locations. In addition, furniture, thermal insulated sliding window frames, and some other materials are produced in Mongolia using imported machine tools. The construction materials and equipment that are generally used locally are rarely in stock at local agents, with customs clearance performed for each project for many items. Therefore, the ease of obtaining consumables for lighting fixtures and maintenance parts needs to be taken into consideration when selecting items to be procured. The sources from which the required construction materials, electrical items, sanitary items and air conditioning equipment are to be procured are shown in the table below.

Table 2-41 Procurement Plan for Main Construction Materials

	Source			Remarks
	Mongolia	Japan	3rd Country	
[Temporary Work]				
Scaffolding	○			Owned by medium or larger construction companies.
Temporary Fences	○			Molded steel plate generally used
Temporary Office/Warehouse/Shed	○			Prefabricated type also used
[Materials]				
Ordinary Portland Cement	○			Local products can be procured
Aggregate	○			Local products can be procured
Deformed Bar	○			Local products can be procured
Formwork Plywood	○			Local products can be procured
ALC Block			○	Imported items generally used
Waterproofing Material			○	Imported items generally used
Light-Gauge Steel			○	Imported items generally used
Colored/Bent Sheet Metal			○	Imported items generally used
Aluminum Fittings		○	○	Imported items generally used. Fittings that require special standard for air tightness, insulation, etc., shall be brought from Japan.
Wood Fittings			○	Imported items generally used, but items can be locally procured depending on quantity
Glass			○	Imported items generally used
Tile			○	Imported items generally used
Acoustic Board			○	Imported items generally used
Plaster board			○	Imported items generally used
Paint			○	Imported items generally used, but items can be locally procured
[Equipment / Electrical Items]				
High-Level Tanks			○	Imported items generally used
Pumps			○	Imported items generally used
Piping Materials/Metal Fittings			○	Imported items generally used
Sanitary Ware			○	Imported items generally used
Distribution Panels			○	Imported items generally used
Wiring/Piping	○		○	Imported items generally used, but items can be locally procured
Lighting Fixtures			○	Imported items generally used

2) Means of Transportation

Since Mongolia is a landlocked country, overland transport consists of the main means of transportation. Items from China are procured in Beijing or Shanghai and transported by railway to Ulan Bator. Items procured from other countries are transported by ship to Tianjin, from where they are transported by railway to Ulan Bator. Since the materials/equipment described in Table 2-41 can be currently procured in China, it is expected that the third country procurement source will be China.

(2) Procurement of Equipment

Since medical equipment is not manufactured in Mongolia, all medical equipment used in Mongolia is imported from foreign countries. Therefore, medical equipment required in this project shall be procured from Japan, in principle. Japanese, European and American manufacturers has local agents in Mongolia for medical equipment requiring maintenance services. Therefore for these medical equipment, third countries shall be included in the consideration. If the number of Japanese manufacturers of a certain type of equipment required in this project is limited, procurement of the equipment concerned from a third country shall be considered in order to ensure competitiveness of the tender.

This project is diplomatically important for Japan and Mongolia. Implementation of this project is expected to upgrade the quality by using Japanese technologies and products. Since procurement of equipment manufactured in either the recipient country or Japan is the principle of the Grant Aid Cooperation of the government of Japan, the country of origin of the major equipment to be procured in this project, *i.e.* MRI, CT and angiograph, shall be Japan.

On the other hand, maintenance service provided by local agents of the manufacturers will be indispensable for the operation of the advanced medical equipment, such as X-ray apparatus, ultrasound system, biochemical analyzers and automated blood cell analyzer. Therefore, if none of the Japanese manufacturer of the equipment concerned has a local agent in Mongolia, the procurement from a third country in Europe, North America or elsewhere shall be approved.

Table 2-42 Procurement Plan for Major Medical equipment

Number	equipment	procurment	manufacturer
15	ENT treatment cabinet	Japan	Japan
16	Otolaryngology chair	Japan	Japan
38	Tympanometry	Japan	Japan
39	Flexible nasopharyngoscopes	Germany	Germany
40	Coagulation apparatus (for ENT)	Japan	Japan
43	Refract meter	Japan	Japan
48	Fully completed green light laser apparatus	Japan	Japan
50	Gastro surgical instrument set	Japan	Japan
51	Gall bladder and liver surgical instrument set	Japan	Japan
52	Abdominal surgery instrument set	Japan	Japan
55	Operation light、ceiling and mobile	Japan	Japan
56	Ultrasound apparatus 3/4D	Japan	Japan
58	Ventilator	Japan	Japan
59	Defibrillator	Japan	Japan
60	Patient monitor	Japan	Japan
85	ECG (for stress test)	Mongolia	USA
86	Holter ECG	Switzerland	Switzerland
90	Ultrasound apparatus 3/4D	Japan	Japan
91	Ultrasound apparatus, doppler	Japan	Japan
96	EMG	Japan	Japan
101	EEG	Germany	Germany
111	MRI	Japan	Japan
112	CT scanner	Mongolia	Japan

Number	equipment	procurment	manufacturer
113	Fluoroscopy X-ray apparatus	Mongolia	USA
114	Conventional X-ray apparatus	Mongolia	USA
115	Mobile X-ray apparatus	Mongolia	USA
116	Mammography	Japan	Japan
117	Film developer	Japan	Japan
123	PACS	Japan	Japan
126	Angiography	Japan	Japan
129	Gastroscopy (flexible type), adult and child	Germany	Germany
130	Colonoscopy (flexible type)	Germany	Germany
132	Auto endoscope reprocessor	Singapore	Holland
143	Binocular microscope, group teaching system	Japan	Japan
144	Safety cabinet	Japan	Japan
145	Clean bench	Japan	Japan
162	Biochemical analyzer (automated)	Mongolia	Germany
163	Blood gases analyzer	Japan	USA
164	Electrolyte analyzer	Japan	England
165	Immunology analyzer	Mongolia	Germany
168	Blood cell counter	Japan	Japan
169	Coagulation measuring system	Japan	Japan
171	Staining apparatus	Japan	USA
174	Urine test strips analyzer	Japan	Germany
175	Urine sediment analyzer	Japan	Japan
176	Blood culture apparatus	Belgium	Belgium
183	Cryostat	Japan	USA
184	Automatic tissue processer	Japan	USA
185	Embedding center	Japan	Japan
189	Fluorescence microscope	Japan	Japan
199	Morgue refrigerator with 2 place	Japan	Japan
200	Morgue table	Japan	Japan
201	Large autoclave	Japan	Japan
202	Medıum autoclave	Japan	Japan
230	Operation ceiling lamp	Finland	Finland
231	Universal operation table	Japan	Japan
232	Operation table	Japan	Japan
234	C-arm X-ray apparatus	Japan	Japan
235	Anesthesia machine	Japan	Japan
236	Laparoscope set	Germany	Germany
237	Microsurgery scope	Germany	Germany
238	Patient monitor	Japan	Japan
240	Coagulation apparatus	Japan	Japan
241	Defibrillator	Japan	Japan
242	Incubator	Japan	Japan
243	Infant warmer	Japan	Japan
254	Ventilator	Japan	Japan
255	Ventilator, CPAP	Japan	Germany
256	Patient monitor	Japan	Japan
257	Central Monitor	Japan	Japan
259	Defibrillator	Japan	Japan

(3) Transport Plan (scopes, routes, modalities, etc.)

1) Equipment to be Procured from Japan

Equipment shall be delivered to a designated warehouse at Yokohama Port (at the expense of the manufacturers up to the warehouse), where the cargo will be loaded on board a container ship and transported to Tianjin Port, China, where the container will be transshipped to a freight train and carried to a container yard in Ulan Bator, from where the container will be delivered to the project site by truck.

2) Equipment to be Procured from Third Countries

If third-country equipment is to be procured, such products shall be first delivered to Ulaanbaatar by air or by train, and then delivered to the project site by trucks after custom clearance.

(4) Installation Work Plan

Medical equipment items to be procured under this project will accompany installation work. General equipment (relatively simple equipment that can be handled by ordinary technicians) shall be installed by technicians dispatched from installation service providers. As for MRI, CT scanner and other X-ray apparatuses, ultrasound equipment, large/medium-sized autoclaves, and video endoscopic systems, as well as biochemical analyzer, blood counter, and other laboratory equipment, and PACS, which integrates the diagnostic imaging apparatuses, will be installed by the engineers of their respective manufacturers or their local agents.

2-2-4-7 Startup Training / Operational Guidance

(1) Startup Training

Many of the equipment items to be procured under this project require guidance on operation and maintenance. For such items, the engineers of their respective manufacturers will provide on-site initial training for the hospital/medical staff. The consultant will supervise the initial training and provide advice and support as necessary.

(2) Operational Guidance

There is no plan for additional operational guidance.

2-2-4-8 Soft Component

Soft Component shall not be implemented in this Project.

2-2-4-9 Equipment Maintenance Plan

The one-year warranty period of the equipment will begin at its handover. The seasonal change in climate is large in Mongolia with the temperature falling below -30ºC in the long and severe winter and rising above 30ºC in the summer. There are also large seasonal changes in the number of patients and types of diseases. Therefore, it is desirable for the hospital to have warranties on the major pieces of the equipment for more than one year after it starts receiving patients.

The initial operating cost of the hospital will be high. Therefore, it will be very difficult for the hospital to pay for replacement parts if major equipment has broken down. Breakdown and malfunction of major equipment will also compromise the trust of the people in the hospital significantly.

Therefore, maintenance contracts for a two-year period, which is the maximum period possible within the E/N period of the Grant Aid system, consisting of the ordinary one-year warranty period after the handover and an additional one-year maintenance period, shall be concluded for the MRI, CT scanner and angiograph with their suppliers. The maintenance contracts shall be comprehensive maintenance/inspection contracts (full maintenance contracts), including the following as the major contents.

1) Quarterly inspections
2) On-call service provided by a local agent
3) Remote monitoring service
4) Provision of replacement parts for the maintenance free of charge at the above-mentioned inspections
5) Repair and adjustment of the equipment, including replacement of consumables, free of charge for the malfunction and breakdown during the ordinary use within the limit of the pre-determined number of inspections

2-2-4-10 Implementation Schedule

In the event this project is implemented with grant aid from the government of Japan, the procedure for the implementation schedule until groundbreaking for this project is outlined below.

(1) Exchange of Notes by both governments (E/N), conclusion of Grant Agreement (G/A).

(2) Japanese consultants will be recommended by Japan International Cooperation Agency (JICA).

(3) Implementation Design/Supervision Contract will be concluded with the recommended consultant and the Mongolian National University of Medical Sciences.

(4) Preparation of implementation design document, tender procedure in Japan, conclusion of contract with contractor will be implemented. The construction works shall commence after the verification of the contract.

After the construction contract is signed, the Japanese government will verify the contract. Then the construction contractor, equipment suppliers and installation contractor will start facility construction and equipment work. It is estimated from the scale of the planned facility and local construction labor circumstances that construction work, equipment and installation will take about 27.5 months. Smooth procurement of materials and equipment, prompt handling and review of the various procedures in Mongolia by the related agencies, and smooth implementation of work to be performed by the Mongolia side are prerequisites for this schedule. The project implementation schedule based on this is shown in Fig. 2-14.

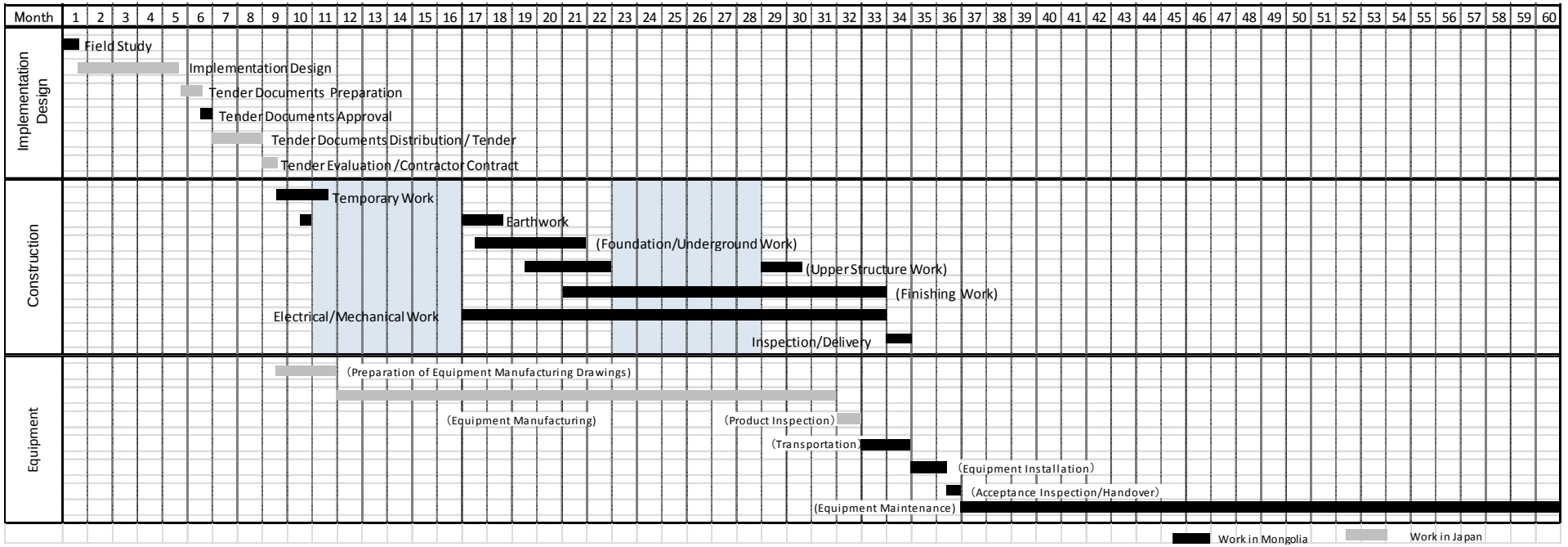


Fig. 2-14 project Work Implementation Schedule (Proposed)

2-3 Obligations of the Recipient Country

In implementing this project, the project components described in this section must be completed within the prescribed deadline by the planning and implementing agencies in Mongolia.

(1) Obtaining building permits for the facilities before construction is started

The implementing agency needs to make an application with the government agency in charge of facility construction and obtain building permits. The counterpart in Mongolia is responsible for payment to local architects for application as well as payment of any application or other such charges.

(2) Complete removal of any structures, waste and trees, filling in of holes, elimination of any other items on planned facility construction site which may interfere with construction

(3) Construction of site boundary wall, gate, staff parking lot, peripheral road as well as site landscaping work and other required work that matches facility plan.

(4) Implementation of extension work to site boundary for electrical, hot water, water supply, sewage, gas, telephone and other infrastructure trunk lines

(5) Provision of sites for temporary office, workshop, material yard etc. during construction, connection of temporary power, water and telephone lines for planned construction site during construction

(6) Operation and Maintenance of Constructed Facilities / Procured Equipment in Appropriate Manner

The facilities and equipment procured under this project shall be used in an appropriate and effective manner, and the required budget and personnel for maintenance shall be secured. In addition, the medical devices (other than those provided by the government of Japan), furniture, fixtures and other items required to operate the facility shall be provided with funding by the government of Mongolia, and the facility shall be operated in an appropriate manner. Following is list of major item.

a. General medical equipment
b. Kitchen equipment, pots and pans, plates and utensils, trolleys for food distribution
c. Washing machines including dryers and ironing
d. Waste management equipment (trolleys, carts, etc)
e. Administration equipment such as computers, copy machines, etc.
f. Furniture
g. Laboratory glassware
h. Audio visual equipment for lecture halls
i. IT system for hospital operation and management
j. Linen, uniform clothes etc.
k. Ambulances and other vehicles
l. Others

(7) Payment of A/P related interbank service charges and commissions in accordance with B/A.

(8) Ensuring prompt unloading at port, customs clearance and payment of these and other such

expenses for products procured by means of grant aid

(9) Exemption from payment of any customs duties, VAT, and any other financial surcharges by Japanese citizens for products and services procured based on the authenticated agreement

(10) Facilitation of permission required for dispatched Japanese citizens and third country citizens to enter and stay in Mongolia in order to perform services based on authenticated agreement

(11) Acquisition of required permits, licenses and other required actions for implementation of the project

(12) Covering of all expenses that cannot be covered with grant aid from Japan that are required for this project.

2-4 Project Operation and Maintenance Plan

2-4-1 Operation and Maintenance Arrangements

(1) Operation System

The Mongolian National University of Medical Sciences has reviewed the organization of the Mongolian and Japanese University Teaching Hospital, and plans to establish the organization outlined below. The organization chart shown in Fig. 2-15 was prepared in accordance with regulations of the Ministry of Health concerning the establishment of hospitals.

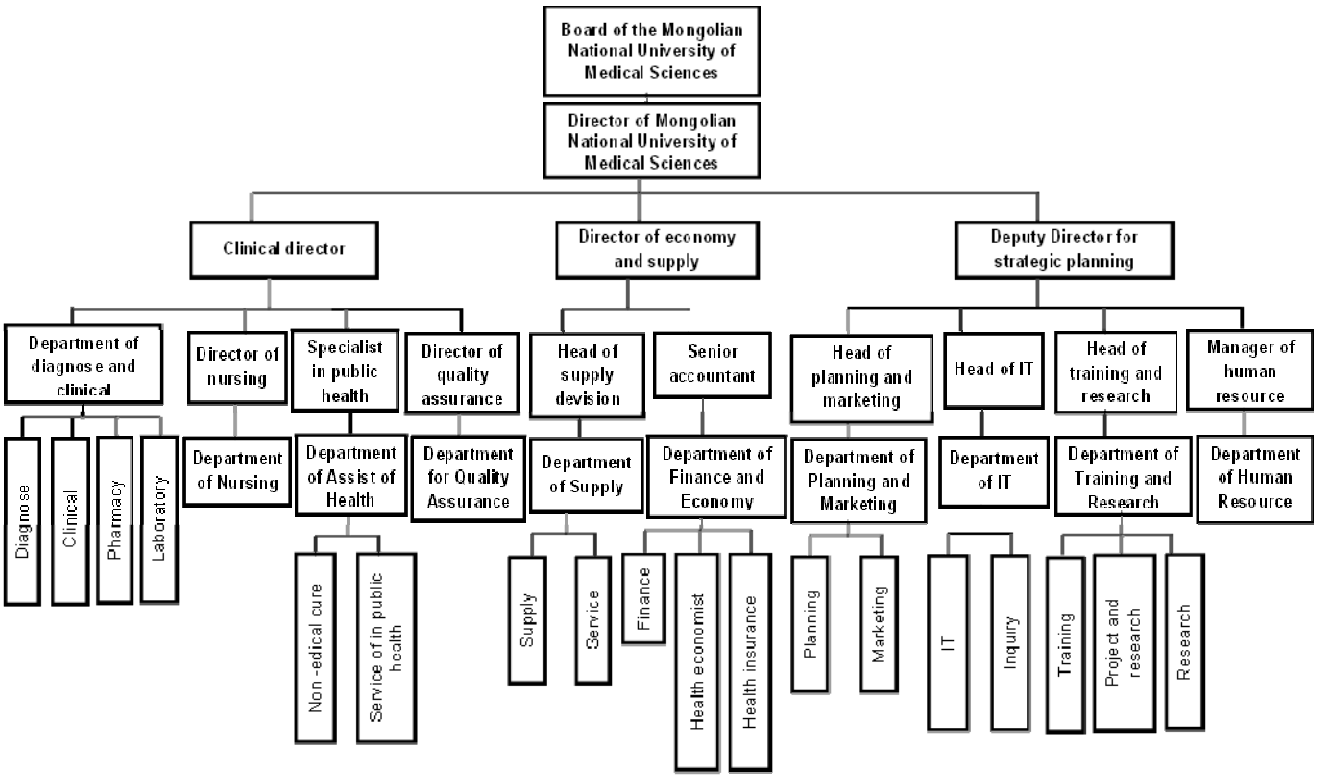


Fig. 2-15 Mongolia- Japan Teaching Hospital Organization Chart

According to this organization, the Hospital will be operated by three separate divisions under the Hospital Director: Clinical Division, Economy and Supply Division and Strategic Planning Division. The number of personnel required by the Ministry of Health regulations will be secured, with plans calling for hiring of 67 doctors, 62 nurses, 10 radiologists / lab technicians, 34 service staff, 26 managers / office staff and 3 medical consultants, for a total of 202 staff.

According to hospital statistics (2012) from the Ministry of Health, Labour and Welfare in Japan, the average number of total staff per 100 beds at a regular hospital is 151.8 persons. Therefore, the total number of staff is considered to be adequate. This project is developing a teaching hospital, and there are more doctors than at a regular hospital since specialized doctors are required to perform teaching.

(2) Maintenance System

Maintenance of this teaching hospital will be performed by full-time technicians. In order to maintain the facility, it is important that technicians who are familiar with the facilities and devices and how to deal with problems perform daily maintenance and inspection, and inspect devices in accordance with facility device instruction manuals. Accordingly, it is necessary to secure and train technicians so that they have a full knowledge of the constructed facility and the installed devices.

2-4-2 Maintenance Plan

(1) Facilities

The maintenance of facilities consists of a focus on the following two points: (1) Implementation of daily cleaning, and (2) Repairs of any wear, damage or deteriorated parts.

Carrying out daily cleaning will have a favorable influence on the attitude of persons using the facility and promote careful usage of the facility devices and equipment. In addition, this leads to early discovery of damage / breakdowns and allows repairs to be performed at an early point, extending the life of the devices and equipment.

The details of periodic inspection and repairs which have a direct impact on the life of the facility will be submitted by the contractor as a “Maintenance Manual” when the facility is handed over, at which time an explanation of the inspection procedures and periodic cleaning procedures will be made. An outline of these procedures is described in the table below.

Table 2-43 Outline of Periodic Inspection at Facility

	Description of Inspection	Frequency of Inspection
Exterior	● Repair/repainting of exterior walls ● Inspection/repair of roof ● Periodic cleaning of rainwater pipes and drains ● Inspection/repair of seals for doors/windows etc. ● Periodic inspection/cleaning of gutters/manholes, etc.	Repair once/5 years, Repaint once/3 years Inspect once/3 years, Repair once/10 years Once/month Once/year Once/year
Interior	● Finish coat repainting ● Adjustment/repair to ensure fittings close properly	Repair once /10 years, Repaint once /10 years Once/year

(2) Building Equipment

It is important to perform daily “preventive maintenance” of building equipment before it becomes necessary to repair breakdowns, replace parts or perform other repairs. In addition to the length of time that equipment is used after operation is started, the life of building equipment can definitely be extended by operating the equipment properly, performing daily inspection, lubrication, adjustment, cleaning and repairs. This type of daily inspection will prevent breakdowns and incidents from happening, and minimize the extent of damage caused by breakdowns or incidents.

It is vital that daily inspection and maintenance procedures be strictly observed by maintenance personnel, including for generators, pumps and other devices for which periodic maintenance and inspection are required, and that a maintenance system be established under which the periodic inspection is outsourced to the manufacturer agent as necessary. The general expected lifetime of the main building equipment is described in the table below.

Table 2-44 Expected Lifetime of Building Facility Equipment

	Type of Building Facility Equipment	Expected Lifetime
Electrical	● Power distribution panel ● Fluorescent lamps ● Incandescent lamps ● Emergency generator	20 – 30 years 5,000 hours – 10,000 hours 1,000 hours – 1,500 hours 30 years
Water Supply/ Discharge	● Pumps, piping, valves ● Tanks ● Sanitary ware	15 years 20 years 25 years – 30 years
Air Conditioning	● Piping ● Exhaust fans ● Air conditioners	15 years 20 years 10 years

In order to keep the clean air and to avoid the infection, it is particularly important to perform maintenance for the filters.

Three kinds of filters are installed in the each air conditioning unit for operation rooms and ICU. The kinds of filters are pre-filter, medium efficiency air filter and high efficiency particulate air filter. The pre-filter needs washing once every two months and exchange once a year, the medium efficiency air filter needs exchange once a year and the high efficiency particulate air filter needs exchange once a year.

Besides, the pre-filter and the high efficiency particulate air filter are installed in each exhaust duct for infection rooms. The pre-filter needs washing once every two months and exchange once a year and the high efficiency particulate air filter needs exchange once a year.

(3) Operation and Maintenance Plan

Daily maintenance, inspection, and minor repair work shall be performed by the medical equipment technicians of the hospital’s maintenance department or the equipment users. Major equipment failures, etc. that cannot be handled by the hospital’s staff will be serviced by the local agents of their respective manufacturers.

Maintenance contracts shall be concluded for the MRI, CT scanner and angiograph with their suppliers and engineers of the manufacturers or their local agents will perform the maintenance of the equipment during the contract period. The costs of the contracts for two years after the handover of the equipment will be included in the grant aid assistance. Even after this two-year period has expired, the maintenance contracts will be required for the operation of the equipment. A detailed examination on the operating conditions of the equipment shall be conducted and the contracts shall be revised in accordance with the result of the examination.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The total project expenses required when this cooperation project is implemented are estimated to be ※ yen. According to the estimation conditions described in (3) below for the breakdown of expenses to be covered by Japan and expenses to be covered by Mongolia for the items described earlier, the expenses for Japan and Mongolia are described by item (1) and (2) respectively. However, these amounts are the grant limit amounts in the Exchange of Notes.

(1) Expenses Covered by Japan Rough Total project Expenses ※ yen

Table 2-45 Expenses Covered by Japan

Item / Description	Amount (million yen)	Remarks
1. Facility Construction	※	
2. Procurement of Equipment	※	
3. Maintenance contract	※	
4. Building Design / Construction Supervision / Technical Instruction	※	
Total	※	

※Cost cannot be disclosed.

(2) Expenses Covered by Mongolia Approx. 453 mil. yen (Approx. 7,600,668 thousand Tg)

Table 2-46 Expenses Covered by Mongolia

Item / Description	Amount (thousand yen)	(Tg)
1. project Site Grading/Preparation	56,000	939,597
2. Application/Acquisition of Building Permits (Including fees for local architects)	16,000	268,456
3. project Site Landscaping	116,000	1,946,308
4. Infrastructure Connection Work (Lead-in lines for electricity, hot water, water supply, sewage, gas, telephone)	13,000	218,120
5. Medical Devices / Furniture / Fixtures etc. Not Included in Grant	249,000	4,177,852
6. Bank Service Charges/Payment Fees	3,000	50,335
Total	453,000	7,600,668

* Prices and the foreign exchange rate as of January 2014, with no consideration to the price escalation or the change in exchange rate
* Above estimate does not include admistrative costs for establishment of the new teaching hospital. Administrative costs such as recruiting new staff, training them, and project management during the construction period will become necessary.

(3) Estimation Conditions

The above amounts were calculated based on the estimation conditions described below.

Time of Estimation: January 2014

Currency Exchange Rate: 1.0 US$ ＝ 101.37 yen ＝ 1,699.18 Tg

1 Tg＝0.0596 yen

Construction Period: As described in project implementation schedule.

Other: This project will be implemented in accordance with the grant aid scheme of the Japanese government.

2-5-2 Operation and Maintenance Cost

(1) Results of Operation and Maintenance Expense Estimation

The estimation results for the operation and maintenance expenses after this project is implemented are 3,750,203,685 Tg per year (equivalent to about 223 million JPY), as described in the table below.

Table 2-47 Estimation of Operation and Maintenance Expenses

Item / Description	Amount (Tg)
1) Personnel Expenses	1,428,426,828
2) Operation and Maintenance Expenses	
1. Facility Operation Expenses	
A. Electricity Charges	592,672,481
B. Emergency Generator Fuel Expenses	29,304,000
C. Communication Charges	145,200,000
D. Coal Charges	281,064,960
E. Water Charges	19,764,162
F. Sewerage Charges	10,692,000
G. Medical Gas Charges	289,476,510
H. Filter Replacement Cost	25,671,141
2. Equipment Operation Expenses	587,000,000
I. Consumable Charges	
3. Facility/Equipment Maintenance Expenses	
J. Facility Maintenance Expenses	288,766,777
K. Equipment Maintenance Expenses	52,164,826
(Maintenance Contract Expenses)	
Total	3,750,203,685

* Building and equipment depreciation costs are not included in above operation and maintenance cost estimate.

(2) Basis of Calculation

1) Personnel Expenses

In this project, plans call for employment of a total of 202 personnel in this project, and the personnel expenses calculated by the Mongolian National University of Medical Sciences is: 1,428,426,828 Tg/year. When a staff member of the Mongolian National University of Medical Sciences works in the educational activities in the hospital, the salary of the member shall not be included in the personnel cost of the hospital because s/he is a staff member of the university.

2) Operation and Maintenance Expenses

1. Facility Operation Expenses

A. Electricity Charges

a. Expected Electric Power Usage

- Weekdays in Summer: 1,020 kW x 0.6 (Average demand factor) x 24 hours x 25 days = 367,200 kWh/month
- Holidays in Summer: 306 kW x 0.6 (Average demand factor) x 24 hours x 5 days = 22,032 kWh/month
- Weekdays in Winter: 1,150 kW x 0.6 (Average demand factor) x 24 hours x 25 days = 414,000 kWh/month
- Holidays in Winter: 405 kW x 0.6 (Average demand factor) x 24 hours x 5 days＝29,160 kWh/month

* The empirical value of 0.6 was used as the average demand factor with the change in the outdoor temperature and the decrease in the consumption during the night taken into consideration.

b. Estimated Electricity Charges

Summer Charges: (367,200 kWh/month + 22,032 kWh/month) x 105.6 Tg/ kW x 4 months = 164,411,597 Tg/year …①

Winter Charges: (414,000 kWh/month + 29,160 kWh/month)x105.6 Tg/kw x 8 months = 374,381,568 Tg/year...②

① + ② = 538,793,165 Tg/year

(① + ②) + (① + ②) x Tax 10% = 592,672,481 Tg/year

B. Emergency Generator Fuel Expenses

- New Emergency Generator: 750 kVA (Fuel consumption: 200 L/h) x 1 unit

  As the result of study during the preparatory stage, estimate is for periodic inspection operation of 3 hours during day (average of 2 days per month)
- Emergency Generator Fuel Expenses

  Fuel Price (Type A Heavy Fuel Oil): 1,850 Tg/L

  During day: 200 L/h x 3hours x2 days x 12 months x 1,850 Tg/L＝26,640,000 Tg/year …①

  ① + ① x Tax 10%＝29,304,000 Tg/year

C. Communication Charges

a. Telephone Charges

- No. of Lines: 50 new lines

  Estimate No. of outside calls per line to be 10 times/day for 3 minutes/call.

  10 times/day x 3 min./call x 30 days = 900 minutes/month/line
- Estimated Telephone Charges

  900 min./month/line x 200 Tg/min./line x 12 months x 50 lines = 108,000,000 Tg/year

b. Internet Charges

- No. of Lines: 50 new lines
- Estimated Internet Charges (Expected that medium speed internet contract will be made):

40,000 Tg/ month

40,000 Tg/month/line x 50 lines x 12 months = 24,000,000 Tg/year … ②

(① + ②) + (① + ②) x Tax 10%=145,200,000 Tg/year

D. Coal Charges

● Heating Coal Consumption

16,652 kg/day x 30 days x 6 months x 0.5 (load factor) x 160 Tg = 239,788,800 Tg/year … ①

* The empirical value of 0.5 was used as the load factor because the consumption of coal for heating significantly affects the difference in the load between the midwinter and the transient seasons.

● Hot Water Supply Coal Consumption

390 kg/ days x 30 days x 12 months x 0.7 (load factor) x 160 Tg＝15,724,800 kg/year...②

(① + ②) + (① + ②) x Tax 10％＝281,064,960 Tg/year

* The empirical value of 0.7 was used as the load factor because the seasonal change in the consumption of coal for the hot water supply, which is affected only by the changes in the amount of hot water use and the temperature of the water supplied, is less than that in the consumption of electric power or coal for heating.

E. Water Charges

● Expected usage of 90 m^3/day of city water

90 m^3/ days x 30 days＝2,700 m^3/month

● Estimated Water Charges

2,700 m^3/month x 554.55 Tg/m^3 x 12 months＝17,967,420 Tg/year...①

① + ① x Tax 10％＝19,764,162 Tg/year

F. Sewerage Charges

● Expected that water supply volume = Water discharge volume → 90 m^3/day

90 m^3/ days x 30 days＝2,700 m^3/month

● Estimated Water Charges

2,700 m^3/month x 300 Tg/m^3 x 12 months＝9,720,000 Tg/year...①

① + ① x Tax 10％＝10,692,000 Tg/year

G. Medical Gas Charges

● Oxygen Supply Unit 100,000 yen/year for replacement of accessories

● Pressurized Air Supply Unit 200,000 yen/year for replacement of filters and other accessories

● Aspirator 200,000 yen/year for replacement of filters and other accessories

● Medical Gas Outlet Replacement Charges: 500,000 yen/year

● Oxygen Cylinder Replacement Charges: 9.7 cylinders/day x 365 days = 3,541 cylinders/year

3,541cylinders/year x 2,800 yen/cylinders＝9,914,800 yen/year

● Laughing Gas Cylinder Replacement Charges: 0.43 cylinders/days x 365 days ＝ 157

cylinders/year

157 cylinders/year x 35,000 yen/cylinders＝5,495,000 yen/year

- Nitrogen Cylinder Replacement Charges: 0.48 cylinders/ days x 365 days＝175 cylinders/year

175 cylinders/year x 3,000 yen/cylinders＝525,000 yen/year

- Carbon Dioxide Cylinder Replacement Charges: 0.29 cylinders/days x 365 days ＝ 106 cylinders/year

106 cylinders/year x 3,000 yen/cylinders＝318,000 yen/year

Total: 17,252,800 yen/year⇒289,476,510 Tg/year

H. Filter Replacement Charges

- Pre-Filters ..... Replace filters once/year3,000 yen /filter x 150 filters/year = 450,000 yen/ year
- Medium Performance Filters ..... Replace filters once/year8,000 yen/filter x 60 filters/year＝ 480,000 yen/year
- HEPA Filters ..... Replace filters once/year30,000 yen/filter x 20filters/year ＝ 600,000 yen/year

Total：1530000 yen/year ⇒ 25671141 Tg/year

2. Equipment Operation Expenses

1) Cost of Medical Equipment Consumables and Other Items

Cost of medical equipment consumables will be approximately 35 million yen per year.

The main consumables consist of chemicals used for the automatic biochemical analyzer, immunological testing device and other testing devices in the laboratories, and the electrodes and other materials used by patient monitoring devices, electrocardiographs, and other bio-information devices.

3. Facility/Equipment Maintenance Expenses

J. Facility Maintenance Expenses: 288,766,777 Tg

- Building Repair Expenses

Building repair expenses change considerably over time, but the average building repair expenses for 10 years after the facility is completed are estimated to be approximately ,

5,453,000 yen (Approximately 91,493,288 Tg)

- Facility Repair Costs

Facility repair costs will be low for about the first five years after completion of the facility, but after this the number of parts and devices that need to be replaced will increase. The average repair costs over a span of 10 years is estimated to be approximately ,

10,906,000 yen (Approximately 182,986,577 Tg)

● Elevator Maintenance Expenses

Annual maintenance expenses for a contract with the manufacturer agent are estimated.

Annual charges: 851,500 yen (Approximately 14,286,912 Tg)

K. Equipment Maintenance Expenses

Medical Equipment Maintenance Expenses

The table below shows the costs of the maintenance contracts required in this project. While the maintenance of the MRI, CT scanner and angiograph will be covered for two years after the handover by the grant aid assistance, the costs of the maintenance contracts for them shall have to be paid after expiration of the two-year period.

Table 2-48 Maintenance Contract Cost for Main Equipment

Department	Equipment	Contract Content	Approximate Cost (per 1 Year)
Radiology	MRI	Regular inspection (from third year after handing over)	US$ 11,200
	CT Scanner	Regular inspection (from third year after handing over)	US$ 8,400
	Angiograph	Regular inspection (from third year after handing over)	US$ 19,800
	Fluoroscopy Equipment	Regular inspection	US$ 3,800
	General Radiological Equipment	Regular inspection,	US$ 3,600
	Mammography	Regular inspection,	US$ 6,000
	C-arm (surgical) radiography system	Regular inspection	US$ 4,600
	Mobile radiography system	Regular inspection	US$ 4,700
Clinical Testing Equipment	Automatic Biochemical Analyzer	Regular inspection	US$ 2,000
	Automatic Immunological Tester	Regular inspection	US$ 2,000
Information Management System	PACS	Regular inspection	US$ 4,000
Total up to 2 years after handing over			US$ 30,700
Total from 3rd year after handing over			US$ 70,100

* The amounts do not include the cost of replacement parts etc. required for repairs.

(3) Expected Income and Expenditures after Project Implementation

The increase in yearly maintenance costs caused by implementation of this project amount to a total of approximately 3,750,203,685 Tg (approximately 223 million yen) when the facilities and equipment are added. This estimation assumes that all 202 staff necessary for thie new Hospital shall be newly hired. However, some of the staff maybe from the University, so the actual cost

maybe lower than this.

This amount is approximately 20% of the total expenditures by the Mongolian National University of Medical Sciences of 1,109,841,325 yen (Table 2-48).

Table 2-49 Income of Mongolian National University of Medical Sciences over Past 4 Years

(Unit: Yen)

	Income	Expenditure
2009	351,798,047	281,742,478
2010	502,535,451	524,993,961
2011	560,922,752	493,637,371
2012	1,286,020,544	1,109,841,325

* Converted into Yen at rate in January following year.
January 2010: 0.065 yen = 1 Tg January 2011: 0.066 yen = 1 Tg
January 2012: 0.050 yen = 1 Tg January 2013: 0.060 yen = 1 Tg

The executed budget over the past five years in Mongolia is shown in Table 2-49 below. Mongolia has been experiencing rapid economic growth in recent years, and this has resulted in yearly increase of executed budgets. The executed budget in 2013 was approximately 432,582 million yen, and the yearly maintenance expenses for this project are about 0.05% of this amount.

Table 2-50 The executed budget over the past five years in Mongolia (Unit: Yen)

	2009	2010	2011	2012	2013
Executed budget	129,609	206,082	223,409	298,549	432,582

* Converted into Yen at rate in January following year.(same as for table 2-50)
January 2010: 0.065 yen = 1 Tg January 2011: 0.066 yen = 1 Tg
January 2012: 0.050 yen = 1 Tg January 2013: 0.060 yen = 1 Tg January 2014: 0.0596 yen = 1 Tg

The budget of Ministry of Education and Science is shown in table 2-50. The implemented budget of year 2014 is 7,538Tg, and the maintenance cost of the Project is about 2.96% of this budget.

Table 2-51 Ministry of Education and Science

The executed budget over the past four years

	2011	2012	2013	2014
Million Yen	8,672	6,695	6,691	7,538
Million Tg	131,388	133,909	111,521	126,470

In addition to the fact that yearly income by the Mongolian National University of Medical Sciences is increasing in the recent years, the importance of securing the budget for operation and maintenance expenses is recognized by the Ministry of Education and Science, which is the agency responsible for this project. This project has been positioned as the major Project in Mongolia, hence the yearly budget allocation for operation and maintenance expenses should be sufficiently secured after the project is completed.

Chapter 3 Project Evaluation

Chapter 3. Project Evaluation

3-1 Preconditions of the Project

In implementing this Project, the following prerequisites need to be fulfilled by the government of Mongolia.

- For the rare species in the project site under this Project, a concrete plans such as transplantation of the species shall be made by the Ministry of Education and Science with relevant authorities, and this concrete plans to be implemented before the tender of construction work.
- The obstacles and plantings that exist in the Project site shall be demolished and removed, and the land shall be leveled prior to the tender of the construction work.
- Various building permits necessary for the facilities to be built in this Project shall be timely issued.

3-2 Necessary Inputs by Recipient Country

The government of Mongolia shall implement following inputs for the Project effectiveness and sustainability.

- The Ministry of Health shall accredit the Hospital as tertial level teaching hospital, and postgraduate training of doctors shall be done at this Hospital.
- Employ 67 doctors, 62 nurses, 10 radiologists / lab technicians, 34 service staff, 26 managers / office staff and 3 medical consultants, for a total of 202 staff and implement necessary training for proper operation of the Hospital..
- To secure the budget necessary for the operation and maintenance of the Hospital after the completion of the Project.
- To connect the infrastructure including electricity, telephone line, city water and drainage to the target facilities.
- To procure the general office furniture and fixtures that are out of the scope of assistance by Japan and to purchase the consumables and replacement parts that may be needed for maintenance of the facilities and equipment.
- To contract with manufacturers or agents of major medical equipment for proper maintenance.

3-3 Important Assumptions

The followings are external conditions of the Project effectiveness and sustainability.

- The medical insurance system shall be improved so that the budget for medical service is secured, and everybody including the poor people will be able to receive good medical service.
- The system for postgraduate training of doctors and career training of health service staff shall be improved so that necessary budget is secured for these trainings.
- It is important that the government of Mongolia will take the initiative to continuously undertake the improvement of the Hospital according to the Master Plan, so that the Hospital will correspond to the global improvement of medical service technology.

3-4 Project Evaluation

3-4-1 Relevance

This Project is deemed to be appropriate as the cooperation project using the Japan's grant aid from the following views:

(1) Beneficiaries

The patient catchment area of the Hospital is Bayanzurkh District having the population of 250,000. In addition, the 1,290,000 citizens of Ulan Bator are included in the beneficiary population of this Project because the advanced medical equipment including MRI, CT and angiography will be introduced in this Project in this country where until now only several sets have been installed.

The Hospital will be the first teaching hospital in Mongolia and function as the place of clinical training of for all medical graduates in the country. Therefore, this Project will contribute to the improvement of medical service at the national level, and thus the beneficiaries of the Project cover all people of Mongolia.

(2) Human security

This Hospital will provide upgraded medical service to more people in Bayanzurkh district and other areas. This Hospital shall also function as teaching hospital and upgrade the quality of medical service that will provide high quality medical service to all parts of Mongolia. The life of people of Mongolia will become more stable with this high quality medical service that is available to all, and is an important element for security of the people.

(3) Contribution to the medium and long term government policy of the recipient country

This Project is in line with the objectives stated in the “Millennium Development Goals-Based Comprehensive National Development Strategy of Mongolia” targeted for year 2021. The construction of the facility and provision of the medical equipments of this Project contributes directly to this Strategy that places provision of good medical health service as one of the major input.

(4) Relevance to the assistance policy of Japan

Ministry of Foreign Affairs states three major assistance strategy for Mongolia in the country data book (2012). a) Strengthening governance for sustainable development of mining sector, b) assistance for development that will contribute to all the people, c) strengthening the function of Ulaanbaatar city. The Project is related to b) and c) of this strategy, and thus is consistent with the assistance strategy.

3-4-2 Effectiveness

The Project objective of upgrading the post graduate training of the doctors, and upgrading tertial medical service that have high priority, can be validated by the number of post graduate training, the number of advanced image diagnosis, and the number of surgery. The measurement of quality of training is difficult to measure in quantity, thus it is stated as qualitative effectiveness.

The Project objective of improvement of secondary medical service in the city can be validated by the number of surgery, number of outpatient, and number of inpatient explained in the following chart. If the Hospital functions properly as secondary medical service in the city, the congestion at tertial medical service facilities in the city will be relieved. Therefore, this is stated as qualitative effect of the Project.

The quantitative and qualitative effectiveness that are expected in implementation of this Project are shown in following (1) and (2).

(1) Quantitative Effects

Table 3-1 Quantitative Effects

Index	Target Value	Description
Number of resident doctors	Approx. 150 resident doctors per year	There are 116 resident doctors in Mongolian National University of Medical Sciences at present and there are approximately 150 to 200 applications.
Number of image diagnoses	CT: Approx. 5,700 cases per year	CT: The average number of inspections per day is 20 cases, taking 5 to 25 minutes per case. 20 cases×24 days/month=480 cases/month 480 cases/month×12month ≒ 5,700 cases
	MRI: Approx. 2,800 cases per year	MRI: The average number of inspections per day is 10 cases, taking 20 to 30 minutes per case. (*5) 10 cases×24 days/month=240cases/month 240 cases/month×12month ≒ 2,800cases
	Angiography: Approx. 1,200 cases per year	Angiography: The average number of inspections per day is 5 cases. (*6) 5 cases×20 days/month=100 cases/month 100 cases/month×12month=1,200 cases
Number of Operations	Approx. 2,060 cases per year	It is estimated that 2 cases/day before and after noon are operated in 3 operating rooms at full capacity, on the basis that the operations made will be mainly planned operations. 2 cases×3 rooms×20 days/month=120 cases/month 120 cases/month×12month=1,440 cases (*1) The number of emergency operations is estimated to be about 30% of the total number of operations. (*2) 1,440 cases÷0.7≒Approx. 2,060 cases (Total of operations) 2,060 cases×0.3≒Approx. 620 cases (Number of emergency operations)
Number of outpatients	Approx. 600 persons per day	15 consultation rooms are provided to make 6 to 7 hours of diagnosis per day. The diagnostic time is 10 minutes per patient. 15 rooms×360 – 420 minutes /10 minutes ≒ 600 people/ days
Number of inpatients	Approx. 4,300 persons	104 beds are provided. The general bed occupancy rate of 90% in hospitals in Mongolia and 8 days of hospitalization on average are assumed. (*3,4) 104 beds×365 days×90%÷8 days ≒ 4,300 people

*1 According to Health Indicator 2012, the average number of operations in general county hospitals in the entire country is approx.1,350 cases per year, which makes the assumption deemed to be reasonable.

*2 According to Health Indicator 2012, the average rate of emergency operations in the total number of operations in general county hospitals in the entire country is about 30%. This value is adopted.

*3 According to Health Indicator 2012, the average number of hospitalization days in district hospitals in Ulan Bator City is about 8 days.

*4 According to Health Indicator 2012, the total number of beds in district hospitals in Ulan Bator City is 1,505 and the number of inpatients is 72,353 per year. Calculated assuming that the average number of hospitalization days is 8 days, the average bed occupancy rate is about 104% at present. The official guideline for bed occupancy rate is 80%. From these figures, the number of inpatients is calculated at the bed occupancy rate of 90%.

*5 The introduction of MRI in Mongolia has just started, and the number of usage cases is low. Thus, the index value is the ideal number based in the cases in Japan.

*6 The introduction of angiography in Mongolia has just started, and the number of usage cases is low. Thus, the index value is the ideal number based in the cases in Japan.

(2) Qualitative Effects

・The quality of postgraduate education will improve.

・The congestion at other tertiary hospitals in Ulaanbaatar will be relieved.