BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR THE RENOVATION
OF
ISLAMABAD CHILDREN'S HOSPITAL
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

March 2005

Japan International Cooperation Agency

PREFACE

In response to a request from the Government of the Islamic Republic of Pakistan, the Government of Japan decided to conduct a basic design study on the Project for Renovation for Islamabad Children's Hospital, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Pakistan s study team form 2nd December to 25th December, 2004. The team held discussions with the officials concerned of the Government of Pakistan, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Pakistan in order to discuss a draft basic design, and as this result, the present report was finalized.

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

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

March 2005

Seiji Kojima
VicePresident
Japan International Cooperation Agency

March 2005

LETTER OF TRANSMITTAL

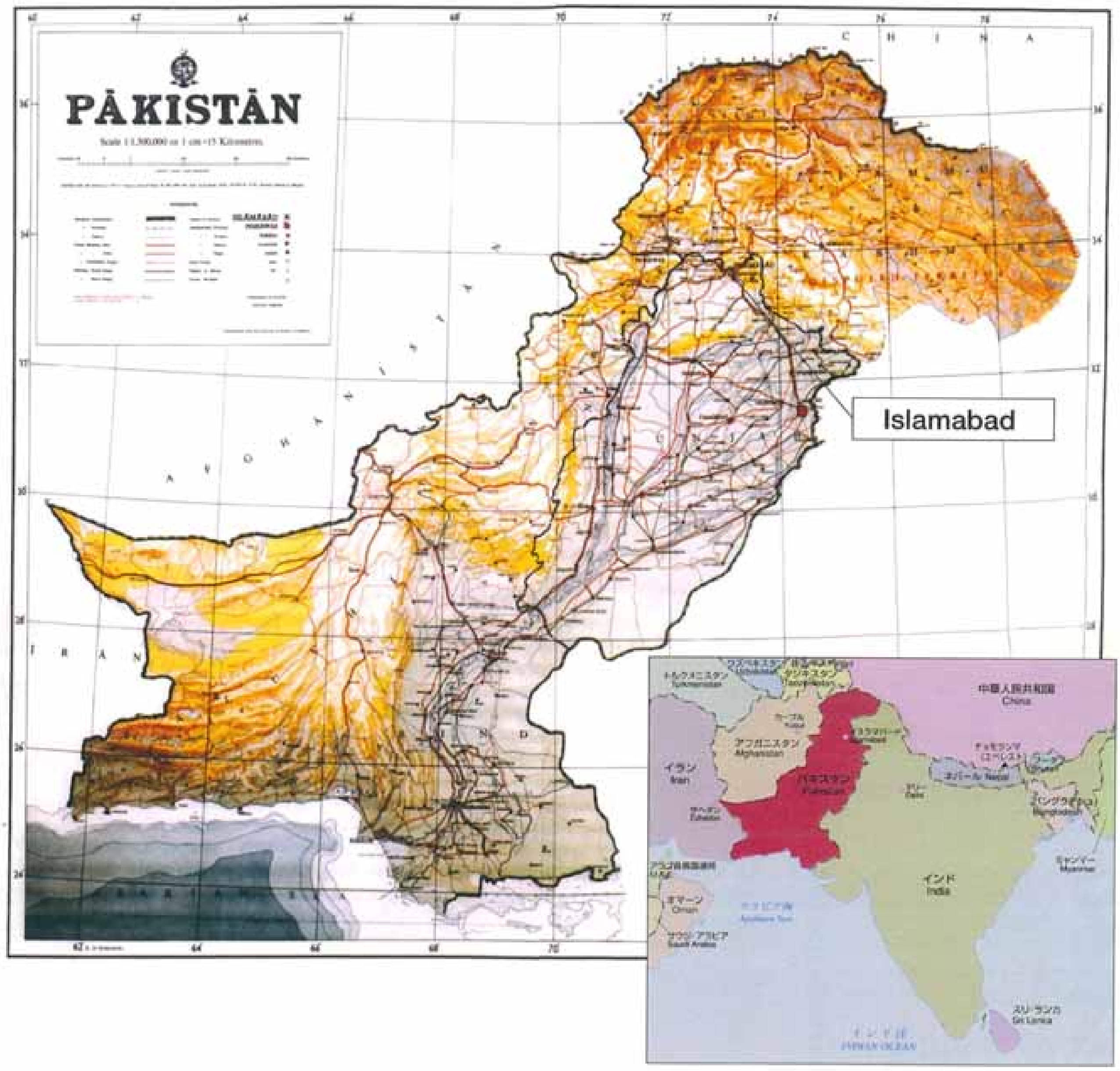
We are pleased to submit to you the basic design study report on the project for Renovation for Islamabad Children's Hospital in the Islamic Republic of Pakistan.

This study was conducted by K.ITO Architects & Engineers Inc. under a contract to JICA, during the period from November, 2004 to March, 2005. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Pakistan and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

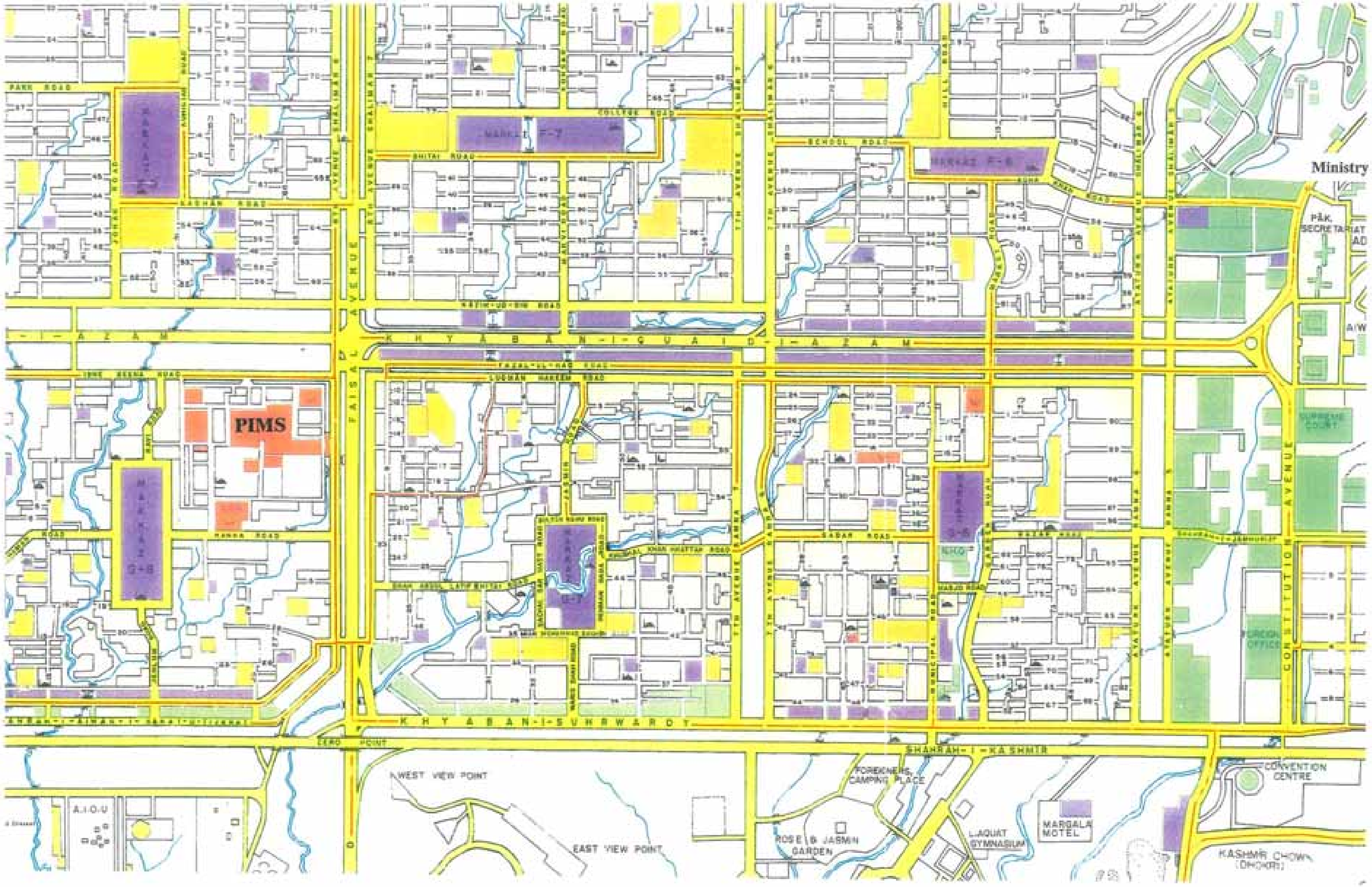
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

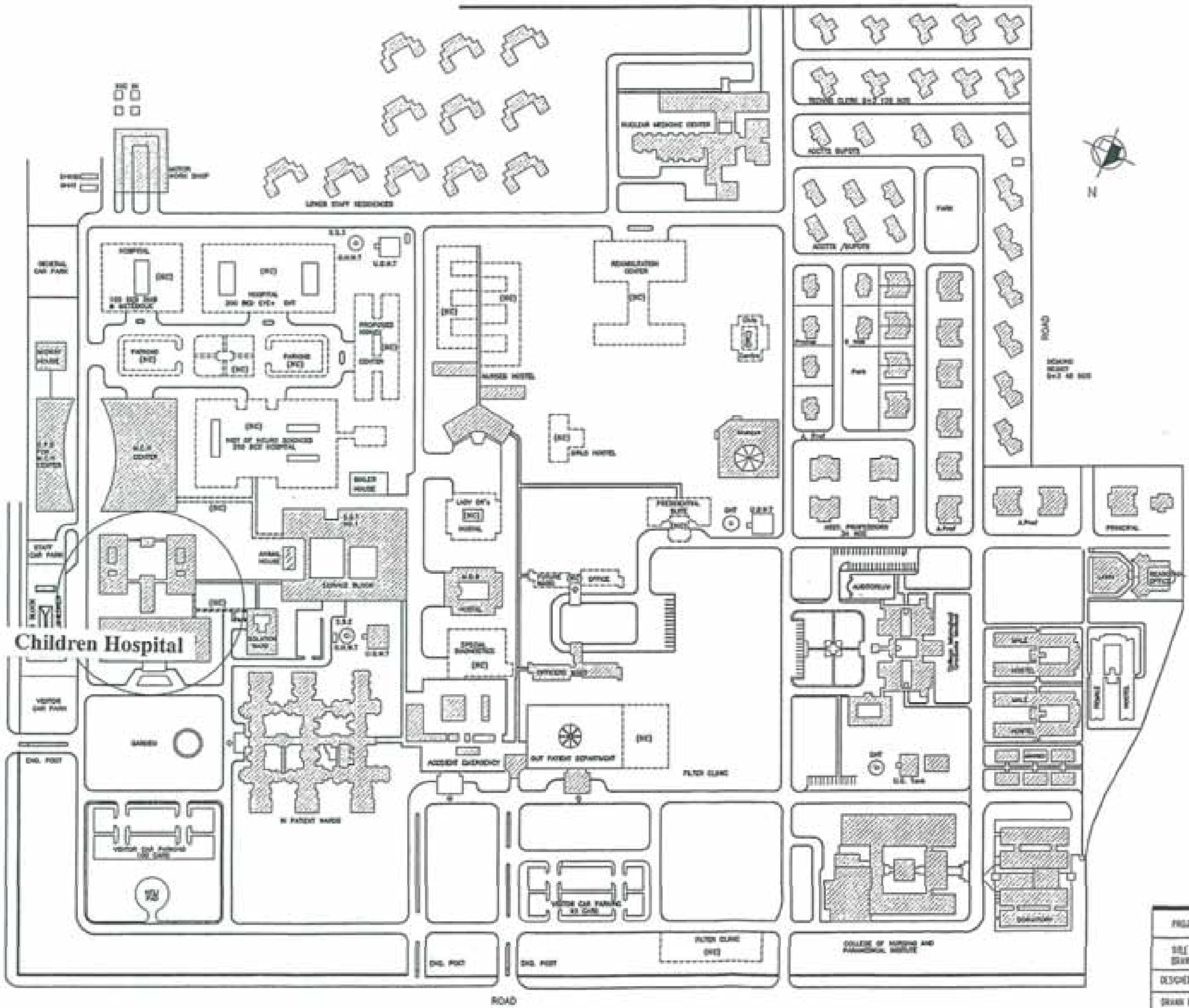
Kenji Miyazaki
Project Manager
Basic Design Study Team on
The Project for The Renovation of
Islamabad Children's Hospital in
The Islamic Republic of Pakistan
K.ITO Architects & Engineers Inc.



The Islamic Republic of Pakistan



Islamabad Street Map



PIMS Site Plan

PROJECT	PAKISTAN INSTITUTE OF MEDICAL SCIENCES ISLAMABAD		
TITLE OF DRAWING	MASTER PLAN		
DESIGNED BY:		DATE:	SCALE:
DRAWN BY:	GAC CHECK	DRG NO.	
APPROVED BY:			

Perspective of the New Operating Theatre Building

OVERVIEW

PROPOSED SITE

Existing O.T.

Existing Recovery RM

Existing X-ray RM

Existing ICU

Existing Sterilization RM

Existing Wastewater treatment plant

The Project for Improvement of Islamabad Children's Hospital

Repairing of Boiler

Replacement of Chiller

Replacement of Pumps

Replacement of Panel

Generator RM

Water stopper wall

List of Figures and Tables

ABBREVIATION

ADB	Asian Development Bank
AJK	Azad Jammu and Kashmir
AP	Authorization to Pay
AVR	Automatic Voltage Regulator
BA	Banking Arrangement
BHU	Basic Health Units
BOD	Biochemical Oxygen Demand
CDA	Capital Development Authority
CDWP	Central Development Working Party
CIDA	Canadian International Development Agency
COD	Chemical Oxygen Demand
EAD	Economic Affairs Division
ECNEC	Executive Committee of National Economic Council
EOJ	Embassy of Japan
E/N	Exchange of notes
GDP	Gross Domestic Product
GNP	Gross National Product
GOJ	Government of Japan
JICA	Japan International Cooperation Agency
MCH	Maternal and Child Health
M/D	Minutes of Discussion
MDB	Main Distribution Boards
MOH	Ministry of Health
NGO	Non-Governmental Organization
NWFP	North West Frontier Province
OPD	Out Patient Department
PC	Personal Computer
PIMS	Pakistan Institute of Medical Sciences
PTTC	Project Type Technical Cooperation
RC	Reinforced Concrete
RHC	Regional Health Center
SAP	Social Action Program
SS	Suspended Soil
SUI	Sui Northern Gas Pipe Ltd
UNDP	United Nations Development Program
UNESCO	United Nations Education, Scientific and Cultural Organization
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children Emergency Fund
WAPDA	Water and Power Development Authority
WB	World Bank
WHO	World Health Organization

SUMMARY

Summary

With the enhancement of pediatric care being the priority for the healthcare sector under its national development policy, the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") has been working on the improvement of the level of health of its children by focusing on the development of basic local healthcare facilities. Although the situation has been improving in recent years, the related health indexes for Pakistanis are still worse than those for neighboring countries with similar socioeconomic conditions. For example, in Pakistan the average life expectancy is 64 years, the neonatal mortality rate is 82 per 1000 babies and 105 out of 1,000 children die before they live to be five years old.

The government of Pakistan has adopted a Ninth Five-year Plan (1998 to 2003), an economic development program, whose main targets are economic growth and poverty reduction to be achieved by its own efforts. In the plan, health and medical policies focus on community health care, maternal and child health, and pediatrics. To achieve the goals, the program is designed to narrow the gap between the rich and the poor, urban and rural districts, and men and women. In addition, the government has been implementing its Ten-year Health Policy, which was initiated in 2001 with the same objectives.

In 1985, the government established, with grant aid from Japan, the Children's Hospital, a medical institution specializing in pediatrics, as part of the Pakistan Institute of Medical Sciences (PIMS), a core national institution for medical care to raise the level of health services.

Since then, the number of patients visiting the hospital has been increasing since the population of the country has been growing and there is no specialty hospital for pediatrics established north of Islamabad other than the Children's Hospital of PIMS. The hospital can no longer handle the increasing number of patients with its existing facilities and equipment. PIMS has been trying to cope with such difficulties through its own efforts. In 1991, for instance, it built a wing for the Outpatients Department (OPD) beside the Children's Hospital. In addition, accommodation facilities are under construction for patients and their families from distant locations.

However, since the Operating Department has only two operating theatres, the capacity is now limited to 4,500 cases a year, or a maximum of 30 cases a day. This low capacity keeps patients out of the hospital, and they are forced to wait for approximately 6 months before they can be operated on. When the operating theatres were constructed 20 years ago, two operating tables were installed in each room in order to carry out a significant number of operations with an insufficient number of staff. However, with the development of medical skills, the operating theatres are used for a higher level of surgery, such as brain procedures. In addition, as international standards for medical care are becoming stricter, in-hospital infection is regarded as a topical issue. There is, therefore, great concern that when two patients are operated on at the same time in the same room, infection between the patients cannot be prevented. Due to the limited space, the operating theatres are not equipped with adequate facilities, including recovery or changing rooms and hygiene equipment. Other areas, such lounges for the doctors and nurses and waiting rooms for the families of the patients, are also insufficient. Proper medical services can hardly be provided using such facilities. The medical equipment

has deteriorated due to aging, and most equipment should also be replaced, since the use of aging equipment sometimes causes difficulties in conducting the proper procedures for medical treatment.

The government of Pakistan made a request to the Government of Japan for grant aid to extend an operating wing, repair the existing wing of the Operating Department and replace the aging medical equipment. With this grant aid, the Pakistani government will improve the efficiency of the Operating Department of the Islamabad Children's Hospital to expand its operating capacity and reduce the waiting time for operations. The aid will also be used to build operating theatres installed with a single operating table, so that infection during an operation can be prevented, to replace the current dilapidated medical equipment, provide better medical services, and improve the working conditions of the staff.

After the request for grant aid was received, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team from December 2 to 24, 2004, to conduct a survey. For this on-site survey, the team interviewed some officials of the Pakistani government to make sure of the scope of what they had requested. The team also examined the project site and existing facilities, and collected information, data and related documents.

On the basis of the results of the on-site survey and under the following basic policies, consideration was given to determining the most suitable type and size of facilities and equipment, and a proposal on a basic design and an implementation plan was prepared.

Facilities

(1) The children's hospital and its Operating Department shall be designed to have the most appropriate composition and level of facilities and equipment in accordance with the functions required and the conditions for the activities.

(2) The extension building for the Operating Department shall be constructed in a way such that it is used in coordination with the existing facilities. The building materials and equipment shall be ones that can be maintained and managed by the present construction, electrical and mechanical engineers. Efforts shall be made to streamline the construction work and lower the costs through factory pre-finish and on-the-spot assembly (prefabrication methods) for the interior work of the operating theatres.

(3) The extension building shall be in conformity with the existing hospital’s buildings in terms of its structural design and interior/exterior materials in order to reduce extra operating costs after construction.

(4) This hospital shall be improved to resist rainfall as heavy as the torrential rains that occurred in July 2001.

(5) The construction plan shall be designed in such a way that it imposes the fewest restrictions on the operation of the hospital. For this purpose, the extension work shall be completed before starting the renovation work of the existing building where Operating Department to be transferred is currently located.

Equipment

(1) In choosing and procuring medical equipment, the hospital’s maintenance and management capabilities as well as the service provision status of local agencies shall be taken into consideration. Equipment to be installed in the extension building shall be coordinated with that in the existing facilities in terms of its capabilities and functions.

With the proposal, JICA dispatched a Draft Report Explanation Team from February 24 to March 5, 2005, to give an explanation of the Draft Report and hold discussions on it. Through these discussions, the Government of Pakistan gave its consent to the basic design. An outline of the definitive program is given below.

＜Facility＞

Departments	Floor	Units/Rooms	Planned Space m^2
Extended Wing	1 F	Operating theatre （for day surgery, recovery room, plaster cast room, hand-washing/preparation room, sterilized materials room, sanitation and washing room, locker room / lounge, cleaning room, consultation and explanation room, waiting room, reception counter, pump room	373.0
	2 F	Operating theatre, preparation/recovery room、changing room, lounge, hand-over room, waiting room, explanation room, WC, skybridge	462.0
	R F	Machine room, ELV machine room	146.0
	Total		981.0
Restored Wing	1 F	X-ray photography room, operating theatre, examination staff room, dark room, film store room, data room, physiotherapy room	131.0
	2 F	Operating theatre, hand-washing/preparation room, preparation/recovery room, staff station, prayer room, conference room, storage room, washing room, sterilization room, cleaning room, corridors, skybridge	392.0
	Total		523.0
Outdoor facilities		Wastewater treatment equipment	

＜Content of medical equipment＞

Section	**Content of main medical equipment**		**Planned items**
New OT	**Operating lamp, Operating table, Electrosurgical unit, Anesthesia apparatus, Patient monitor, Fiber gastroscope, Fiber colonoscope, Bronchoscope, Sigmoidoscope, Cystoscope, Operating microscope, Incubator, Ventilator, etc.**		**26 Items**
Existing Dept.	**Radiology**	**X-ray unit w/TV system, X-ray unit, Mobile X-ray, Ultrasound unit, etc.**	**5 Items**

	NICU	**Ventilator/infant, Phototherapy unit, Infant incubator, Jaundice meter, Patient monitor, etc.**	**8 Items**
	PICU	**Ventilator/each kind, Syringe infusion pump, Infusion pump, Patient monitor, etc.**	**5 Items**
	Operating Room	**Operating lamp, Operating table, Plaster cutter/electric, Electrosurgical unit, Electric drill for orthopedic surgery, etc.**	**8 Items**
	Accident & Emergency	**Infant warmer, Plaster cutter/electric, etc.**	**3 Items**
	Laboratory	**Hematology analyzer, Chemistry analyzer, Microscope, Blood gas analyzer, Water bath, Distillation plant, etc.**	**11 Items**
	Special OPD	**Ultrasonic nebulizer, Dental unit, Electric tonometer, Fundus camera, etc.**	**7 Items**
	Others	**Ultrasonic nebulizer, Suction machine, Pulse oximeter, Infant incubator, Oxygen flow meter, etc.**	**6 Items**
Total			**79 Items**

When this project is implemented as a grant aid project of Japan, the total construction period, including that for the preparation of a detailed design, will be approximately 18 months. The estimated project expenses for this project are ¥674 million in total. The share of Japan and Pakistan is estimated at ¥657 million, and ¥17 million, respectively. The budget for the Children's Hospital is included in that of PIMS, which the Hospital belongs to, and the Hospital's budget accounts for 25% of that of PIMS. The budget of PIMS consists of a contribution from the Ministry of Health of Pakistan (MOH) and its own revenues, including medical service fees. The 2003/2004 budget is approximately ¥800 million. The MOH budget had stayed around 1% of the total national budget, but the 2003/2004 budget showed a sharp increase. Its own revenues account for 15% of the total budget. The budget that Pakistan should share to implement the Project shall be prepared by MOH.

This project has already been approved by the Ministry of Planning and Development of Pakistan (PC-1), and its budget has also been approved by the Cabinet (Executive Committee of the National Economic Council: ECNEC). The project can start as soon as the Japanese government completes the procedures.

The results to be expected through the implementation of the Project are as follows.

(1) Extend to and restoration of the Operating Department

Three operating theatres will be extended, the second operating tables will be removed from the existing operating theatres, and both the clean and non-clean areas of the existing Operating Department will be restored to strengthen the functions of the Operating Department and improve its conditions.

1) The operating capacity is to be expanded from the current level of 4,500 cases per year, and the waiting period is to be reduced from the current level of 6 months

2) In-hospital infections that may occur during operations can be prevented.

3) The improved environment will make patients feel more comfortable and staff more motivated.

4) The health indexes for children in Pakistan will be improved due to the availability of better medical services provided by the Children's Hospital.

(2) Repair of the wastewater treatment equipment

1) The equipment, which has broken down, is to be repaired, so that environmental pollution can be prevented.

(3) Replacement of equipment

1) The scope of general, orthopedic and otolaryngology surgeries will be expanded.

2) Endoscopes will be installed, so that biopsies can be carried out for the patients.

3) X-ray photograph and ultrasonograph equipment will be renewed, so that the accuracy of basic diagnostic imaging will be improved and the number of diagnoses will be increased.

4) ICU equipment will be replaced, so that the credibility of patient care will be enhanced.

5) The capacity of the clinical laboratory will be expanded, so that more hematologic tests and biopsies can be conducted.

6) Diagnosis and treatment skills at the Dental and Ophthalmology Departments can be improved.

7) Better medical services and educational functions can be provided.

With these potential effects in mind, Japan’s grant aid for this project is deemed appropriate for the following reasons.

1) This project covers about five million children as beneficiaries, including those classified as the poor living in the northern part of Pakistan, accounting for one-third of the national territory.

2) The stabilization of the people’s livelihood can be expected by providing a solution to the inadequacy of medical facilities and the aging of the medical equipment used in the children’s hospital.

3) The personnel requirements for the implementation of this project, including the doctors, are expected to be fulfilled considering the scale and technical level of the current PIMS staff resources. The maintenance and management of the facilities and equipment are also feasible with the present engineering staff.

4) The project will contribute to the improvement of the level of health of Pakistan’s population, especially that of children, as well as to the achievement of the nation’s development plan in the healthcare arena.

5) Considering that PIMS has so far received support from Japan various forms through grant aid or technical assistance prior to this children’s hospital improvement project, it is highly appropriate to implement this project within the framework of Japan’s grant aid.

In order to carry out this project as effectively and efficiently as possible, it is important to formulate both a long term plan and yearly budget plans for the replacement, maintenance and repair of the electrical/mechanical installation systems for the 20-year-old children’s hospital.

In addition, it is desirable for a system to be in place that will ensure maintenance and management support not only from the hospital’s engineering staff, but also from their agents.

Contents

CHAPTER 1

BACKGROUND OF THE PROJECT

Chapter 1 Background of the project

Soon after Islamabad became the nation's capital in 1961, the government of Pakistan started a project to construct the Pakistan Institute of Medical Sciences (PIMS) in the city for the purpose of improving the level of health of the population. Since its completion in 1978, PIMS has been providing citizens in and around Islamabad and government employees with comprehensive healthcare services, including tertiary medical treatment, and also functioning as an education and research institution for medical practitioners.

Islamabad Children's Hospital was founded in March 1985 in the framework of the "Construction Project for the Children's Hospital in the Islamic Republic of Pakistan", Japan's grant aid project carried out in 1982-1983, which was aimed at improving the quality of pediatric services of PIMS and educating its medical staff. Another technical assistance project the "Islamabad Children's Hospital" supported by Japan was carried out from 1986 to 1993 in order to train human resources involved in child health care by dispatching Japanese medical experts, including doctors, to Pakistan and accepting trainees from Pakistan as well as to enhance the functioning of the hospital as a core pediatric institution in which the graduates from the training courses are expected to work.

As a result of the above-mentioned support from Japan, the Islamabad Children's Hospital has developed into one of Pakistan's largest tertiary pediatric institutions with 230 beds. The hospital now consists of the general outpatient department, special outpatient department (internal medicine, surgery, orthopedics, ophthalmology and otolaryngology sections), emergency care department, central treatment department (X-ray rooms, inspection rooms, operating theatres and a pharmacy), as well as an isolation ward for patients with infectious diseases. The current total staff size is 520, made up of 69 doctors, including the hospital director, 105 nurses, 120 medical and other facility engineers and 226 support personnel such as cleaners, carpenters, and clerical workers.

Torrential rains hit Islamabad in July 2001 and rain and muddy water poured into the basement of the hospital where the electric and mechanical rooms are located, causing insulation failure of the instruments and the breakdown of the electrical/mechanical systems. As a result, the hospital was paralyzed for several days, forced to temporarily move its hospitalized patients to other medical facilities and to stop offering outpatient services. Due to its continued recovery efforts, such as draining the rainwater and cleaning and drying the machines, the hospital managed to partially resume its services after the main power source came back on. However, such a temporary and insufficient restoration measure left the possibility of a serious subsequent disaster or an injurious accident arising from a short circuit or insulation failure of the electrical/mechanical systems or from the sudden stoppage of the medical equipment during an operation.

Under these circumstances, the Pakistani government requested Japan to provide through grant aid the funds required for the hospital to recover from flood damage and to prevent a functional gridlock. In August 2001, the Japanese government sent a follow-up mission to Pakistan to assess the damage and discuss the measures to be taken, and found that the hospital had been seriously damaged by the heavy rain. The mission then set up a follow-up cooperation plan that included emergency measures, such as the replacement of the main power supply switch system and the heat source equipment of the hospital and the installation of cables leading from the power generator in the MCH (Mother and Child Health) center to the hospital. From the standpoint of time and cost, it was decided that other restoration measures would be covered by a full-fledged grant aid project to be implemented later. This follow-up cooperation plan started in April 2002 and was completed in October 2002.

After the implementation of the follow-up cooperation project, the Pakistani government requested the Japanese government to provide grant aid to carry out a full-scale restoration plan formulated based on the follow-up survey and to establish future disaster prevention measures. A basic design study team, organized by the Japanese government and sent to the hospital in preparation for the implementation of the “Project for the Rehabilitation of the Children’s Hospital, Islamabad” and sent to the hospital, concluded that the project needed to be carried out because it would generate not only direct benefits, such as the repair of the damaged facilities, the restoration of safety and the prevention of recurring accidents, but also indirect benefits, such as the betterment of the environment for the children’s hospital and the restoration of the medical services and education functions of PIMS as a whole. The work related to this project started in March 2004 and was completed at the end of February 2005.

However, while it has been 20 years since the hospital was constructed, the number of operations has been rising along with an increasing number of patients accompanying the growth in the population and the expansion of the hospital’s services (annual total was 4,500 operations and the daily maximum was 30 operations in 2002), and these now exceed its functional capacity. In addition, the progress of medical technology has led the hospital to perform highly technical operations. Twenty years ago, there was no choice but to simultaneously conduct two operations in a single operating theatre due to the limited number of medical staff compared to the task at hand, posing the threat of hospital infections. However, now the hospital is required to achieve the current world standard “one table per operating theatre”. Furthermore, the rooms for post-operation recovery and the surgery waiting rooms are small, not well-equipped and not sufficiently hygienic, and there is not enough space available for doctor/nurse resting rooms and waiting rooms for the family members of the patients. Under these conditions, it is difficult for the hospital to provide proper medical services.

In addition, the aging 20-year old medical equipment currently used by the hospital is detrimental to the provision of proper medical treatment and services, requiring replacement to keep pace with the progress of medical science.

Against this background, the Government of Pakistan asked Japan for grant aid to expand and upgrade the hospital’s operating theatres, to improve its pediatric facilities, and to enhance its medical equipment and management resources.

CHAPTER 2

CONTENTS OF THE PROJECT

Chapter 2 Basic concept of the project

2-1 Outline of the Project

2-1-1 Project Purposes

Established in 1985 with the help of grant aid from Japan, the Islamabad Children's Hospital has been providing basic child healthcare services as a core pediatric institution in Pakistan and also functioning as a training facility for local medical practitioners. In addition, the hospital offers free medical services for the poor who account for 40% of the total number of patients in order to fulfill its responsibility as a public medical institution. However, the current situation is that along with the population growth in the northern part of the country (from 300,000 to 800,000 in Islamabad), it is becoming difficult for the hospital to handle the increasing number of patients (No. of patients: 250/day - 400/day; No. of operations: 6/day - 15/day) due to the inadequate facilities and equipment.

In particular, the hospital has only two operating theatres, forcing patients to wait in a long line to have their operation, for as long as 6 months in the longest cases, despite the fact that about 4,500 surgical operations are performed there every year with a daily maximum of 30 operations. In addition, each of these two operating theatres has two operating tables for simultaneous surgery on two different patients, posing the risk of hospital infections. This layout, which was common when the hospital was established 20 years ago, originally aimed to enable as many operations as possible to be carried out with the limited number of medical staff. However, now that highly advanced and risky surgical operations, such as brain surgery, are performed by the hospital, along with the improvement of the level of PIMS's medical technology as well as that a number of cutting edge medical studies point out the danger of hospital infections, the "one operating theatre, one operating table" principle must be adopted as a design policy for the hospital's operating theatres and in consideration of the fact that it is the current international standard.

Among the other obstacles preventing the hospital from offering effective medical services are the lack of sufficient medical equipment to deal with the increasing number of patients and the inadequate specifications of such medical hardware in the light of today's advanced level of medical technology, although most of it has been properly maintained by the mechanical engineering staff since the establishment of the hospital. Urgent action should be taken to address this problem as well.

Thus, the purpose of this project is to enhance the capability of the Operating Department of Islamabad Children's Hospital by adding three new operating theatres and by converting the existing operating theatres to "single table" ones, with the aim of eliminating the impediments to the hospital's provision of proper healthcare services arising from the inadequate and low quality of the operating theatres and medical equipment. If this project is put in place, the hospitals will have 5 operating theatres with 5 operating tables, instead of the current 2 with 4 tables. One of the three operating theatres to be added to the hospital under this project will be used for minor surgery that does not require overnight hospitalization, leading to the more effective use of the operating theatres in accordance with the duration and difficulty of the operation.

The project also aims to streamline non-surgical eye, ear, nose and throat treatment procedures. In addition, the project ensures that brain surgeons will continue to be dispatched from the headquarters hospital, and that the number of general surgery teams will be increased from three to four. Through these efforts, the number of operations in the hospital will be increased from the current level of approximately 4,500 per year, and the waiting period for patients in need of a surgery will be reduced from the current level of about 6 months. Moreover, the project has the objectives of preventing inter-patient infection during surgery by achieving the one-room-one-table principle for operating theatres and of improving various services for patients and their family members.

2-2 Basic Design of the requested Japanese assistance

2-2-1 Basic Policies

(1) Design policy

The facilities and equipment proposed in this project shall be designed according to the design policies stated below and established on the basis of the results of the on-site assessment of Pakistan's natural and social environments, construction and procurement conditions, circumstances related to the management, facilities and equipment of the existing children's hospital, maintenance and management capabilities, and the terms of the construction work as established by the grant aid arrangements.

Facilities

(1) The children's hospital and its Operating Department shall be designed to have the most appropriate composition and level of facilities and equipment in accordance with the functions required and the conditions for the activities.

(2) The extension building for the Operating Department shall be constructed in a way such that it is used in coordination with the existing facilities. The building materials and equipment shall be ones that can be maintained and managed by the present construction, electrical and mechanical engineers. Efforts shall be made to streamline the construction work and lower the costs through factory pre-finish and on-the-spot assembly (prefabrication methods) for the interior work of the operating theatres.

(3) The extension building shall be in conformity with the existing hospital’s buildings in terms of its structural design and interior/exterior materials in order to reduce extra operating costs after construction.

(4) This hospital shall be improved to resist rainfall as heavy as the torrential rains that occurred in July 2001.

(5) The construction plan shall be designed in such a way that it imposes the fewest restrictions on the operation of the hospital. For this purpose, the extension work shall be completed before starting the renovation work of the existing building where Operating Department to be transferred is currently located.

Equipment

(1) In choosing and procuring medical equipment, the hospital’s maintenance and management capabilities as well as the service provision status of local agencies shall be taken into consideration. Equipment to be installed in the extension building shall be

coordinated with that in the existing facilities in terms of its capabilities and functions.

(2) Design requirements

1) Details of the facilities

As long as two operating tables share one operating theatre, effective use of the tables will not be possible since a major operation requires the whole room and the duration of each operation is different. Infection during operations should also be of concern. If one theatre is limited to one table, however, it will be possible to use each theatre effectively, increase the number of operations per day, preventing infections and reducing the number of medical accidents. Consequently, PIMS requested that the number of operating theatres be increased and the number of operating tables per theatre should be limited to one. The total number of operating tables will increase from four to five.

Since the average number of operations per day is estimated to be 15 from the actual results so far, the average number of operations per table is 3.75 a day. If the number of operating tables increases to five, the average number of operations per day will increase to 18.75. Therefore, if a new table is used for day case surgery to reduce the number of patients waiting for operations, it will be possible to use the operating tables efficiently.

A surgical operation team generally consists of the surgeons, an anesthetist and the nurses. If the number of teams increases from three to four, the waiting period for operations will be reduced by one quarter, or shortened from six months to four and a half months. (Refer to the Figure 1)

If the number of operations per day is 18, it will be possible to perform major operations in the two existing theatres (two operations per day in each theatre), medium-level operations in the two new theatres (four operations per day in each theatre) and minor operations in other new theatre for day case surgery (six operations per day). Since it will be also possible to choose the most appropriate theatre according to type of operation, the quality of operations may improve. In addition, when a disaster occurs, it will be possible to perform 30 operations a day if six operations are carried out in each theatre. (Refer to the Figure 2)

Each of the existing theatres will be converted into a theatre usable for brain surgery, orthopedic surgery and other major operations that require a considerable amount of time, equipment and personnel. Therefore, the number of operating tables in each of the theatres will be reduced to one. Three general-purpose theatres will be constructed in the new building. Of these, one theatre will be used for day case surgery. This will allow more effective and efficient use of the five operating theatres.

The number of beds in the recovery room attached to each theatre can be calculated from the length of the operation and the number of operations per day. According to this calculation, one bed will be necessary for an operating theatre for major surgery, two beds for a medium level theatre and four beds for the theatre for day case surgery.

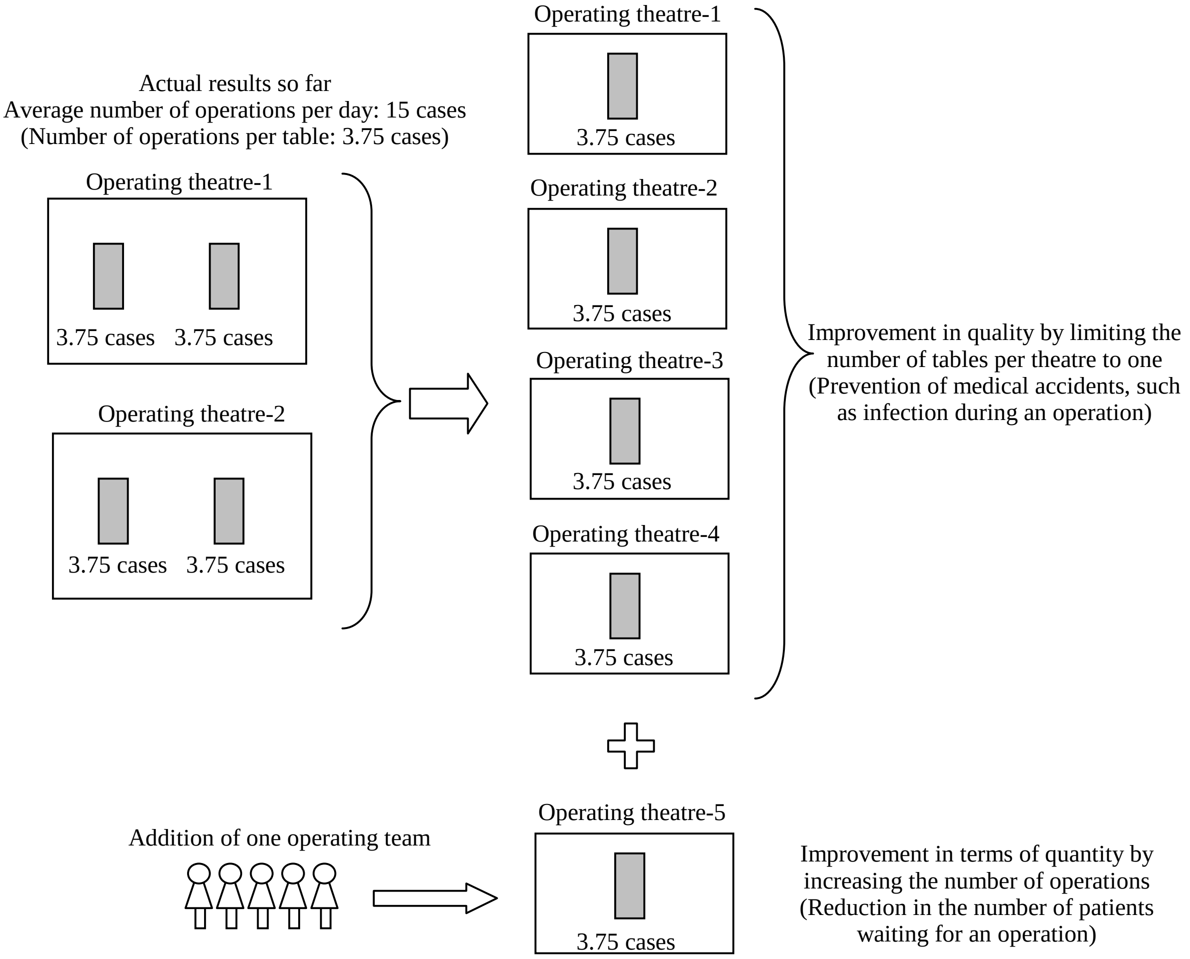


Figure 1 Improvement in the quality and quantity of operations

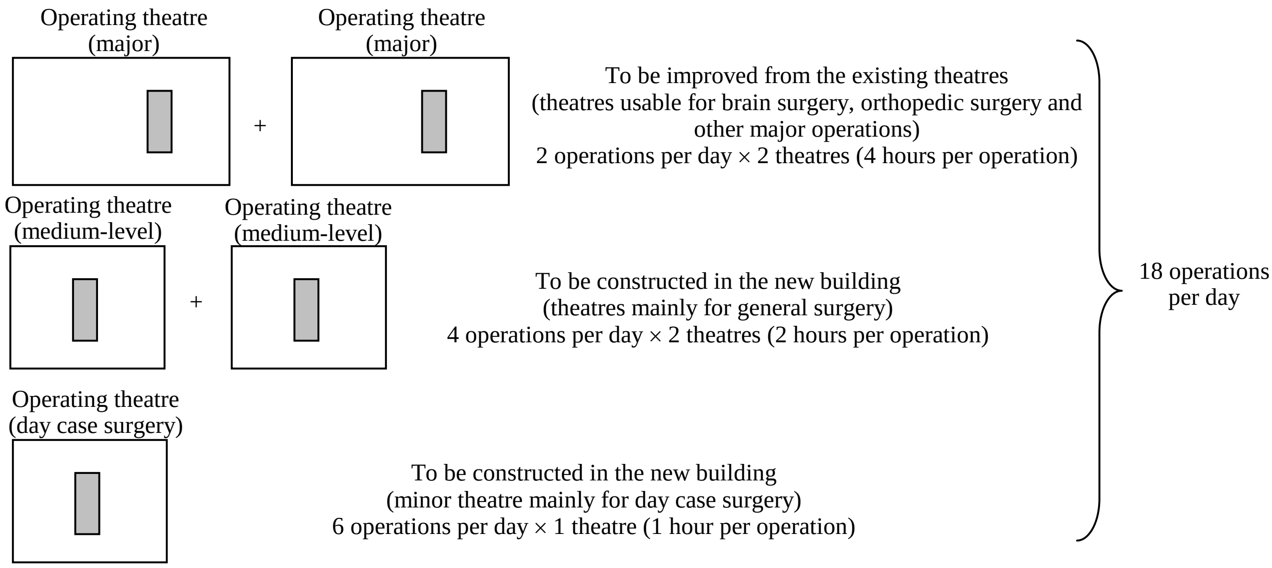


Figure 2 Use of the operating theatres by type

In addition, the operating department needs scrubbing rooms for the operations, a changing room and a rest room for women (female doctors and nurses), a changing room and a rest room for men (male doctors and anesthetists), a doctors' recording room, toilets, a shower room (only for men), a family waiting room, a briefing room and a plaster procedures room. In addition to these, the operating theatre for the day case surgery requires a reception counter, an exclusive waiting room, a consulting room and a soiled materials disposal and washing room.

Since the changing rooms and the rest rooms in the existing operating department are to be moved to the new building room for Muslims, the existing ones will be converted into an equipment storeroom, a prayer room for Muslims, a conference room and to provide space for the extension and improvement of the CSSD (Central Sterile Supply Department).

2) Determination of the size of the rooms

a) Operating theatre:
The standard size of an operating theatre is 6 m x 6 m. This size enables a consulting doctor, an assistant doctor, an anesthetist and nurses to take their proper positions and arrange the operating table and other equipment properly, due to the varied types of operation. The standard operating theatre in the MCH (Mother and Child Heath Centre) of PIMS is also 6 m × 6 m.

b) Recovery room:
The size of a recovery room is determined by the number of beds, the space for equipment and the flow lines of the staff. A space of about 8 m^2 is required for a bed. In addition to this, space for a nurse counter is also required.

c) Changing room:
The size of a changing room is determined by the number of users and the number of lockers. In the children's hospital, for safety and sanitation the staff members do not share a locker, and each one has their own locker. The number of lockers and the size of the room can be estimated from the present number of staff members and the additional number of staff members after the extension of the facilities.

Table 1 Staff deployment

Type of staff	Present number (persons)	Planned number after the extension (persons)
Doctors	12	20
Anesthetists	8	12
Nurses	10	16
Operation assistants	6	20
Total	36	68

The changing rooms are classified into those for doctors and anesthetists, those for female doctors and nurses, those for other male staff and for other female staff. The number of lockers in each room is as follows:

Table 2 Number of lockers installed

Type of staff	Number of staff members	Number of lockers (three locker unit)
Doctors and anesthetists	32	11 (for 33 persons)
Female doctors and nurses	16	6 (for 18 persons)
Other male staff	10	4 (for 12 persons)
Other female staff	10	4 (for 12 persons)

d) Rest room:
Rest rooms are divided in the same way as the locker rooms. An area of 2.5 m^2 per person is required, including space to place tables and sofas.

Doctors and anesthetists (32 persons) × 2.5 m^2 × 0.5-0.6 (rate of simultaneous use) = 40-48 m^2
Female doctors and nurses (16 persons) × 2.5 m^2 × 0.5-0.6 (rate of simultaneous use) = 20-24 m^2
Other male staff (10 persons) × 2.5 m^2 × 0.5-0.6 (rate of simultaneous use) = 12.5-15 m^2
Other female staff (10 persons) × 2.5 m^2 × 0.5-0.6 (rate of simultaneous use) = 12.5-15 m^2

e) Plaster Procedures Room:
A space of about 5 m × 6 m is necessary for a treatment table, a doctor and assistants, a mobile X-ray TV unit and the related equipment.

f) Family waiting room:
The number of families will be twice the total number of beds in the recovery room and operating theatres since each child is attended by two parents. The waiting room on the first floor requires a space of 30 m^2 for 20 persons from 10 families, estimated at 1.5 m^2 per person. The space for the waiting room for the day case surgery should be 15 m^2 since there are four beds in the recovery room and five patients are likely to be accompanied by their parents (a total of ten persons). The total area should be 24 m^2 since there should also be space for the reception counter and the entrance.

g) Consulting room:
A space of about 3 m × 4 m (12 m^2) is necessary for an examination couch, a doctor, nurses and the patient.

h) CSSD (Central Sterile Supply Department):
The space is determined from the present conditions for the equipment, the working space and the stock area and the additional space requires an additional 10% of the existing area due to the extension of the whole Operating Department.

i) Conference room:
A meeting of 12 persons requires a space of about 18 m^2 (12 × 1.5 m^2 per person).

2-2-2 Basic plan (facilities plan / equipment plan)

(1) Site and facilities arrangement plan

1) Site selection

As the site for the new building, PIMS proposed a court-like space surrounded by the central clinical block, the west ward (surgical ward located on the 1st floor), the isolation ward and a connecting corridor. In this space stands a temporary canteen that sells food and drinks with chairs and tables set outdoors.

To the east of the space lies the dry area (a vacant moat for the underground parking lot and the machinery room), and to the west lies a rainwater drainpipe (with a diameter of 900 mm). Therefore, it is possible to undertake construction in a space with a length of about 15 m between the west ward and the medical treatment centre and a width of about 25 m between the dry area and the drainpipe.

Since the Surgical Department requires enlargement of the existing Operating Department and connection between the Operating Department and the surgical ward, it is necessary to construct the new building close to both the Operating Department and the surgical ward. Although there are other lots that are appropriate in terms of space, the selected lot is the most appropriate since it is close to the surgical ward, the Operating Department, the ICU and the CSSD.

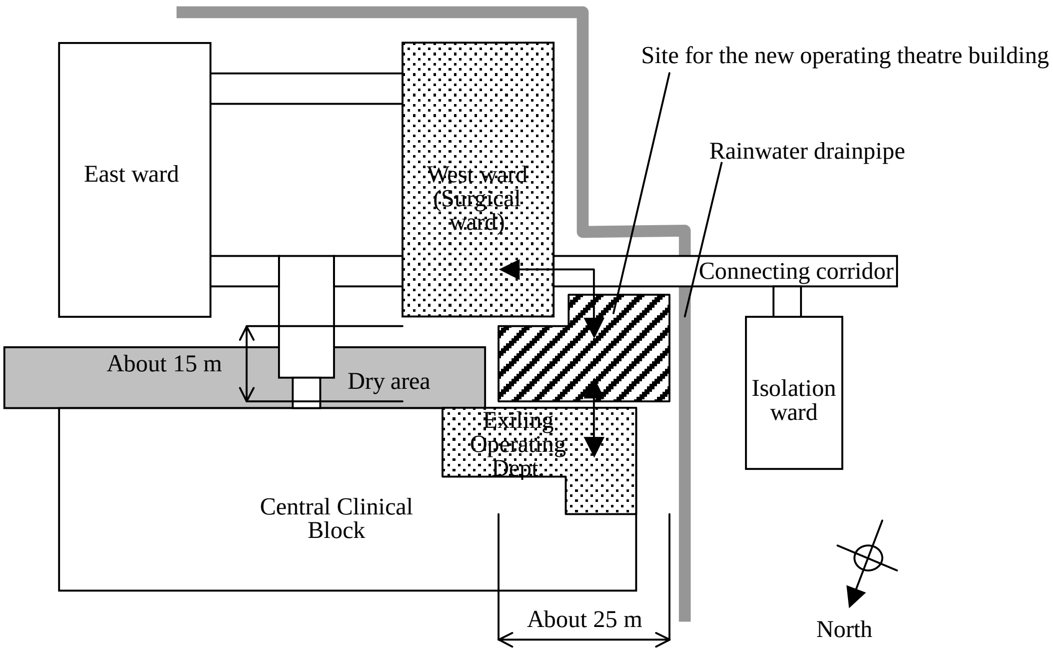


Figure 3 Site proposed for the new building

2) Ground conditions

According to the survey conducted when the children's hospital was constructed, the proposed site is in comparatively good condition. However, since the foundations of the Central Clinical Block and the west building were constructed as open-cut, the surroundings of the existing buildings were basically refilled with earth, with the result that the existing ground is not so strong. This time, a boring survey was conducted mainly in the area surrounding the existing buildings, including the depth of the earth for refill. As a result, it was found that the surrounding area is strong enough, except for a part near the slope of the dry area, which requires the placement of concrete under the foundations.

3) Underground obstacles

Under the site for the new building lie electric power cables to the children's hospital and a concrete water tank for the cooling tower. They were constructed by Pakistan during the construction of the buildings and thereafter, respectively. It is necessary to change the route of the cables and remove the tank before the construction of the new building.

In addition, the medical oxygen pipe and the fuel gas pipe to the MCH (Mother and Child Heath Centre) have been laid on the roof of the connecting corridor from the PIMS general hospital, both of which were installed by Pakistan. If a passage connecting the new building with the surgical building is constructed above the corridor, it will be necessary to change the route of the pipes.

It was agreed that Pakistan would carry out the above-mentioned removal and route changes before the commencement of construction by Japan. This agreement was recorded in the minutes of discussions during the survey.

On the other hand, between the Central Clinical Block and the Isolation Ward lies a trench pit that contains the main power cable and the pipes for water supply, hot-water supply, steam, cold water and medical gas. These were installed by Japan during the construction of the children's hospital. Since they are difficult to move to the outside area of the construction site, it is necessary to temporarily change their route while carrying out the construction.

Given the above-mentioned conditions, it is considered that the proposed site is suitable since it has ground that is strong enough for the planned construction and the site can be functionally connected to the existing facilities and harmonized with them as part of the medical services.

4) Facilities arrangement plan

Given the scale of the extension and its purpose (to improve the Operating Department's functions), the construction of only one building will be sufficient. In addition, since it is necessary to connect the existing Operating Department with the surgical ward and because the site is narrow, there are restrictions as to where the building can be constructed. On the ground floor, it is necessary to establish an entrance for the day case surgery, making it front onto a road on the premises.

(2) Construction plan

1) Floor plan

Access to the Operating Department should be shifted to the west ward since the present access route from the central clinic block is congested with staff members who come and go between the existing Operating Department and the sterilization supply centre, together with the outpatients and their families. Since the existing NICU and PICU will be used as they are, the new operating theatres should be constructed close to the existing operating theatres. This also applies to the recovery rooms. The rest rooms, the changing rooms and the family waiting room should be constructed along the new access. As a result, the inside flow line between the existing building and the new building will be established through the central corridor, and each room will face the central corridor. This floor plan can be considered to be functional.

Concerning the improvements in the existing facilities, it is necessary to return to the original design, since the disorderly conversion and extension of the Operating Department due to the increase in the number of operations and staff members have brought about a breakdown of the boundary between the clean area and unclean area in the Operating Department and CSSD, resulting in non-compliance with the basics of medical services.

Concerning access to the day case surgery, it is reasonable to set up an entrance on the western side that faces a road on the premises, and construct a waiting room, a reception counter, a consulting room and a recovery room behind the entrance. Construction of the operating theatre and the plaster procedures room further behind the entrance is necessary to maintain hygienic conditions.

2) Cross-sectional plan

To ensure efficient medical treatment and management, the operating theatres for the inpatients should be separate from the theatre for the day case surgery, and the reception, consultation, operation and accounting should be divided accordingly. The heights of the stories should be matched with those of the existing facilities. Since the surgical ward (1st floor of the west ward) is 50 cm lower than the existing operating department, a slope will be necessary.

3) Elevation plan

When the existing hospital was designed 20 years ago, the design of the PIMS hospital and designs for Islamic buildings were adopted. This precedent should be followed so that the new building harmonizes with the existing children’s hospital in form and color. Moreover, since the summer heat is severe, sunshades and other measures to provide insulation should be provided.

(3) Structural plan

1) Ground conditions of the planned construction site and the foundation structure plan

Ground surveys were conducted at five points before the existing buildings were constructed. For this project, additional surveys at three points were consigned to and carried out by the University of Engineering and Technology, Taxila. The former surveys indicated a similar ground structure at all five points, as shown below.

0.00 – 2.50 m: slightly loose silty clay
2.50 – 6.00 m: slightly solid, reddish silty clay
6.00 – 7.50 m: slightly solid, reddish silty clay
7.50 – 10.00 m: solid silty clay

One survey point showed a groundwater level of GL-9.4 m, and another point GL-9.6 m. The other three points showed a level of GL-10 m. No sump water was found. The findings above and the results of excavation at the current site of construction work have led to the judgment that no special treatment is required for groundwater.

The latter survey has produced almost the same results as the former borings. However, less than 35 KN/m^2 (3.5 t/m^2) of bearing capacity of the soil has been recommended for the design since the planned construction site lies adjacent to a particularly steep slope. If the slope had no effect on the ground, it would have around 100 KN/m^2 (100 t/m^2) of bearing capacity. It is desirable, therefore, that blinding concrete be placed over the frame bases near the slope so that the bases supporting the weight of the building have sufficient depth to resist any impact of the slope.

Based on the above, the bases will have the structure of a spread foundation, in principle. Blinding concrete will also be used for the bases built near the slope.

2) Structural plan of the upper structure

The building constructed under this project is a low-rise one, with two floors plus a one floor rooftop machine room. The structure will thus be composed of ferroconcrete pillars and beams, with earthquake resistant walls arranged in a balanced manner. The exterior and interior walls, other than the earthquake resistant walls, will be made of brick, which is a material commonly used for local buildings.

3) Loading

Loads and external forces shall be assumed for this project as shown below in consideration of the local weather and geography as well as the use of the building.

a) Fixed loading
will be estimated on the basis of each finishing or structural material.

b) Wind loading
will be estimated in accordance with the regulations of Pakistan.

c) Live loading
will be estimated principally as specified below in accordance with the regulations of Pakistan and Japan:

Table 3 Live loading

Use	Live loading on the floors
Consultation, treatment, recovery and office room	2900 N/m^2
Operating theatre	4000 N/m^2
Machine room	5000 N/m^2
Roof	1800 N/m^2

d) Earthquake loading
will be estimated on the basis of the earthquake zoning map of Pakistan as shown below.

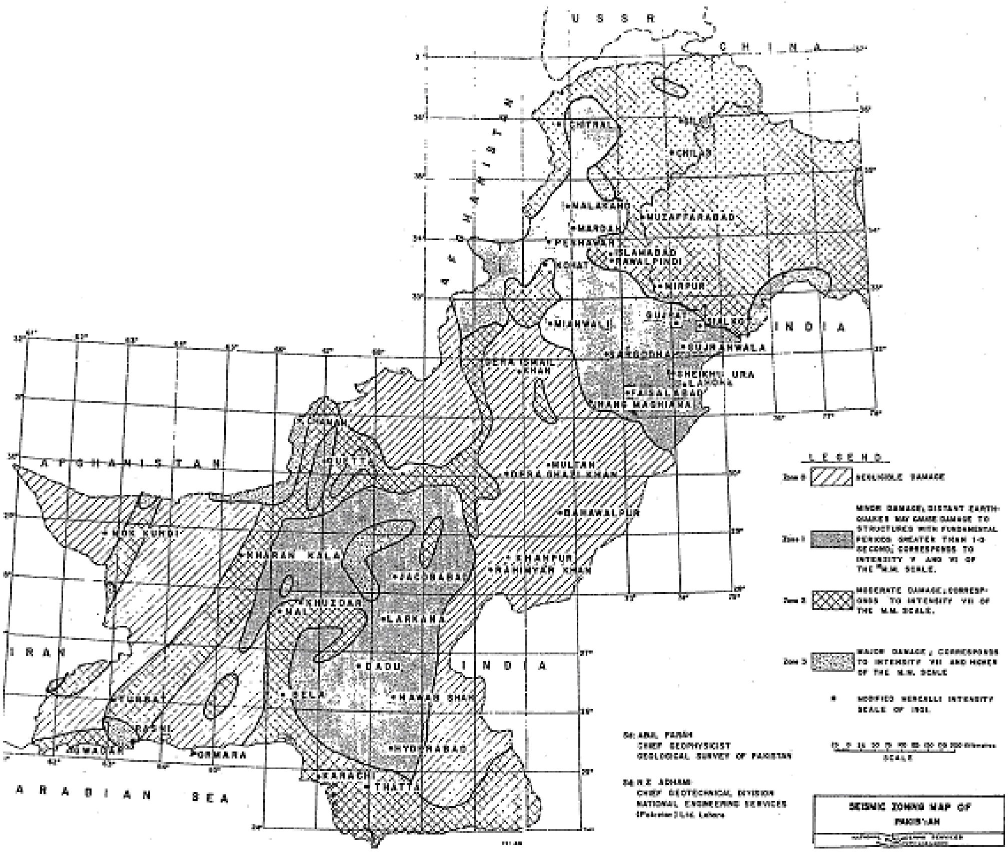


Figure 4 Earthquake zoning map

According to the Building Code of Pakistan (1986), the earthquake shearing force (V) is expressed in the formula below:

$V = Z \times I \times K \times C \times S \times W$

Z=location factor: the constant of Zone 2, where Islamabad is located, is 3/8=0.375

I = importance factor 1.25

K = horizontal force factor 1.0

C = horizontal seismic coefficient $C = 1/15\sqrt{T}$ $T = 0.10 \times N = 0.1 \times 2$ (layer) = 0.2

$\therefore C = 1/15\sqrt{0.2} = 0.149$ As C is 0.12 or less here, C = 0.12 is applied.

S = 1.0

W = seismic loading on the building

The earthquake shearing force for designing at the ground floor of the building, therefore, is expressed as:

$V = Z \times I \times K \times C \times S \times W = 0.375 \times 1.25 \times 1.0 \times 0.12 \times 1.0 \times W = 0.05625 \times W$

For the existing buildings, however, the earthquake shearing force for designing (Qi) was calculated using the formula below:

$Qi = Z \times Ai \times Rt \times Co \times W$

Z = location factor, 0.5
Ai = amplification factor for the lengthwise direction of the building
1.0 at the ground floor
Rt = oscillatory characterization factor, 1.0
Co = standard shearing force, 0.2
W = seismic loading on the building
The earthquake shearing force for designing at the ground floor of the building, therefore, was expressed as:
$Q1 = 0.5 \times 1.0 \times 1.0 \times 0.2 \times W = 0.1 \times W$

The ratio of the earthquake shearing force for designing at the ground floor level of the building calculated according to the Building Code of Pakistan 1986 and that of the existing buildings, which was calculated as stated above, is:
$Q1 / V = 0.1 \times W / 0.05625 \times W = 1.77 > 1$

In March 2002, when a magnitude 5.4 earthquake occurred near Islamabad, buildings around the children's hospital were severely damaged, while little damage was found in the hospital building. This fact demonstrated that the structures designed by Japan effectively functioned then to resist the earthquake.

The earthquake shearing force for designing applied to the existing buildings shall therefore be adopted for the structures designed for this extension work.

e) Materials used
Concrete: design strength Fc = 21 N/mm^2
Iron reinforcing bar: yield strength 345 N/mm^2, 295 N/mm^2

(4) Electrical facility plan

1) Plan for New building

a) Power supply
The children's hospital, hereinafter referred to as the existing building, is supplied with electric power from the PIMS substation through a three-phase four-wire system at the low voltage of 400v/230v. The new building will be supplied with electric power from the electricity room of the existing building for normal and emergency lighting and power, and an automatic voltage regulator (AVR).

As the maximum demand for electric power ever recorded in the existing building is around 355 kW, the 500 kVA capacity of their power receiving system is still high enough to meet the additional 94 kW of electricity demand estimated for the new building.

Medical equipment that requires a power source capable of providing electricity with limited voltage variation is supplied through the AVR. Assessment of the power demand through the existing AVR has shown that it has excess capacity since some of the items of equipment, such as dialysis machines, are out of use. AVR-regulated electricity shall therefore be supplied to the new building through the existing AVR (100 kVA).

Table 4 Estimated demand

Type of load	Load capacity (kW/kVA)	Demand factor (%)	Demand (kW)
Lighting	22.6 (23 W × 982 m^2)	60	13.7
Receptacles	27.5 (28 W × 982 m^2)	50	13.8
Elevators	4.5	0	0
Air conditioners	78	70	54.6
Pumps	3	20	1.8
Operating theatres	15 (5 kVA × 3)	70	10.5
		Total	94.4

Table 5 Estimated AVR capacity

	Room	Equipment loading AVR	Load capacity (kVA)
Existing building (existing equipment)	ICU	Isolation transformer 5 kVA × 6	30
	NICU	Isolation transformer 5 kVA × 7	35
	Emergency OT	Isolation transformer 5 kVA × 1	5
	OT-3	Isolation transformer 5 kVA × 2	10
	OT-4	Isolation transformer 5 kVA × 2	10
	Pathology test	Testing tools	18
	Dialysis	Dialysis machines 12 kVA → 0 kVA (out of operation)	0
New building	OT-1	Isolation transformer 5 kVA × 1	5
	OT-2	Isolation transformer 5 kVA × 1	5
	OT-5	Isolation transformer 5 kVA × 1	5
		Total	123
123 kVA × 0.8 (demand factor) = 98.4 kVA → Existing AVR 100 kVA is also used to supply electricity load to the extension building.			

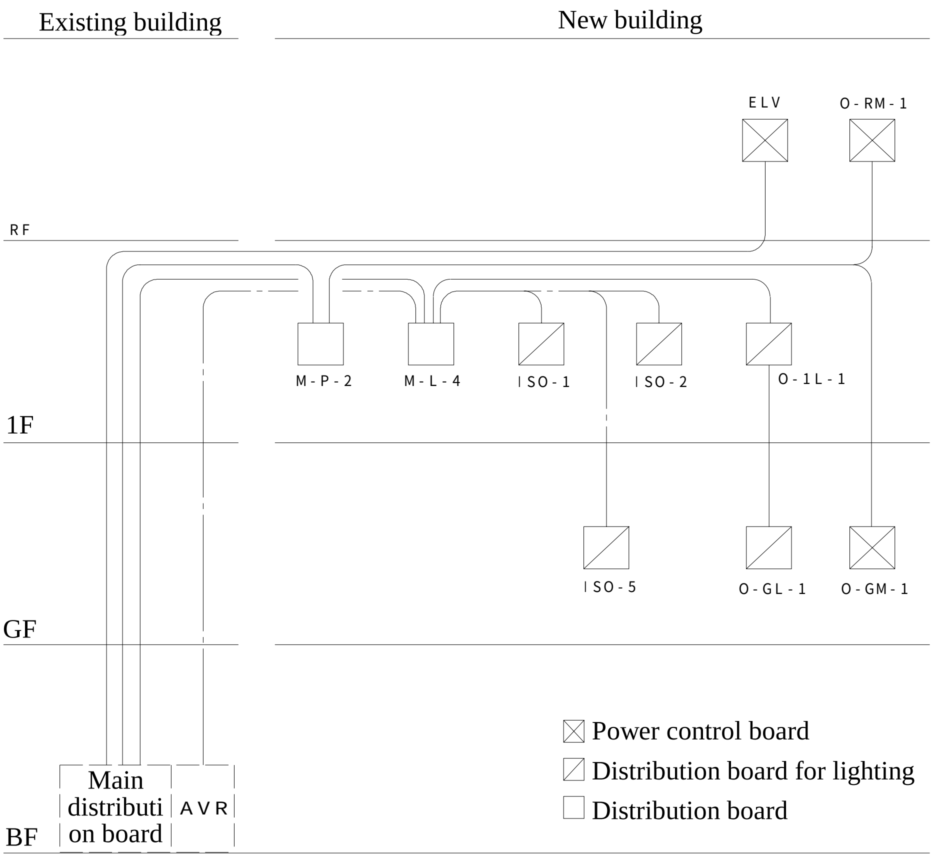


Figure 5 Main feeder lines diagram

b) Lighting and receptacle system

For the existing building, illuminance was designed with reference to JIS. For the new building, it will be designed taking into consideration the present conditions of the existing building. The light sources will be fluorescent lights since they have a higher efficiency.

The receptacle will be equipped with round 2-pin receptacles, either with or without an earth terminal, as these are still common in Pakistan. The receptacle arrangement in each room will be determined on the basis of the number of receptacles required in the room and the arrangement plan for the medical equipment installed there.

Table 6 Illuminance in each room (general lighting)

Room	JIS illuminance (l ×)	Illuminance adopted for designing (l ×)	Illuminance planned for the existing building (l ×)
Operating theatre	750 – 1500	1000	1000
Preparation / recovery room	75 – 150	150	150
Soiled materials disposal room (subject to the standards for a sterilizing room)	100 – 200	100	100
Sterilization room	100 – 200	100	100
Scrub / preparation room (subject to the same standards as the sterilization room)	100 – 200	100	100
Changing / rest room	75 – 150	150	150
Doctor recording / rest room	150 – 300	300	300
Reception room	150 – 300	150	150
Consultation room	300 – 750	300	300
Waiting room	150 – 300	150	150
Corridor (subject to the same standards as the outpatient ward)	150 – 300	150	150
Plaster procedures room	300 – 750	300	300
Conference room	150 – 300	150	150
Toilet	75 – 150	75	75
Storage	100 – 200	100	100
Prayer room	100 – 200	100	–
Machine room	100 – 200	100	100

c) Public address system
The existing building has an amplifier for the emergency public address system installed in an office. As it has no spare lines, existing lines will be extended to the new building.

d) Telephone system
The existing building has, in the telephone exchange room, a telephone switchboard with 50 incoming and 335 extension numbers. As it has no spare lines, a board with 8 extension numbers will be added to connect the lines to the new building. Telephone extensions will be installed at each staff station and the doctors' recording and rest room.

e) Clock system
In the existing building, signals are sent from a main clock. Under this project, the operating theatres will be equipped with a clock with analog-digital operation on AC power.

f) Television system
In the existing building, each building has a TV antenna. Under this project, TV terminals will be installed in the waiting rooms and a TV antenna installed on the roof.

g) Intercom system
The existing building has an intercom system in the Operating Department. Under this project, the system will also be installed at nurse counters and in

the operating theatre to connect them with the existing Operating Department, PICU, NICU and emergency operating theatre.

h) Nursing call system
The existing building has an intercom system, instead of a nursing call system. Under this project, nurse counters and each bed in the recovery rooms will be connected to the nursing call system, which will not have voice communication functions.

i) Fire alarm system
The existing building has a P-type receiver with 50 lines in an office. Its spare lines will be used for the additional building. Fire detectors installed there will be those made in Japan since they must be the same type as the fire detectors installed in the existing building.

2) Renovation work for the existing building

Facilities will be installed according to the renovation work for the existing building.

At IPCU, NICU and the emergency operating theatre, the intercom system for communications in the Operating Department will be replaced with a new one to connect them to the new building of the Operating Department.

3) Temporary shifting for underground buried cables

Cables coming in from the PIMS substation will be re-laid temporarily. Permanent cables will be laid so that they can detour around the new building. The temporary cables will be laid by the Pakistani side. The main feeder line cables in trenches will also be re-laid temporarily, and permanent cables will be laid in pits constructed in the underground frames of the new building.

(5) Mechanical facilities plan

1) Plan for the new building

a) Water supply
The existing building is supplied with water from the water tower of PIMS. As water supply conditions are poor, the supply is often cut off. A water-receiving tank will therefore be installed to secure a stable supply even when the water is cut off. Water will be supplied to the tank from a branch pipe coming from a trunk pipe laid within the premises.

Water quality analysis has shown that the source water must be softened and sterilized. On the rooftop of the extension building, water softeners, sterilizers, and rooftop water tanks will be installed to supply water, which will be delivered to the floors by gravity feed.

The reservoir will be a concrete tank laid in a pit under the ground floor. The elevated water tanks, where the treated water is stored, will be FRP panel tanks, which allow inspection of all six sides as required for hygiene control. The water supply flow is shown below:

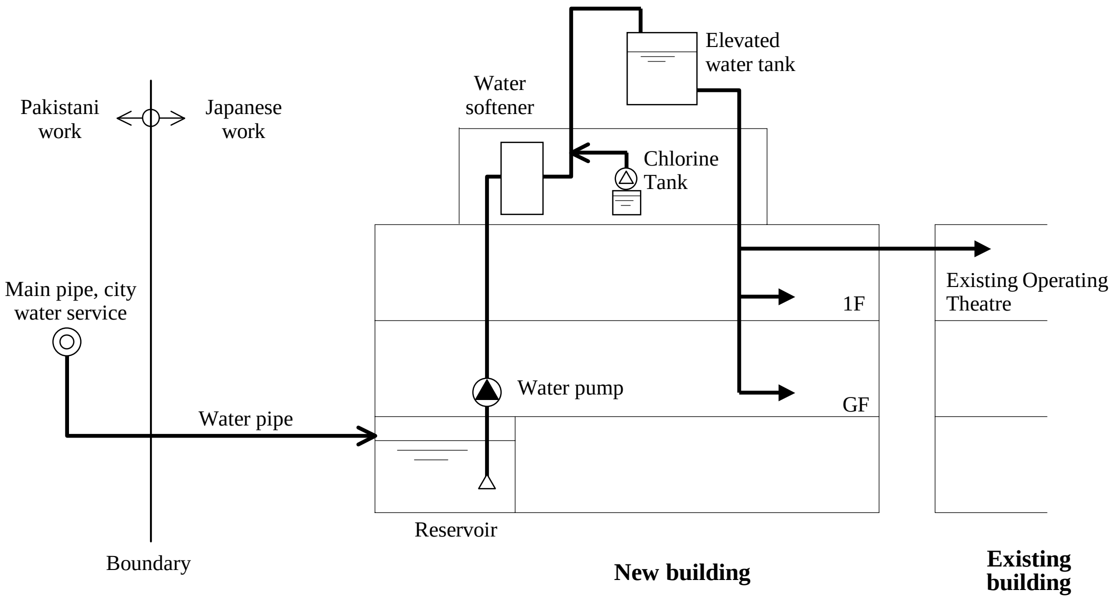


Figure 6 Water flow

b) Sewerage
The existing sewerage equipment will be used. General wastewater will be discharged to nearby catch basins (sewerage trunk pipes). Laboratory testing discharges and infectious wastewater will be neutralized and sterilized in the existing wastewater treatment plant, and then discharged to the general wastewater pipes. Rainwater will be discharged to the nearby existing trunk stormwater drains. The flow of sewerage is shown below:

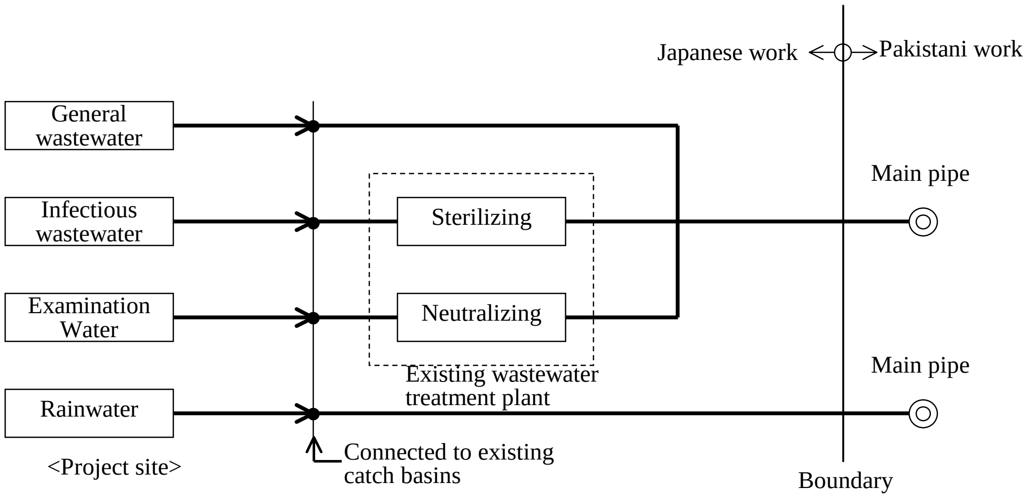


Figure 7 Sewerage flow

c) Hot water supply
In the existing building, a central supply system has been installed, and hot water tanks are located in the underground machine room. Under this project, hot water will be supplied exclusively to the hand washing equipment in the operating theatres and syringing, plaster cast, shower and other rooms. For water quality control, hot water will be supplied through a local supply system that warms up the water delivered from the operating building using gas heaters.

d) Sanitary fixtures
An Asian-style water closet is commonly used. For hygiene control, all the water closets installed in the new building will be Western-style ones. Sanitary fixtures, except for special sinks, will be local products for easier maintenance and management.

e) Gas installations
Utility gas will be supplied to the water heating rooms and water heaters. The gas pipes will be connected to the PIMS trunk pipes feeding into the existing boiler room.

f) Fire prevention system
The existing building has indoor hydrants. As the new building has a special nature as operating theatres, the fire prevention system will be dry chemical extinguishers, which are more suitable for preventing secondary disasters caused by water, ensuring the safety of the patients and saving their lives.

g) Medical gases
As is the case with the existing building, the operation theatre, recovery and plaster procedures room will be equipped with oxygen, nitrous oxide gas, and suction and compressed air equipment. Oxygen is supplied from the liquified oxygen tanks of PIMS. Under this project, as the consumption of nitrous oxide gas and suction and compressed air is low, a sufficient supply can be provided by branch pipes.

h) Air conditioning
The new building consists of the operating theatres and related rooms. These must be air-conditioned 24 hours a day. The existing building has a central heating system, which consists of gas steam boilers and absorption type chillers. The boilers and chillers installed there do not have sufficient capacity to supply energy to the new building. If a new large heat source is installed in the new building for air conditioning, the cost will be considerable. Electrical air conditioning units will therefore be adopted. Assessment of local products indicates that the performance is adequate and they are unlikely to cause any trouble for the maintenance and management system.

i) Ventilation
Ventilation equipment will be installed in the laboratories, storage, mechanical rooms and other rooms where equipment installation is required under this project.

2) Renovation work for the existing building

To comply with the construction plan, the pipes for water supply, sewerage and air conditioning are to be repaired. As large a proportion as possible of the existing pipes and ducts will be reused.

3) Temporary shifting of the underground buried pipes

Energy supply pipes have been laid in trench pits from the central block to the isolation ward. Before the construction work, the pipes will be re-laid temporarily, and after the completion of the extension work, they will be laid in pits constructed in the underground frames, as is the case for electrical equipment.

4) Repair of the existing wastewater treatment plant

The wastewater treatment plant has been out of order due to aging and damage from the torrential downpour. Testing and contaminated wastewater is now discharged without any treatment into rain drains, which is causing damage to the environment.

In order to avoid this environmental damage, the water treatment plant will be repaired. As the construction part of the treatment plant is still available, only the pumps and control panels will be renewed.

(6) Construction materials plan

1) Basic policy

Policies have been established, as stated below, in accordance with the design policy of this project taking into consideration the climate, natural and construction conditions of the construction site in Islamabad, the period, costs, maintenance and management of the children's hospital and the system of maintenance and management:

a) Local materials shall be procured, as far as possible, to ensure lower construction costs and a shorter work period;

b) Materials shall be suitable for the climate and natural conditions of Islamabad, highly weather-resistant, and easy to maintain and manage to ensure lower maintenance and management costs;

c) Materials shall match the design and materials of the existing building to avoid an uncoordinated appearance;

d) Materials used indoors shall have high performance levels for sanitary control and durability since they are to be used for the extended and repaired sections of the Operating Department; and

e) The quality of the materials shall be sufficiently high such that they can be used for the Operating Department.

2) Materials

In accordance with this basic policy, the materials described below have been adopted for this project:

a) Structural materials
As is the case for the existing building, the building frames will be constructed using ferroconcrete and the walls of brick since they are commonly used in Pakistan. For the concrete, sand, coarse aggregate and cement are all easily obtained at the site. However, as freshly mixed concrete is unavailable, concrete must be produced using mixers at the site. The quantity of concrete produced at one time will therefore be limited. Although reinforcing bars can also be easily obtained, shipment from Japan should be considered since the price is rising due to the recent tightness of global iron supplies.

b) Outer finishing materials
The outer walls will be constructed with a combination of concrete mortar, finishing with weather resistant paint and dressed bricks. These materials are all easy to maintain and manage and are highly weather-resistant.

c) Roofing materials:
The roof will be constructed of concrete slabs waterproofed with asphalt, heat-resistant bricks will also be laid over the slabs, as is the case with the existing building. This local method will be adopted since in summer the temperature is 40℃ or higher. Waterproof materials, made and procured in Japan 20 years ago, are still preventing water leakage. Japanese waterproofing materials will also be used for this project since their high performance is suitable for the roofs of the Operating Department wards, the quality is assured, and they will match the materials of the existing building.

d) Doors and windows
Aluminium sashes made in Japan will be used for the exterior doors and windows since high performance is required to ensure sufficient air-tightness, water-tightness and weather resistance. Steel doors made in Japan will be used for the major areas of fire control and for hygiene purposes. Locally made wooden products will be used for the other areas.

e) Floor finishing
The floors of hygiene maintenance areas such as operating theatres and recovery rooms will be covered with long sheets of polyvinyl chloride flooring material, as is used in the existing building, for hygiene control. The floors of the cleaning room, lavatories and plaster cast rooms will be covered with locally made ceramic tiles since water is used in these rooms. The floors of the waiting room, outside of the hygiene maintenance areas, will be covered with Terrazzo tiles. The floors of the repaired sections will be covered with the same long sheets of polyvinyl chloride flooring material as

those used originally, in principle.

f) Wall finishing
Walls other than those of the areas mentioned above will be mortared and painted. The walls of the rooms in which water is used will be covered with ceramic tiles. The floors of the operating theatres will be covered with pre-engineered panels.

g) Ceilings:
The ceilings, except for those of the operating theatres where maintenance will be required, will be finished with a removable latticework ceiling, which is commonly called a China Ceiling, and will be finished with painted cement panels for the other areas. The ceilings of the operating theatres will be finished with removable metal panels for airproofing purposes.

Table 7 Plan for major materials

<table>
<tr><td colspan="2">Structure</td><td colspan="4">Ferroconcrete</td></tr>
<tr><td colspan="2">Floor height</td><td colspan="4">Ground: 4.1 m, 1st: 4.1 m</td></tr>
<tr><td rowspan="5">Exterior finishing</td><td>Rooftop</td><td colspan="4">Waterproof insulated asphalt covered with heat-resistant bricks</td></tr>
<tr><td>Entrance eaves</td><td colspan="4">Concrete/mortal finish, resin spray coating</td></tr>
<tr><td>Exterior walls</td><td colspan="4">Concrete/mortal finish, resin spray coating, dressed bricks</td></tr>
<tr><td>Windows
Doors</td><td colspan="4">Aluminium sash, tinted glass
Steel doors</td></tr>
<tr><td>Exterior floors</td><td colspan="4">Dressed brick</td></tr>
<tr><td rowspan="9">Interior finishing</td><td>Room</td><td>Floor</td><td>Walls</td><td>Ceiling</td><td>Ceiling height</td></tr>
<tr><td>Operating</td><td>Long sheets of polyvinyl chloride flooring</td><td>Glazed calcium silicate panels</td><td>Steel panels</td><td>2,700</td></tr>
<tr><td>Recovery</td><td>Long sheets of polyvinyl chloride flooring</td><td>Mortared, EP finish</td><td>Removable latticework</td><td>3,000</td></tr>
<tr><td>Plaster casting</td><td>Ceramic tiles</td><td>Ceramic tiles</td><td>Removable latticework</td><td>2,600</td></tr>
<tr><td>Waiting</td><td>Terrazzo tiles</td><td>Mortared, EP finish</td><td>Removable latticework</td><td>2,600</td></tr>
<tr><td>Lounge</td><td>Ceramic tiles</td><td>Mortared, EP finish</td><td>Removable latticework</td><td>2,600</td></tr>
<tr><td>Sterilizing</td><td>Long sheets of polyvinyl chloride flooring</td><td>Mortared, EP finish</td><td>Removable latticework</td><td>2,600</td></tr>
<tr><td>Lavatory</td><td>Ceramic tiles</td><td>Ceramic tiles</td><td>Cement panels, VP</td><td>2,600</td></tr>
<tr><td>Corridor</td><td>Long sheets of polyvinyl chloride flooring</td><td>Mortared, EP finish</td><td>Removable latticework</td><td>2,600</td></tr>
</table>

EP: Emulsion-paint
VP: Vinyl-paint

(7) Equipment plan

Based on the design policy, the selection of equipment will mainly be carried out in order to renew aging equipment and make up for the deficiencies in each section.

1) Radiology section

More than 20 years have already passed since almost all existing equipment was introduced using equipment available at the time the diagnosis and treatment service of this hospital began. The decline in the quality of the photographic images of the X-ray unit and ultrasound scanner has been significant and the equipment is obsolete. This diagnosis equipment is indispensable for the basic diagnostic services in the hospital and so qualitative improvements are required immediately.

The present situation of diagnostic activity is as follows. In addition, a qualitative, as well as quantitative improvement in diagnosis is expected in the execution of this project. The equipment listed in Table 3-9 is planned to be renewed in this project.

Table 8 Activity situation

Content of the diagnosis	Activity situation
X-ray unit w/TV system	4 patients/day
X-ray unit	35 patients/day
Mobile x-ray unit	NICU / PICU 10 patients/day General ward 15 - 20 patients/day
Ultrasound	12 - 15 patients

2) Central clinical laboratory

As for the current clinical laboratory, each examination is executed by a 24-hour service in the general outpatient building. The clinical laboratory in the central examination building stopped for a while but a policy of managing it again has been decided on with an emergency inspection room and preparations are advancing. Meanwhile, the clinical laboratory section in the Children’s Hospital is cooperating to provide some of the clinical examinations in the adjoining mother and child hospital.

Blood cell analyzer, Bio-chemistry analyzer, Microscope, and the blood gas analyzer, etc. are requested for this cooperation project.

3) Neonatal intensive care unit (NICU):

This unit officially has 12 alcoves and it is managed by adopting a three-shift system. The unit is always full and the beds are shared is situations of near 100% occupancy as noted in the investigation.

Many of the incubators have been in use since the hospital opened. Upgrading of these is also therefore required urgently. The expansion of the neonatal intensive care unit is being planned now under an original hospital budget.

The main diseases or condition of the patients in this section are as follows.

Table 9 Patient's main disease in NICU

Disease or condition		Proportion
(1)	Prematurely born babies of low weight birth	Approx. 25%
(2)	Septicemia	Approx. 25%
(3)	Prognosis after an operation/Abnormality	Approx. 15%
(4)	Meconium aspiration syndrome	Approx. 6 – 7%
(5)	Apparent death at birth	Approx. 5%

The requirements are for such equipment as ventilators, phototherapy units, incubators, and syringe pumps for the neonatal intensive care unit.

4) Pediatric intensive care unit (PICU)

This unit officially has 12 beds (Breakdown 10 beds + Burn 2 beds) and it is managed by adopting a three-shift system. When the hospital opened there was one patient monitor assigned to each bed, and, at first, the system enabled the doctor and nurses to observe the patients from a central monitor.

The monitors still function normally but are now rather obsolete. The patient turnover here is 55-65 patients/month. The main diseases or condition of the patients are as follows.

Table 10 Patient's main disease in PICU

Disease or condition		Proportion
(1)	Traffic accidents	Approx.45%
(2)	Pneumonia	Approx.20 – 25%
(3)	Prognosis after an operation and abnormalities, Burns, etc.	Approx.10 – 15%
(4)	Septicemia	Approx.10%
(5)	Kidney disorders and dialysis treatment	Approx.1 – 5%

The requirements are for such equipment as patient monitors, ventilators, and syringe pumps for the pediatric intensive care unit.

5) Operating theatres

The existing operating theatres are already equipped with operation lights, operating tables, electrosurgical units, anesthesia apparatus, patient monitors, fiberscopes, incubators, and infant warmers, etc. Most of these systems have become aged and the deterioration in their functionality is significant.

The renewal of the equipment that is required as the main equipment used in the new operating building is of extremely high priority under this cooperation project since the existing operating theatres have become dilapidated. The average number of operations in 2000- 2003 was 4,299.

6) Special outpatient department

Patients from the general outpatient department whose diagnosis and treatment have been assessed by a doctor as being more urgent or necessary receive treatment in the special outpatient department established in the main building.

Special sections that relate to the special outpatients department include the otorhinolaryngology, dental, ophthalmology, and rehabilitation units.

a) Otorhinolaryngology
It is obvious that most of the existing equipment has deteriorated due to age. Still, the treatment unit for otorhinolaryngology, etc. can continue to be used with thorough maintenance performed by a biomedical engineer. The average number of outpatients a year in the period 2000-2003 was about 6,652 people. for an ultrasonic nebulizer from the otorhinolaryngology unit. There is a procurement request

b) Dentistry
Two dental chair units used to treat patients are assigned to the special outpatients department. Concerning the unit procured in 1985, its functionality has declined significantly and this interferes with the diagnosis and treatment although it is possible that it could continue to be used. In addition, one new dental chair unit was procured for the training of dentists in 2004. However, its use has been limited to the training of dentists. The number of patients in the section concerned in 2003 was about 7,130 people.

There is a procurement request for one dental chair unit and a dental X-ray film development machine from the dental department.

c) Ophthalmology
Much of equipment was basically installed in 1985, but the slit lamp was bought as new equipment in 2004. The functionality of the tomometer and the fundus camera has declined markedly and their condition is such that they cannot be used any longer.

The number of patients is approximately 40-50 patients/day, and about 6,180 patients were accepted, which was confirmed by statistics for 2003.

There is a procurement request for such equipment as a tomometer, fundus cameras, and synophtore from the ophthalmology section.

d) Rehabilitation
This is a support section, and facilities related to rehabilitation are divided into physiotherapy, therapeutic exercise, and bathtub treatments, etc. and are managed by this section. Supply of another low frequency therapy unit was requested although one low frequency therapy unit was operating in the physiotherapy room under this project.

The number of patients that received treatment from the rehabilitation section is approximately 4,710 patients according to statistics for 2003.

7) Examination of individual items of equipment

Close examination of the equipment has been carried out based on the criteria mentioned below. At the same time, it is assumed that the need for and the validity, etc. of the equipment procured using the following criteria have been analyzed and examined.

(1) Whether or not it is equipment regarding which renewal due to superannuation and quantitative insufficiency can be confirmed
(2) Whether or not it is equipment that contributes to functional improvements as part of the central facilities in the children's hospital
(3) Whether or not it is equipment required for the extension of the facilities (new operating building) and the renovation plan for the existing facilities

(High Priority)
1) Equipment that is to replace existing old/decrepit equipment
2) Equipment that is to supplement equipment that is clearly lacking in quantitative terms
3) Equipment that is required for basic hospital treatment/diagnosis
4) Equipment that matches the hospital's needs (social position/function)
5) Equipment that may be of great benefit or have a significant effect for the hospital
6) Equipment that is highly cost-effective
7) Equipment for which a system of maintenance and management can be assured (External consignment included).

(Low Priority)
1) Equipment with overlapping functions or uses
2) Equipment with high maintenance management costs
3) Equipment for which the beneficial effect is limited
4) Equipment with low cost-effectiveness
5) Equipment that cannot be operated using the hospital's current technical capacity

6) Equipment for which a system of maintenance and management cannot be assured (External consignment included).
7) Other equipment

The result of the above-mentioned examination and evaluation is given in an appendix to this chapter at the end of the document as “Results of the Examination of the requested Equipment”.

The result was that the following equipment was eventually excluded from this plan.

Table 1 Equipment excluded from the project

NOT-8 Muscle Stimulator	RAD-4 Ultrasound w/Color doppler	NIC-8 Distillation plant
NIC-9 Ultrasound w/Color doppler	PIC-5 Infant warmer	PIC-6 Distillation plant
EOT-5 Fiber gastroscolpe	EOT-6 Fiber colomoscope	EOT-7 Autoclave, small size
EOT-10 Video camera for endoscope	EOT-11 Operating microscope	EOT-14 Video camera for OT
EOT-15 Video gastrofiberscope	LAB-3 Platelet aggregator	LAB-4 Coagulo meter
LAB-5 Multi head microscope	LAB-7 ELISA Plate reader	LAB-9 Centrifuge
LAB-12 Electrolyte analyzer	LAB-16 Refrigerator	LAB-18 Computer w/printer
EYE-2 Slit lamp microscope	EYE-3 Ophthaomological exam unit	WAD-4 Glucometer
COM-3 Oxygen outlet point	COM-4 Suction outlet point	

The following medical equipment was assumed to explain the result of the analysis in Japan and the action method at this stage, and after reconfirming the current state and the content when it explained at Draft final explanations, it was judged whether to make it to the plan object.

NOT-8 Muscle Stimulator (New OT) Planned qty: 0
There is generally no use example in the operation room for this equipment concerned on the medical practice site in Japan.
It seems that this equipment is used for awaking etc. when anesthetizing it. However, Children’s Hospital doesn't have it as existing equipment. The utility of disposition for the equipment is assumed to be low and the substitution method is possible. Judging from the above mentioned points, it is excluded from the supply of equipment in this plan.

PIC-3 Syringe pump (PICU) Planned qty: 10 sets
The dosage to the pediatric is more than that of the infant. Therefore, it is judged that using of Syringe pump and Infusion pump together is able to offer better treatment in PICU. Judging from these viewpoints, changing the planned amount of 5 syringe pumps and 5 infusion pumps considers as a higher validity.

PIC-5 Infant warmer (PICU) Planned qty: 0
It is thought that this cooperation wants to clarify the division of roles of the NICU and the PICU. Therefore, it is required to do the proposal to sift the infant warmer (the planned qty 2 sets) from this section to the NICU.
Then the total quantity of the infant warmer becomes 4 sets in NICU instead of 2 sets.

COM-3 Oxygen outlet point Planned qty: 0

Domestic analyses in Pakistan have shown that oxygen outlets that meet the standards of the current central piping system of the children’s hospital are no longer produced and that it is impossible to procure genuine parts produced by the existing supplier. To improve the present conditions, all the pipes and parts connected to them must be replaced. In this case, medical gas supplies must be stopped and other large-scale installation work must be carried out.

When the facility originally set up, the oxygen outlet point was procured as a equipment concerned facility construction. Judging from the content of this construction, it excludes from the supply item as a category of equipment.

COM-4 Suction outlet point Planned qty: 0

Supply of these items must also be provided for the same reason as stated above.

Endoscopic concerned

The study team proposed which equipment as fiber gastroscope, fiber colonoscope, bronchoscope, sigmoidoscope and cystoscope would be disposed in the day surgery room located on the grand floor in new operating theater, and it was agreed by the hospital.

The study team also proposed to be supplied fiber type of bronchoscope, sigmoidoscope and cystoscope instead of rigid type because of the burden for the patient.

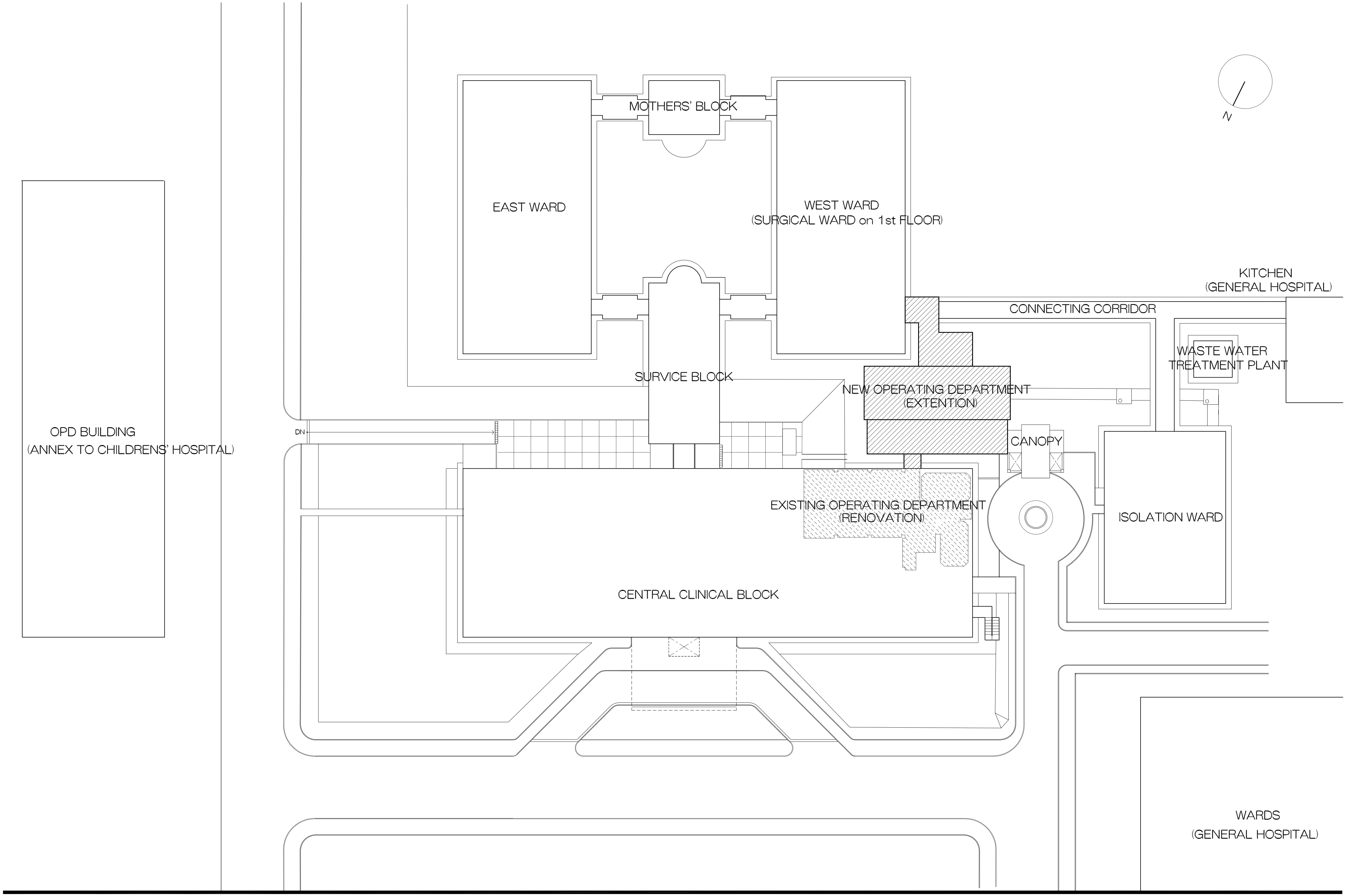
But the hospital was eager to have the rigid type because the rigid one on a clinical site in Pakistan is a main current, and a lot of doctors have been accustomed to deal with. More over, the equipment is also excellent in durability. Therefore, the study team undersood these current situations in the medical site.

The result is summarized to the requested equipment through an examination and an evaluation at a domestic analysis in Japan as well as at the local investigation stage. The content of the equipment disposition by this plan becomes like the “Medical Equipment list for supply”.

The main specification, the use, and the level etc. of the planned major equipment are as per “Main equipment list” in appendix to the chapter of material.

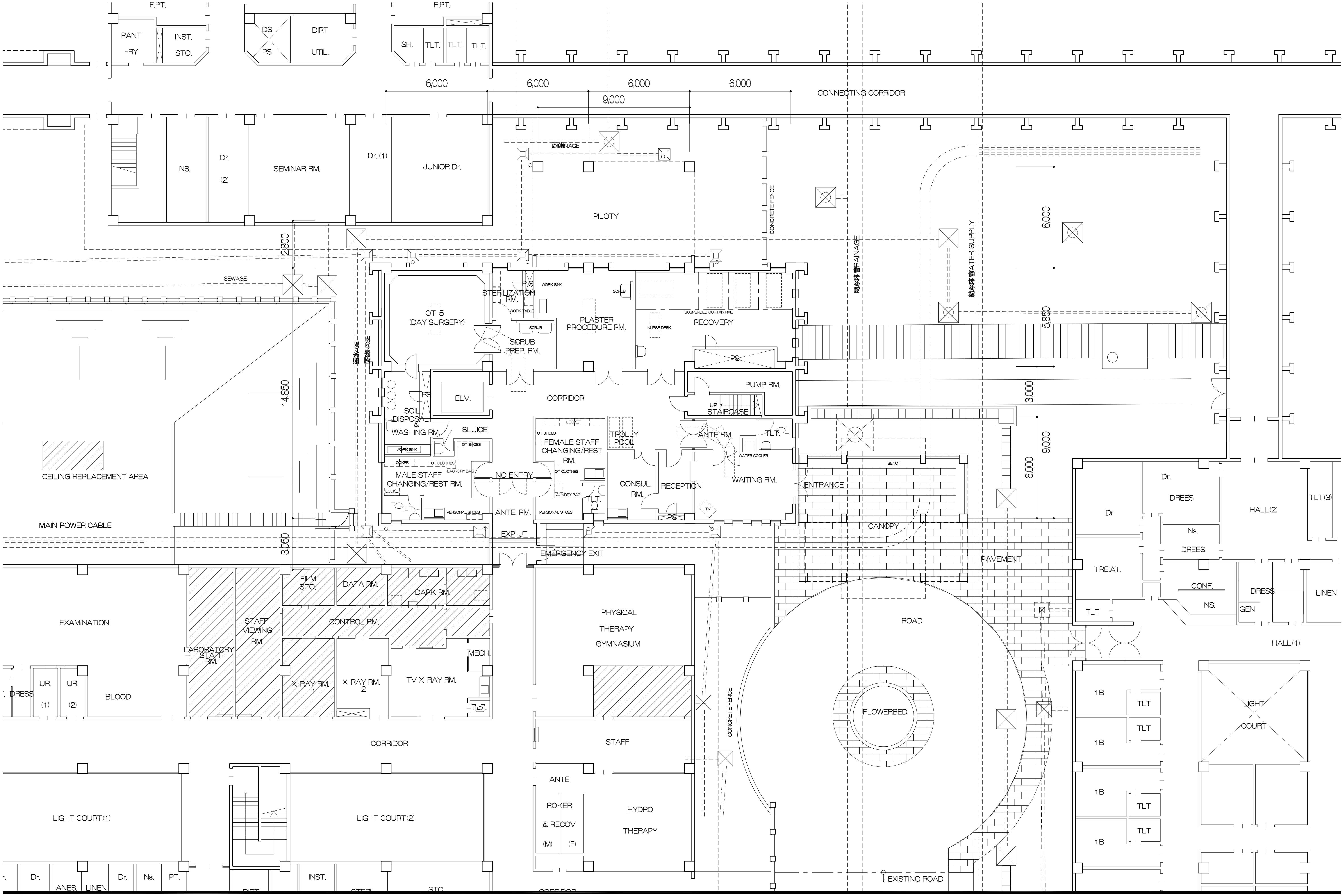
2-2-3 Basic design drawing/Table of the basic equipment plan

Planned floor area		
New building	Ground floor	373 m^2
	First floor	462 m^2
	Rooftop room	146 m^2
	Total	981 m^2
Renovation area	Ground floor	131 m^2
	First floor	392 m^2
	Total	523 m^2



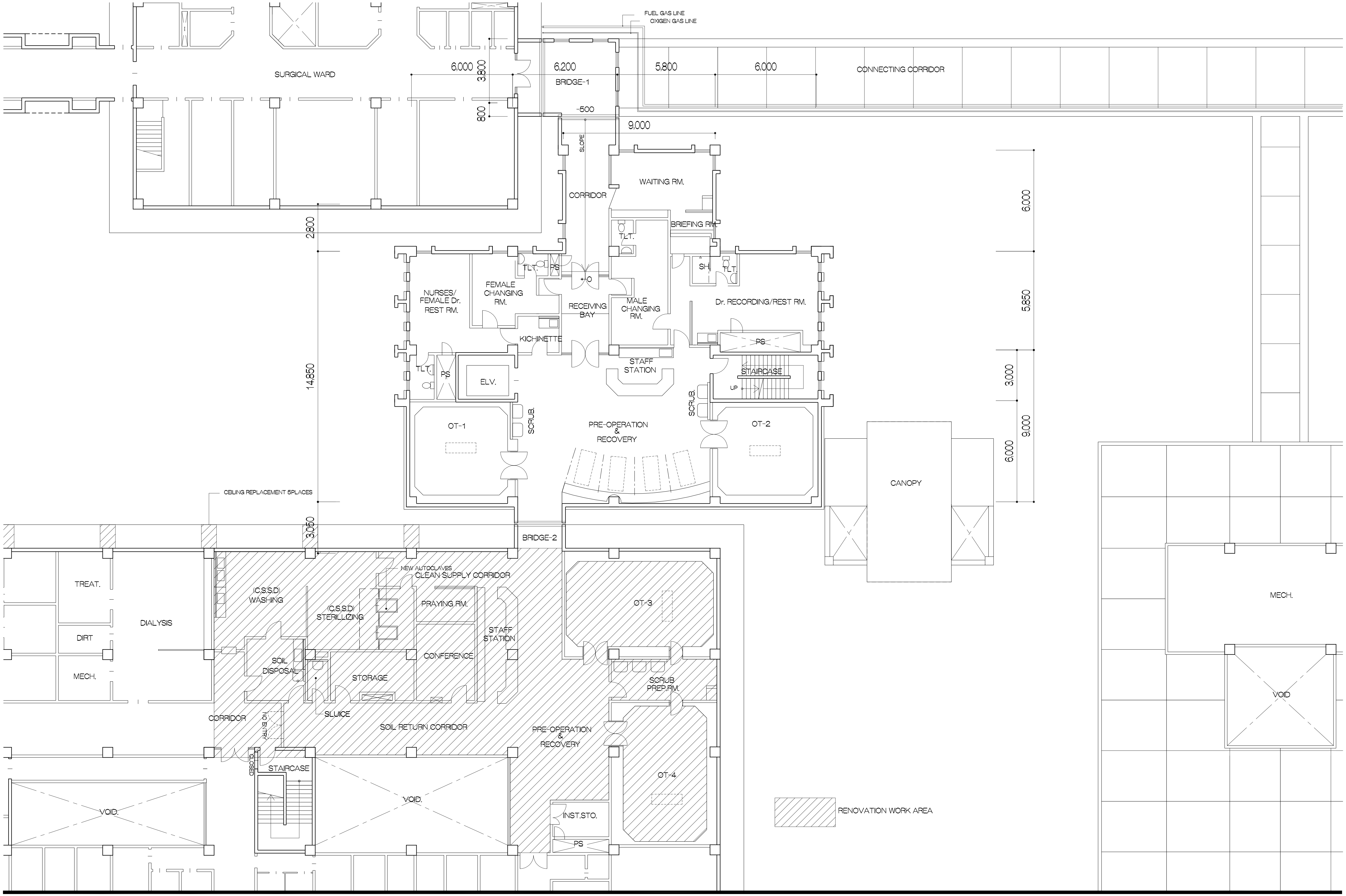
THE PROJECT FOR RENOVATION OF THE ISLAMABAD CHILDREN'S HOSPITAL

SITE PLAN S 1:600



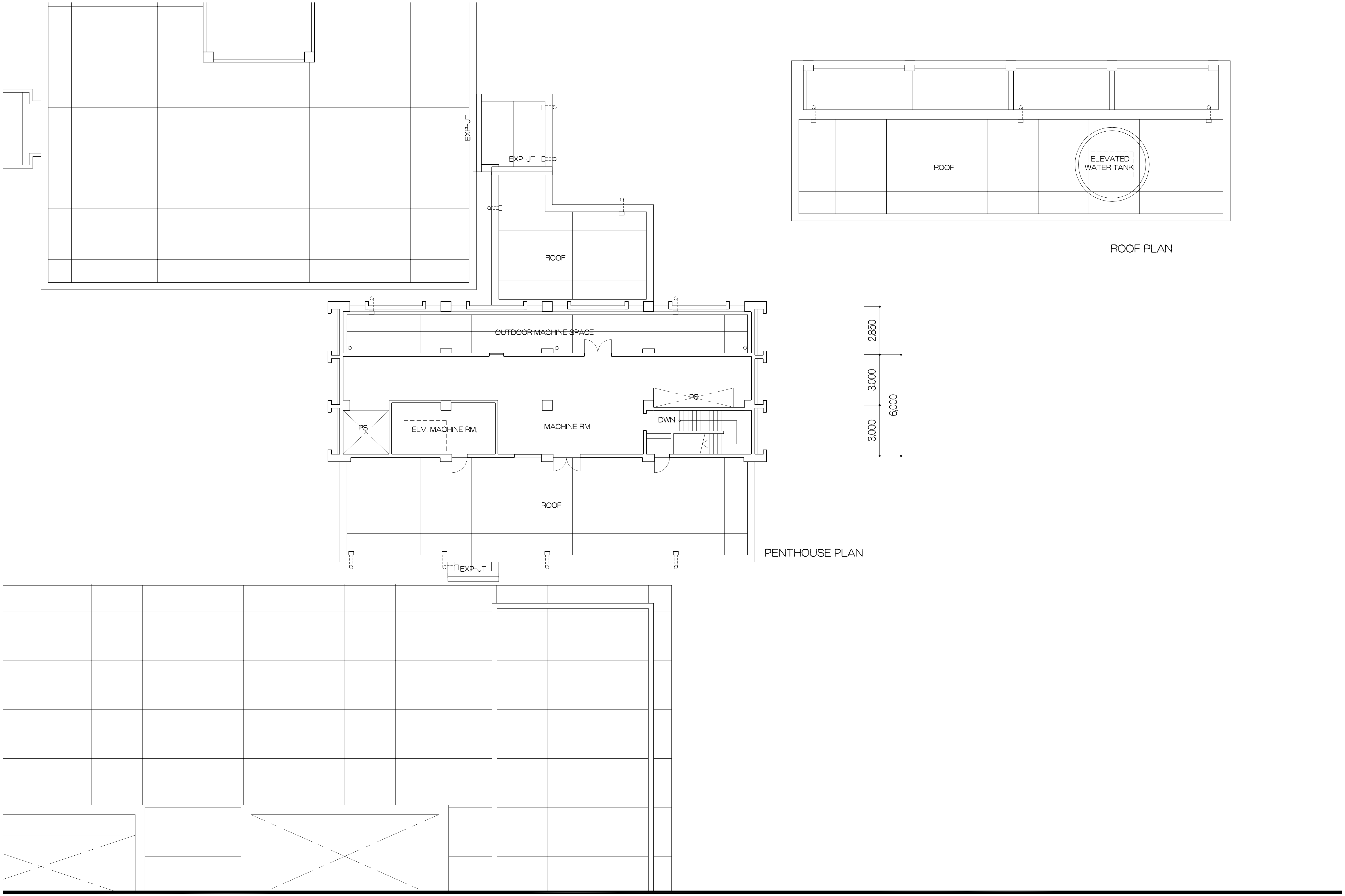
THE PROJECT FOR RENOVATION OF THE ISLAMABAD CHILDREN'S HOSPITAL

GROUND FLOOR PLAN S 1:200



THE PROJECT FOR RENOVATION OF THE ISLAMABAD CHILDREN'S HOSPITAL

1ST FLOOR PLAN S 1:200



THE PROJECT FOR RENOVATION OF THE ISLAMABAD CHILDREN'S HOSPITAL

PENTHOUSE AND ROOF PLAN S 1:200