Ministry of Health
Socialist Republic of Viet Nam

Basic Design Study Report
on
The Project for the Improvement of Bach Mai Hospital
in
Socialist Republic of Viet Nam

July 1997

Japan International Cooperation Agency

Nihon Sekkei Inc.

PREFACE

In response to a request from the Government of Socialist Republic of Viet Nam the Government of Japan decided to conduct a basic design study on the Project for the Improvement of the Bach Mai Hospital and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Viet Nam a study team from February 17th to March 18th, 1997.

The team held discussions with the officials concerned of the Government of Viet Nam, 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 Viet Nam 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 Socialist Republic of Viet Nam for their close cooperation extended to the teams.

July, 1997

Kimio Fujita
President
Japan International Cooperation Agency

July, 1997

Letter of Transmittal

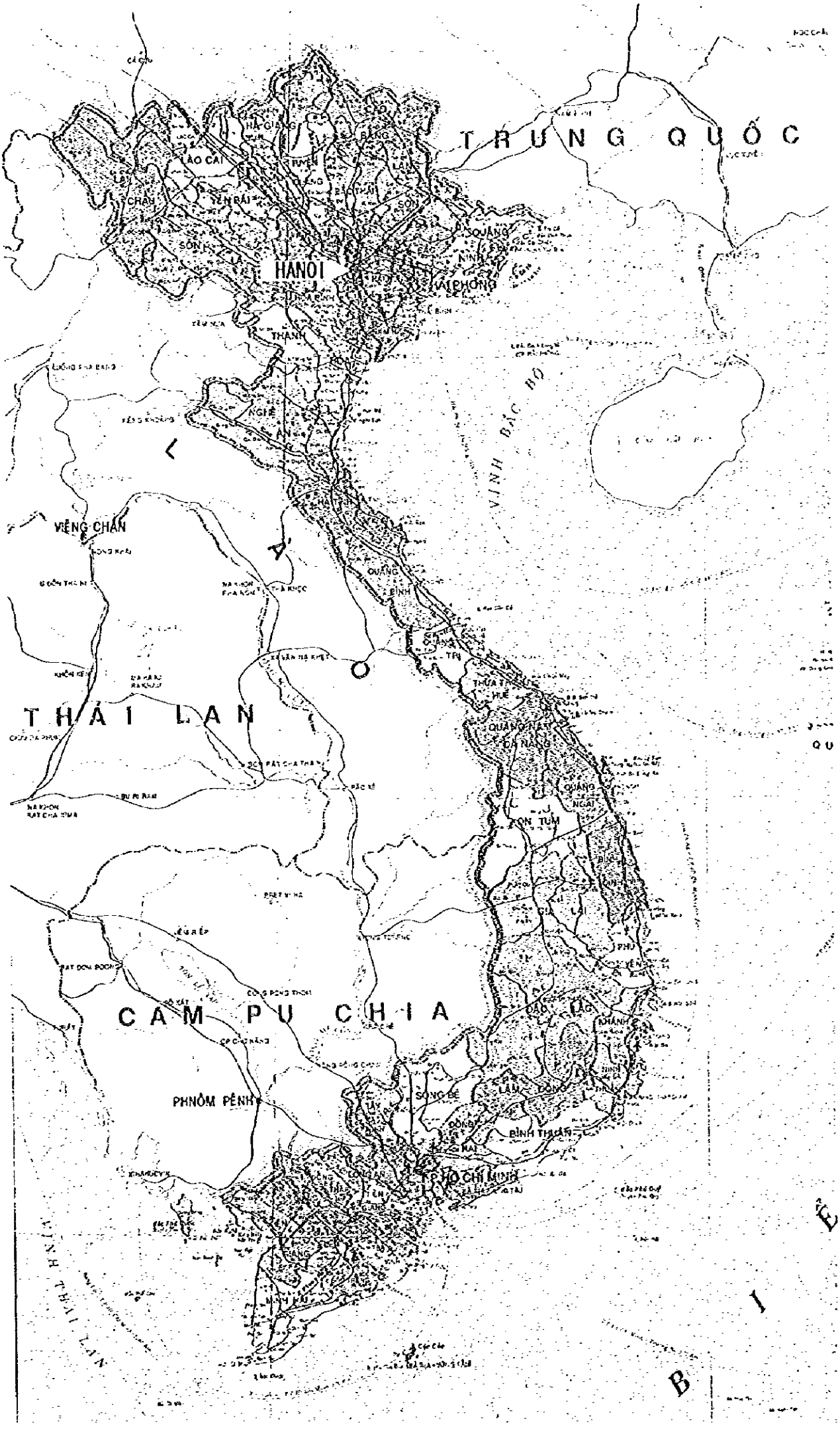
We are pleased to submit to you the basic design study report on the Project for the Improvement of the Bach Mai Hospital in Socialist Republic of Viet Nam.

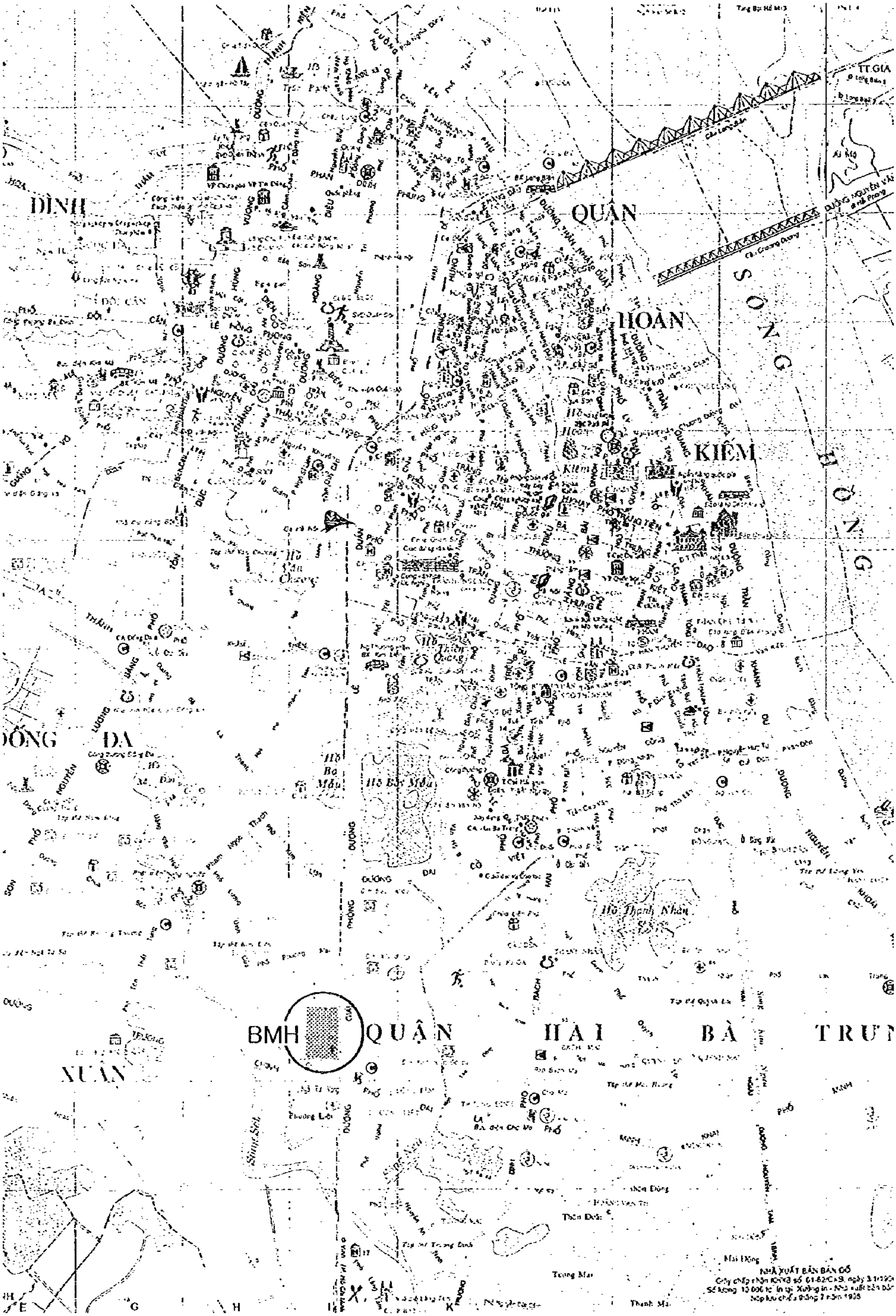
This study was conducted by Nihon Sekkei, under a contract to JICA, during the period from February 3rd to August 22nd, 1997. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Viet Nam and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

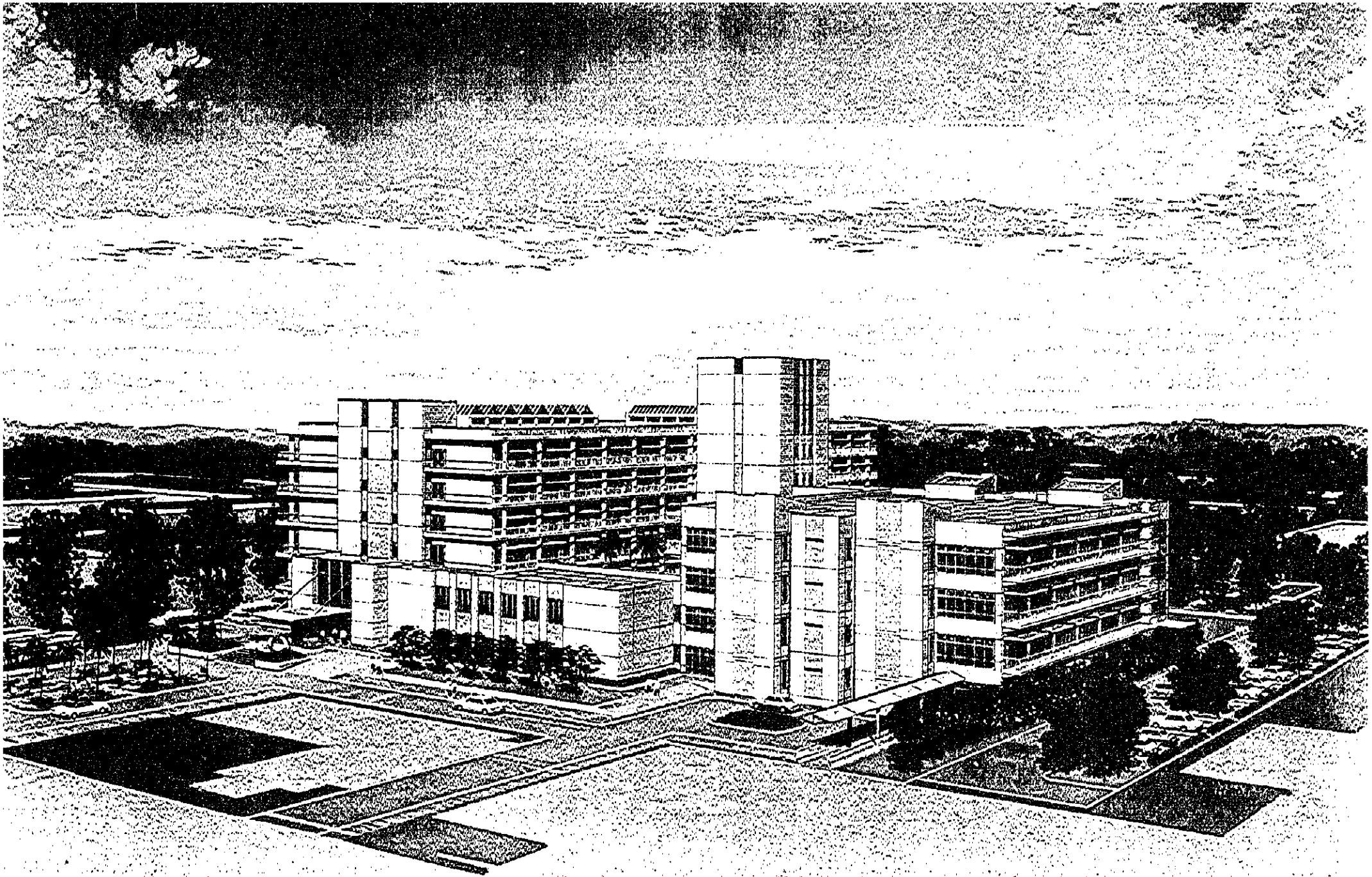
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Ichiro Kanagawa
Project manager,
Basic design study team on
The Project for the Improvement of the Bach Mai Hospital
Nihhon Sekkei Inc.


TRUNG QUỐC
HANOI
VIỆT NHÀ
VIỆNG CHĂN
THÁI LAN
CAM PU CHIA
PHNÔM PÊNH
TP HỒ CHÍ MINH
VỊNH BẮC BỘ
VỊNH THÁI LAN
A
A'
B
B'


DÌNH
QUẬN
HOÀN
KIẾM
SÔNG
ĐỐNG ĐA
Hồ Văn Chương
Hồ Thiền Quang
Hồ Bảy Mẫu
Hồ Thanh Nhàn
BMH
QUẬN HAI BÀ TRUN
XUÂN
Cầu Long Biên
Cầu Chương Dương
NHÀ XUẤT BẢN BẢN ĐỒ



ABBREVIATIONS

BMH	Bach Mai Hospital
B/D	Basic Design Study
CCU	Coronary Care Unit
CSSD	Central Sterilizing and Supply Department
E/N	Exchange of Notes
GDP	Gross Domestic Product
GNP	Gross National Product
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
MDF	Main Distribution Frame
MRI	Magnetic Resonance Imaging
PABX	Private Automatic Branch Exchange
RI	Radio Isotope
Viet Nam	Socialist Republic of Viet Nam

Table of Contents

Annex

1. Basic Design Study Team
   (1) Team Members
   (2) Schedule
   (3) Discussant
   (4) Minutes of Meeting

2. Explanation Team for the Draft Basic Design
   (1) Team Members
   (2) Schedule
   (3) Discussant
   (4) Minutes of Meeting

3. Other Data
   (1) Evaluation for Requested Medical Equipment
   (2) Technical Note

Chapter 1 Background to the Request

CHAPTER 1 Background to the Request

1-1 Events Leading up to the Request

The Socialist Republic of Viet Nam, located on the eastern coast of the Indochinese Peninsula, has an area of 332,000 square kilometers, a population of 73.1 million (1994), and a GNP of 190 U.S. dollars per capita (1994). Viet Nam was once divided into northern and southern factions, but was unified in April of 1975 when President Thieu of South Viet Nam announced an unconditional surrender. In December of 1986 at the 6th Convention of the Communist Party, a policy of complete reform was adopted for the purpose of achieving a socialist based market economy which could free itself of the long-term after-effects of the war. Since 1989 the results of this policy of complete reform have become increasingly apparent; inflation has been brought under control, rice is plentiful, and the expansion of foreign investment has resulted in the creation of a promising economic future. In 1991, the 7th Convention of the Communist Party adopted not only resolutions calling for the continuation of the total reform policies but a new constitution with provisions for a national economic system based on these policies.

Indices for health care and medical treatment show that on the whole conditions in Viet Nam compare favorably with those of other Southeast Asian countries. In recent years, however, of a lack of sufficient quantities of medical supplies and equipment have resulted not only in an overall lack of proper medical care, but have combined with malnutrition (2,250 calories in 1992: lower than average for Southeast Asia and other Pacific nations) and insufficient sanitation facilities to produce conditions which have resulted in the morbidity and death rates of contagious diseases such as malaria and tuberculosis to climb. In order to combat these problems, the Vietnamese government in 1989 established a program of health care and medical treatment to promote the improvement of health care and sanitation facilities. Following the Paris Accord of October 1991, the Japanese government began to reconsider the provision of support, and later provided grants for medical equipment for nine facilities in the city of Hanoi (including the Bach Mai Hospital) as well as for the Cho Ray Hospital and Hai Ba Trung Hospital.

Bach Mai Hospital (BMH), for which this proposal is being prepared, is the largest general hospital (980 beds) in Hanoi, being a top referral hospital. This hospital was first established in 1911 by the French, and the building itself now suffers seriously from deterioration; in addition to rain leaks there are other serious problems with piping, wiring, air conditioning, and sanitation facilities. Most of the medical equipment is more than

thirty years old, and is therefore now seriously outdated. In addition to its responsibility of functioning as a modern medical facility, it must also function as a teaching hospital. With these concerns in mind, in 1992 BMH applied to the Ministry of Public Health for an upgrade of its facilities, and in 1994 a master plan including the number of beds and hospital functions was presented to the government. In October of 1995, this plan was adopted by the government. Nevertheless, a project of this scale was difficult for the government to undertake on its own, and the government now requests Japan to provide grant assistance for the modernization its facilities and equipment.

1-2 Summary and Principal Components of the Request

The outline the request for assistance consists of the following components:

1-2-1 Facilities

The following items were confirmed during B/D

Priority 1 - Technical Block

To include the following facilities:

central laboratories (hematological examinations, biochemical examinations, microbiological examinations, pathological examinations, general examinations) radiological examinations, physiological examinations, endoscope examinations, ICU ward, surgical operation theater, pharmacy, central surgical supply, administration, research

Priority 2 - Ward

A total of 450 beds in the following departments:

internal medicine (pneumology, endocrinology, nephro-urology, gastro-enterology)

surgery, pediatrics, gynecology and maternity, mixed ward

The Priority 3 - Institute for Clinical Research in Tropical Medicine is to be constructed by the Vietnamese government.

1-2-2 Medical Equipment

The final request for medical equipment included items which are extremely expensive and highly advanced such as MRI and lithodialysis units as well as equipment for facilities outside the range of this proposal. Because there were also requests for equipment types considered to be outside the standards for medical equipment agreed to during the preliminary survey, we have further

reorganized the selection standards into the following categories:

Category I: essential equipment for maintaining the hospital's present level of service

Category II: equipment to be used in improving the level of existing medical equipment

Category III: equipment for improving hospital functions per this proposal

Category IV: equipment not included in the medical equipment selection standards agreed to in the preliminary survey

Of the above shown equipment, items falling under category IV are to have a quantity of 0, and are to be removed from the medical equipment list attached to the minutes. The items include following:

(1) microscope with image analysis unit
(2) microscope with video unit
(3) MRI
(4) stone pulverization unit
(5) panorama X-ray equipment
(6) spiral CT scanner
(7) mammary gland X-ray unit
(8) color doppler ultrasonic diagnostic unit
(9) electronic sphygmomanometer
(10) electronic stethoscope

All other category IV items were eliminated.

The following items needed farther study. After the study back in Japan, the following numbers are decided to be included in this Project.

Angiography camera unit..... 1 unit
Artificial dialysis unit..... 2 units for ICU
Blood bank related instruments ..... 2 units of Refrigerators

After this, Vietnamese Government requested again to the Draft Report Explanation Team to reconsider 20 more ICU beds and a Fluoroscopic Xray TV unit with remote control system.

Chapter 2 Content of the Project

CHAPTER 2 Contents of the Project

2-1 Objectives of the Project

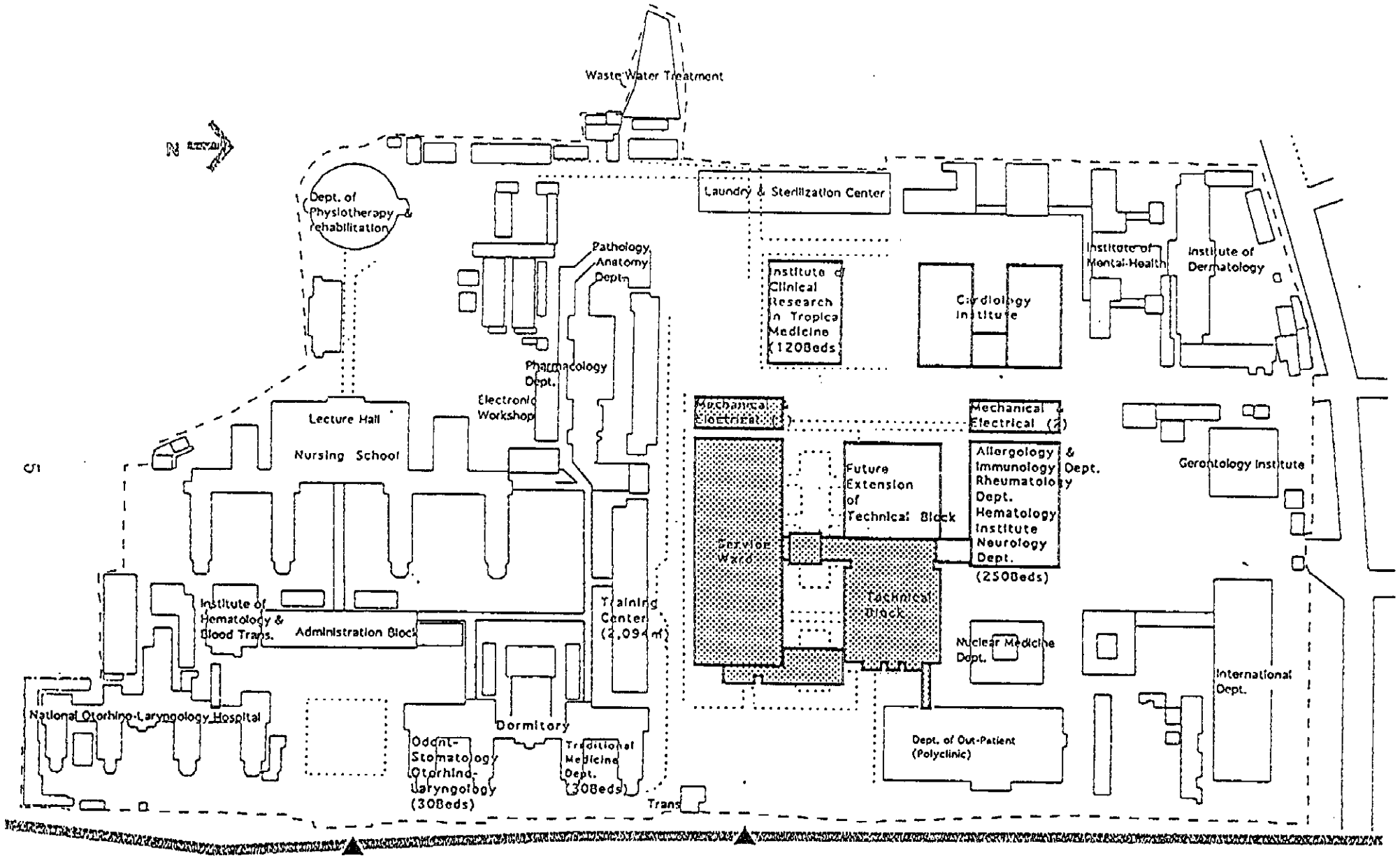
The Government of Viet Nam is currently promoting the improvement of the quality of the country's health care services on the basis of its 6 th health policy. The two main goals of the health policy are:

(1) Reduction in the disease rate and increase in the average life span
(2) Provision of equal opportunities for efficient and high-quality, health care services to the people

In the present health policy, the Government of Viet Nam places utmost emphasis on the expansion of the country's health care service network and the improvement of the quality and efficiency of the country's health care services. To this end, the Government of Viet Nam considers it imperative to raise the level of health care technologies, improve the medical facilities and introduce state-of-the-art medical equipment. In this connection, the Government of Viet Nam considers it important to reeducate and retrain the country's medical professionals so that the health care service network will function efficiently. As part of its plan to bring the health policy to fruition, the Government of Viet Nam approved the Bach Mai Hospital (BMH) Master plan, which aims to improve both quantitatively and qualitatively the country's health care technologies, nurturing competent medical professionals and building a full-blown health care service network.

This project is aimed at improving BMH's facilities and equipment to help the Government of Viet Nam implement the master plan successfully. However there is a limit to the scope of the Japan's Grant Aid Scheme and the Government of Viet Nam is expected to fulfill the remaining portion of the Master Plan along with this project in early stage. This project is therefore expected to lead to an improvement of the quality of the hospital's health care functions, which in turn will result in an improvement of the quality and efficiency of the country's healthy care services. This project is also aimed at contributing directly and indirectly to the enhancement of the quality of health care services for the people by establishing a system for clinical training, postgraduate education and technical support for medical facilities.

Following "Proposed Future Plan" shows how Viet Nam and Japan will cooperate to realize BMH Master Plan.



PROPOSED FUTURE PLAN

2-2 Basic Concept of the Project

2-2-1 Cooperation Guidelines

(1) Because of the past process of BMH's growth, each clinical division of the hospital has been operating independently from all the others. As a matter of course, there is a limit to each clinical division growing in this way. Against a background of rapid advancements being made in medical technology, as well as medical equipment, and globalization of various diseases, it is far from sufficient to strive hard for the prevention of epidemics within the country. In other words, it is imperative for the country's major medical institutions to carry out drastic reforms so that they may be able to cope with the technical innovations in medicine and the emergence of new intractable disease. In the case of this hospital, such a reform may be materialized by all its clinical divisions cooperating with one another by eliminating sectionalism and thereby enhancing the technical level of the health care services they offer. Such efforts will certainly result in the people's greater access to health care.

(2) Such reform should also be aimed at spreading the basic concept of health care (not only medical technologies by also the nursing system) nationwide through educational programs and thereby making the country's health care system more efficient. In this connection, a part of the facilities for medical education and training would be included in this project.

The following should be the cooperation guidelines to be adopted for the implementation of this project.

—To cooperate in the procurement of the ward, the technical block and related equipment, which forms a part of the BMH master plan.

—To give due consideration to the optimum scale of the planned facilities and equipment in view of the fact that BMH is one of the country's major referral hospitals.

—Special attention should be paid to the design of the planned facilities and equipment in view of the fact that BMH is a teaching hospital.

—To examine the optimum scale of the planned facilities and equipment from both technical and financial points of view.

—To make full use of local methods of construction and locally available building machines and materials.

—To give priority to those items of equipment which can be easily maintained and managed.

2-2-2 Examination of the Contents of the Request

(1) Contents of the Request

The following tables show the outline of the contents of the Government of Viet Nam's request for the improvement of the facilities of Bach Mai Hospital (BMH), which have been confirmed by the Ministry of Health of Viet Nam and this study group.

2 − 1 Content of the request

(MOH)

Priority-1. Technical Block			
Central laboratories	Hematology Exam. Biochemistry Exam. Microbiological Exam. Culture Medium Room Clean Room Pathological Exam. Specimen Room Analyzing Room Dark Room Blood/Urine Collection Sterilizing Storage/Chilled Room	I C U	Ward (30 beds) Nurse station Equipment Duty Room
		Surgical Operation (6)	Operation Theater Preparation Nurse station Equipment Changing Room Anesthesia
		Pharmacy	Pharmaceutical Room Storage
Radiology Dept.	General X-ray (4) Mammography X-ray (3) CT-Scan (1) Operation Room Dark Room	CSS	Washing Assembly Sterilization Sterilized storage
Physiological Test	ELG (1) EEG (1) Electromyogram (1) Ultrasound (1) Lung Test (1)	Administration	Director (1) Deputy Director (3) Medical office Lecture Hall (1) Class Room (3)
Endoscope	Endoscope (4) Recovery Preparation Washing Equipment		

Priority-2. Ward	
Internal Medicine · Pneumology (50beds) · Endocrinology (50beds) · Nephro-Urology (50beds) · Gastoro-Enterology (50beds)	Pediatrics (50beds)
	Gynecology/Maternity (50beds)
Surgery (100beds)	Mixes Ward (50beds)

(2) Examination of the Request (Facility)

1) Scale of the Facilities: Number of Beds

Table 2-2 shows a change in the number of beds for every 10,000 persons in Viet Nam from 1992 to 1994.

2 – 2 Number of Beds Per capita.

(MOH)

	Beds per population of 10,000
1992	25. 99 beds
1994	22. 68 beds

2 – 2 – 1 Trend of beds in Viet Nam

(MOH)

FY	beds	Central Level		Provincial Level	
		beds	%	beds	%
1991	182,13	123,60	6	58,53	3
1992	173,536	120,710	70	52,826	30
1993	183,934	134,635	73	49,299	27
1994	162,054	119,519	74	42,535	26

As can be seen from Table 2-3, the average bed occupancy rate for 1996 of the subject wards is more than 100 percent. It should be noted that the optimum bed occupancy rate for the planned ward will be about 85 to 90 percent in light of the hospital's capacity to take in emergency cases. All this means a shortage of beds at the hospital.

It is therefore urgently necessary for the hospital to take measures to increase the numbers of wards and beds. When BMH is improved and the referral system is completed throughout the country, the need for the bed will increase further more.

2 – 3 *Ward Occupancy Rate in BMH*

(BMH)

Name of Department	1992		1993		1994		1995		1996	
	Treatment men-day	Occupancy Rate	Treatment men-day	Occupancy Rate	Treatment men-day	Occupancy Rate	Treatment men-day	Occupancy Rate	Treatment men-day	Occupancy Rate
ICU	6,323	69.3	6,657	72.9	7,239	79.3	7,147	78.3	8,002	87.7
Surgery	24,37	89.0	25,066	91.5	25,020	91.3	22,237	81.1	22,908	83.7
Gynecology and Maternity	14,063	96.3	13,679	93.7	15,267	104.5	13,433	92.0	12,546	85.9
Pediatric	13,014	89.0	13,275	90.9	12,463	85.3	9,488	65.0	12,221	83.7
Pneumology	12,266	96.0	12,855	100.6	11,216	87.7	9,399	73.6	9,589	75.0
Endocrinology	13,770	107.8	15,783	123.6	14,990	117.4	12,314	96.4	14,494	113.4
Nephro-Urology	16,114	126.1	20,104	157.3	20,187	158.0	15,827	123.9	19,830	155.2
Gastro-Enterology	14,781	115.7	16,626	130.2	15,252	119.3	14,210	111.2	18,526	145.0
Sub Total	114,708	98.2	124,045	106.2	121,634	104.2	104,055	89.0	118,116	101.1
Hematology	10,092	79.0	12,054	94.3	13,004	101.8	12,759	99.9	16,162	126.5
Neurology	6,603	24.1	25,718	93.9	27,078	98.9	23,852	87.1	25,877	94.5
Rheumatology	11,571	90.6	12,761	99.9	9,682	75.8	9,010	70.5	9,948	77.9
Allergology	6,312	57.6	7,348	67.0	8,493	77.5	9,143	83.4	9,166	83.7
Sub Total	34,578	54.2	57,881	90.6	58,257	91.2	54,764	85.8	61,153	95.7
Inst. of Dermatology and Venereology	20,494	56.1	28,603	78.3	28,627	78.4	19,267	52.8	23,116	63.4
Inst. of Gerontology	7,125	65.0	7,147	65.3	7,996	73.0	7,159	65.3	7,421	67.7
Inst. for Clinical Research in Tropical Medicine	30,143	82.5	28,553	78.2	30,250	82.8	27,444	75.2	31,041	85.1
Inst. of Mental Health	17,139	93.9	15,120	82.8	14,116	77.3	12,332	67.5	13,140	72.0
Inst. of Cardiology	28,185	140.4	30,051	149.6	29,753	148.2	28,963	144.3	33,051	164.6
Traditional Medicine	7,731	84.7	6,789	74.3	7,825	85.7	9,864	108.1	8,068	88.4
Rehabilitation					3,071	84.1	2,184	59.8	3,277	89.7
Nuclear Medicine							123	3.4	155	4.2
Odonto-Stomatology, Otorhino-Laryngolory and Ophtalmolory	3,999	72.9	3,406	62.1	3,688	67.3	1,521	27.8	810	14.8
International Hospital	3,422	18.7	5,934	33.1	5,693	31.1	5,963	32.6	3,681	20.1
Total	267,524	79.7	307,529	91.6	310,910	91.6	273,639	79.8	303,029	88.3
Averaged	13.5		14.4		14.2		12.9		13.8	

2 – 4 Staff in BMH

(BMH)

Name of Department	Doctor	Nurse	Engineer	Midwife	Others	Total
I C U	8	31				39
Surgery	15	38	7			60
Gynecology and Maternity	13	20	3	15		51
Pediatric	12	21				33
Pneumology	7	11				18
Endocrinology	7	12				19
Nephro-Urology	8	11				19
Gastro-Enterology	9	12				21
Sub Total	79	156	10	15		260
Test and Radiology	33	34	80	2	20	169
Administration	21	17	5		183	226
Sub Total	54	51	85	2	203	395
Total	133	207	95	17	203	655

Name of Department	Doctor	Nurse	Engine	Midwife	Others	Total
Inst. of Dermatology and Venereology	35	31	12		4	82
Inst. of Gerontology	15	16	4		1	36
Inst. for Clinical Research in Tropical Medicine	36	50	9			95
Inst. of Mental Health	10	17				27
Inst. of Cardiology	21	23	2			46
Inst. of Hematology and Blood Transfusion	Included in Hematology Dept.					
Sub Total	117	137	27		5	286
Hematology	22	15	19		1	57
Neurology	12	32				44
Rheumatology	7	11				18
Allergology	9	8	1			18
Sub Total	50	66	20	0	1	137
Traditional Medicine	7	10	2			19
Rehabilitation	5	9	4		1	19
Nuclear Medicine	13	8	2			23
Odonto-Stomatology, Otorhino-Laryngolory and Ophtalmolory	18	20	6			44
International Hospital	27	20	6	1	2	56
Out-patient Department	12	13				25
Sub Total	82	80	20	1	3	186
Total	249	283	67	1	9	609
Grand Total	382	490	162	18	212	1,264

2 – 4 – 1 Average number of staff in Japan

	Doctor	Nurse	Engineer	Midwife	Others	Total
Stuff par 100 beds	13.4	67.5	15.8		21.6	118.3
Stuff par 480 beds	64	324	76		104	568

It will be necessary to work out a unified arrangement of the ward's planned facilities from the standpoint of functionality and operational efficiency. Such arrangement will lead to a reduction in the nurses' workload, which in turn will prove to be a great boon to the hospital because it is suffering from a shortage of nurses. From the standpoint of cost-effectiveness, however, the clinical divisions to cover the planned ward should only be Internal Medicine, Surgery, Gynaecology/Maternity and Pediatrics, all of which have high bed occupancy rates. Special divisions (Traditional Medicine and Rehabilitation) and institutes, both of which operate independently from the other divisions, are to be excluded). Of the departments of the Internal Medicine Division, those whose functions are closely related to those of the other institutes and those whose bed occupancy rates are low are to be excluded from this project. The number of the technicians at the Technical Block is considered sufficient because its facilities are already well centralized.

It is expected that the centralization of functions will make operations at the Technical Block more efficient.

It is expected, therefore, that the scale of the planned facilities and the number of beds which are optimal for Internal Division (4 departments), Surgery, Gynaecology/Maternity and Paediatrics will help significantly raise the technical level of BMH's health care services.

BMH is also serving as a teaching hospital. It will therefore be necessary to pay special attention to this function of the hospital.

2) Ward

As is seen from Table 2-3, the average bed occupancy rate will be more than 130 percent at the wards to be covered by this project. Given the present total number of beds (293) for these wards and the possibility of some increase in the number of patients in the future, it is considered appropriate to build the Ward with 450 beds (excepting ICU) under this project.

2 -- 5 Number of Beds in BMH

beds

Name of Department	Present	Master Plan	Final Request
Surgery	75	100	100
Gynecology and Maternity	40	60	50
Pediatric	40	60	50
Internal Medical			
Pneumology	35	60	50
Endocrinology	35	60	50
Nephro-Urology	35	60	50
Gastro-Enterology	35	60	50
Mixed Ward	0	0	50
Sub Total 1	295	460	450
I C U	25	40	30
Total	320	500	480

Inst. of Dermatology and Venereology	100	100	0
Inst. of Gerontology	30	50	0
Inst. for Clinical Research in Tropical Medicine	100	120	0
Inst. of Mental Health	50	100	0
Inst. of Cardiology	55	100	0
Inst. of Hematology and Blood Transfusion	0	0	0
Hematology	35	60	0
Neurology	75	100	0
Rheumatology	35	60	0
Allergology	30	30	0
Traditional Medicine	25	30	0
Rehabilitation	10	20	0
Nuclear Medicine	10	20	0
Odonto-Stomatology, Dental and Ophthalmology Otorhino-	15	30	0
Out-patient Department	0	0	0
Health Service Station	90	0	0
Total	560	820	0
Grand Total	980	1320	480

At present, the bed occupancy rate varies to some extent from division to division. To solve this problem a mixed Ward is proposal in this plan. By doing so, there will be more efficient communication between the staff members of these divisions, which in turn will help to improve the technical level of the hospital's health care services.

Viet Nam's hospital building design standards stipulate that a nursing unit shall consist of 25 to 30 beds. However in consideration of the present total number of nurses and the present condition of ward operation and management at BMH, a nursing unit should be with 50 beds at the hospital. It should be noted that such number is the norm in Japan as well.

3) Technical Block

The number of BMH's technicians is almost the same as the average for hospitals in Japan. For the Technical Block, or the medical centre, to function sufficiently with that number of technicians, it is necessary for the functions of the Technical Block to be centralized. Those clinical divisions with highly advanced medical care, the Nuclear Medicine Division and the division already provided with adequate facilities and equipment are not included in this project. The Technical Block is designed for about 700 beds hospital, which should cover the need of the whole hospital excepting the institutes which are operating virtually independently from the other divisions and those clinical divisions whose functions are not closely related to those of the Technical Block.

i) Central Examination Division

The Central Examination Division consists of Haematology Examination, Biochemistry Examination, Microbiological Examination and Pathological Examination Departments. These examination functions are indispensable to the hospital. If these functions are centralized in the Technical Block, a very efficient and functional Central Examination Division will come into being.

As can be seen from Table 2-6, the number of examinations conducted at each of these departments is increasing from year to year. In 1996, for example, the average daily number of examinations carried out at the hospital was about 2,500. From the standpoint of efficiency, it is necessary to work out a unified architectural design of the examination facilities of these departments.

2 – 6 Number of Testing BMH

(BMH)

Tests	1992	1993	1994	1995	1996
Biochemical	123,815	178,825	204,061	188,417	286,701
Hematological	141,375	184,038	222,034	184,763	317,440
Micro Biology/Bacteriology	70,847	59,480	59,536	55,297	81,196
Ultra Sound	9,872	11,803	17,021	22,367	19,896
X ray					
Chest	10,163	8,454	8,321	10,206	13,235
Legs and Arms	10,284	9,035	7,915	10,303	12,254
Gastro-Eenterology	5,037	3,284	3,009	4,158	4,501
Urology	2,763	215	218	118	1,543
Abdominal	245	2,433	1,905	2,145	1,414
Others	5,384	2,340	2,867	2,830	4,708
Total	33,876	25,761	24,235	28,960	37,655
Endoscope	1,025	1,175	1,630	1,846	1,921

ii) Physical Examination Department

It is desirable that this department's facilities be located between the ward and the outpatient department because patients will come to this department from both the ward and the outpatient department. Such location of its facilities will make it easier to fully utilize various equipment and therefore will make the department's examination functions more efficient and more manageable.

iii) Endoscope Examination Department

From the standpoint of operational and functional efficiency, it is desirable that this department's facilities be located adjacent to those of the Physical Examination Department. Since more than 1,900 endoscope examinations are carried out every year at this department, it is appropriate that this department be provided with 4 endoscope examination rooms.

iv) Radiology Examination Department

Since about 70 percent of the patients who are examined at this department are outpatients, it is desirable that this department be located near the outpatient department and the ward. A unified arrangement of the examination rooms will make the operations at this department efficient and will improve the quality of the

services to the patients.

According to Table 2-5, about 120 radiology examinations were conducted a day on average at this department in 1996. Of the average daily number of radiology examination, 96 were general X-ray examinations and 24 were fluoroscopy examinations. If that number of examinations are to be carried out within 4 hours every day, 4 general X-ray rooms and 3 fluoroscopy examination rooms will be needed. Since a CT will be the one moved from the existing facility, a new CT room is necessary. As the department is currently provided with only one angiography system, an additional angiography will be needed for the additional one to cope with future expansion of this department's service.

v) Operation Theatres

At this division, surgical operations are performed with the results of radiology examinations and other relevant examinations. In other words, operation theatres are functionally closely related to those departments. For this reason, it is impossible to have operation theatres independent from the other departments. For smooth movement of patients, it is desirable that operation theatres be located near the ward and the emergency department. It is considered appropriate the operation theater to be located within the Technical Block.

Table 2-7 shows that about 10 surgical operations were conducted a day on average in 1996.

In consideration of the time required for preoperative preparations and postoperative sterilization, it is appropriate that two surgical operations be performed in one operation theatre a day. Taking into account emergency surgical operations, it will be necessary to provide 6 operation theatres (10 operations ÷ 2 operations + 1) under this project.

2 – 7 Medical Services in BMH

(BMH)

Name of Department	Name of Medical	1992	1993	1994	1995	1996
Surgery	Appendix	306	341	413	374	247
	Liver	74	23	21	22	12
	Uro-Nephro	102	136	158	106	126
	Stomach	221	205	223	290	148
	Cholemia	233	307	356	263	292
	Casualty +Orthopedics	199	66	170	192	189
Sub Total		1,135	1,078	1,341	1,247	1,014
Gynecology and Maternity	Eccyesis pregnancy	8	29	44	61	81
	Cystectomy	28	40	45	49	54
	Fibroidectomy	39	60	45	45	63
	Laparotrachelotomy	89	123	129	222	284
	Curettage	106	266	577	697	355
	Others	54	34	26	55	77
Sub Total		324	552	866	1,129	914
Odonto-Stomatology,	Odonto-Stomatology	117	181	250	256	150
Otorhino-Laryngolory and	Eyes	74	88	124	92	131
Ophtalmolory	ENT	25	5	42	85	24
Sub Total		216	274	416	433	305
	Others minor surgeries	159	356	259	72	422
Total		1,834	2,260	2,882	2,881	2,655

vi) Delivery Department

Usually, the delivery department is located near the gynaecology and maternity department. And also it is desirable that they be located near the operation department to the emergency operations. In 1996, there was a total of 1,370 normal deliveries at this department, which was an increase of 140.2 percent over the previous year. There are about 5 deliveries a day on average, it will be to provide 3 delivery rooms under this project.

vii) Central Supply and Sterilization Department

It is necessary to locate this department near by the operation theaters. For this reason, it is desirable that this room be located within the Technical Block together with the Operation Department. CSSD should be large enough to clean and sterilize the operation and diagnosis equipment and tool. For the clinical divisions and wards which are not included in this project are to be handled by the existing supply room.

viii) Pharmacy

To shorten the traffic of the nurses, it is reasonable, to provide a pharmacy to supply drugs to inpatients the planned ward. The existing facility will be used for pharmaceutical storage and dispensary.

4) Relative Office Division

At present, medical doctor's rooms are located within each department and wards, which make it difficult for the medical doctors to communicate with each other beyond the divisions/departments they belong to. Under this project, a group of medical offices to accommodate all the medical doctors belonging to the divisions/departments covered by this project, which will encourage communication among the medical staff and thereby contribute to the enhancement of the quality of the health care services by the hospital. This medical office will be required to have a library function.

It will be necessary that a night duty room be located near each ward. Except for the office room to deal with hospitalization and discharge, the existing administration office rooms, such as the medical affairs room and the accounting room, will remain in the existing building. The rooms for the director and other executive members of the hospital will be provided under this project.

5) Service Division

Electric/machine rooms, a warehouse, locker rooms and a room to store and manage medical equipment in the wards are indispensable to this project.

A washing room is being constructed on the premises of the hospital separately from this project. So, no washing room is needed in this project.

6) Education /Training

Bach Mai Hospital is serving as a teaching hospital. As can be seen from Table 2-8, many medical students, medical doctors and nurses are educated or reeducated and trained at this hospital. It is necessary to provide facilities for use in such education, and training programs under this project.

The conference room should be located adjacent to each divisions/departments for efficient use --- for the nurses' meetings, consultation for the patients and so on.

In 1996, as much as 48 seminars were sponsored, both at home and abroad, by this hospital. This means that 4 seminars are sponsored a month, or every week, on average by the hospital.

In light of the above-mentioned achievements made by the hospital and the objectives of this project, to improve Bach Mai Hospital's education and training facilities, for the country's better health care service network. It is therefore to provide a lecture halls under this project.

2 – 8 *TRAINING ACTIVITIES OF BACH MAI HOSPITAL IN 1995 AND1996*

(BMH)

1. PRACTICING ACTIVITIES OF STUDENTS OF HANOI MEDICAL COLLEGE

(1) Students of 2nd year (1 month course)
- 1995 : 10 groups with 100 students
- 1996 : 10 groups with 100 students

(2) Students of 3rd year (3 month course)
- 1995 : 6 groups with 126 students
- 1996 : 10 groups with 200 students

(3) Students of 4th year (14 weeks course)
- 1995 : 12 groups 174 students
- 1996 : 12 groups 240 students

(4) Students of 5th year (2 weeks course)
- 1995 : 12 groups with 200 students
- 1996 : 12 groups with 200 students

(5) Students of 6th year (10 month course)
- 1995 : 12 groups with 200 students
- 1996 : 12 groups with 200 students

(6) Post-graduate training
- 1996 : Masters : 20, Doctors S. Degree I. : 225, Doctors S. Degree II : 39, Ph.D : 18

2. MEDICAL SECONDARY SCHOOL

(1) Training Secondary Nurses for general nursing work (2 year and a half course)
- 1995 : Total 135 students
- 1996 : Total 184 students

(2) Retraining
- -Course of chief nurse : 3 month
- -Course of general nurse : 2 month
- 1995 : 5 course with 135 participants
- 1996 : 5 course with 184 participants

(3) Training in the specialized subjects : (2 weeks course)
- 1995 : 230 participants
- 1996 : 17 participants

3. Special Course for Medical Stuffs from Provincial Hospitals

(1) Doctor : (from to month course)
- 1995 : 235 participants
- 1996 : 287 participant

(2) Technicians(2 weeks to 6 months)
- 1995 : 135 technicians
- 1996 : 184 technicians

(3) Special Training for Technicians(2 weeks)

1995 : 12 technicians
1996 : 18 technicians

4. BMH. SEMINAR

(1) Seminar by International Experts

1995 : 16 times
1996 : 22 times with 200 participates

(2) Other Seminars

1995 : 24 times
1996 : 26 times

No of participants from 100 to 200 depend on each seminar.

(3) PLAN OF SEMINAR IN 1997

· Institute of Dermatology	4 times
· Institute. of Clinical Research in Tropical Diseases	4 times
· Inst. of Gerontology	4 times
· Rehabilitation Dept.	1 times
· Respiratory Dept.	2 times
· Nephro-Urology Dept.	2 times
· Gastro-Enterology Dept.	4 times
· Pediatrics Dept.	2 times
· Allergology Dept.	4 times
· Hemodialysis	2 times
· Neurology Dept.	4 times
· Intensive care unit	2 times
· Inst. of Mental Health	4 times
Total	39 times

(3) Examination of the Request (Medical Equipment)

i) Criteria for selection and categories

In principle, the items of equipment to be procured under this project are those which are to be installed in the facilities to be constructed under this project. This study group and the Vietnamese side have agreed that items of equipment that meet the following criteria for selection should be procured under this project.

a. Items of equipment to be included in this project

—Those for use in diagnosis and treatment (urgent need)
—Those for use in ordinary or established technologies (technical level)
—Those which can be operated, maintained and managed by the Vietnamese side (costs of operation, maintenance and management)
—Those which are replace the existing ones (replacement)
—Those which are needed in relation to the hospital's functions and its clinical level (urgent need)
—Those which can be operated by the present staff members of the hospital (operation, maintenance and management)
—Those which are expected to benefit more patients more effectively (expected effect)

b. Items of equipment not to be included in this project

—Those which are for use in radiological research (environment)
—Those which are for use in advanced research (expected effect)
—Those which it will be technically and financially difficult to maintain and manage (operation, maintenance and management)
—Those which it will be possible for the hospital to procure within the limits of its budget (costs of operation, maintenance and management)
—Those whose quantities can be reduced through centralization of the hospital's functions (centralization)

In examining the requested items of equipment against those criteria for selection, those criteria were divided into groups as shown in parentheses and they were further divided into the following three categories.

Category I : Those times of equipment which are indispensable for the maintenance of the hospital's present functions
Category II : Those items of equipment which are to be unnecessary additions to the existing ones
Category III: Those items of equipment which are to be procured for the improvement of the hospital's functions related to this project
Category IV: Those items of equipment which are not to be included in this project since they are not meeting with the selection criteria agreed with preliminary Survey Team

On the basis of the above-mentioned criteria, the requested of equipment were filtered and the items of equipment to be procured under this project were selected. The evaluation list of the requested equipments is attached to the report as an appendix.

2-3 Basic Design

2-3-1 Design Concept

(1) Basic Guidelines

Shown below are the basic guidelines for the design of the facilities to be procured under this project.

1) To work out an efficient and functional architectural design by centralizing the facilities of the ward building and the technical block.
2) To pay special attention to the distinction between the traffic lines for patients and those for the staff members, and the distinction between clean and dirty zones.
3) To pay special attention to the size of the places for use in education and training, as well as the other rooms, in light of the nature of the hospital as a teaching hospital.
4) To work out a site plan and divisional organization bearing in mind future expansion by the Vietnamese side.
5) To work out an architectural plan that makes full use of the blessing of nature, such as natural ventilation and lighting, living condition and customs in and around Hanoi.
6) To design the building with special care for the energy sawing and also for the function, durability and easy maintenance.
7) To make the architectural plan and design as much practical as possible while complying with the country's current applicable laws, regulations and standards.
8) To employ the schedule of the construction work that are workable in the rainy season and shorten the assembly time.
9) To plan with the Future plan and with the allocation of the function in mind.

(2) Guidelines in Relation to Natural conditions

1) Project Site

The project site is located on the premises of Bach Mai Hospital. It borders on the nuclear medicine building and the Institute of Dermatology and Venereology on the north, on the outpatient building and the microbiological examination building on the east, and on the roads on the west and the south.

The site is even but there are many big trees growing on it. These trees should be incorporated into the site plan as much as possible.

2) Wind

In and around Hanoi, the wind usually blows from the east.
There are no wide fluctuations in wind velocity throughout the year. The planned facilities should be so designed as to utilize the easterly ;wind for natural ventilation.

3) Rain

In and around Hanoi, the rainy season usually lasts from May to September. The average annual rainfall in Hanoi is about 1,500mm, but the rainy season accounts for about 75 percent of the annual total rainfall. During the rainy season, the daily rainfall sometimes exceeds 150mm. It will be necessary, therefore, to protect the openings in the exterior walls with louvres and awnings to prevent the rain from blowing into the rooms and the corridors. The roofs of the buildings and the drain ditches should also be so designed as to be able to discharge rainwater easily.

4) Sunlight

Hanoi is situated at lat. 45N and therefore sunlight comes mainly from the south. In summer, the sun is very strong. It will therefore be necessary to make the rooms very resistant to sunlight and to protect the openings in the exterior walls facing south and north with louvres and awnings to minimize the effect of direct sunlight. It will also be necessary to take into account the very strong afternoon sun in designing the planned buildings.

5) Climate

The change of the season is s quite noticeable in and around Hanoi. The monthly average temperature ranges from 16.6 c to 29.3 c. The lowest temperature in winter is 8c, which means heaters are indispensable in winter. The highest temperature in summer, on the other hand, is nearly 40c. If the rooms of the planned facilities are to be comfortable with minimum air conditioning, adequate ventilation in summer and adequate heat insulation in winter should be the primary considerations in working out the floor plan and section.

(3) Guideline in Relation to Social conditions

Bach Mai Hospital is the largest tertiary referral hospital in the northern part of Viet Nam, but it also serves as a teaching hospital. In working out the architectural plan and design for the facilities to be constructed under this project, therefore, due consideration should be given to the above-mentioned fact.

In Viet Nam, inpatients are usually attended on by many of their family members. It will be necessary, therefore, to provide relatively large waiting halls under this project.

The facilities of the clinical divisions should be so designed as to let in patients only.

(4) Guideline in Relation to the Actual condition of the Local Construction Industry

1) The authorization system and applicable laws and regulations

In Viet Nam, no major construction work can be started without the prior approval of the Minister of Construction. In addition, the approval of the fire authorities must be obtained prior to applying for the approval of the Minister of Construction (it will take about 20 days to obtain the approval of the fire authorities). Application for the approval of the Minister of Construction are first reviewed by the Evaluation Division of the Ministry of Construction.

The review process is completed within 40 days. Within 15 days of the completion of the process, the approval of the Minister of Construction is issued. In this project, the Vietnamese side is to be responsible for following these procedures. For the smooth following of the procedures, it will be necessary for Bach Mai Hospital to hire a local architectural design office and also to work closely with the Japanese consultants selected.

It will be about 45 days before the Japanese side prepares design drawings and the Vietnamese side translates them into Vietnamese to follow the above-mentioned

procedures. It will therefore be necessary to work out a design drawing preparation work schedule taking into account the above-mentioned time requirement.

The construction of the main access to the project site, a part of which crosses the railway track must be started after obtaining the permission of the railway authorities. It will take about 6 months to complete the work to obtain such permission, which is to be within the scope of the work to be conducted by the Vietnamese side. In Viet Nam, the standard on the construction of hospitals was issued in 1995. The fire service standards were issued in 1993 and 1995. Other related standards have also been issued in recent years. The implementation of this project is premised on compliance with these standards. But it is not very long since theses standards were enforced. For this reason, it will be necessary to draw up the practical architectural plan and design taking into consideration the actual situation in Viet Nam.

(5) Guidelines for Utilization of the Services of Local Contractors and Locally Available Construction Machines/ Materials

1) Facilities

In determining the scale of the planned facilities, due consideration should be given to the functions and scale of Bach Mai Hospital's existing facilities, the Japanese standard on the floor spaces of medical facilities and the planned layout of necessary items of equipment. Table 2-9 shows a comparison of the average minimum floor space per bed and the floor space per bed indicated in the request.

2 – 9 Department Area Allocation in wholesome Hospital model

㎡

	A Japanese Hospital Standard	Hospital A	Hospital B	Average	%	Final Request
㎡/beds	66.98	79.5	68.0	71.50		60
beds		506beds	733beds			480beds
Total Floor Area		49,883 ㎡	49,883 ㎡			28,800 ㎡
Ward	23.64	27.3	25.8	25.58	35.78	10,304 ㎡
Technical Block	17.60	15.4	14.6	15.87	22.20	6,394 ㎡
Policlinic	9.26	7.7	8.6	8.52	11.91	3,430 ㎡
Administration	5.84	7.5	7.0	6.78	9.48	3,730 ㎡
Service	10.02	21.6	10.8	14.14	19.78	5,697 ㎡
Education and Trying	0.62	0.0	1.2	0.61	0.85	245 ㎡

—It will be necessary to determine the ratio of the floor spaces for use in education and training to the total separately in view of the fact that BMH is a teaching hospital.

2 – 10 Planned Floor Area to be included in this project

m²/bed

Department	Area (480 beds)	Reference
Ward	10,304	60 m²/beds × Proposed beds
Technical Block	6,888	75% of total area in Diagnostic and Treatment Center is usable area. (See 3-11)
Out-patient Department	0	Utilize existing policlinic.
Administration	2,087	See 3-12 for the rooms allocated to the Departments.
Service	2,874	45% of the total Department area is the planned Floor Area (See 3-13)
Education and Training	1,343	Added up all necessary space for education and training. (See 3-12)
Sub Total	23,496	
Common use	1,175	23,496 m² × 5 %
Total	24,671	24,671 m² ÷ 480 beds = 51.4 m² /beds

・Connecting Corridors, and Exterior Corridors are not included.

2 – 11 Activities included in the Diagnostic and Treatment with Floor Area

	A Hospital	Hospital A	Hospital B	Average
Specimen Test	2.6	1.6	2.0	2.1
Biochemistry	0.9	0.7	0.5	0.7
Endoscope	0.3	0.1	0.3	0.2
Xray Diagnosis	2.1	2.0	1.6	1.9
Xray Treatment	0.6	0.5	0.5	0.5
Nuclear Medicine	0.5	0.4	0.3	0.4
Surgical Operation	2.6	2.6	2.2	2.5
Delivery	0.8	0.4	0.7	0.6
Central Supply	1.0	Included Service	0.7	0.9
Pharmacology	1.0	1.1	1.1	1.1
Rehabilitation	3.2	2.4	0.5	2.0
Special Treatment	0.7	0.7	0.2	0.5
Common and Others	1.3	2.8	3.8	2.6
Total	17.6	15.4	14.6	15.9

	% in BMH	% in D.&T.Dept.	Proposed Floor Area (m²)
Specimen Test	2.9	13.1	1,218
Biochemistry	1.0	4.4	420
Endoscope	0.3	1.3	126
Xray Diagnosis	2.6	11.9	1,092
Xray Treatment	0.7	3.1	0
Nuclear Medicine	0.6	2.5	0
Surgical Operation	3.5	15.6	1,470
Delivery	0.8	3.8	336
Central Supply	1.2	5.6	504
Pharmacology	1.5	6.9	630/3 210
Rehabilitation	2.8	12.5	0
Special Treatment	0.7	3.1	0
Common and Others	3.6	16.2	1,512
Total	22.2	100.0	6,888

2－12 Proposed Area for Management and Education

	Floor Area ㎡	Calculation
Director	41	6.4×6.4
Vice Director	103	6.4×3.2× 3 Rooms
Conference	163	20Students×1Rooms、16Students×1Rooms, 8Students×3Rooms
Medical Office	355	79－8=71Students 71× 5㎡=355
Department Head	164	6.4×3.2× 8 Rooms
Medical Record	82	
Library	82	
Duty Room	410	6.4×3.2×10Nursing Unit× 2 Rooms
Security	20	6.4×3.2
Reception	41	6.4×6.4
Sub Total	1,461	
Others	626	Usable 70%
Total	2,087	

	Floor Area ㎡	Calculation
Lecture Hall	360	300Students×1.2㎡/Students (incl.stage)
Lecture Room	180	50Students×1.2㎡/Students× 3 Rooms
Conference	400	40Students×1.0㎡/Students×10Rooms
Sub Total	940	
Common and Others	403	Usable 70%
Total	1,343	

—Of the facilities of the Relative Offices, those for the medical affairs and accounting departments are not to be included in this project (the existing ones are to be used). Only the director's office, the vice director's office, the conference room and the case history room of the planned ward are to be procured under this project.

The scale of the medical office (including space for a library) is to be determined on the basis of the total number of physicians to work at the clinical divisions to be covered by this project. In the case of the technical block, each clinical division within the block is to have its own medical office in light of the nature of the operations to be conducted by physicians to work at the technical block and these physicians' communications with the technicians.

—The conference room is to be located near each department for its effective use, namely, so that it may be used for other purposes than education (nurses' meetings and consolation services for patients).

2 —13 Function and Floor Area Ratio in Service Department

	A Hospital Standard	HOSPITAL A	HOSPITAL B	Average	% in BMH	% in Dept	Area for 480beds in
Food Supply		1.4	1.2	1.3	1.0	8.0	0
Welfare		0.9	1.2	1.1	1.3	6.7	374
Machine Rooms		12.5	4.2	8.4	10.2	51.5	628
Laundry		Incl. in Storage	0.4	0.2	0.2	1.2	0
Storage		2.6	0.8	1.7	2.1	10.4	605
Common and Other		4.2	3.0	3.6	4.4	22.1	1,267
Total	10.0	21.6	10.8	16.3	19.8	100.0	2,874

Area for machine Rooms in based on proposed Plan

The materials to be procured for this project should basically be those which are easy to maintain and manage. The same rule should apply to their finish. On the other hand, however, those rooms which must be always clean and those where precision equipment is to be installed should be of higher grade.

2 --14 Floor Area

Floor	Ward		Connecting Corridor/ Machine Rooms		Technology Block	
	Total Floor Area	Construction Floor Area	Total Floor Area	Construction Floor Area	Total Floor Area	Construction Floor Area
PH			/164	/164		
6	2,321	2,773	184/	184/		
5	2,321	2,773	184/	184/		
4	2,321	2,773	256/	256/	1,915	1,982
3	2,321	2,773	256/	256/	1,821	1,982
2	2,867	3,344	256/	256/	1,820	1,967
1	3,270	4,083	256/464	256/464	1,820	1,967
Total	15,421	18,519	1,392/628	1,392/628	7,376	7,898
Total Floor AreaTotal	24,817					
Construction FloorArea Total	28,437					

2-3-2 Basic Plan

(1) Architectural Plan(3-17-(1)~(10)

1) Site conditions

The project site is situated to the south of the centre of Hanoi, the capital of Viet Nam. It is located on the premises of Bach Mai Hospital, which faces Giai Phong Road and the railway track connecting, Hanoi and Ho Chi Minh. The road running along the eastern side of the project site is about 35 meters long. The project site is bordered on the roads running on the southern and western sides in the premises of the hospital. The site is flat but there are many big trees growing on it.

2) Site Plan

Generally, a hospital has a variety of complicated functions. It is important, therefore, to design a hospital's facilities in a manner that eliminates or minimizes confusion of such functions of the hospital. This project is aimed at improving part of Bach Mai Hospital's existing facilities and constructing a technical block. The planned facilities are not to be designed to satisfy the hospital's all functional requirements but to be functionally closely linked to the existing facilities. It is important to draw up a site plan which gives due consideration to the linkage between the wards located between the planned technical block and the wards in the existing building and the outpatient building.

It is also important to secure a space for future expansion so that the hospital may maintain its functionality. The project site may be approached either via the road running along the northern side of the premises of the hospital or by crossing the railway track running along the eastern side (a gate needs to be built at the crossing). Since the road on the premises of the hospital, which connects to the above-mentioned road is not wide enough, the latter approach to the project site is functionally preferable. The planned technical block is to be approached by patients from both the planned ward building and the outpatient building. So it is desirable that the technical block be located halfway between the two facilities. In addition, the above-mentioned crossing is located in the centre of the premises of the hospital. From the standpoint of centralization of the hospital's examination functions, too, it is desirable that the technical block be approached from the crossing. It should be noted that the crossing is located adjacent to the existing block, which means a great convenience also to the hospital's staff members. For these reasons, the long side of the building is to lie south to north, not east to west, for the greatest comfort inside the building.

The technical block: It is very likely that the planned technical block will be extended in the future in keeping with further advancements made in medical technology. It will be necessary, therefore, to secure spaces for such extension on the eastern and western sides of the project site, the space on the eastern side for future extension to cope with expansion of functions and the one on the western side for future extension for the introduction of new functions.

The ward : A space for this facility has been secured on the northern side of the technical block.

The electric/machine building is to be located on the western side of the project site, with a space for future extension.

3) Floor Plan

Ground Floor

The facilities of the radiological diagnosis department, which are likely to be visited mostly by outpatients, are to be located on the ground floor of the technical block. The area surrounding these facilities, which is to include a waiting hall, should be open and well ventilated. These facilities may be approached easily from the outpatient building. The layout of these facilities is so simple that patients will find it very easy to find out where to go. The areas for the staff members are concentrated in the centre of the building so that the hospital may operate the technical block and the ward with a limited number of staff members. The main entrance to the ward building is to be located on the western side and the facilities of the relative offices on both sides of the entrance hall. The paediatrics building is to be located on the eastern side of the ward building. The well ventilated based of the well hole style entrance hall may be used as a play room. The vertical traffic lines (the elevator and staircase) are to be concentrated in the junction between the technical block and the ward building so that the junction may be approached easily from the two facilities. A lecture room which is to be located near the main entrance may be used for various purposes, including education and training of the

medical students and the medical professionals and education programs for patients, their families and their communities.

Second Floor

The facilities of the physical examination department, which will be utilized mainly by outpatients, and those of the endoscope examination department, which should preferably be located adjacent to the facilities of the physical examination department, are to be located in the technical block. The dispensing pharmacy to supply drugs to the ward is to be located near the elevator and the staircase.

The surgery department's ward and medical office are to be located on the first floor of the ward building. The medical office is to be located above the entrance hall and the ward is to be located on the western side of the entrance hall. Since the ward is linked to the department's ward on the second floor by a vertical traffic line, close communications between the two wards can be maintained in the internal staircases. A lecture hall to be located near the medical office and another lecture hall to be located below the medical office will form part of the administration zone created around the medical office. (drawing:)

Third Floor

The facilities of the sample examination department are to be concentrated in the technical block. The facilities of the delivery department will also be located there. The ward on this floor will have a gynecology and maternity department of its own.

Forth Floor

The facilities of the operation department and the central supply and sterilizing department are to be located on this highest floor of the technical block. The floor plan for these facilities should place emphasis on cleanliness. The ward on this floor will consist of ICUs for patients who have just undergone operations and a combined ward.

5 and 6 th Floor

A ward is basically to consist of 2 nursing units per floor. Each nursing unit is to face a nurse centre located on the opposite side of its entrance. This arrangement is aimed at creating complementary relations between the nurse centres and making security check easier. Near a nurse centre should be nurses' rooms, single rooms for serious cases and single rooms for infectious disease cases so that these cases may receive careful nursing. Under this program, one nursing unit is to consist of 50 beds in consideration of operational efficiency and the present total number of nurses working at the hospital.

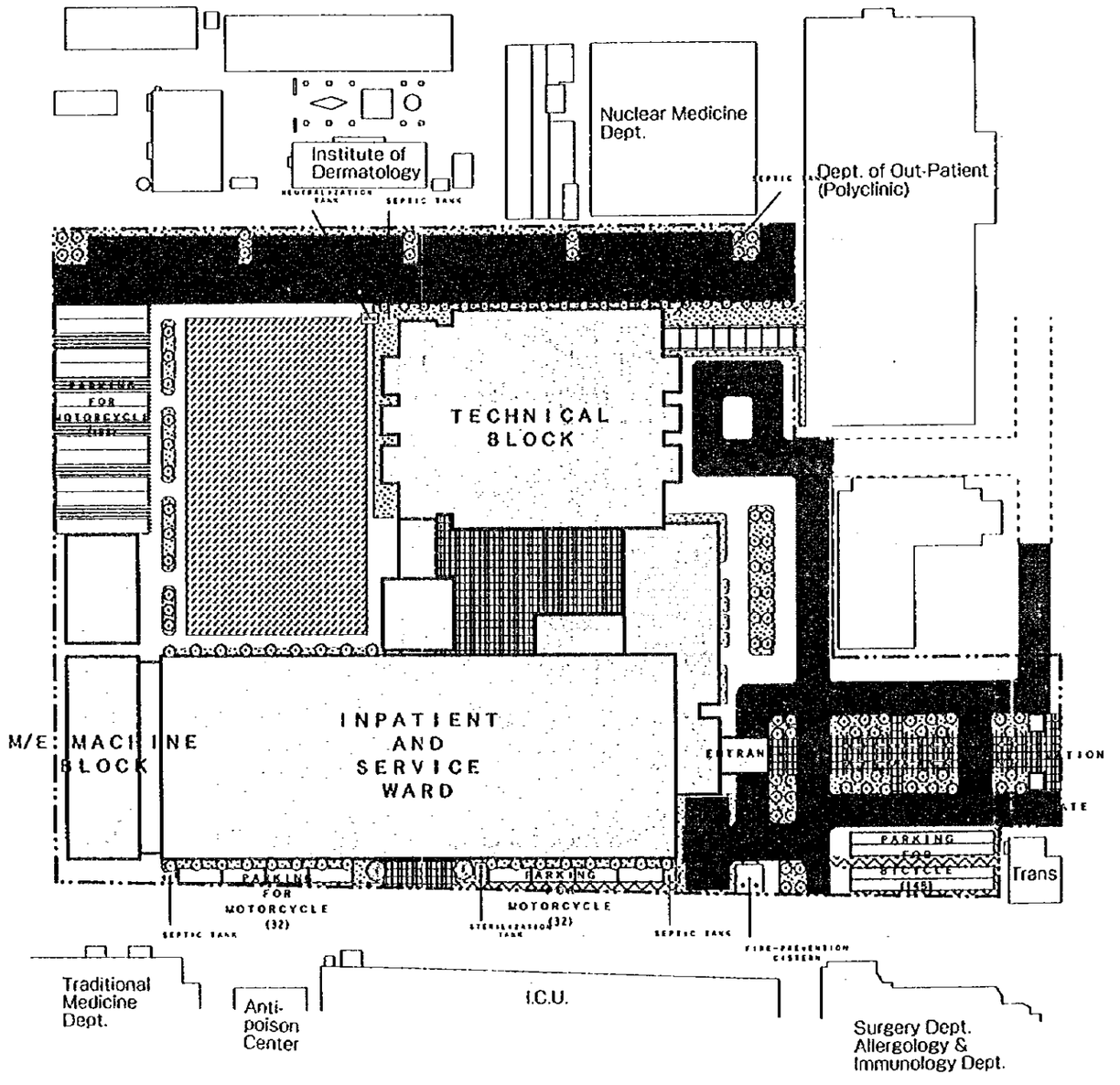
4) Sectional Plan

Ventilation of the wards and spaces for patients is mostly to be natural ventilation. In this connection, it will be important to secure adequate air volume by means of sufficiently high storey and ceiling heights. The construction of the entire building is to be characterized by good ventilation by means of the wellhole

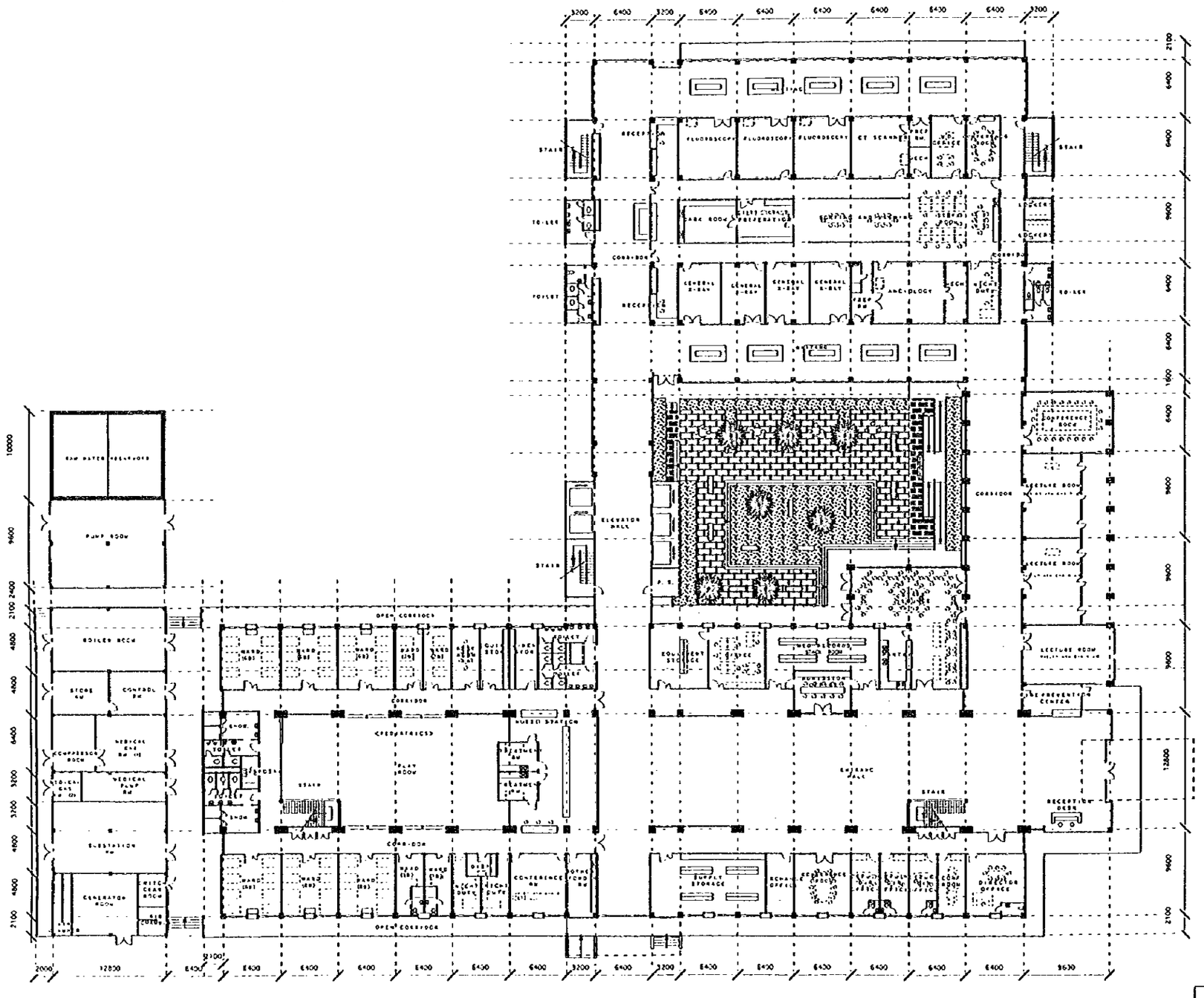
style entrance halls in the centre of the building. Since the technical block and the ward building are closely linked to each other on each floor, the storey heights for the ground to the third floors of the ward building are to be based on those for the Technical Block. The main diagnosis and examination rooms of the technical block will require air conditioning because they will be provided with many items of medical equipment. In addition, many of these items of medical equipment will be large-sized. For these reasons, the storey height for these rooms is to be 4.5 meters. The storey height for the fourth and fifth floors ins to be 3.9 meters to secure a ceiling height of 3.6 meters as stipulated by the Vietnamese standard on hospital construction.

As to the transportation equipment, two elevators for use in the transportation of beds and two elevators for the use of patients and the staff members are to be procured under this project to make vertical transportation of patients easy and reduce the transportation burden on patients.

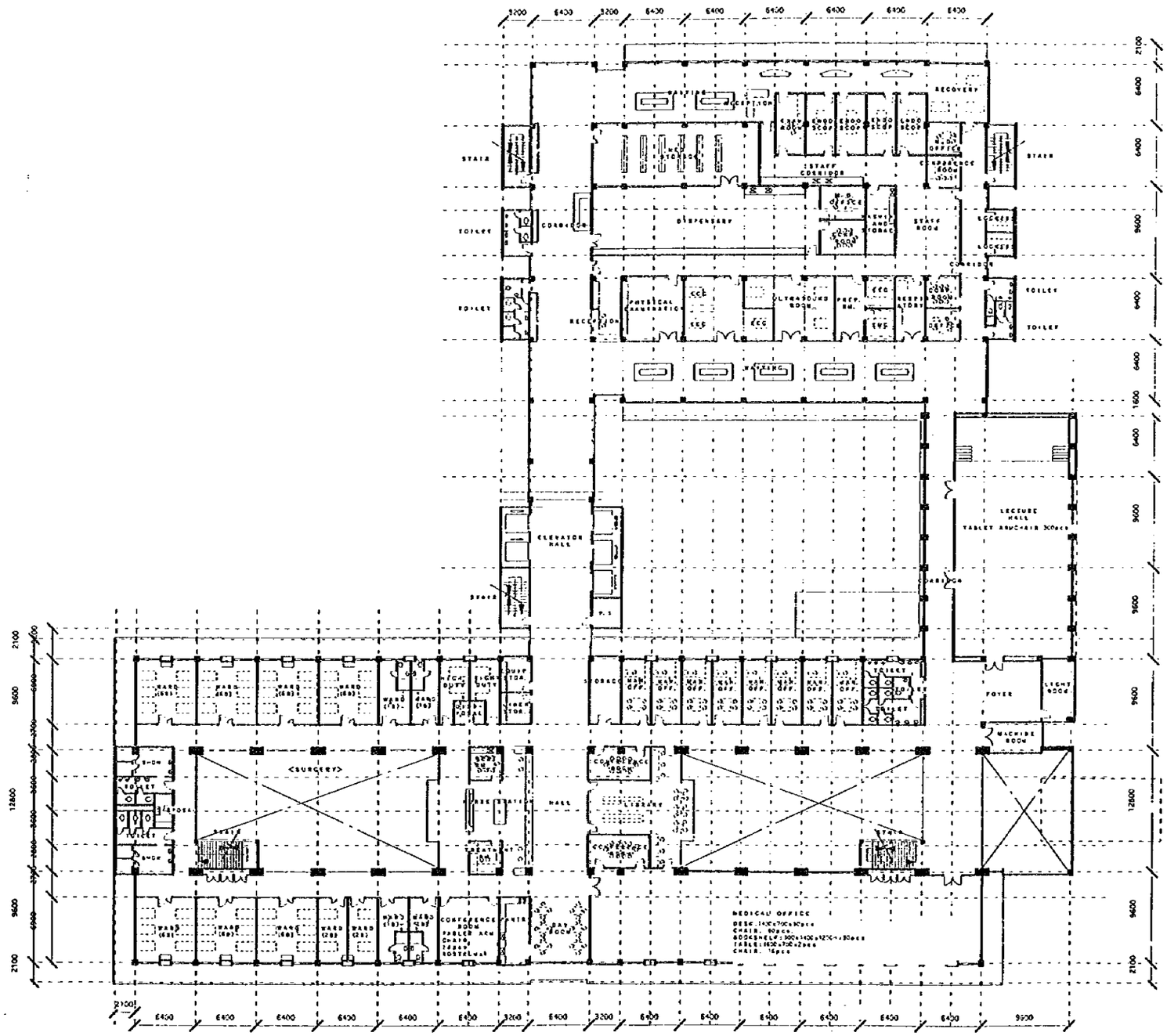
As for the emergency evacuation of patients, a two-way evacuation system is to be introduced in which patients can evacuate via the two primary evacuation routes, one in the outer corridors and the other in the inner corridors.



BACH MAI HOSPITAL
SITE PLAN SCALE 1/1000

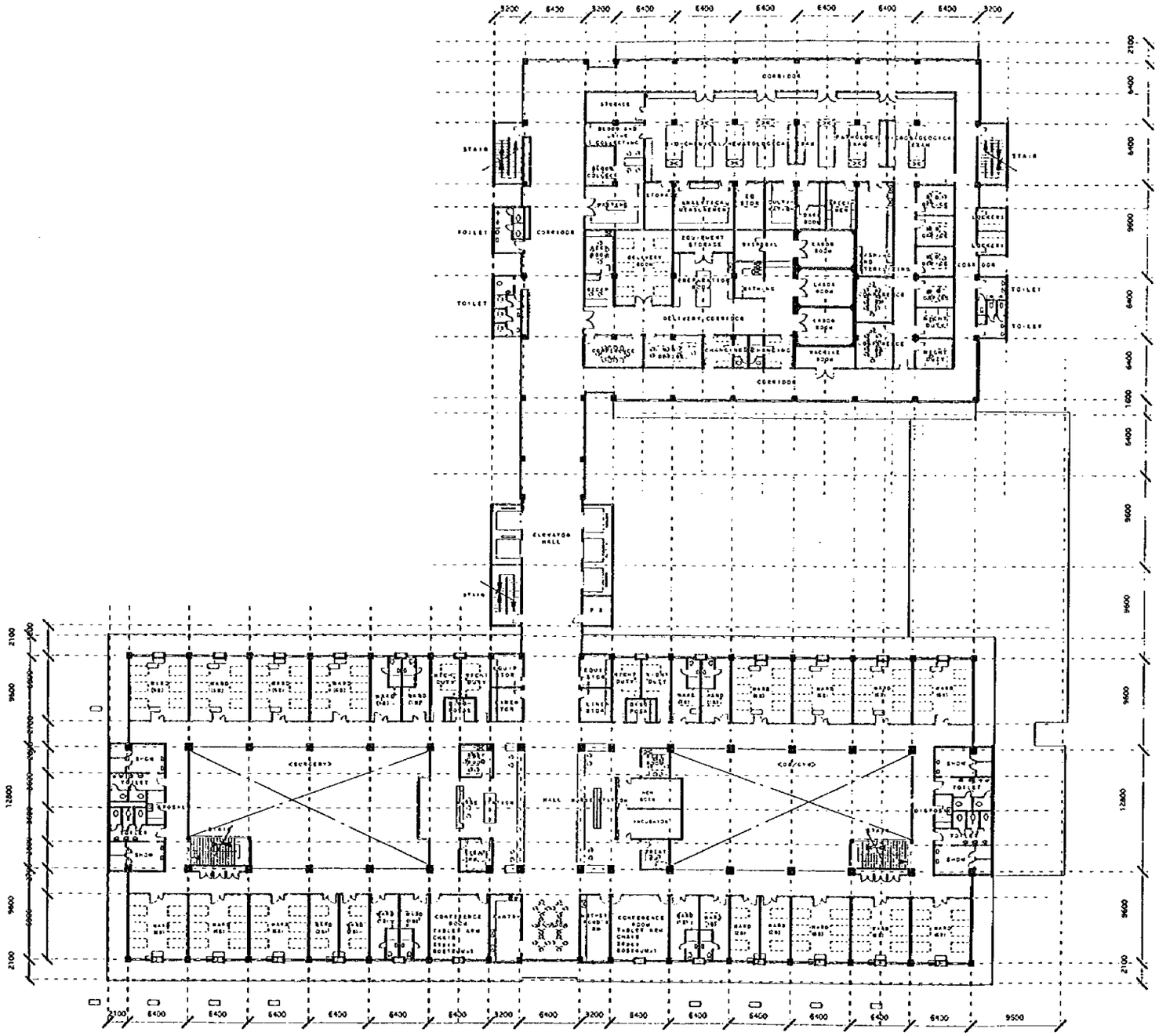


BACH MAI HOSPITAL
1F PLAN SCALE 1/500



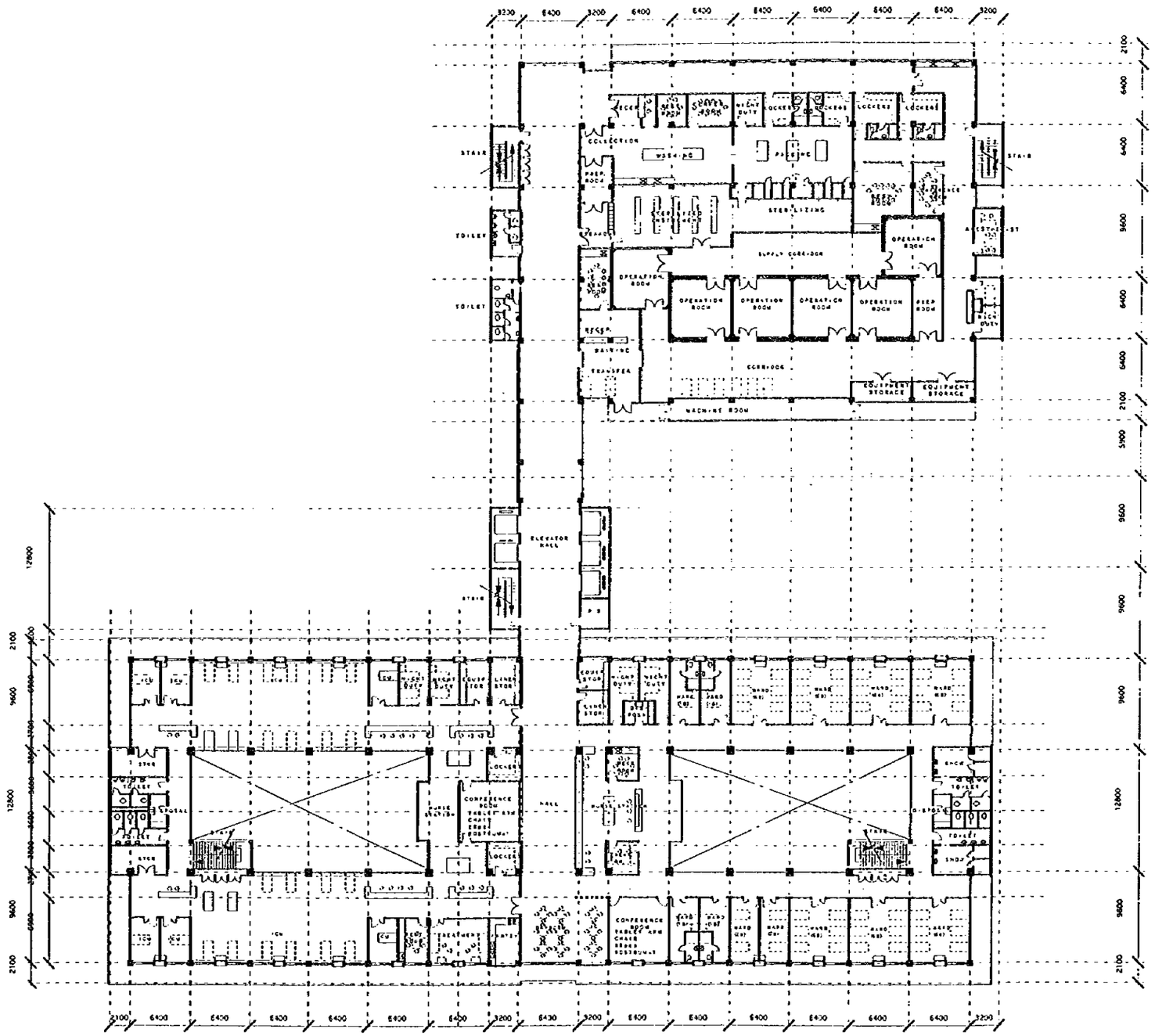
34

BACH MAI HOSPITAL
2F PLAN SCALE 1/500

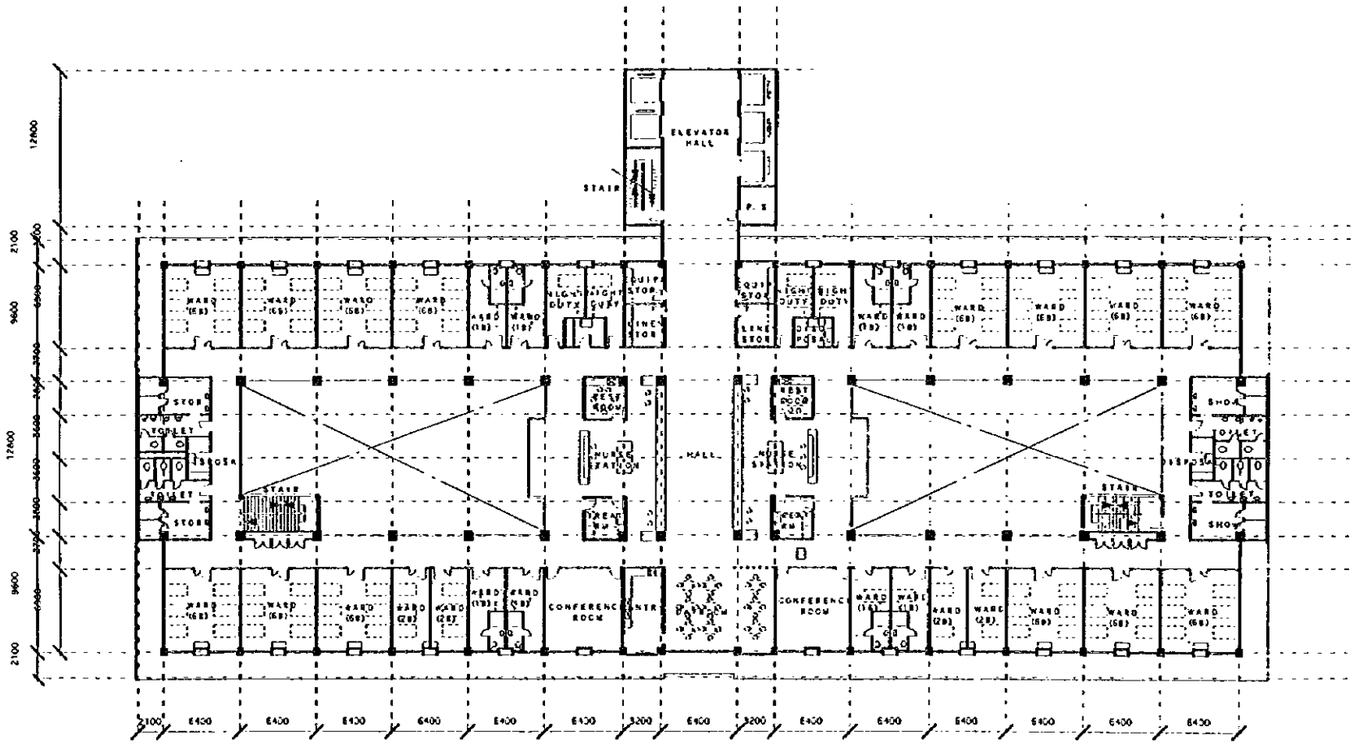


35

BACH MAI HOSPITAL
3F PLAN SCALE 1/500

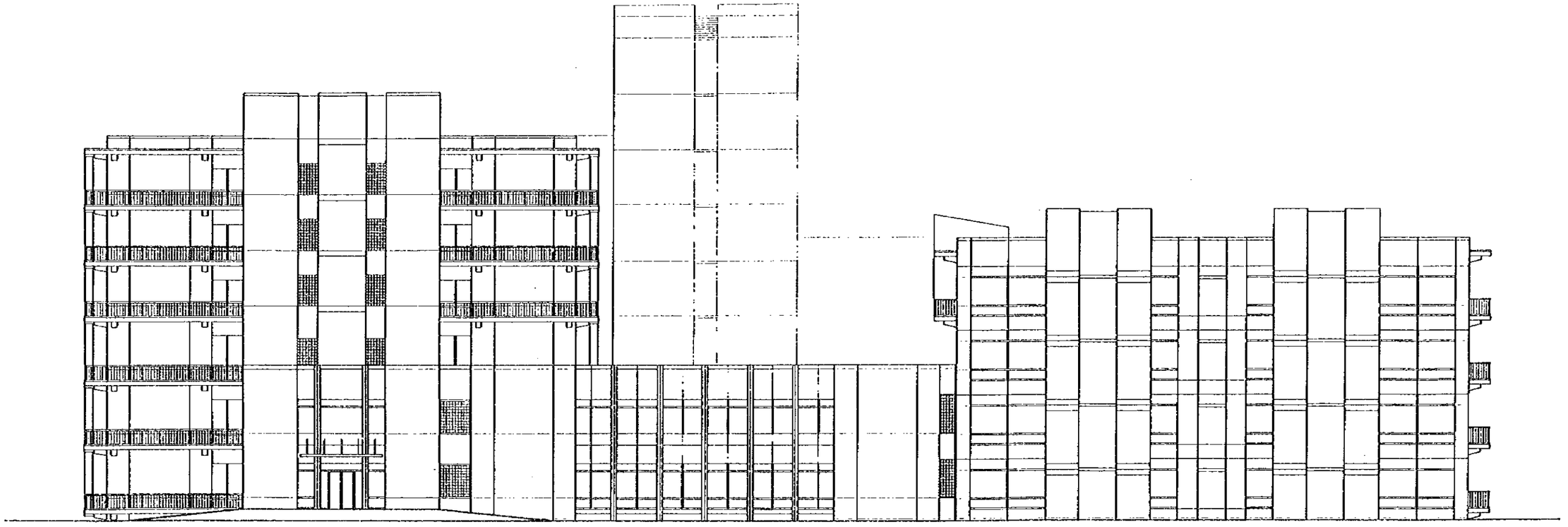


BACH MAI HOSPITAL
4F PLAN SCALE 1/500



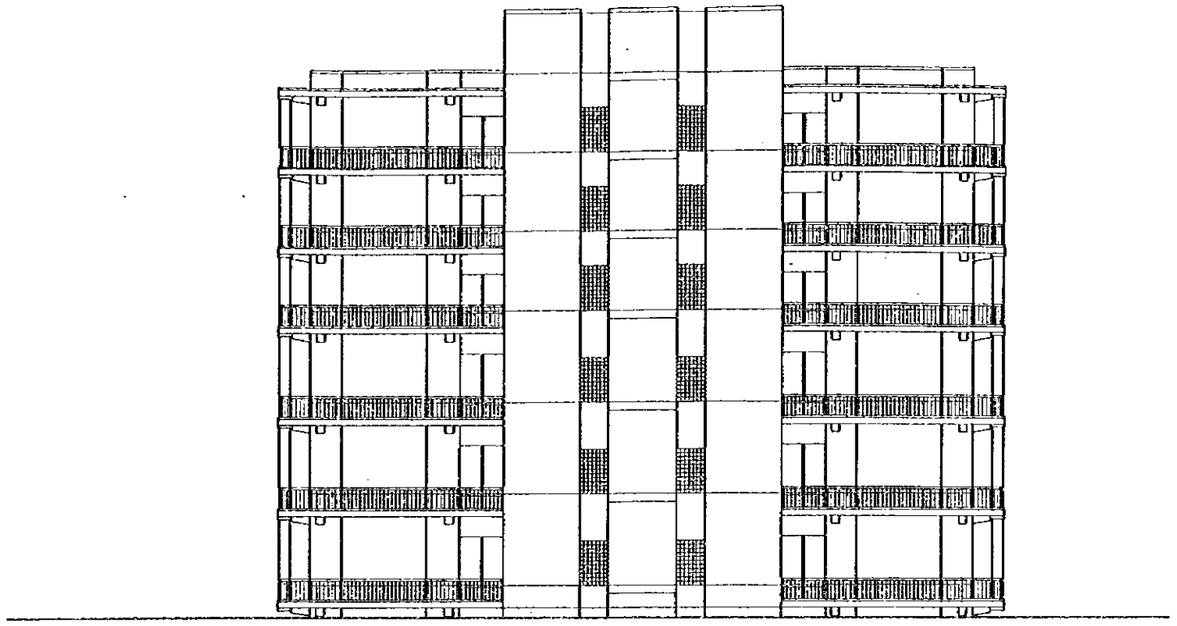
37

BACH MAI HOSPITAL
5F-6F PLAN SCALE 1/500

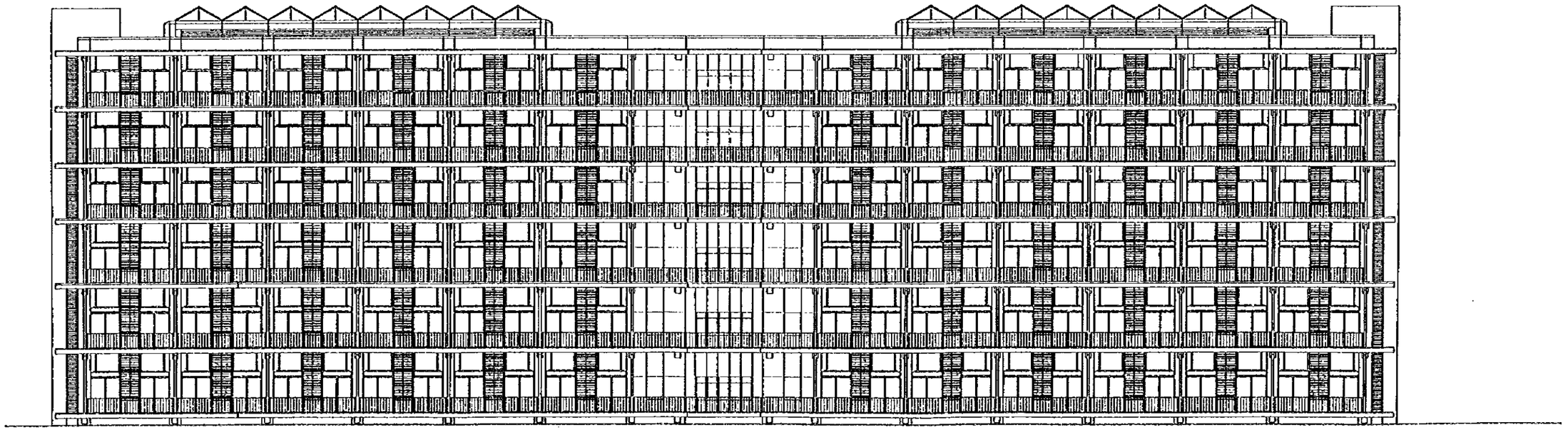


EAST ELEVATION

HOSPITAL
ELEVATION SCALE 1/300

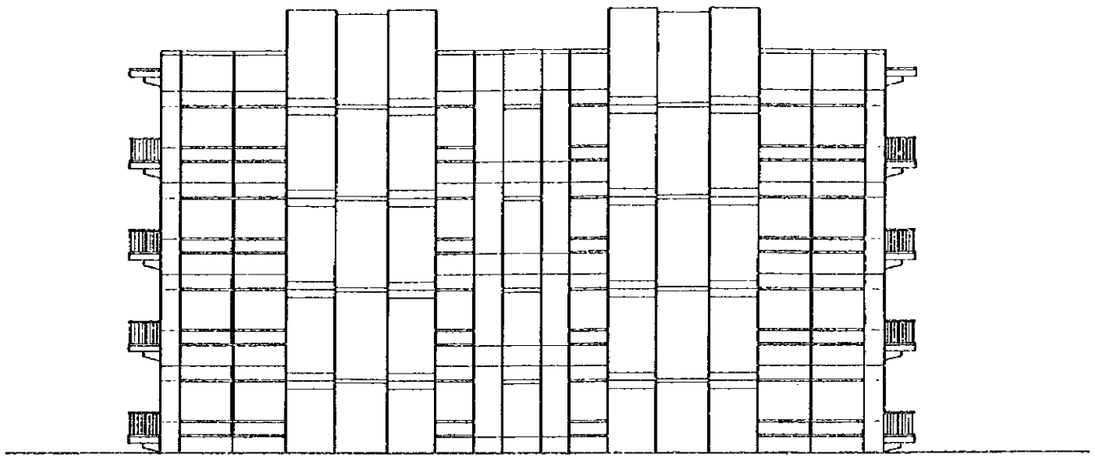


WEST ELEVATION

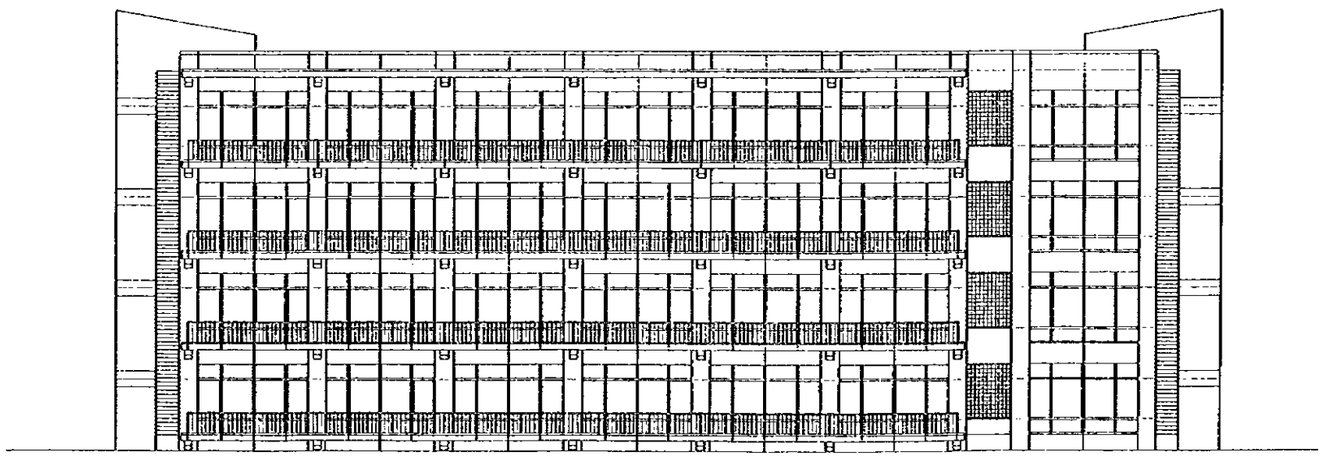


SOUTH ELEVATION

INPATIENT AND SERVISE WARD
ELEVATION SCALE 1/300

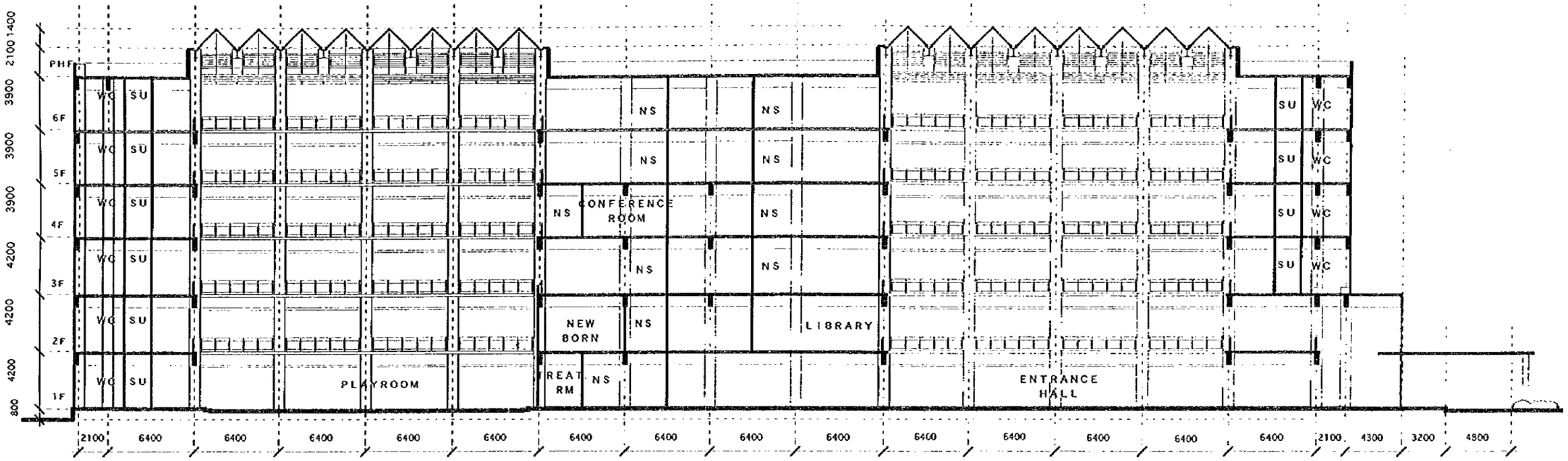


WEST ELEVATION

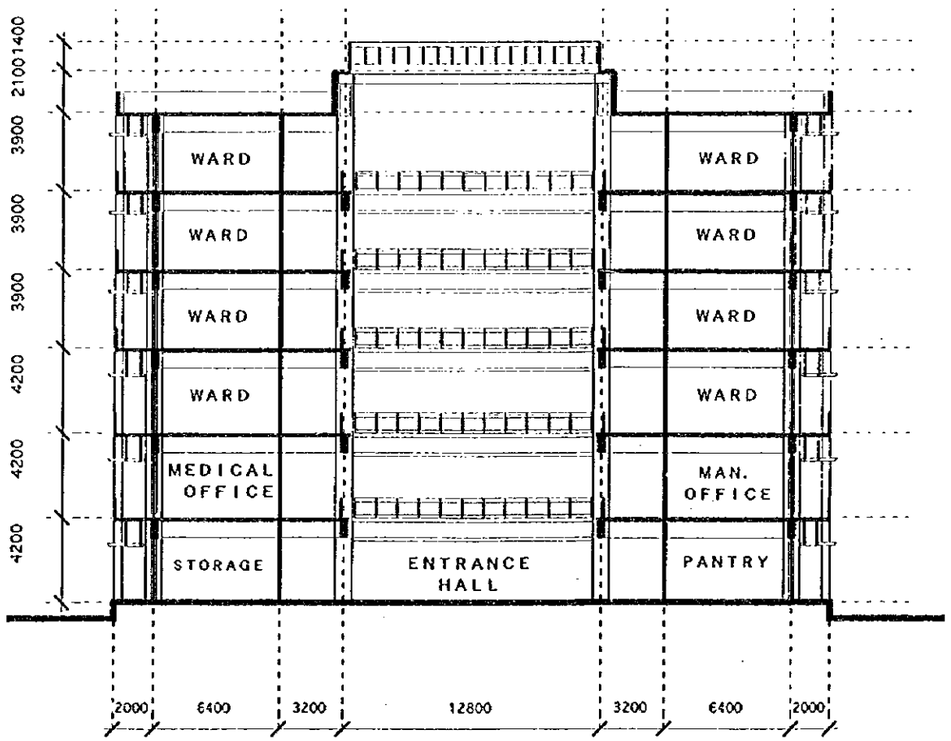


NORTH ELEVATION

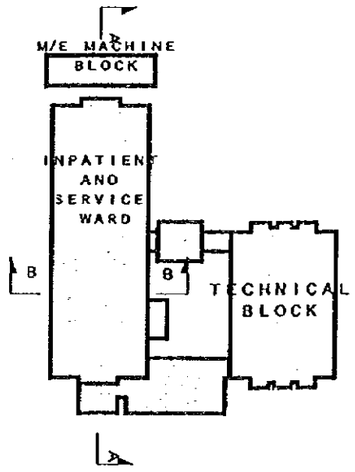
TECHNICAL BLOCK
ELEVATION SCALE 1/300



SECTION A-A



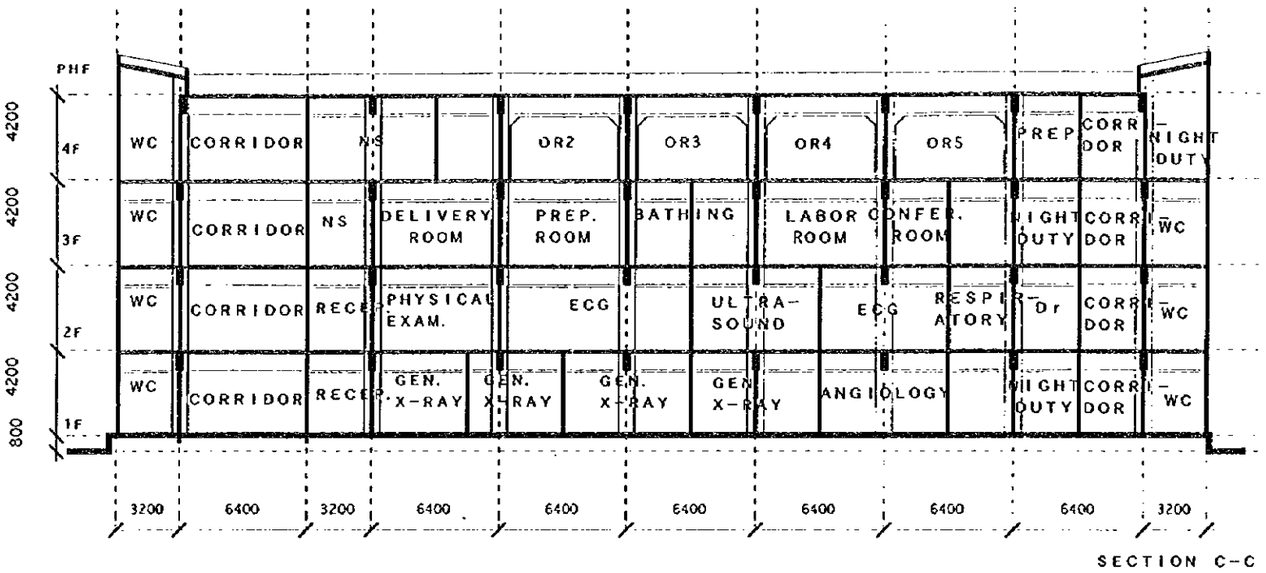
SECTION B-B



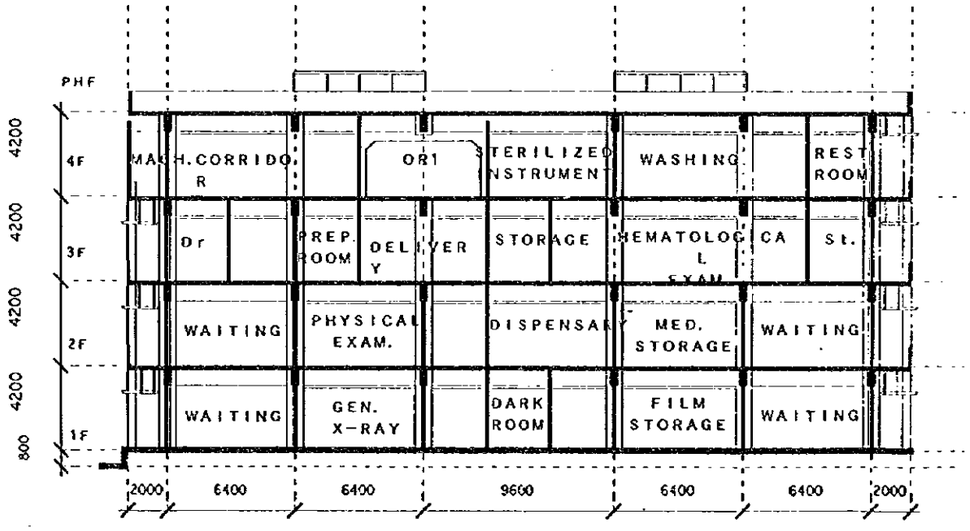
41

INPATIENT AND SERVICE WARD
SECTION SCALE 1/300

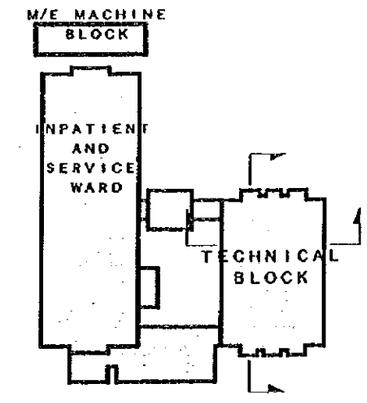
TECHNICAL BLOCK



SECTION C-C



SECTION D-D



TECHNICAL BLOCK
SECTION SCALE 1/300

(2) Structural Plan

1) Structural Plan

Both the ward building and the technical block are to be reinforced concrete buildings, which are highly resistant to earthquakes and which are widely used in Viet Nam. It is desirable that reinforced concrete walls be used as bearing walls. In Viet Nam, however, such walls are seldom used. Usually, bricks or concrete blocks are used as bearing walls. Since in the floor plan for the facilities to be built under this project there are only a few bearing walls to be erected in the same place, pure frame structure consisting of columns and beams only is to be employed to ensure adequate resistance to vertical and horizontal forces.

It should be noted that steel beams are to be used in the roof of the upper part of the atrium so that the atrium's impression of lightness, such as its top light, may not be impaired.

2) Basic Guidelines for Structural Design

The following are the basic guidelines for the structural design for this project.

a. The size of the external force and the assumed load to work on the buildings to be built under this project are to be determined on the basis of the local weather and geographical conditions, the ground of the project site and the uses of the planned facilities.

b. In principle, the values as specified in the applicable Vietnamese standards of the allowable stress to work on the materials are to be used. In actuality, however, these values are to be determined taking into account the quality of the materials.

c. The stress on frame structure and the proportioning of section are to be determined giving due consideration to the applicable Vietnamese standards, the ACI code and the standards established by the Japan Architectural Society.

3) Load and External Force

The values of load and external force (expecting seismic force) are to be determined in accordance with TCVN2737 "LOADS AND ACTION" (hereinafter referred to as "TCVN2737").

a. Dead load

The value of dead load for each material is to be determined.

b Live load

The values of live loads are to be determined in consideration of the Building Standards Law of Japan and the standards of the American Standard Association (ASA). The values of live load for the portions of the buildings which are to be used for special purposes are to be determined on a case by case basis giving due consideration to the actual situation.

2 – 18 Live Load

	Live Load (daN/m ₂) [kg/m ₂]	
Ward	200	[204]
Consultation	300	[310]
Common	300	[310]
Office	300	[310]
Storage	500	[510]
Roof	100	[105]

c. Wind force

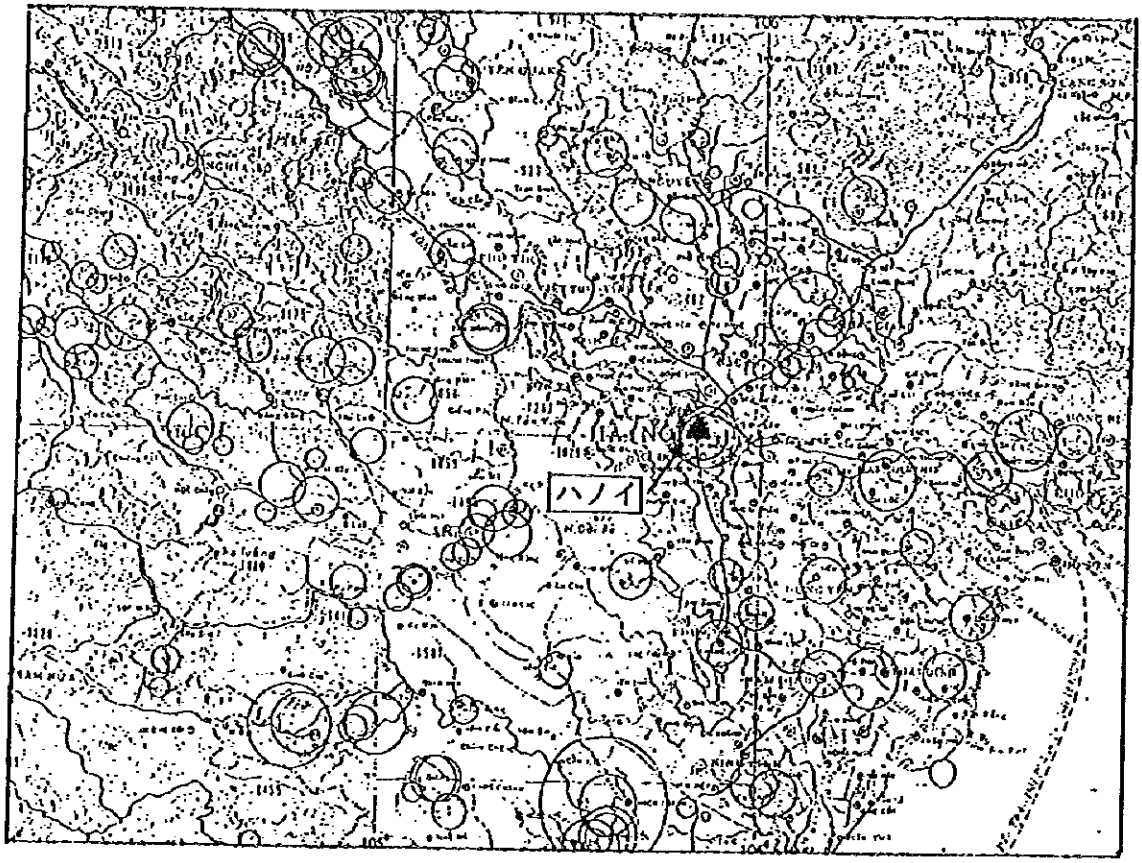
According to TCVN2737, Hanoi belongs to Zone II. B and the reference wind speed applicable to architectural design is 95 daN/m² (97 kg m²).

2 – 19 Wind Pressure Regions in Viet Nam

d. Seismic force

The local record of earthquakes in and around Hanoi show that there were a number of earthquakes with magnitudes of 4 to 5 on the Richter scale. "INSTRUCTIONS MATHEMATICAL AND STRUCTURAL CALCULATION FOR CONSTRUCTION AREAS SUBJECTED EARTHQUAKE IN VIET NAM', which was published in 1994, state that buildings should be designed taking seismic force into consideration. In this project, therefore, seismic force is to be determined in accordance with these guidelines.

2 – 20 Earthquake Record



Legend

Magnitude M_s=6.6 - 7.0

Magnitude M_s=6.1 - 6.5

Magnitude M_s=5.6 -6.0

Magnitude M_s=5.1 - 5.5

Magnitude M_s=4.6 - 5.0

Magnitude M_s=4.1 - 4.5

Magnitude M_s=3.6 - 4.0

Magnitude M_s=3.1 - 3.5

Magnitude M_s<3.0

4) Bearing Ground and Foundation Plan

According to a boring survey conducted on the project site, the project site is located in a river location and the ground under the surface layer consists of alternative clayey and sandy layers. The layer to serve as the bearing ground is located at a depth of about 48 meters. In view of the fact that the planned buildings are relatively high (the ward building is to have 12 storeys) and therefore the column axial force is great and that the construction work under this project is going to be carried out on the premises of a hospital, pile foundation made of locally available piles, the construction of which generates fewer vibrations, is to be employed in the construction work under this project is going to be carried out on the premises of a hospital, pile foundation made of locally available pies, the construction of which generates fewer vibrations, is to be employed in the construction work under this project.

2 -21 Soil layer and N-value

Depth(m)	Layer	N-value
0.0~ 2.2	Filled Soil	8~12
2.2~ 4.7	Stiff Cray	8~15
4.7~12.1	Soft Cray	3~7
12.1~13.6	Firm Cray	8~11
13.6~20.8	Fine Sand	12~26
20.8~30.6	Soft Cray	6~13
30.6~33.2	Fine Sand	19~39
33.2~34.3	Firm Cray	9~15
34.3~42.5	Fine Sand	14~47
42.5~43.8	Firm Cray	7~24
43.8~48.0	Fine Sand	11~43
48.0~	Gravel,Cobbie	>50

(3) Mechanical and Electrical Plan

1) Electrical Plan

i) Power supply System

Electric power (3-phase, 3-line, 10kv) is to be supplied to the electric room on the project site from the nearest substation of Hanoi Power Company via the two existing substations (Substation No. 1 and No. 2) on the premises of Bach Mai Hospital. Since it is expected that voltage will be raised to 24 kv in the near future, the items of equipment which can be used on either voltage are to be procured under this project. The planned facilities' total power demand is estimated at about 1,200 kw. It will therefore be necessary to supply electric power (standard 3-phase, 4-line 380/220 v) to each of the planned facilities via the required number of transformers and panel boards. As it is expected that the voltage fluctuation rate for commercial electric power will range from -15% to +15%, automatic voltage regulators (AVR) with minimum capacity are to be

installed for the protection of medical equipment and other items of precision equipment. In addition, it is expected that there will be power failure once twice a month on average, each failure lasting up to 8 hours. So a diesel generator is to be installed as emergency power supply in order to maintain the lowest level of functions in emergencies. The generator and the power generator room are to be equipped with proper sound insulation, soundproofing and vibration-proofing devices.

ii) Lighting and Socket Outlet System

In principal, the design illuminance is to be in accordance with the Japanese Industrial Standards (JIS). In consideration of the present condition in Viet Nam, however, the actual illuminance is to range from 60 percent to 70 percent of the JIS values. Fluorescent lights are to be used as the main light sources. As many switches as possible are to be installed for operation cost saving.

Round 2-pin type socket with earth terminal or round 2-pin type socket without earth terminal, which are common used in Viet Nam, are to be installed. Their locations and specifications are to be decided according to the kind of power sources, capacity and method of connection.

iii) Lightning Protection system

Lightning rods and lightning conductors are to be installed on the roofs of the planned facilities to protect them against lightening. Individual items of medical, electric and communications equipment are to be provided with earthing system, as necessary.

iv) Telephone System

The telephone system installed on the project site is to be connected to an overhead telephone line from Hanoi Telephone Office, which runs along the western side of the project site, via a in-coming cable. The capacity of the in-coming cable is to be about 50 lines in consideration of future extension of the planned facilities.

Since the circuit capacity required of the planned facilities will be 20 city lines and about 300 extensions, a PABX is to be newly installed and connected to the existing PABX for efficient internal and external telephone communications.

It should be noted that the costs of the work to install the in-coming cable and the work to connect it to the telephone line are to be defrayed by the Vietnamese side.

v) Public Address System

The main devices of a large-scale public address system are to be installed in the security guards' room. The public address system is to be used for paging medical doctors, entire building announcement and emergency announcement (evacuation at the time of outbreak of a fire and so on). It will also be necessary to introduce local public address systems in the reception rooms and the pharmacies for calling patients' names.

vi) Master TV Antenna System

A master TV antenna (VHF-UHF antenna) is to be installed and it is to be

connected to the outlets in the administration office rooms and the education/training rooms.

vii) Intercom System

Nurse call system (1 circuit per room, simultaneous call type) are to be installed for communications between the nurse stations and the ward. The generator room, the machine rooms and other similar rooms are to be equipped with maintenance intercoms.

viii) Radio Paging System

Bach Mai Hospital's existing wireless equipment is to be remodeled to serve also as a paging system to call up medical doctors. Additional base radio equipment, ambulance radio equipment and handheld radio equipment for the use of medical doctors and antennas are to be added to the existing radio equipment.

ix) Automatic Fire Alarm System

An automatic fire alarm system is to be installed for early detection of fires and prevention of spread of damage. Gas leak detectors are to be installed in places where inflammable gas is to be used. In principle, the Fire Service Act of Viet Nam is to be observed, but there are no local standards are available. Therefore the planning is to be made with reference to the Fire Standard of Japan.

2) Mechanical Plan

i) Water Supply System

In view of the fact that the water supply situation is pressing at BMH and the need to secure stable supply of water, well water will be mainly used at the planned facilities, water from wells, which are to be newly dug by the Vietnamese side, will be supplied to the planned facilities together with city water.

It is expected that water from the above-mentioned wells will be muddy and have relatively large quantities of iron and manganese. It will also be hard water. For these reasons, it will be essential to install a water treatment system consisting of filtering sand, activated carbon, an iron/manganese removing unit, a water softening unit and a sterilizing unit to provide drinking water and water for use in examinations and in the boilers.

On the other hand, water for use elsewhere is to be supplied untreated.

Water is to be stored in a water tank to be newly installed, from where it is to be pumped up into an elevated water tank for water supply. The water tank to store treated water is to be installed on the ground from the standpoint of prevention of contamination. Fig.3-22 shows the flow of water supply at the project site.

fig. 2 −22 Water Suppp ly

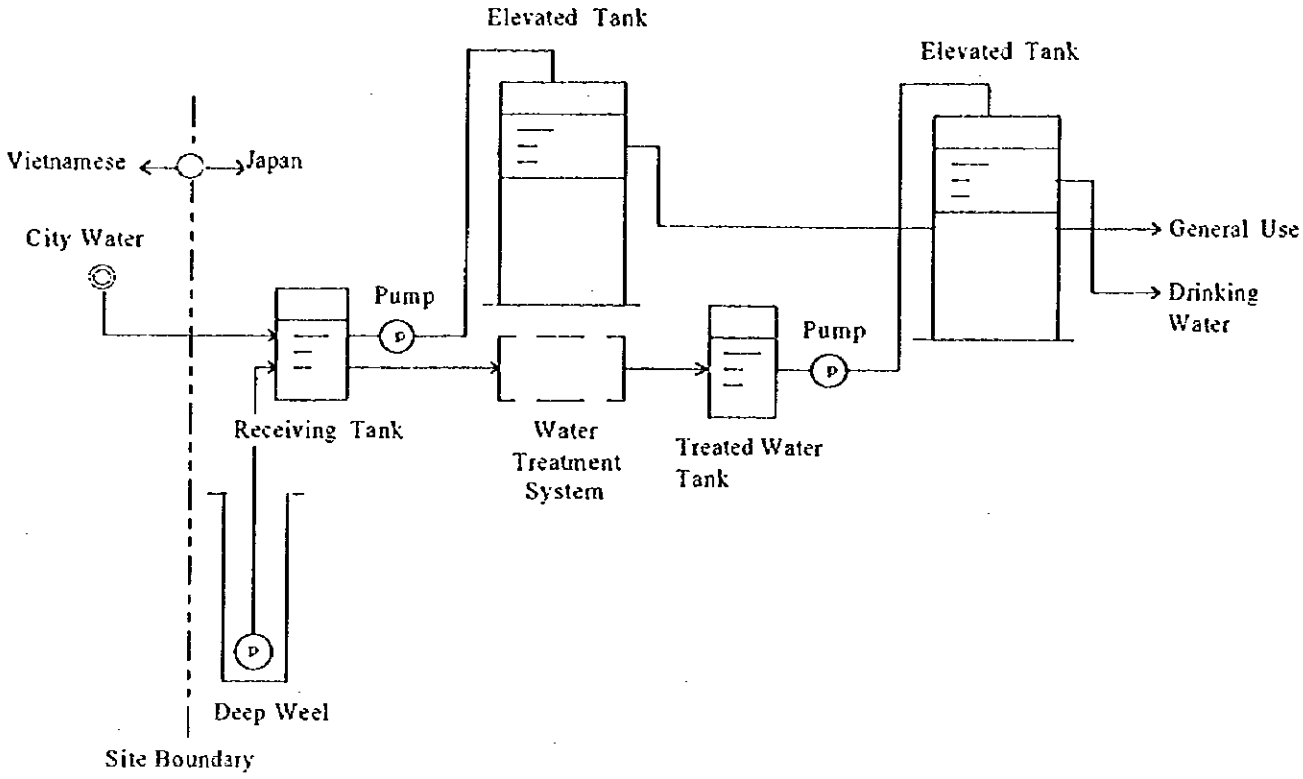
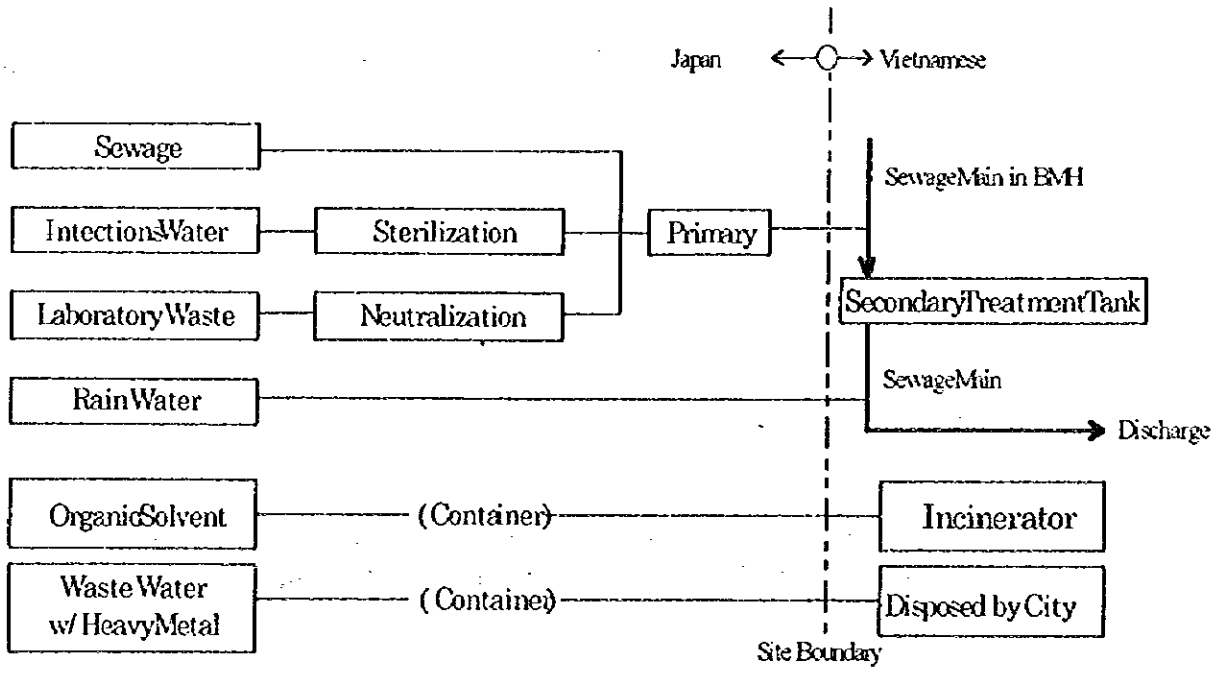


fig.2−23 SewerageFlow



ii) Drainage System

Ordinary waste water is to be discharged into the nearby river after being treated first in a septic tank and then in the existing waste water treatment facility.

Waster water from the infectious disease wards is to be led into a septic tank after being sterilized. Waste water from the examination facilities is to be led into a septic tank after being neutralized.

Waste water containing organic solvents will be collected in containers and be burned in a incinerator and the waste water containing heavy metal(s) is to be stored in containers and will be treated by the city.

Rainwater is to be discharged directly into the nearest sewer.

Fig.3-23 shows the flow of waste water.

iii) Hot Water Supply System

In the planned facilities, hot water is to be supplied selectively to such facilities as the operation theatres, the delivery rooms and the central supply rooms. In principle, hot water is to be supplied from a hot water tank which uses steam as the heat source.

iv) Sanitary Fixtures

Asian-type toilets are to be procured as toilets for common use. On the other hand, Western-style toilets are to be procured as toilets for use in private places. Since
sanitary fixtures can be broken, those which are available locally are to be chosen in consideration of easy maintenance.

v) Gas Supply System

LP gas is to be supplied as the gas for use in the pantries and the examination departments. Gas is to be supplied from a centralized gas supply system consisting of gas cylinders.

vi) Fire Protection System

The fire protection system is to consist of:

—Sprinklers
—Indoor fire hydrants
—Outdoor fire hydrants
—Siamese Connection
—Fire extinguishers

vi) Medical Gas System

Oxygen/nitrous oxide equipment, vacuum and compressed air equipment are to be installed in the planned facilities. Medical gas is to be supplied from a centralized gas supply system.

vii) Kitchen Equipment

Each pantry is to be provided with simple kitchen equipment, such as gas equipment, for the use of the staff members and patients' families.

viii) Air-conditioning System

a. Basic Guideline

It will be necessary to select an air-conditioning system taking into account a wide variety of factors, including the weather conditions in and around Hanoi, the economic situation at BMH and the need to maintain the basic functions of the hospital. In principle, the operation theatres, the delivery rooms, the ICUs, the examination rooms, the lecture hall and the single rooms in the wards are to be air-conditioned and all the other rooms are to be ventilated by means of natural ventilation.

b. Heat Source Equipment

Since oil as the heat source for boilers is inexpensive in terms of running cost, oil-burning steam boilers are to be procured under this project. Hot water from the boilers is to be used for hot water supply and autoclave sterilizing.

c. Air-conditioning System

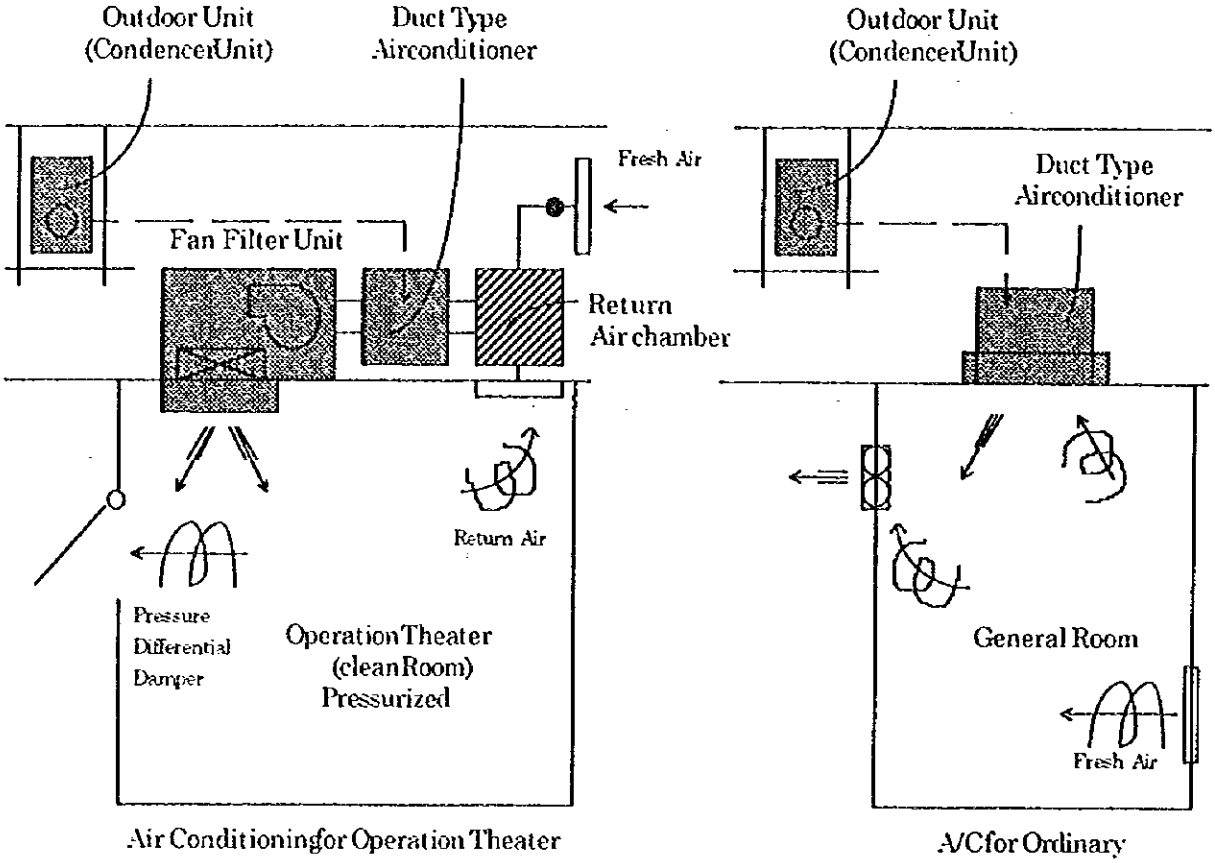
Each of the operation theatres, the delivery rooms and the ICUs, all of which named to be very clean, is to be air-conditioned with an air-conditioner provided with high-performance filters and a duct-type air-conditioning system. All the other rooms to be air-conditioned are to be air-conditioned with air-cooled heat-pump type air-conditioners. Fig.3-24 shows the conceptual sketch of the air-conditioning system. The rooms not to be air-conditioned are to be ventilated by means of ceiling fans so that an impression of coolness may be created.

Generally, developing countries are faced with the problem of difficulty in the maintenance of air-conditioners covered up in the ceiling. In the case of the planned facilities, therefore, exposed type air-conditioners and pipes are to be installed in principle.

d. Ventilating Equipment

The boiler rooms, the electric rooms and the generator room, which will generate a lot of heat or bad smells, are to be provided with intake/exhaust ventilating system, and the toilets and the shower rooms with exhaust ventilating system.

fig.2-24 Airconditioning System



(4) Equipment Plan

Listed in the following table are the items of equipment which have been judged to be necessary and appropriate as a result of the above-mentioned examination and the examination of the equipment operation, maintenance and management plan to be mentioned later in this document.

Item No.	Department	Equipment Name	Q'ty
HE - 1	Hematology Examination	Blood coagulator	1
HE - 2		Binocular microscope	3
HE - 3		Hematocrit centrifuge	1
HE - 4		Tabletop centrifuge	2
HE - 5		Automatic blood cell counter	1
HE - 6		Differential leukocyte counter	3
HE - 7		Deep freezer	1
HE - 8		Medical refrigerator	1
HE - 9		Automatic micropipette set	1
HE - 10		Incubator	1
HE - 11		Drying oven	1
HE - 12		Automatic slide stainer	1
HE - 13		Blood pipette washer	1
HE - 14		Colorimeter	1
HE - 15		Rotary shaker	1
HE - 16		Electric balance	1
HE - 17		Pipette shaker	1
HE - 18		Laboratory small items	1
HE - 19		Blood bank refrigerator	2
BE - 1	Biochemistry Examination	Biochemical auto analyzer	1
BE - 2		Tabletop centrifuge	1
BE - 3		Medicine refrigerator	2
BE - 4		Auto pipette	1
BE - 5		Auto dilutor set	2
BE - 6		Spectro p hotometer	1
BE - 8		Trolley (Laboratory cart)	2
BE - 9		Instrument cabinet	5
BE - 10		Pipette washer	3
BE - 11		Laboratory small items	1
ME - 1	Microbiological Examination	Colony counter	1
ME - 2		Binocular microscope	3
ME - 3		Incubator	2
ME - 4		Drying oven	2
ME - 5		Deep freezer	1
ME - 6		Anaerobic culture apparatus	1

ME - 7		Table top centrifuge	2
ME - 8		Vortex shaker	2
ME - 9		Electronic balance	1
ME - 10		Water bath	2
ME - 11		Vertical sterilizer	1
ME - 12		Micropipette set	1
ME - 13		Laboratory small items	1
PE - 1	Pathological Examination	Fluorescent microscope	1
PE - 2		Medicine refrigerator	2
PE - 3		Auto micropipette	1
PE - 4		Deep freezer	1
PE - 6		Binocular microscope	4
PE - 7		Tabletop centrifuge	1
PE - 8		Tissue fixing shaker	1
PE - 10	Pathological Examination	Tissue staining set	1
PE - 11		Paraffin oven	1
PE - 12		Drying oven	2
PE - 13		Slide warmer	2
PE - 14		Paraffin bath	2
PE - 15		Electronic balance	2
PE - 16		Automatic tissue processor	1
PE - 17		Microtome knife sharpener	1
PE - 18		Incubator	1
PE - 19		Vortex shaker	1
PE - 20		Magnetic stirrer	1
PE - 21		pH meter	1
PE - 22		Slide container	3
PE - 23		Interval timer	3
PE - 24		Laboratory small items	1
RE - 1	Radiology Examination	General X-ray apparatus	2
RE - 3		Automatic film processor	1
RE - 4		Mobile X-ray unit	1
RE - 5		Film dryer	1
RE - 6		X-ray examination small item	1
RE - 7		Darkroom small items	1
RE - 8		Angiography system	1
PY - 1	Physical Examination	Holter system	2
PY - 2		Ultrasound scanner (whole body)	1
PY - 3		Pulse doppler apparatus	1
PY - 4		EEG	1
PY - 5		ECG stress test system	1
PY - 6		Autospirometer	1
PY - 7		Electrocardiograph	2
PY - 8		Sphygmomanometer	6
EE - 1	Endoscopy Examination	Laparoscope system	1
EE - 2		Colonoscope system	1

EE - 3		Duodenoscope system	1
EE - 4		Cystoscope system	1
EE - 5		Arthrofiberscope system	1
EE - 6		Fiberscope TV system	3
EE - 7		Endoscope cabinet	2
EE - 8		Endoscopy table	4
EE - 9		Endoscopy electrosurgical unit	1
EE - 10		Suction pump	4
EE - 11		Manual disinfector	3
IC - 1	Intensive Care Unit	ICU bed	10
IC - 2		Ventilator	2
IC - 3		Patient monitor	10
IC - 3'		Central monitor	2
IC - 4		Suction unit	5
IC - 5		Nebulizer	4
IC - 6		Infusion pump	10
IC - 7		Syringe pump	10
IC - 8	Intensive Care Unit	Pulse oximeter	2
IC - 9		IV hanger	10
IC - 10		Medical refrigerator	2
IC - 11		Medicine cabinet	2
IC - 12		Weighing scale for bed	2
IC - 13		Patient record cabinet	2
IC - 14		Stethoscope	10
IC - 15		Sphygmomanometer	15
IC - 16		Emergency cart	6
IC - 17		Ambu-bag	10
IC - 18		Feeding pump	10
IC - 19		Autoclave (Table top type)	2
IC - 20		Water treatment system (for 2 bed)	1
IC - 23		Hemodialysis machine	2
IC - 24		X-ray film viewer	1
OT - 1	Operation Theatre	Scrub station	2
OT - 2		Universal operation table	6
OT - 3		Operating light*	6
OT - 4		Electrosurgical unit	6
OT - 5		Anesthesia apparatus (with ventilator)	6
OT - 7		Laparoscopy operating system	1
OT - 6		CTV-Camera System	
OT - 8		Suction pump	6
OT - 9		Patient monitor	6
OT - 10		Defibrillator	2
OT - 11		Medical refrigerator	1
OT - 12		Blood refrigerator	1
OT - 13		Blood warmer	2
OT - 14		Instrument table	6

OT - 15		Operating instrument set	6
OT - 16		Instrument container	1
OT - 17		Sphygmomanometer	6
OT - 18		Kick bucket	6
OT - 19		IV stand	12
OT - 20		Film viewer*	6
OT - 21		Dressing drum	6
OT - 22		Stretcher	2
OT - 23		Recovery bed	2
OT - 24		Ambu-bag	6
OT - 25		Endotracheal set	1
OT - 26		Chair for anesthesia	6
OT - 27		Operation chair	6
OT - 29		Instrument carriage	6
OT - 30		Instrument cabinet*	6
OT - 31		Electa shelf	4
OT - 32		Pulse oxymeter	3
PH - 1	Pharmacy	Bottle rack	4
PH - 2		Medicine rack	4
PH - 3		Medicine cabinet	4
PH - 4		Medicine safety box	1
PH - 5	Pharmacy	Water purifier	1
PH - 6		Balance	2
PH - 7		Mortal and pastle	2
PH - 8		Trolley	2
PH - 10		Medical refrigerator	3
CS - 1	Central Supply and Sterilizing	High pressure steam sterilizer	4
CS - 3		Tube washer	2
CS - 4		Tube dryer	2
CS - 5		Washing spray gun system	1
CS - 6		Glove washer	1
CS - 7		Drying oven	2
CS - 8		Electa shelf	6
CS - 9		Transport trolley	4
CS - 10		Distribution trolley	2
CS - 11		Basket trolley	2
CS - 12		Dressing drum	10
CS - 13		Dressing container	10
CS - 14		Small items for sterilization	1
GE - 1	General item	Slide projector	2
GE - 2		Overhead projector	2
GE - 3		Screen	2
LR - 1	Labour Room	Labour bed	6
LR - 2		Irrigator stand	6
LR - 3		Examination light	1
DE - 1	Delivery Room	Delivery bed	3

DE - 2		Anesthesia apparatus	1
DE - 3		Operation light*	3
DE - 4		Delivery instrument set	3
DE - 5		Infusion pump	3
DE - 6		Scrub station	1
DE - 7		Instrument table	3
DE - 8		Instrument tray	3
DE - 9		Suction unit	3
DE - 10		Fetal monitor	2
DE - 11		Vacuum extractor	2
DE - 12		Irrigator stand	3
DE - 13		Infant warmer	2
DE - 14		Foot stool	3
DE - 15		Instrument cabinet*	3
DE - 16		X-ray film viewer*	3
NP - 1	New Born/Premature Nursery	Infant incubator	4
NP - 2		Infant ventilator	2
NP - 3		Phototherapy unit	1
NP - 4		Neonatal monitor	2
NP - 5		Infant treatment table	2
NP - 6		Infant care center	1
NP - 7		PO2/PCO2 monitor	1
NP - 8		Infusion pump	1
NP - 9		Syringe pump	1
NP - 10	New Born/Premature Nursery	Examination light	2
NP - 11		Laryngoscope	2
NP - 12		Weight and height scale	2
NP - 13		Nebulizer	2
NP - 14		Medical refrigerator	1
NP - 15		Nursing bottle warmer	1
NP - 16		Nursing bottle sterilizer	1
NP - 17		Instrument cabinet	3
NP - 18		Emergency cart	1
IS - 1	Other Department	Bedside monitor	13
IS - 2		Ventilator	6
IS - 3		Defibrillator	6
IS - 4		Infusion pump	9
IS - 5		Syringe pump	9
IS - 6		Weight and height scale	9
IS - 7		Instrument cabinet	9
IS - 8		Diagnostic instruments	9
IS - 9		Hand driven resuscibag	9
IS - 10		Suction pump	18
IS - 11		Nebulizer	9
IS - 12		Examination light	9
IS - 13		Pulse oxymeter	3

IS - 14		ECG	9
IS - 15		Medical refrigerator	9
IS - 16		Film illuminator	9
IS - 17		Revolving stool	18
IS - 18		Emergency cart	9
IS - 19		Medicine cabinet	9
IS - 20		Automatic infant scale	2
IS - 21		Autoclave (Table top)	9