No.

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT OF FACILITIES
OF
THE HUE CENTRAL HOSPITAL
IN
THE SOCIALIST REPUBLIC OF VIET NAM

DECEMBER 2003

JAPAN INTERNATIONAL COOPERATION AGENCY

NIHON SEKKEI, INC.
MEDICAL ENGINEERING & PLANNING CO. LTD.

G R 2
J R
03－284

PREFACE

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

JICA sent to Viet Nam a study team from June 22nd to July 10th, 2003.

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 the Socialist Republic of Viet Nam for their close cooperation extended to the teams.

December 2003

Kunimitsu Yoshinaga
Vice President
Japan International Cooperation Agency

December 2003

Letter of Transmittal

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

This study was conducted by Nihon Sekkei, Inc., under a contract to JICA, during the period from May, 2003 to December, 2003. 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,

Masahiro Ikawa
Project Manager

Basic Design Study Team on
the Project for Improvement of Facilities for the Hue Central Hospital

Nihon Sekkei, Inc.

Location Map

The Socialist Republic of Viet Nam

Hue City Map

Project Site

Perspective

List of Figures & Tables

Chapter 2

ABBREVIATION

A/P	Authorization to Pay
AVR	Automatic Voltage Regulation
B/A	Banking Arrangement
BS	British Standard
CHC	Commune Health Center
DOHA	Direction Office of Healthcare Activity
E/N	Exchange of Notes
HCH	Hue Central Hospital
HEPA	High Efficiency Particulate Air filter
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
JASS	Japanese Architectural Standard Specification
JIS	Japan Industrial Standard
MDF	Main Distribution Frame
MOF	Ministry of Finance
MOH	Ministry of Health
MPI	Ministry of Planning and Investment
NICU	Neonatal Intensive Care Unit
PABX	Private Automatic Branch Exchange
WHO	World Health Organization

Summary

The Socialist Republic of Viet Nam (hereinafter referred to as "Vietnam"), with a population of about 79.71 million (as 2002), is a country situated on the east side of the Indo-China Peninsula, situated between 9 degrees and 23 degrees Latitude North and between 102 and 110 Longitude East, with a total land area of 331,689km^2. The country stretches 1,700km long in the north to south direction. Vietnam is bordered by Cambodia, Laos and China. Topographically, Vietnam may be broadly broken down into the following regions. These are northern mountainous region constituting the border area with China, the northern plain region stretching over the basin of the Hong Song River flowing from the northern mountainous region, the narrow central region between the mountainous area at the border with Laos and the South China Sea, and the vast Mekong River Delta region with Ho Chi Minh City as the center of the region. The Thua Thien - Hue Province where Hue City is situated occupies an area 60km wide and 70km long in the central coastal region of Vietnam. This region may be further divided into mountainous area, highland area, coastal plain area and lagoon and wetland area. Climatically, this area falls under the tropical monsoon zone, with a hot dry season and a relatively cool and humid rainy season alternating.

The gross domestic product (GDP) per capita of Vietnam is about US Dollars 410 (as of 2001). Since the adoption of the doi moi policy toward the end of 1986, the system of market economy and the open-door policy have been actively promoted. Since 1991, the year when the Cambodian issue was resolved and the collapse of the Soviet Union took place, the promotion of the doi moi policy has been accelerated. Since then the macro economy of Vietnam faired well for a while, supported by increasing direct foreign investments and increasing export, registering an average growth rate of 8.9% in GDP from 1992 to 1997. The Asian economic crisis which occurred in 1997 caused the direct foreign investment, those from the ASEAN countries in particular, and the growth rate of export to decline significantly. As a result, Vietnam suffered from declining economic growth. The growth rate of GDP declined to 8.2% in 1997, 5.8% in 1998, and 4.8% in 1999; however, the economy of Vietnam showed a sign of recovery, as indicated by the GDP growth rate of 6.7% in 2000, thanks greatly to the practical and active policy measures taken by the government which included invitation of foreign capital investment, export promotion. The government formulated in 2001 the Ten-Year Socio-Economic Development Strategy (2001-2010), that aims at achieving an economic growth rate of 7.3% per year, thereby doubling the national income in coming 10 years. This ten-year strategy calls for development of market, industry and production, and creation of employment opportunities by stabilization of the macro economy and reform of the industrial structure. The strategy also plans to shift the excess manpower in the rural agricultural areas to other industries, concurrently achieving agricultural

productivity as an important policy objective. In addition, the strategy stresses the importance of fulfilling the basic human needs and correction of regional economic disparity.

The indicator of medical and healthcare quality of Vietnam has markedly improved in the past 30 years, as indicated by the infant mortality rate of 30 and average life expectancy of 69 as of 2001, levels better than those of other countries of comparable income levels. However, a large number of people still suffer from malnutrition and infectious diseases; while on the other hand, such life-style related cases as traffic accidents and drug addiction are increasing. In other words, there is a trend for polarization of disease pattern. Regionally, while the infant mortality rate in the southern region is 10 out of 1,000, a level comparable to those of advanced countries, that in the Central Vietnam is 82, indicative of a great regional disparity. In Vietnam, the Cho Ray Hospital in the south and the Bach May Hospital in the north have been remodeled into modern hospitals with Japan's ODA. These two hospitals now serve as the top reference hospital in their respective regions, greatly contributing to the improvement of regional medical and healthcare service. However, because of the very long geographic and topographic conditions of Vietnam, people in Central Vietnam cannot easily receive medical services of these core hospitals. In short, the level of medical and healthcare service in the Central Region is inferior to those of North or South Vietnam.

Against such a background, the government of Vietnam formulated the "Healthcare and Protection Strategy for 2001 to 2010," to develop the medical and healthcare service sector. The Strategy includes the following objectives: (1) provision of primary healthcare to all people, (2) realization of access to high-quality medical service, and (3) reduction of morbidity rate and extension of average life expectancy. One of the practical policy measures of the Strategy is early construction of high-quality of medical center in Central Vietnam. The top reference hospital in Central Vietnam is the Hue Central Hospital (HCH). HCH has provided advanced medical services, in surgeries in particular, and also plays the role of the regional reference hospital, with its high clinical therapeutic functions. In addition, HCH plays various important roles in Central Vietnam, which include clinical education by the Hue Medical University, technology transfer to hospitals in provinces of Central Vietnam, and community health direction activities (DOHA). In reality, however, HCH is finding it increasingly difficult to adequately cope with increasing outpatients and inpatients beyond the hospital capacity, with its facilities and equipment becoming obsolete, with its medical services obviously deteriorating, with its examination departments inadequately distributed.

Under such a circumstance, the government of Vietnam formulated the "Hue Central Hospital Rehabilitation Plan" to correct such a situation and to improve the level of medical service in

Central Vietnam. However, the government of Vietnam found it difficult to carry out this plan of its own for reasons including fiscal difficulty, and filed a request for a grant aid for this project with the government of Japan. In the meantime, in addition to this request for grant aid, a request for technical cooperation for improvement of regional medical service system for Central Vietnam has been filed with the government of Japan.

Given such a situation, a Japan's project formulation study was conducted during a period from July to August 2002. As a result of the project formulation study, a recommendation was made to the effect that the grant aid program combined with such a technical cooperation is necessary for Central Vietnam, following the past cooperation to the Cho Ray Hospital and Bach May Hospital. Also, a preliminary study was done in January 2003 to define the scopes of work and cooperation of the grant aid program. The preliminary study has concluded that strengthening of HCH, the core hospital in the concerned region, has relevance to the cause for improvement of medical and healthcare service in Central Vietnam.

In response to this, the government of Japan has decided to conduct a basic design study, and the Japan International Cooperation Agency (JICA), an independent administrative institution, dispatched a basic design study team from June to July 2003. The study team had detailed discussions with the concerned parties of Vietnam, studied the relevant facilities, collected necessary materials, and surveyed the planned construction site. The study team has prepared this basic design study report, following the home office analysis and presentation of the basic design draft conducted in September to October 2003.

The result of the study has confirmed the necessity of improvement of HCH, and necessities of construction of the Outpatient Building and the Central Diagnosis and Treatment Building in the site of the Hue Central Hospital in Hue City, and procurement and installation of concerned facilities and equipment to realize the said improvement.

The following is the summary of the Hue Central Hospital Improvement Project.

Responsible organization: The Ministry of Health (MOH), the Government of Vietnam
Executing agency: Hue Central Hospital (HCH)
Overall schedule: This cooperation project will take a total of 32 months from the signing of the exchange of notes (E/N) to the completion of the project; specifically, 6 months for the detailed design work, 4 months for execution of the tender, and 22 months for construction, procurement and installation of facilities and equipment.

Planned construction site: Construction site in the Hue Central Hospital premises in Hue City

Building structure: Central Diagnosis and Treatment Building:
Reinforced concrete, 7-storied aboveground building (newly constructed)
Outpatient Building:
Reinforced concrete, 3-storied aboveground building (newly constructed)
Machine Building:
Reinforcing concrete, one-storied building (newly constructed)

Total floor area:	Central Diagnosis and Treatment Building:	10,208.0 m^2
	Outpatient Building:	3,704.0 m^2
	Machine Building:	409.6 m^2
	Total:	14,321.6 m^2

Facility and equipment plan: As per shown below

Facilities to be constructed	Central Diagnosis and Treatment Building 1st floor: X-ray Department 2nd floor: Physiological examination and endoscope divisions, bacteriological examination 3rd floor: Blood examination, biochemical examination, pathological examination 4th floor: Operation Department, washing and sterilization room 5th floor: Recovery ward 6th floor: ICU wards 7th floor: Serious patient wards (Roof: Warehouse, etc.) Outpatient Building 1st floor: Outpatient Division (orthopedics, emergency rescue, recovery room), medical matter and accounting, dispensary 2nd floor: Outpatient Division (general internal medicine, specialized internal medicine, general surgery, specialized surgery, pediatrics, traditional medicine) 3rd floor: Outpatient Division (ophthalmology, otolaryngology, dentistry, laser therapy) Machine Building Machine Building: Machine room (boiler, refrigerating machine, pump, etc.), transformer room, facilities for the generator room
Procurement of facilities and equipment	Medical facilities and equipment necessary for operation of the above medical facilities, etc. (X-ray equipment, hot-air sterilizer, centrifuge, electrocardiograph, etc.)

The total project cost of this project is estimated at 3,052 million yen (3,011 million yen for the Japanese portion and 41 million yen for the Vietnamese portion).

The maintenance and operation cost after completion of this project is calculated at 6,658 million Vietnamese dong (hereinafter VND), or 3,373 million VND for facility maintenance and 3,285 million VND for equipment maintenance. This amount corresponds to 8.5 percent of HCH's annual budget for 2003, or 78,601 million VND. Since HCH and MOH assures budgetary provisions for the maintenance and operation cost, difficulties with maintenance and operation of the provided facilities and equipment are not expected.

Realization of this project (the cooperation project of the Japanese side and the obligation of the Vietnamese side) is expected to bring about the following direct effects.

(1) Provision of high-quality tertiary medical service

Renewal of the obsolete facilities and equipment of the Hue Central Hospital will intensify its hospital functions as tertiary medical institution (specifically, functions of the Examination Department, operation rooms, ICU, Outpatient Division, etc.). The intensified medical functions thus realized of the Hue Central Hospital will enable the hospital to adequately and promptly cope with patients who come to receive high-quality medical services not available elsewhere in this region. In short, the Hue Central Hospital will become able to provide high-quality tertiary medical services.

(2) Enhanced efficiency of medical services by centralization of the central diagnosis and treatment functions

The project will centralize the central diagnosis and treatment functions, and the outpatient functions including the emergency rescue functions, presently separately located in the hospital premises. The centralization of these functions will improve the efficiency of medical services. The effects of centralization include shorter waiting time and distances of movements of the patients in the hospital, shorter period from order to completion of medical examinations, and shorter average inhospital days of patients.

(3) Shortening of waiting time for hospitalization through improvement of occupancy rate of hospital beds

Presently, the occupancy rate of the hospital beds exceeds 120 percent due to lack of beds, and the patients have to wait for a maximum of six months before they can be hospitalized. The planned installation of surgery ward will increase the number of beds by 50. Coupled with reduction of average in hospital days through the efficiency improvement, the occupancy rate

of beds will be improved, and this will enable the waiting time for hospitalization to be reduced.

As enumerated above, realization of this project will improve the medical service to the people in this region, not limited to about one million people of Thua Thien - Hue Province where HCH is situated but including the entire 18 million people of Central Vietnam, the region covered by HCH. In this respect, implementation of this project as Japan's grant aid program is very significant as well as necessary, and the content of the project is highly relevant to the cause for the project.

In implementing the cooperation project it is important that the Vietnamese side's works have been completed by the appropriate time. Demolition and removal of the existing facilities and ground preparation, in particular, need to have been completed by the time the Japanese side's works start. Besides, the following arrangements and improvements are desired in order for this project to be operated smoothly and effectively.

(1) The hospital staff should receive sufficient training on proper operation and maintenance of the facilities to be built or modified by this cooperation project, with a sufficient budget secured specifically for this purpose.

(2) It is necessary to strengthen the referral function, which is not sufficient enough now, and to intensify the DOHA activities to reinforce the ties with hospitals under the umbrella of HCH, thereby upgrading the quality of regional medical services, including the preventive medical services.

(3) Many pieces of medical equipment are older than 20 years. Some of them have been modified by the maintenance technicians, because spareparts or consumables for such pieces are no longer available. However, such practices could be hazardous to the patients. Hereafter, establishment of a sound management system of medical equipment is urgently desired, including securing of a proper budget and a long-range procurement plan of medical equipment.

(4) Normally, a maintenance agreement should be sealed with the suppliers for purchase of such expensive facilities or equipment as X-ray equipment. Presently, some are used without such an agreement. This presents a risk of some pieces of medical equipment being not effectively used in the future. The management system of medical equipment is desired also from this viewpoint.

Table of Contents

Chapter 1. Background of the Project

CHAPTER 1. BACKGROUND OF THE PROJECT

The government of Vietnam intends to provide high-quality medical services to all people in its "Healthcare and Protection Strategy for 2001 to 2010," a developmental project in the medical and healthcare sector, and consequently to achieve reduction of morbidity rate, promotion of health, and extension of average life expectancy. As one of the means to achieve these objectives, the government intends to establish high-level medical service centers in strategic areas of the country, including Hue City. Also, the "Hospital Network Development Basic Plan" suggests necessity of additional investments in HCH in North and Central Vietnam.

HCH is the oldest hospital in Vietnam established in 1894, and has been the core medical institution in Central Vietnam. However, hospital facilities are largely obsolete and hospital buildings are distributed in disorder. Therefore, operation of the hospital is destined to be inefficient. Besides, with the existing beds, the hospital finds it difficult to cope with an increasing number of patients. As a matter of fact, the hospital places some beds in excess of the capacity in wards and corridors to accommodate patients.

Under such as circumstance, the Ministry of Health, the government of Vietnam, has filed a request with the government of Japan for assistance in implementing the hospital improvement plan, consisting of construction of hospital facilities and provision of medical equipment, to improve the functions of the hospital. In January 2003, a preliminary study team was dispatched to Vietnam. It has been confirmed as a result of the preliminary study that extension of a grant aid program to this issue is relevant for the following reason. The improvement of the hospital's functions in diagnosis, training and community medical service will contribute to, and have far-reaching and pervasive favorable effects on, improvement of medical and healthcare service to the people of Central Vietnam.

As a result of the preliminary study, the contents of the request have been confirmed, of which the outline is as shown below.

(1) Facility

- Four-storied emergency and outpatient building (contemplated scale: 3,000m^2)
- Seven-storied building holding surgery wards for patients for surgery and examination (Surgical, Examination, ICU Division) (contemplated scale: 12,000m^2)

(2) Equipment

- Medical equipment for the newly constructed Emergency Rescue and Outpatient Building (Emergency Department, outpatient for Surgical Division, Internal Medicine Division, Otolaryngology Division, Dentistry Division, Ophthalmology Division, etc.)
- Medical equipment for the newly constructed examination and surgery wards (surgery, examination, ICU, Radiology Division, clinical test room, etc.)
- Medical equipment for the existing facility (Pediatrics Division, Obstetrics and Gynecology Division, Dispensary Division)

Chapter 2. Contents of the Project

CHAPTER 2. CONTENT OF THE PROJECT

2-1 Basic Concept of the Project

In Vietnam, the Bach May Hospital in the North and the Cho Ray Hospital in the South have been improved to modern hospitals by Japan's grant aid programs and technical cooperation programs. These two hospitals now play the roles of the best hospitals, and contribute greatly to improvement of healthcare in their respective regions.

However, people in the Central Vietnam cannot easily benefit from the medical services of these two core hospitals, because of Vietnam's geography being stretched in the north to south direction and other geographical conditions. It cannot be denied that the levels of medical service and healthcare in the Central Vietnam are lower to those of the North or South.

The best hospital in Central Vietnam is the Hue Central Hospital (HCH). HCH has provided advanced medical services, in surgeries in particular, and also plays the role of the regional reference hospital in Central Vietnam, with its high clinical therapeutic functions. HCH plays various important roles in Central Vietnam, drawing upon such functions as clinical education by the Hue Medical College, technology transfer to hospitals in provinces of Central Vietnam, and community health direction activities (DOHA: Direction Office of Healthcare Activity). In reality, however, HCH is finding it increasingly difficult to adequately cope with increasing outpatients and inpatients beyond the hospital capacity, with its facilities and equipment becoming obsolete.

This project intends to redress such situations of HCH. Not only the grant aid program, but also implementation of a technical cooperation program centered on the community health direction system is being studied. This project will construct the Building for Outpatient Department and Emergency Department and the Central Examination Unit, to improve the medical and healthcare service of HCH, and will work in cooperation with the technical cooperation program to make HCH the core hospital, thereby strengthening the regional medical service in Central Vietnam.

Realization of this project will improve the medical facilities and equipment of HCH (expected outcome), and, consequently, the medical and healthcare service will be improved (project objective). Further, medical and healthcare service of Central Vietnam, with its center as Thua Thien - Hue Province, may be expected (overall goal).

Table 2-1 below outlines the cooperation project.

Table 2-1 Outline of Cooperation Project

Division	Function
Central Examination Unit (Seven-storied building, 10,208.0m^2)	X-ray Examination Department Physiological Function Examination Department Endoscopy Department Pathology Examination Department Surgery room ICU Recovery room Sterilization room of equipment exclusively for operation rooms Surgery ward (50 beds)
Emergency Rescue and Building for Outpatient Department and Emergency Department (Four-storied building, 3,704.0m^2)	Out-paint Clinic (internal medicine, surgery, ophthalmology, ENT, dental) Emergency Department
Mechanical Building (One-story building, 409.6m^2)	Medical pump room, etc.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

1) In formulating the hospital improvement project, consistency will be maintained between this improvement project and the Master Plan (total plan for the entire facilities) for HCH. This improvement project will integrate and centralize the facilities and functions, now scattered in the premised of HCH, to enable more efficient management of the hospital.

2) HCH is the only tertiary medical institution in Central Vietnam (referral function). In addition, HCH is supposed to provide education and training services to medical and healthcare professionals of hospitals and healthcare organizations under its umbrella, or the executing agency of DOHA (Direction Office of Healthcare Activity) in other words, and to serve as the education hospital of the Hue Medical College. Accordingly, this improvement project will be formulated so as to assist smooth implementation of the DOHA activities.

3) This improvement project will be formulated with implementaton of Japan's technical cooperation program in mind to follow this improvement project.

4) The improvement project will clearly define the portion borne by the Japanese side and that borne by the Vietnamese side, after having clarified the total project. It is supposed that the Vietnamese side will formulate their plan in coordination with the schedule, content and the Japanese side's plan.

5) In developing the architectural plan and the equipment plan, the hospital's managerial ability of the existing facilities (number of medical and healthcare professionals, technological level, financial affordability, state of procurement of consumables and spareparts, etc.) will be studied. And, the scope of the improvement project will be formulated not to exceed the technological and financial limits that can secure the sustainable development of the hospital. The study team will not develop too large a project, keeping in mind that this project basically intends to correct the situation of obsolescence of facilities and equipment.

6) The study team will study assistance to the hospital by other donors, NGOs and donor countries, and will develop a plan that maintains coherence with such assistances, while avoiding duplications with them.

(2) Policy toward Natural Condition

Thua Thien - Hue Province, in which Hue City is located, occupies a coastal area of Central Vietnam, extending 70 kilometers in north to south direction and 60 kilometer in east to west direction. This area may be classified into mountainous area, highland area, coastal plain area and lagoon/wetland area. Climatically, this area falls under the tropical monsoon zone, in which hot dry season and humid and relatively cool rainy season alternate. The following design policy is established considering such natural environmental characteristics.

1) Wind speed and wind direction

The wind is generally mild, with the annual average wind speed of about one meter per second, and the maximum monthly wind speed of about 20 meters per second. Wind blows most frequently from northwest throughout the year. Northwest wind prevails in the monsoon season, or from December to April. From May to September, however, southeast wind prevails. From May to June, in particular, a hot and dry wind called "Laos wind" blows.

In order to use such prevailing winds for natural ventilation of the planned buildings, the two buildings - Building for Outpatient Department and Emergency Departments, and the Central Examination Units - will be laid out parallel to northwest to southeast direction so that these buildings may not block the prevailing winds.

2) Precipitation

The precipitation in Hue City for the past five years averaged at about 3,700mm, more than two times the precipitation in Tokyo, or 1,500mm, and is the comparable to the highest precipitation of Japan, 3,900mm, observable in Owase, Mie Prefecture. In 1999 a high annual precipitation of 5,639mm was recorded, with a heavy downpour of 2,451mm observed through November 2 to November 3, which caused a large-scale flood, inundating the area around HCH. Typhoons come from September to December. The plain areas suffer from damages of floods and inundation whenever typhoons come.

During the rainy season, from September to December, more than 75 percent of the annual precipitation falls mainly on the northern part of this area. By contrast, the precipitation in the dry season, from January to August, is only 25 to 30 percent of the annual precipitation.

Accordingly, the design should give an allowance of about 50 percent to the rain intensity to the amount of drainage from the roof or from the exterior. Specifically, a rain intensity of 150mm/hour will be used instead of 100mm/hour normally used.

3) Temperature and humidity

The annual mean temperature is about 25°C. The monthly maximum mean temperature from April to September exceeds 30°C, peaking at around 35°C from June to August. The highest recorded temperature for the past five years was 39.5°C. The lowest temperature can be lower than 10°C, with the lowest temperature of 8.8°C recorded in January 1934. The coldest season is from December to February, with the temperature lingering from 13°C to 15°C. Room heating is necessary during this season.

Humidity is high throughout the year, with the average humidity at 86% to 88%. Humidity often exceeds 90% from October to February.

The buildings will be designed to have wider openings for windows to have better natural ventilation to suit such a high temperature and high humidity condition. To prevent mold growth, construction materials with flat surfaces will be selected to the extent possible, to avoid forming concave or hollow portions, in the floor planning.

4) Sunshine

The annual sunshine duration is about 1,800 hours, almost comparable to that of Tokyo. The sunshine duration is the longest from May to August, and shortest from November to February. Hue is located at latitude 16 degrees, 26 minutes north, or south of the tropic of Cancer. Therefore, the solar altitude becomes 90 degrees two times a year, or the sun shines directly in the center of the sky.

Therefore, the buildings need to be equipped with eaves and balconies to shield intense sunshine.

5) Disaster

① Earthquake

Recorded earthquakes that occurred in Thua Thien - Hue Province and its surroundings are shown in the table below. None of the persons the study team interviewed during the field survey said that he/she experienced any earthquake in this area for the past several decades.

Table 2-2 Earthquake Record

Year	Source		Depth (km)	Magnitude
	Latitude north	Longitude east		
1685	16.5	106.6	15	4.1
1829	16.48	107.41	15	4.8
1947	16.09	108.09	15	4.8
1947	16.55	107.43	10	4.5
1954	16.09	108.09	15	3.0
1966	16.94	107.07	15	3.8
1966	16.22	108.27	15	2.7

Even in such a condition, in Vietnam structural designs are required to incorporate the seismic force; therefore, the seismic force must be reflected in the structural calculation.

② Flood

The flood of November 1999 was the most damaging of all floods in the past 70 years. A water level of 4.98 meters was recorded at the Phu Xuan Bridge of the Huong River flowing just in front HCH. The flood washed away 25,015 houses and killed 352 people in Thua Thien - Hue Province, listed as the greatest disaster for the past 100 years. The first floors of HCH buildings were reportedly flooded up to about 10 centimeters deep during the flood. The premises of HCH is 3.9 to 4.3 meters above sea level.

The design of this project will consider the flood water level in determining the height of the first story floor.

③ Typhoon

The typhoon which hit the Aluoi District of Thua Thien - Hue Province on April 7, 1981 registered a maximum instantaneous wind speed of 40 meter per second. On October 16, 1985, Typhoon Cecil hit Hue City and registered a maximum instantaneous wind speed of 28 meter per second. The same typhoon registered maximum instantaneous wind speed of 35 meters per second in Dong Ha, 40 meters per second in Khe Sanh. Another typhoon which hit Hue on April 28, 1993 registered a maximum instantaneous wind speed of 30 meters per second.

The structural design of buildings will be done in compliance with the Vietnamese standards for wind loads.

(3) Policy toward Socioeconomic Condition

Under the hardship of prolonged war and various difficulties, Vietnam has been lagging long behind the other ASEAN countries in economic development. Since 1986 when the government of Vietnam adopted the policy of Doi Moi, the government has keenly promoted economic development, with liberal delegation of authorities to state countries, with positive introduction of foreign capitals. However, human resource development required for management of companies, and preparation of social infrastructure are still insufficient.

There are many virtues of the Vietnamese people worthy of admiration, organizational strength of people, diligent and hardworking people, for example. This project will give due consideration to the socioeconomic aspects of Vietnam mentioned above, and intends to promote effective project management through prompt decision makings, while giving sufficient advice to the Vietnamese side on the establishment of their executing organization.

(4) Policy toward Construction Business Conditions, Procurement Conditions or Particular Business Conditions, Trade Practices

Formerly, the construction technology was maintained at certain level by the force of assistances from the former Soviet-block countries. Since economic liberation, foreign companies have entered the construction market, and this has pushed up the technology level of the construction companies of Vietnam. Construction companies from such economies as Hong Kong, Singapore, ROK, Japan, Germany formed joint venture companies with Vietnamese companies, and are engaged mainly in construction of projects related to foreign capital investment. Such a practice has promoted technology transfer to the Vietnamese construction companies, and their mechanization, which resulted in marked improvement of their construction abilities.

Presently, an 18-storied hotel and a large information center are being constructed by joint ventures between Vietnamese companies and foreign companies in Hue. A number of such construction machines as tower crane, heavy lift crane, concrete pump vehicle are used on the construction sites. The major materials are mostly procurable in Hue and surroundings except for certain specialty materials. Their supplies are relatively stable.

(5) Policy toward Employing Local Contractors

Vietnamese construction companies had obtained a certain technical level. Recently, through experience in co-working with overseas construction companies, the Vietnamese construction companies have learned modern construction methods, and their technical levels have been upgraded. However, the Vietnamese construction companies are not capable enough in such

fields as coordination among different types of works or schedule controlling. Particularly, they tend not to grasp construction works and installation works in an integrated execution system. For this reason, execution problems such as redoing and delays are occurring. In addition, their quality management systems are not always very specific about inspection methods. In case local construction companies are employed, proper management and guidance will be necessary on these aspects.

(6) Policy toward Executing Agency's Managing and Maintenance Ability

HCH has a history of more than 100 years. Throughout the history HCH has added buildings one after another. There are some 50 to 60 buildings, limited only to major ones. Some of them have been deteriorated faster than they should be, though they were built recently, partly and presumably as a result of the severe climatic conditions: high precipitation, high temperature and high humidity. Under such a condition, a team of 60 persons is engaged in maintenance of the facilities and medical equipment. The hospital may be regarded as having an established system of maintenance, although there is room for improvement, technologically and in manning.

One of the most important aspects of project formulation is to facilitate maintenance and to reduce the running cost. Materials locally procurable will be preferentially adopted, while studying the breakage and wear of the construction materials and the equipment used in the existing buildings.

(7) Policy toward Determination of Grade for Facility Installation and Equipment

1) Facility plan

In determining the grade of facilities, reference will be made to the Standards for Medical Facilities used in Vietnam. This project will construct two buildings, the Building for Outpatient Department and Emergency Department and the Central Examination Unit. The grade commensurate with the purpose and function of the each will be applied to realize the maximum benefit to cost ratios.

2) Equipment plan

Such pieces of equipment that are necessary for diagnosis and treatment will be promptly renewed or supplemented to restore and improve the deteriorated medical services. On the other hand, the kinds of equipment will be limited to those that can be managed and maintained, thereby ensuring effective utilization of provided medical equipment.

(8) Policy toward Method of Construction and Procurement, and Implementation Schedule

1) Policy toward method of construction

The Huong River flows close to the project site. Geologically, the ground of the site consists of alternating layers of clayish fine sand and silty fine sand. The bearing ground of buildings exists 20 to 30 meters deep from the ground surface, and the pile foundation is the common choice for building foundations. Spread foundations are also seen for medium-rise and low-rise buildings. The commonest building structure is the rigid frame structure with brick walls.

Because of the construction site being in the center of Hue City, large construction vehicles should normally be subject to traffic hour regulation. Notwithstanding, it has been confirmed that special permit be issued to this project from the police. Therefore, the effect on the construction work would not be significant. Nevertheless, precautions will be necessary not to interfere with the medical activities of the existing facilities, which will be operational during the construction period.

Further, various works for infrastructure construction and improvement will be done by the Vietnamese side concurrently with this project. People in charge of this project and those with the infrastructure project must coordinate with each other, to confirm each other's schedule and other concerned items not to interfere with the progress of the project.

2) Policy toward method of procurement

A study on distribution of construction materials in Vietnam, in Hanoi, Hue and Da-nang for example, indicates that major materials are locally procurable, with few exceptions. Materials of various qualities and specifications from Europe, Southeast Asia, China are marketed in Vietnam. The materials and equipment to be employed will be locally procured to the extent possible in order to facilitate maintenance and repairs after commissioning. However, quality and availability of the materials will be confirmed to avoid any adverse effect on the construction schedule.

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

2-2-2-1 Overall Project Description (Study of the Request)

(1) Background and History of the Request

The state of medical care and healthcare service is far superior to those of Cambodia or Laos but Vietnam's indicator of medical and healthcare quality is still low, compared with those of Thailand or Malaysia. To improve such a situation, the government of Vietnam has formulated the "Healthcare and Protection Strategy for 2001 to 2010" to develop the medical and healthcare service sector, in which the government announces a target to reduce the infant mortality rate to 25/1,000 births and the maternal mortality rate to 70/100,000 births by 2010, for example.

Viewed by region - north, central and south -, Central Vietnam in which Hue City is situated shows higher infant and maternal mortality rates, and rate of malnutritious children. This is presumably attributable to the delay in the improvement of a core hospital in Central Vietnam, to the level comparable to the Bach May Hospital in the North or the Cho Ray Hospital in the South, in addition to severer living environments and lower standard of living.

The core hospital in the Central Vietnam is HCH, a hospital with a history of more than 100 years. There remain a number of old facilities and building, as old as the hospital, in the hospital premises along with new ones. Some of older buildings, as well as medical facilities and equipment, have become really obsolescent. Under such a condition, the hospital cannot adequately cope with an increasing number of patients, and has to resort to such a makeshift measure as placing more beds than the capacity. The hospital facilities are so scattered to make efficient management difficult.

The government of Vietnam has developed the HCH Improvement Plan (a master plan) to improve such a situation of HCH, and promotes rehabilitation of the existing facilities and construction of new facilities one by one, with the cooperation of NGOs and other organizations. Notwithstanding, there is a long way to go before the hospital can achieve the planned total improvement.

Against such a background, the government of Vietnam has filed a request with the government of Japan for a grant aid program for construction of facilities and provision of medical equipment. The program includes promotion of integrated services of the Outpatient

and Emergency Rescue Division and the Central Examination Division, constituting the core of the project, to improve the quality and efficiency of medical services.

In response to this request, the government of Japan sent a preliminary survey team of the Japan International Cooperation Agency (JICA) in January 2003. The preliminary survey team had discussions with the Vietnam side on such themes as the present condition of the hospital, scope of Japan's cooperation if the hospital is to be upgraded as the core hospital of Central Vietnam.

As a result of the discussions, it has been confirmed that execution of the said grant aid program will not only improve the medical functions of HCH but also strengthen the education and training function and the DOHA function of the hospital, the functions essential to establishment of the referral system in Central Vietnam, with HCH as the regional core hospital.

Against such a background, the present basic design team was dispatched.

(2) Field Survey and the Final Request

The initial request (1999) covered construction of the following three buildings; namely, the Central Examination Unit (six-storied building), the Building for Outpatient Department and Emergency Department (three-storied building) and the Obstetrics and Gynecology Building (two-storied building), with a total floor area of 16,000m^2, and provision of equipment (including the equipment for the existing buildings).

The Vietnam side and the preliminary survey team, dispatched in response to the request from January 5 to 25, 2003, finally agreed as follows on the requested facilities and equipment through discussions.

1) Four-storied building (the Out Patient, Emergency Rescue Division)
2) Seven-storied building (the Central Examination Division for examination, surgery, surgery ward)
3) Provision of equipment (including equipment for existing buildings)

The basic design survey was conducted from June 22 to July 11, 2003. The finally agreed contents of request in the basic design survey are summarized below.

Table 2-3 Transition of Request

Initial Request	Preliminary Survey	Finally Agreed Content of Request	
Central Examination Unit (Six-storied building)	Central Examination Department (Seven-storied building)	Central Examination Department	Imaging Department (General X-ray, Fluoroscopy etc.) Function Examination (Ultra-sound, ECG, EEG, Spirometer, etc.) Endoscopy Laboratory (Pathology, Hematology, Biochemistry, Microbiology) Operation Theater ICU Recovery Room Sterilization Room for Operation Theater
Building for Outpatient Department and Emergency Department (Three-storied building)	Outpatient, Emergency Rescue Division (Four-storied building)	Outpatient Department	Out-paint Clinic (internal medicine, surgery, ophthalmology, ENT, dental) Emergency Department
Obstetrics and Gynecology Building (Two-storied building)	Surgery wards (Same Unit as Central Examination Department)	In-patient Wards	Surgery wards (neurosurgery, etc.)
Medical facilities and equipment necessary for operation of the above medical facilities, etc. (including the equipment for the existing buildings)	Medical facilities and equipment necessary for operation of the above medical facilities, etc (including the equipment for the existing buildings)	Medical facilities and equipment necessary for operation of the above medical facilities, etc (including the equipment for the existing buildings)	

It should be noted that the Vietnamese side earnestly requested that the total floor area of the facilities be 15,000m^2 or wider, and that 300 or more beds be installed in the wards.

It was confirmed that the provision of medical equipment to the following facilities, etc. would be removed from the list of requested items.

- Laundry
- Mortuary (already procured by the Vietnamese side)
- Workshop for maintenance
- Angio-cardiology Center
- Blood center (taken care of by a World Bank's project)
- Extracorporeal shock-wave lithotripsy unit
- Artificial dialysis
- Nuclear medicine
- Appliances, fixtures, etc. for other divisions within the scope of cooperation

(3) Study on the Request

The results of the study by the study team on the request by the Vietnam side are as follows.

1) Facility plan

① The basic policy of the project is improvement of the conditions caused as a result of obsolescence.

A century has passed since HCH was established. While HCH is still using some of very old obsolescent facilities, HCH had added new facilities and modified the old facilities without a well-defined total facility plan (master plan) until quite recently. Under the present conditions, the hospital is obliged to conduct inefficient medical services.

With such a situation in mind, the study team discussed in detail with HCH the layout of entire hospital facilities, referring to the HCH master plan presented by the Vietnamese side. Through such discussions, the study team confirmed with the Vietnamese side that major functions of HCH would be integrated and centralized by implementation of this project, and determined the practical target as indicated in the following Relocation Plan.

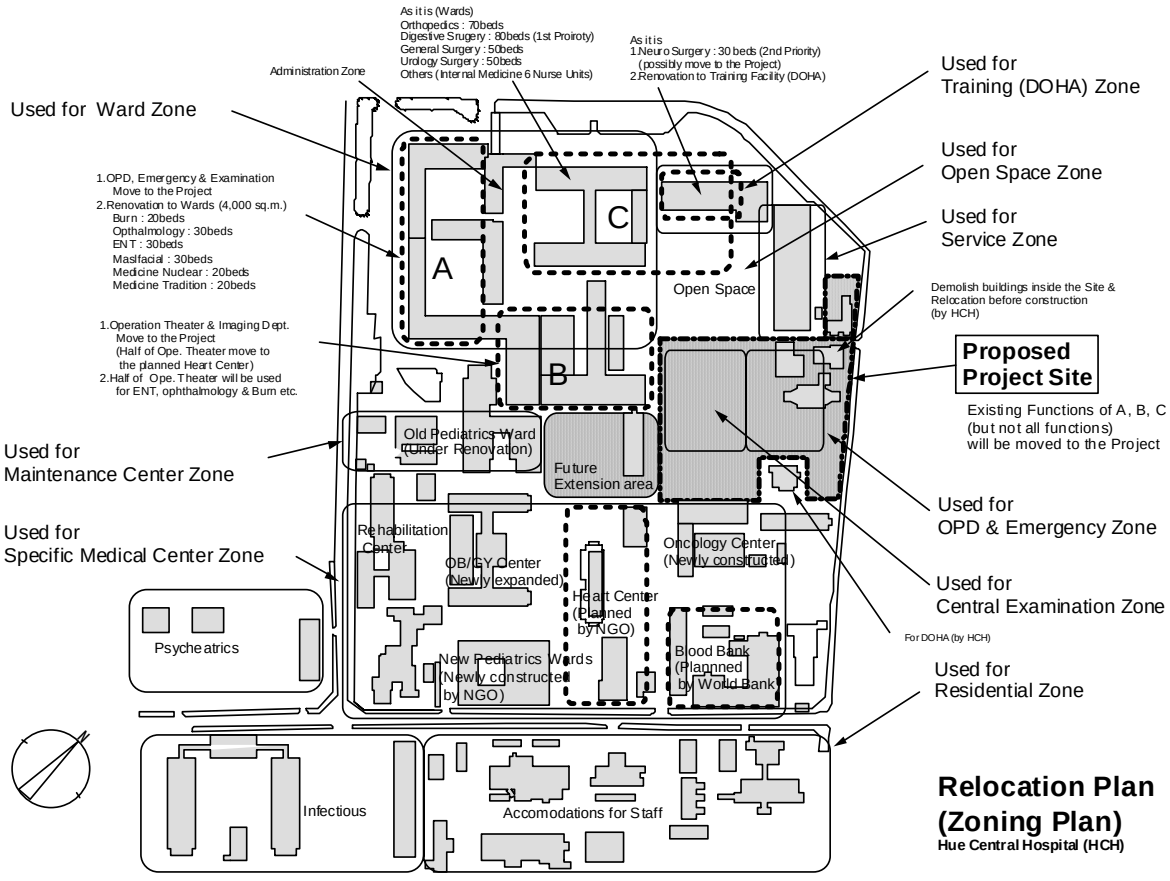


Figure 2-1 HCH Master Plan（Relocation Plan）

The project is designed to improve the medical services and to streamline the hospital management, when the project is completed. Incidentally, there is a minor modification of the construction side as a result of proper location of the sewage treatment facility.

② The subjects of cooperation will be the Central Examination Unit, the Building for Outpatient Department and Emergency Department, and the Training and Management Building.

As a result of the field survey, it has been confirmed that medical services are made very inefficient, because the functions of the Central Examination Division and those of the Outpatient Division are scattered in the hospital premises. The Vietnamese side already secured a site for this project on the east side of the hospital premises, and wishes the above functions to be concentrated in this site. Regarding the Training and Management Building, the following have been confirmed with the Vietnamese side. The Management Division of the proposed Training and Management Building can do with the present facilities. Regarding the Training Division for DOHA activities, HCH will modify and use the existing rooms that become vacant associated with the implementation of this project.

Although the wards are regarded as easier for the Vietnamese side to improve by themselves, it has been confirmed by the survey that a higher priority is given to the wards than to the Management Division. The Vietnamese side considers it urgently necessary to resolve the problems of obsolescence and overcrowded conditions of the surgery wards, and earnestly requested that surgery wards be included in the list of requested facilities.

Regarding the 300 beds in the surgery wards requested as necessary, the study team conferred with the Vietnamese side, with a maximum of 100 in mind for the time being, in consideration of budgetary limit and other constraints. Assuming that even 100 beds cannot be secured, installation of additional beds is justifiable. It was agreed that a provision would be made in the layout plan to permit construction of a ward in the adjacent site.

③ Particular importance is attached to the role of HCH as a base of the referral function and the DOHA activities.

In view of the importance of HCH as a base of the DOHA activities, the design will make a provision to secure a space for trainees in the cooperation project facilities (locker room, conference room) at the hospital's account.

④ Nosocomial infection will be prevented.

The design will provide proper separation between the clean areas and the contaminated areas, and also avoid crossing of traffic lines of the patients and those of the healthcare and medical professionals. In addition, provisions will be made for prevention of nosocomial infections in the treatment and disposal of medical wastes, and water supply and wastewater facilities.

⑤ Prevention of inundation of the buildings

The height of the first-story floor of the planned buildings will be designed to be higher than the highest flood water level conceivable in the Hue area from the past flood records.

2) Equipment plan

As a result of the field survey, such pieces of equipment that can cause environmental problems, that may be provided by other donors have been removed from the list for further study. Major equipment that has been removed from the list is as follows.

① Equipments that can cause environmental problems

The equipment for nuclear medicine can cause environmental contamination and therefore were eliminated from the list.

② Equipments that may be provided by other donors

The equipment for the Angio-cardiology Center and the Blood Center to be constructed will be provided by other donors; therefore, these pieces of equipment were removed from the list for further study.

③ Other eliminated equipment

Regarding equipment for such fields as the extracorporeal shock-wave lithotripsy (ESWL), artificial dialysis, etc. were excluded from the standpoint of benefit-cost relation. Those equipment for laundry were eliminated because they did not fall under medical equipment.

As a result of eliminating improper equipment through the above processes, the study team scrutinized the list after coming back to Japan. Finally, the state of equipment has been summarized as shown in the table below.

Table 2-4 Equipment Study Result

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
Emergency Room	1	Operating Table (B)	1	1		●		●	1	1
Emergency Room	2	Operating Light (B)	1	1		●		●	1	1
Emergency Room	3	Defibrillator	2	1			●	●	0	0
Emergency Room	4	Ultrasound Scanner	1	1			●	●	1	1
Emergency Room	5	Ventilator	1	1			●	●	0	0
Emergency Room	7	ECG 6 Channels	2	1			●	●	1	1
Emergency Room	8	Blood Gas Analyzer	1	0					0	0
Emergency Room	10	Infusion Pump	5	1			●	●	0	0
Emergency Room	11	Minor Surgical Instrument Set	2	1		●		●	3	2
Emergency Room	13	Suction Unit	4	1	●			●	0	0
Emergency Room	14	Table Top Steam Sterilizer	2	2			●	●	1	1
Emergency Room	16	Ambulance Car	2	3			●	●	2	2
Surgery	7	Plaster Bandage Table	4	1		●		●	1	1
Dental Clinic	1	X-ray Unit for Dental	1	1		●		●	1	1
Dental Clinic	2	Automatic Film Processor	1	2	●			●	1	1
Dental Clinic	5	Dental Laboratory Engine	4	1	●			●	0	0
Dental Clinic	6	Centrifugal Casting Machine	1	2	●			●	1	1
Dental Clinic	7	Dental Instrument Set	1	1		●		●	1	0
Dental Clinic	8	Hydraulic Flask Press	1	1	●			●	1	1
Dental Clinic	9	Model Trimmer	1	1	●			●	1	1
Dental Clinic	10	Laboratory Micromoter	1	1	●			●	1	1
Dental Clinic	11	Laboratory Lathe	1	1	●			●	1	1
Dental Clinic	13	Boiling Sterilizer	1	2	●			●	1	0

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
Dental Clinic	15	Dental Chair Unit	15	16			●	●	8	8
Dental Clinic	16	Parallel Manometer	1	0					0	0
Dental Clinic	17	Programmable Plastic Furnace	2	0					1	1
Dental Clinic	18	Amalgam Mixer	1	0					0	0
Dental Clinic	19	Treatment Vaccum Motor	1	0					0	0
Dental Clinic	20	Ultrasonic Scalar	1	1		●		●	0	0
Ophthalmology Clinic	1	Refracting Unit	1	0					0	1
Ophthalmology Clinic	4	Cryosurgery Unit	1	0					0	0
Ophthalmology Clinic	6	Ophthalmic YAG Laser System	1	0					0	0
Ophthalmology Clinic	7	Argon Laser Photocoagulator	1	0					0	0
Ophthalmology Clinic	8	Goniolens	3	1	●				1	0
Ophthalmology Clinic	10	Trial Lens Set	5	1	●			●	1	0
Ophthalmology Clinic	15	Slit Lamp Microscope	3	1		●		●	1	1
Ophthalmology Clinic	16	Ophthalmoscope	3	1	●				1	0
Ophthalmology Clinic	17	Optometer	3	1	●				1	0
Ophthalmology Clinic	18	Perimeter	2	1			●	●	1	1
Ophthalmology Clinic	19	Ophthalmoscope	2	Over lapped with No.16					0	0
Ophthalmology Clinic	20	Lensmeter	3	1		●		●	0	0
Ophthalmology Clinic	21	Fundus Camera	1	0					1	1
Ophthalmology Clinic	22	Keratometer	1	2	●				1	0
E.N.T. Clinic	1	ENT Treatment Unit	3	0					3	3
E.N.T. Clinic	2	ENT Treatment Chair	3	0					3	3
E.N.T. Clinic	3	Audiometer	2	2					1	1
E.N.T. Clinic	6	Nebulizer Unit	3	1			●	●	2	2
E.N.T. Clinic	8	Sinuoscope	4	0					0	0
E.N.T. Clinic	9	Microscope for the ENT	1	0					0	0
E.N.T. Clinic	11	Stroboscope	2	0					0	0

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
E.N.T. Clinic	13	Exam and Treat Instrument Set	3	1		●		●	1	0
Operation Theater	1	C-arm X-ray Unit	1	1		●			1	1
Operation Theater	2	Universal Operating Table	8	8		●		●	8	8
Operation Theater	3	Orthopedic Operating Table	2	0					1	1
Operation Theater	4	Operating Light	8	0	●				8	8
Operation Theater	6	Electro Surgical Unit	8	0	●				8	8
Operation Theater	7	Patient Monitor	8	0	●				8	8
Operation Theater	8	Anesthesia Apparatus with ventilator	8	1	●				8	8
Operation Theater	10	Infant Ventilator	3	0					0	1
Operation Theater	11	Operating Microscope	3	2			●	●	1	1
Operation Theater	13	Defibrillator	8	1	●				2	1
Operation Theater	14	Cryosurgery Unit	4	0					0	0
Operation Theater	15	ECG 6ch	8	0					1	1
Operation Theater	17	Digestive Instrument Set	2	4		●		●	2	2
Operation Theater	18	Orthopedic Instrument Set	2	4		●		●	2	2
Operation Theater	19	Neurosurgery Instrument Set	2	4		●		●	2	2
Operation Theater	20	Urology Instrument Set	2	4		●		●	2	2
Operation Theater	21	Pediatric Surgery Instrument Set	2	4		●		●	2	2
Operation Theater	22	Micro Surgery Instrument Set	2	4		●		●	2	2
Operation Theater	23	Thoracic Surgery Instrument Set	2	4		●		●	2	2
Operation Theater	24	General Surgery Instrument Set	2	4		●		●	2	2
Operation Theater	25	Small Operating Instrument Set	12	10		●		●	12	7
Operation Theater	26	Surgical Scrub Station	8	8		●			2	2
Operation Theater	27	Blood Gas Analyzer	1	0					0	0
Operation Theater	29	Suction Unit	10	3		●		●	0	0
Imaging	1	CT Scanner, Multi Slice	1	1	●				1	0
Imaging	2	Fluoroscopic X-ray TV System	2	1	●				2	1
Imaging	3	General X-ray System	4	1	●				5	4

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
Imaging	4	Angiographic X-ray System	1	1					1	0
Imaging	5	Mobile X-ray Unit	2	1					1	1
Imaging	6	Automatic Film Processor	4	2		●		●	2	2
Imaging	8	Cassette Pass Box	4	2		●		●	0	0
Imaging	10	Color Doppler Ultrasound	3	0					0	0
Imaging	11	Color Ultrasound	3	0					0	0
Sterilization Room	1	High Pressure Steam Sterilizer	4	4					4	4
Sterilization Room	2	Ultasonic Cleaner	1	0					0	0
Sterilization Room	3	Tube Washer	1	0					0	0
Sterilization Room	4	Jet Washer	1	0					0	0
Sterilization Room	9	Low Pressure Steam Sterilizer	1	0					0	0
Endoscopy + Function Examination	1	Broncho Fiberscope	2	0					1	1
Endoscopy + Function Examination	2	Colono Fiberscope	1	1	●				2	1
Endoscopy + Function Examination	3	Gastrointenstinal Fiberscope	2	1	●				2	1
Endoscopy + Function Examination	6	EndoscopeTV System	1	1	●				3	2
Endoscopy + Function Examination	9	Endoscope Cabinet	1	1	●				1	0
Endoscopy + Function Examination	10	Sprirometer	1	1					1	1
Endoscopy + Function Examination	11	Color Doppler Ultrasound	2	2	●				2	0
Endoscopy + Function Examination	12	ECG 6 Channels	2	2					2	2
Endoscopy + Function Examination	13	ECG 12 Channels	3	0					0	0
Endoscopy + Function Examination	14	ECG 1 Channels	10	0					0	0

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
Endoscopy + Function Examination	15	EEG	1	1					0	1
Endoscopy + Function Examination	16	Electromyograph	1	0					0	0
Endoscopy + Function Examination	11	Color Ultrasound	3	2					2	2
Pathology	2	Rotary Microtome	1	1	●				1	1
Pathology	4	Automatic Tissue Processor	2	1		●		●	1	1
Pathology	6	Automatic Slide Stainer	1	0					0	0
Pathology	8	Slide Warmer	3	1	●				1	0
Pathology	9	Fluorescent Microscope	2	0					0	0
Pathology	11	Stereoscopic Microscope	2	0					0	0
Pathology	13	Electronic Balance	3	1	●			●	0	0
Hematology (Routine Exam)	8	Refrigerated Centrifuge	2	1	●				1	1
Hematology (Routine Exam)	9	Autoclave	2	1			●	●	1	1
Hematology (Routine Exam)	10	Incubator	2	2	●				2	0
Hematology (Routine Exam)	11	Water Distillation Apparatus	1	0					1	1
Hematology (Routine Exam)	12	Water Purifier	1	0					0	0
Hematology (Routine Exam)	15	Drying Oven	2	2		●		●	2	1
Biochemistry	1	Water Distillation Apparatus	2	1			●	●	1	0
Biochemistry	2	Deep Freezer	1	1	●				1	0
Biochemistry	3	Drying Oven	5	2		●		●	2	1
Biochemistry	9	Automatic Biochemical Analyzer	1	2		●			1	1
Biochemistry	11	Automatic Osmometer	1	0					0	0
Microbiology	2	Safety Cabinet	1	1	●				1	0
Microbiology	4	High Pressure Steam Sterilizer	1	1	●				1	0
Microbiology	5	Automatic Micropipette Set	1	1	●				1	0
Microbiology	6	Vertical Sterilizer	2	2		●		●	2	2
Microbiology	8	Water Distillation Apparatus	2	0					1	1

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
Microbiology	9	Hot Air Sterilizer	3	5			●	●	5	3
Microbiology	11	Table Top Centrifuge	3	3			●	●	3	3
Microbiology	12	Electronic Balance	4	1		●		●	1	1
Microbiology	13	Water Bath	3	1		●		●	1	1
Pharmacy	1	Vertical Autoclave	3	1		●		●	0	0
Pharmacy	2	Hot Air Sterilizer	1	1		●		●	0	0
Pharmacy	5	Precision Balance	4	1		●		●	1	1
Pharmacy	6	Water Distillation Apparatus	1	1		●		●	1	1
ICU	1	Central Monitor	1	1					1	1
ICU	2	Patient Monitor	24	9	●				30	21
ICU	3	Pace Maker	2	0					0	0
ICU	4	Defibrillator	2	0					1	1
ICU	5	ECG 6ch	3	0					1	1
ICU	7	Ventilator	10	7		●		●	15	12
ICU	8	Pulse Oximeter	10	0					0	0
ICU	9	Infusion Pump	5	1	●				10	5
ICU	10	Syringe Pump	4	2		●			10	4
ICU	11	Ultrasonic Nebulizer	4	0					1	4
ICU	14	Autoclave, Table-top	4	0					0	0
ICU	8	ICU Bed	30	27			●	●	30	30
Recovery Room	27	Blood Gas Analyzer	1	0					1	1
Recovery Room	2	Suction Unit	5	7		●		●	10	5
Recovery Room	3	Infant Incubator	2	0					1	1
Recovery Room	5	Suction Unit	5	Overlapped with No.2					0	0
Recovery Room	9	Ventilator	10	4		●		●	5	0
Recovery Room	10	Patient Monitor	24	7	●			●	3	0
Recovery Room	11	Defibrillator	2	1		●		●	1	1
Recovery Room	12	Syringe Pump	30	7		●		●	5	0
Recovery Room	13	Infusion Pump	10	1		●		●	5	0

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
Recovery Room	14	Nebulizer	10	0					0	0
Recovery Room	7	Recovery Bed	30	29	●			●	30	0
Peadiatric	4	Infant Incubator	4	10			●	●	10	7
Peadiatric	5	Phototherapy Unit	4	4			●	●	4	4
Peadiatric	6	Patient Monitor	-	0					1	1
Peadiatric	15	Infant Ventilator	2	3	●			●	3	0
Peadiatric	8	Pulse Oximeter	4	0					4	4
Peadiatric	12	Bilirubin Analyzer	2	0					1	0
NICU	3	Infant Ventilator	2	3		●		●	2	1
NICU	5	Patient Monitor	2	1	●				2	2
NICU	6	Syringe Pump	4	5		●		●	4	1
Gynecology-Obstetric (New born)	1	Infant Incubator	4	5			●	●	4	3
Gynecology-Obstetric (New born)	3	Phototherapy Unit	2	2			●	●	2	1
Gynecology-Obstetric (New born)	4	Portable Suction Unit	4	2					0	1
Gynecology-Obstetric (New born)	5	Patient Monitor	2	1	●				0	0
Gynecology-Obstetric (New born)	7	Infusion Pump	4	2					0	0
Gynecology-Obstetric (New born)	8	Bilirubin Analyzer	1	0					1	0
Gynecology-Obstetric (Delivery room)	11	Fetal Doppler	2	2			●	●	2	2
Gynecology-Obstetric (Delivery room)	12	CTG Monitor	2	3	●				3	2
Gynecology-Obstetric (Delivery room)	13	Laryngoscope for Infant	3	1			●	●	3	2
Gynecology-Obstetric (Delivery room)	14	Ambu bag	3	1		●		●	3	2
Gynecology-Obstetric (Delivery room)	15	Infant Warmer	2	2			●	●	2	2
Gynecology-Obstetric (Delivery room)	16	Delivery Instrument set	1	5		●		●	1	1
Gynecology-Obstetric (Delivery room)	17	Vacuum Extractor	2	1			●	●	2	2
Gynecology-Obstetric (Delivery room)	18	Delivery Table	5	5	●			●	5	5
Gynecology-Obstetric (Delivery room)	19	Neonatal PH meter	1	0					0	0
Gynecology-Obstetric (Consultation)	20	Colposcope	1	1	●				0	0
Gynecology-Obstetric (Consultation)	21	Colour Ultrasoud Appratus	1	1	●				0	0

Department	No.	Name of Equipment	M/D Q'ty	State of operation of existing equipment					Total planned Q'ty	Planned Q'ty
				Q'ty	Proper operation rate	Partly out of order	Not usable	Older than 10 years		
Gynecology-Obstetric (Consultation)	22	CTG Monitor	1	1		●		●	1	1
Gynecology-Obstetric (Consultation)	23	Portable Echo Machine	1	0					1	1

Priority
A: Equipment for which necessity and relevance are recognized
B: Equipment that should be studied further
C: Equipment for which necessity and relevance are questionable

After on-the-ground briefing and examination, the following equipment was added to the requests. We decided to recognize the equipment appropriate and include it in the plan after analysis in Japan, based on the above selection policy.

Name of Equipment	Q'ty	Name of Equipment	Q'ty	Name of Equipment	Q'ty
Automatic power source stabilizer 2KV	1	Material shelf	23	Stretcher	14
Automatic power source stabilizer 1 KV	3	Apparatus cabinet	29	Wheelchair	8
Automatic power source stabilizer 0.5KV	28	Bed for patient	88	Bedpan washer	4
Jaundice gauge	1	Bedside cabinet	50	X-ray examination apparatus	24
Chair for patient	110	Examination table	32	Recovery bed	30
Anesthesia apparatus with artificial respirator for child	1				

2-2-2-2 Site Plan

(1) Shape and Use of the Site

The premises of HCH is surrounded by roads on all four sides of near square site, and approach to the hospital can be made from any of these four roads. The planned site for this project is on the center east of the hospital premises and faces the Hai Ba Trung Road. It is therefore best to build the approach from the Hai Ba Trung Road. There is a drawback to this road in that this road is a one-way-traffic road. The advantages are that this road is connected with the two trunk roads of the Hue City, the Le Loi Street and the Hanoi Street, and the approach road from the Hai Ba Trung Road will provide more convenient access to the patients.

The planned site is nearly rectangular, although the site includes a small lot for a monumental building that must be preserved, and is about one hectare wide. The Outpatient Diagnosis and Treatment Building will be located on the road side to facilitate the access of outpatients, and the Central Examination Unit will be placed behind the former, considering the functional coordination with the former and the traffic lines to the existing hospital facilities.

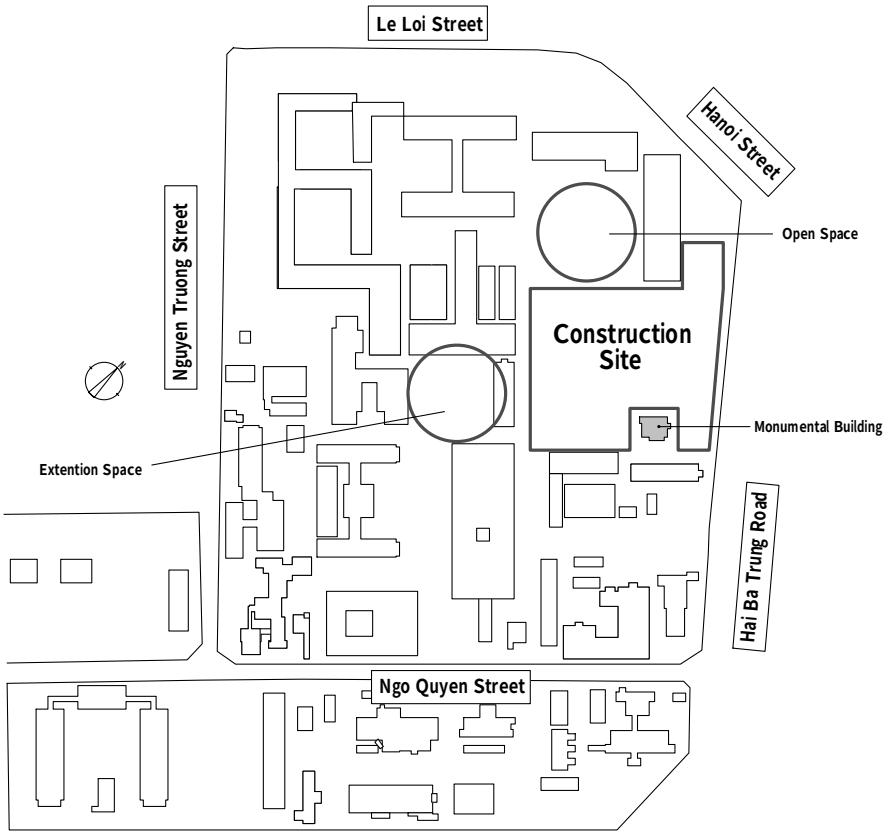


Figure 2-2 Project Site in the HCH Premises

(2) Future Expansion Plan

Installation and expansion of hospital facilities generally become necessary as a result of advancement of medical technologies and facilities. This will also be the case, particularly with the facilities of the Central Examination Division. Therefore, the vacant spot to the north of the planned site of the Central Examination Unit will be reserved for possible future expansion of the functions of the Central Examination Division. The planning of traffic lines will consider such possibility.

The expansion of the wards, now part of the HCH master plan, will be remembered in the planning of the Central Examination Unit, so that the traffic lines between the Central Examination Unit between the planned wards will be really functional.

2-2-2-3 Architectural Plan

(1) Facility Configuration

The scope of this project consists of ward divisions for outpatients, central diagnosis, recovery rooms and ICUs.

The Outpatient Division will be in a building separated from the Central Examination Division Building. This represents a decision to facilitate management in consideration of a custom of the Vietnamese that family members stay in hospital with the inpatient, and these family members walk around in the hospital, while the patient waits for doctor's call or treatment.

The Central Examination Division consists of the X-ray Department, Physiological Examination Department, Endoscope Examination Department, Specimen Examination Department, and Operation Department. The X-ray Department, Physiological Examination Department, and the Endoscope Examination Department, to which the patients come for diagnosis and treatment, are located on the lower floors of the building. The Specimen Examination Department and the Operation Department are located on the floor above the above-mentioned floors. The recovery rooms and the ICUs, because of their roles closely integrated with the Operation Department, are located on the floor just above the Operation Department. On the seventh floor, or the uppermost floor, wards for patients in relatively serious conditions released from the ICU's are placed.

(2) Determination of Capacity of Facility

The following assumptions have been established as basis for calculating required capacities of pertinent rooms of the concerned departments. Relevant data were processed to arrive at the required capacities.

Assumption

1) Annual working day

The Outpatient Division is open on normal business days excluding Saturdays and Sundays, except for the Emergency Department. Therefore, it is assumed that the Outpatient Division is open for 260 days a year but the Emergency Department is open for 365 days a year. The Operation Department is assumed to be open for 365 days a year, because the department carries out emergency operation on Saturdays and Sundays, though the department normally operates 260 days a year.

2) Opening hour and other assumptions for the Outpatient Division

The hospital is open for six hours on normal working days, from 7:30 a.m. hours to 11:00 a.m. hours in the morning and 1:30 p.m. hours to 4:00 p.m. hours in the afternoon.

Of the Outpatient Division, the number of patients receiving diagnosis is assumed to be 10 persons per hour for the internal medicine, surgical medicine and traditional medicine. Four persons per hour are assumed for diagnosis and treatment of the ophthalmology and the otolaryngology each, and two persons per hour are assumed for the dentistry. One person per hour is assumed for the laser treatment.

The Emergency Department is on alert on 24 hours a day. Two persons per hour are assumed for diagnosis and treatment of emergency patient. The emergency patients are assumed on average to stay in the recovery room for six hours.

3) Conditions for diagnosis and treatment by the Central Examination Division

Based on the results of interview surveys and other information obtained during the field survey, the time efficiencies of various diagnoses and treatments of the Central Examination Division are assumed as follows:

General radiology	12 persons/hour	Ultrasonography (heart)	4 persons/hour
Chest radiology	20 persons/hour	Ultrasonography (abdomen)	6 persons/hour
Upper radioscopy	3 persons/hour	Ultrasonography (others)	6 persons/hour
Lower radioscopy	2 persons/hour	Pulmonary function test	6 persons/hour
Angiography	3 persons/day	Endoscopy	1.5 persons/hour
ECG	2 persons/hour	Operation Department	3 times/day
EEG	1 person/hour		

4) Conditions of ward, occupancy rate

The wards are attended to throughout the year, or 365 days a year. The patients stay in ward for 4 days in the ICU and 1 day in the recovery room on average. The hospital should always have some ICU beds and the recovery room beds unoccupied in preparation for emergency. For this reason, the appropriate occupancy rate is assumed to be 80 percent for the capacity calculation.

5) Patient estimation

Here, the number of patients is estimated for 2006 when the new buildings are scheduled for completion and commissioning. The number of patients may be considered to increase in proportion to the population; therefore, the number of patients is estimated from the population increase in Central Vietnam for the past five years. The population increased at an average rate of 2.5 percent per year for the past five years. From this the population in 2006 should be 1.1 times as much as the population of 2002, for the latter the study team has obtained the data. Therefore, the number of patients is assumed to be 1.1 times that of 2002.

Table 2-5 Trend of Population in Central Vietnam

	Administrative division	1998	1999	2000	2001	2002	Annual average
1	Thua Thien - Hue	1,027,100	1,035,200	1,066,100	1,079,900	1,091,900	
	Growth rate		1.008	1.030	1.013	1.011	1.015
2	Quang Binh	792,500	795,200	798,800	799,400	803,000	
3	Quang Tri	553,200	561,400	563,300	572,400	580,800	
	Subtotal	1,345,700	1,356,600	1,362,100	1,371,800	1,383,800	
	Growth rate for the above 2 provinces		1.008	1.004	1.007	1.009	1.007
4	Nghe An	2,830,200	2,842,300	2,853,100	2,865,500	2,895,200	
5	Ha Tinh	1,342,500	1,346,300	1,353,200	1,365,400	1,379,100	
6	Quang Nam	1,355,500	1,361,100	1,365,400	1,385,200	1,388,700	
7	Binh Dinh	1,455,100	1,456,800	1,457,100	1,457,900	1,481,600	
8	Quang Ngai	1,215,300	1,225,800	1,236,400	1,278,400	1,199,100	
9	Phu Yen	757,600	765,300	768,900	785,500	804,200	
10	Khanh Hoa	978,800	982,100	998,200	1,025,400	1,049,200	
11	Gia Lai	815,100	856,200	895,400	989,200	1,020,500	
12	Kon Tum	265,300	289,400	292,500	310,100	326,500	
13	Dac Lac	1,301,600	1,456,100	1,589,200	1,678,400	1,862,600	
14	Ninh Thuan	175,800	215,600	345,800	464,200	515,700	
15	Binh Thuan	924,500	945,400	982,200	1,022,100	1,066,000	
	Subtotal	13,417,300	13,742,400	14,137,400	14,627,300	14,988,400	
	Growth rate for the above 12 provinces		1.024	1.029	1.035	1.025	1.028
	Grand total	15,790,100	16,134,200	16,565,600	17,079,000	17,464,100	
	Growth rate		1.022	1.027	1.031	1.023	1.026

Source: answer to the questionnaire

6) Number of outpatients, number of tests

The numbers of outpatients and various tests show the trends given in the table below.

Table 2-6 Trends of Numbers of Outpatients and Various Tests at the Hue Central Hospital

Department		1999	2000	2001	2002	2003 (First half year)	Average number of patients per day (2002)
General outpatient	Internal medicine	27,463	28,579	26,928	27,567	15,726	106
	Infectious disease	5,894	5,964	5,908	6,516	4,879	25
	Surgery	16,742	17,653	14,814	16,069	10,973	61
	Foreigner	186	203	189	214	96	0.8
Specialized internal medicine	Endocrinology	-	-	5,511	6,048	4,167	84
	Cardiology	-	-	5,374	5,912	3,057	
	Gerontology	-	-	2,411	2,641	1,412	
	Urology	-	-	2,946	3,276	1,685	
	Gastroenterology	-	-	3,712	4,125	2,027	
Specialized surgery	Cardiology	-	-	2,826	3,247	2,297	104
	Gastroenterology	-	-	8,115	8,423	5,364	
	Urology	-	-	4,241	4,689	2,847	
	Neurosurgery	-	-	3,724	4,127	2,564	
	Oncology	5,218	5,402	5,379	6,738	4,072	
	Orthopedics, traumatology	19,923	20,716	17,506	20,435	9,565	78
Others	Obstetrics and gynecology	7,792	7,901	7,881	8,739	6,743	33
	Pediatrics	11,846	11,963	11,921	12,657	7,428	48
	Ophthalmology	12,181	12,203	12,076	14,489	7,825	55
	Otolaryngology	12,899	13,007	13,111	14,503	9,314	55
	Dentistry, oral surgery	17,475	17,676	17,556	20,561	9,048	79
	Traditional medicine	1,084	1,106	1,060	1,174	724	4
	Physical therapy, rehabilitation	612	499	542	506	589	1
	Tuberculosis	2,918	2,831	2,814	3,103	1,724	11
	Dermatology	6,425	6,698	6,671	7,377	3,718	28
	Psychiatry	3,154	3,492	3,442	3,694	2,049	14
	Laser therapy	4,663	2,083	2,600	3,743	5,581	
Emergency rescue	Number of patients	29,437	29,814	29,126	30,022	17,642	
	Average number of patients per day	81	82	80	82	97	
	Maximum number of patients per day	157	162	156	165	184	
	Average in-hospital time	6 hours	6 hours	6 hours	6 hours	5 hours	
Total		151,812	155,893	186,658	206,830	119,893	795

Source: answer to the questionnaire

Table 2-7 Number of Patients for the X-ray Examination Department and Physiological Examination Department of the Hue Central Hospital

Diagnosis and treatment			1998	1999	2000	2001	2002
X-ray Examination Department	Radiography	Plain radiography	34,320	40,633	45,520	63,481	68,490
		Upper abdominal contrast radiography	3,156	3,079	2,562	1,958	1,887
		Lower abdominal contrast radiography	2,035	2,147	1,976	2,248	2,578
		Chest radiography	2,968	24,375	29,567	33,892	35,427
		Angiography	218	452	517	649	1,024
		Catheter	0	112	156	248	516
Physiological Examination Department	Ultrasonography	Heart	1,243	1,876	2,422	2,963	2,931
		Abdomen	8,562	9,482	9,576	10,548	10,894
		Obstetrics	2,416	4,726	6,312	8,983	7,285
		Others	5,617	6,103	6,913	7,829	12,012
	Electrocardiography		5,734	4,672	3,745	3,629	4,118
	Electroencephalography		1,602	1,791	1,643	872	715
	Respiratory function		0	0	118	356	784
	Endoscopy		2,684	3,241	4,055	3,882	4,964

Source: answer to the questionnaire

Table 2-8 Number of Surgical Operations at the Hue Central Hospital

Department	1998	1999	2000	2001	2002
Angio-cardiology	473	536	598	580	659
Gastroenterological surgery	1,713	1,989	2,178	2,311	2,289
Traumatology, orthopedics	1,779	1,815	1,977	2,049	2,053
Renal surgery	781	838	984	975	978
Neurosurgery	378	509	656	747	841
General surgery	673	736	798	795	817
Oncological surgery	579	631	893	943	820
Oral surgery	385	478	588	624	636
Ophthalmology	988	1,038	1,008	1,011	1,055
Otolaryngology	962	1,019	1,050	1,324	1,342
Obstetrics	988	1,283	1,529	1,552	1,619
Others	488	481	602	599	414
Total	10,187	11,353	12,861	13,510	13,523
					6,989
Delivery	3,492	3,755	4,070	4,006	4,624
Normal delivery	2,504	2,672	3,641	3,454	3,005

Source: answer to the questionnaire

Table 2-9 Numbers of ICU Patients and Average Inhospital Days of the Hue Central Hospital

	1998	1999	2000	2001	2002
Number of patients	1,673	1,546	1,570	1,840	1,910
Average number of inhospital days	3.5	3.5	4	4	4

Source: answer to the questionnaire

The required number of rooms for each department is calculated on the preceding assumptions.

Table 2-10 Required Room

■ Outpatient Division

Room	Account	Required Room
General internal medicine	27,567 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 1.94	2 rooms (one each for men and women)
Infectious disease	6,516 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 0.46	1 room
Pediatrics	12,657 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 0.89	2 rooms (one each for men and women)
General surgery	16,069 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 1.13	2 rooms (one each for men and women)
Foreigner outpatients	214 / 260 days / 6 hours / 10 persons attended per hour = 0.01	1 room
Specialized internal medicine	22,002 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 1.55	2 rooms
Specialized surgery	27,224 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 1.92	2 rooms
Orthopedics, etc.	20,435 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 1.44	2 rooms
Ophthalmology	14,489 × 1.1 (rate of increase) / 260 days / 6 hours / 4 persons attended per hour = 2.55	3 rooms
Otolaryngology	14,503 × 1.1 (rate of increase) / 260 days / 6 hours / 4 persons attended per hour = 2.56	3 rooms
Dentistry	20,561 × 1.1 (rate of increase) / 260 days / 6 hours / 2 persons attended per hour = 7.25	8 dental units
Traditional medicine	1,174 × 1.1 (rate of increase) / 260 days / 6 hours / 10 persons attended per hour = 0.08	1 room
Laser therapy	5,581 × 1.1 (rate of increase) / 260 days / 6 hours / 1 person attended per hour = 3.94	4 examination couches (2 rooms)
Emergency rescue	165 (maximum number of patients per day) / 24 hours / 1 person attended per hour = 6.88	3 examination rooms + 7 emergency treatment rooms
Recovery room for emergency rescue	80 (average number of patients per day) / 24 hours × 6 hour stay per person = 19.99	20 beds

■ Central Examination Division

(radiography)

Room	Account	Required Room
General radiology	68,490 × 1.1 (rate of increase) / 260 days / 6 hours / 12 persons attended per hour = 4.02	4 rooms
Chest radiology	35,427 × 1.1 (rate of increase) / 260 days / 6 hours / 20 persons attended per hour = 1.25	1 room
Upper radioscopy	1,887 × 1.1 (rate of increase) / 260 days / 6 hours / 3 persons attended per hour = 0.44	1 room
Lower radioscopy	2,578 × 1.1 (rate of increase) / 260 days / 6 hours / 2 persons attended per hour = 0.91	1 room
Angiography	516 × 1.1 (rate of increase) / 260 days / 3 persons attended per day = 0.73	1 room

(re: physiological examination, endoscopy)

Room	Account	Required Room
ECG	4,118 × 1.1 (rate of increase) / 260 days / 6 hours / 2 persons attended per hour = 1.45	2 rooms
EEG	715 × 1.1 (rate of increase) / 260 days / 6 hours / 1 person attended per hour = 0.50	1 room
Ultrasonography (Heart)	2,931 × 1.1 (rate of increase) / 260 days / 6 hours / 4 persons attended per hour = 0.52	Total 4 rooms
Ultrasonography (Abdomen)	10,894 × 1.1 (rate of increase) / 260 days / 6 hours / 6 persons attended per hour = 1.28	
Ultrasonography (Others)	12,012 × 1.1 (rate of increase) / 260 days / 6 hours / 6 persons attended per hour = 1.41	
Pulmonary function test	784 × 1.1 (rate of increase) / 260 days / 6 hours / 6 persons attended per hour = 0.09	1 room
Endoscopy	4,964 × 1.1 (rate of increase) / 260 days / 6 hours / 1.5 persons attended per hour = 2.33	3 rooms

(re: surgery)

Room	Account	Required Room
Operation room	6,978 × 1.1 (rate of increase) / 365 days / 3 operations per room per day = 7.01	8 rooms (1 room for emergency)

(re: ICU, recovery room, ward)

Room	Account	Required Room
ICU bed	1,910 × 1.1 (rate of increase) × 4 days (average inhospital days) / 365 days = 23.025 23.025 / 0.8 (proper occupancy rate of hospital beds) = 28.78	30 beds
Recovery room	8 (operation rooms) × 3 (frequency of use per day) / 1 day (average inhospital days) = 24 24 / 0.8 (proper occupancy rate of hospital beds) = 30	30 beds

(3) Required Floor Area

The total floor area for architectural planning is calculated from the required numbers and other information of various rooms calculated above. The area of a given room of this cooperation project is determined referring to the standards for medical facilities in use in Vietnam and standards for floor area of medical facilities of Japan (design materials, etc. of the Architectural Institute of Japan), while considering the present states of the concerned existing facilities. Further, determination of floor area takes into account the layout of the medical facilities and equipment to be installed in the subject room, numbers of patients and medical staff to work in the room.

Table 2-11 Floor Area of the Planned Facility

Building for Outpatient Department and Emergency Department

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
1st floor	Entrance area	Entrance hall	231.3	Waiting lounge, benches installed
		Medical matter, accounting	64.7	10.5m×6.2m
		Dispensary	23.4	5.9m×4m
		Guard room	18.6	3m×6.3m
		Subtotal	338.0	
	Emergency rescue	Emergency rescue recovery room	137.8	12m×12m, 20 beds
		Examination room	54.2	3 rooms, one is also for triage
		Emergency entrance	24.8	4.4m×5.7m
		Emergency treatment room	108.1	7 rooms, partitioned by curtains
		Minor operation room	25.4	5.9m×4.4m
		Conference room	13.1	3.0m×4.4m
		Night duty room	57.0	2 rooms, 6.2m×9.2m
		Refuse and waste treatment room	9.8	3.3m×3.0m
		Linen room	10.3	3.3m×3.2m
		Equipment room	9.8	3.3m×3.0m
		Department manager room	13.1	3.0m×4.4m
		Deputy department manager room	14.0	3.2m×4.3m
		Staff station	39.0	5.9m×6.6m
		Subtotal	516.4	
	Orthopedics	Diagnosis and examination room	12.7	3.0m×4.2m
		Casting	19.3	4.6m×4.2m
		Staff area	39.9	3.0m×6.2m, 1.9m×7.5m
		Reception desk	6.5	3.0m×2.2m
		Waiting room	120.4	21.0m×5.7m
		Common corridor, etc.	231.5	According to plan
		Common toilet, etc.	55.4	4.5m×12.3m
		Subtotal	485.7	
	Total		1,340.1	
	Shaft, maintenance corridor, etc.		40.0	
	Total (1st Floor)		1,380.1	

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
2nd floor	General and specialized internal medicine	Staff room	19.3	4.6m×4.6m
		Diagnosis and examination room	63.0	3.0m×4.2m, 5 room
		Reception desk	18.9	3.0m×3.2m, 2 rooms
		Staff station	70.5	16.5m×6.0m
		Waiting room for infectious diseases	18.9	4.5m×4.2m
		Diagnosis and examination room for infectious disease	12.8	3.0m×4.2m
		Waiting room	132.1	22.6m×5.9m
		Subtotal	335.5	
	General and specialized surgery	Treatment room	19.2	4.5m×4.3m
		Diagnosis and examination room	38.5	3 rooms, 9m×4.3m
		Reception desk	9.9	3.2m×3.2m
		Waiting room	94.1	16.5m×5.7m
		Subtotal	161.7	
	Pediatrics, traditional medicine	Diagnosis and examination room	37.8	9.0m×4.2m
		Staff room	18.9	4.5m×4.2m
		Staff station	70.5	16.7m×6.0m
		Reception desk	9.9	3.2m×3.2m
		Waiting room	94.9	16.7m×5.7m
		Department manager room	12.4	3.8m×3.3m
		Deputy department manager room	19.8	6.0m×3.3m
		Conference room	28.6	8.7m×3.3m
		Common corridor, etc	303.8	
		Common toilet, etc.	55.4	4.5m×12.3m, including shower room, locker room, etc.
		Subtotal	652.0	
	Total		1,149.2	
	Shaft, maintenance corridor, etc.		131.5	
	Total (2nd Floor)		1,280.7	
3rd floor	Otolaryngology	Diagnosis and treatment room	44.1	10.5m×4.2m
		Staff room	12.6	3.0m×4.2m
		Reception desk	9.5	3.0m×3.2m
		Waiting room	132.1	22.6m×5.9m
		Subtotal	198.3	
	Ophthalmology	Diagnosis and treatment room	32.0	7.8m×4.2m
		Dark room	12.6	3.0m×4.2m
		Minor operation room	12.6	3.0m×4.2m
		Reception desk	9.5	3.0m×3.2m
		Staff station	70.5	16.5m×6.0m
		Subtotal	137.2	
	Dentistry, laser therapy	Dentistry, treatment room	144.1	7 dental units＋1 room
		Treatment room	72.9	6.0m×12.1m
		X-ray projection room	9.9	3.2m×3.2m
		Dental technician room	41.0	12.4m×3.3m, including the compressor room
		Staff room	31.7	6.0m×3.2m, 4.5m×2.9m, 2 rooms
		Conference room	13.3	4.7m×2.9m
		Staff station	38.0	3.2m×9.1m, 3.2m×3.2m
		Reception desk	9.9	3.2m×3.2m

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
3rd floor		Waiting room	94.1	16.5m×5.7m
		Subtotal	454.9	
	Common	Conference room	94.8	9.2m×10.4m
		Common corridor, etc.	274.1	
		Common toilet	55.4	4.5m×12.3m, including the shower room, locker room, etc.
		Subtotal	424.3	
	Total		1,214.7	
	Shaft, maintenance corridor, etc.		115.1	
	Total (3rd Floor)		1,329.8	

Central Examination Unit

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
1st floor	X-ray department	X-ray projection room	200.9	6 rooms, including angiography room, mammography room, pre-clean room
		Machine room	38.4	6.4m×3.0m, 2 rooms
		CT	38.4	6.4m×6.0m
		MRI	51.2	6.4m×8.0m
		ESWL	38.4	6.4m×6.0m
		Radioscopy	76.8	6.4m×6.0m, 2 rooms
		Dark room	21.0	4.2m×5.0m
		Film room	16.4	4.2m×3.9m
		Reception desk	12.6	4.2m×3.0m
		X-rays reading area	37.8	4.2m×9.0m
		Corridor for controlling	167.4	
		Conference room	18.9	4.2m×4.5m
		Department manager room	12.6	4.2m×3.0m
		Deputy department manager room	12.6	4.2m×3.0m
		Subtotal	743.4	
	Common	Common corridor, etc.	669.3	
		Common toilet	88.9	Including locker room, shower room, etc.
		Subtotal	758.2	
	Total		1,501.6	
	Shaft, maintenance corridor, etc.		106.6	
	Total (1st Floor)		1,608.2	
2nd floor	Physiological examination, endoscope	Reception desk	30.9	Physiological examination reception desk, Endoscope reception desk
		Ultrasonography test room	57.6	4 rooms
		EEG	19.2	3.2m×3.0m, 2 rooms
		Staff room	41.8	3.2m×6.0m, 2 rooms
		Dispensary	20.1	3.2m×6.2m
		Conference room	20.1	3.2m×6.2m
		Department manager room	10.8	3.6m×3.0m
		Deputy department manager room	10.8	3.6m×3.0m
		Recovery room	53.3	9.2m×5.8m

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
2nd floor	Physiological examination, endoscope	Preparation room	28.2	6.2m×6.2m
		Endoscope room	107.6	Including the storage room
		Room for various tests	35.9	5.8m×6.2m
		Washing room	47.2	12.2m×3.9m
		Subtotal	483.5	
	Bacteriological examination	Conference room	32.8	8.1m×4.1m
		Washing room	48.6	8.1m×6.0m
		Test room	170.1	2 rooms
		Office room	24.3	8.1m×3.0m
		Department manager room	13.5	4.5m×3.0m
		Deputy department manager room	10.8	3.6m×3.0m
		Subtotal	300.1	
	Common	Common corridor, etc.	614.2	
		Common toilet	88.9	Including the locker room, shower room, etc.
		Subtotal	703.1	
	Total		1,486.7	
	Shaft, maintenance corridor, etc.		116.6	
	Total (2nd Floor)		1,603.3	
3rd floor	Blood examination department	Test room	220.1	8.1m×27.2m
		Staff room	25.7	8.1m×3.2m
		Conference room	35.9	9.3m×3.9m
		Office room	21.2	3.5m×6.0m
		Department manager room	10.6	3.5m×3.0m
		Deputy department manager room	9.0	3.5m×3.0m
		Subtotal	322.5	
	Biochemical examination, department	Test room	172.1	10.7m×21.0m
		Office room	26.4	3.0m×6.0m
		Department manager room	9.7	3.0m×3.0m
		Deputy department manager room	11.4	3.0m×3.0m
		Subtotal	219.6	
	Pathology examination department	Test room	172.1	10.7m×16.1m
		Office room	26.4	6.5m×4.1m
		Dark room	19.6	6.5m×3.0m
		Excision room	19.6	6.5m×3.0m
		Storage room	19.6	6.5m×3.0m
		Department manager room	9.7	3.0m×3.2m
		Deputy manager room	11.4	3.5m×3.2m
		Subtotal	278.4	
	Common	Wash room	47.0	6.5m×7.2m
		Night duty room	39.6	2 rooms
		Common corridor, etc.	532.6	
		Common toilet	47.0	Including the locker room, shower room, etc.
		Subtotal	666.2	
	Total		1,486.7	
	Shaft, maintenance corridor, etc.		116.6	
	Total (3rd Floor)		1,603.3	

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
4th floor	Surgery department	Operation room	342.0	8 rooms, including 1 pre-clean room
		Equipment room	29.6	7.5m×4.0m
		Dual corridors	115.5	Including the refuse and waste treatment area
		Doctor rest lounge	24.3	
		Anesthesia room	9.5	2.8m×3.4m
		Conference room	15.3	3.0m×5.1m
		Nurse station	15.2	4.5m×3.4m
		Bed transfer area	38.9	4.3m×9.0m
		Sterilized equipment room	62.0	6.0m×10.3m
		Sterilization room	44.0	6.0m×7.3m
		Washing room	62.0	
		Disposable equipment room	19.1	6.0m×3.2m
		Office room	10.0	3.2m×3.2m
		Subtotal	787.4	
	Common	Night duty room	39.6	2 rooms
		Air conditioner machine room	65.7	19.6m×3.4m
		Common corridor, etc.	542.4	
		Common toilet, etc.	64.3	4 rooms, including the locker room
		Subtotal	712.0	
	Total		1,499.4	
	Shaft, maintenance corridor, etc.		116.6	
	Total (4th Floor)		1,616.0	
5th floor	Recovery ward	Recovery	560.3	30 beds
		Staff station	86.6	1.5m×5.8m
		Staff room	18.9	4.7m×4.1m
		Conference	23.1	4.7m×5.0m
		Temporary wash room	13.2	4.7m×2.8m
		Linen room	19.8	6.2m×3.2m
		Night duty room	34.8	3.2m×5.4m, 2 room
		Locker room	42.2	3.2m×6.6m, 2 rooms
		Preparation room	29.8	3.2m×9.2m
		Equipment room	29.8	3.2m×9.2m
		Department manager room	14.0	4.7m×3.0m
		Deputy department manager room	14.0	4.7m×3.0m
		Family waiting room	25.9	8.6m×3.0m
		Refuse and waste treatment room	9.8	4.7m×2.1m
		Air conditioner machine room	55.1	8.5m×6.5m
		Subtotal	977.3	
	Common	Pre-clean room	49.2	
		Elevator hall	35.2	
		Common corridor, etc.	395.8	
		Common toilet	41.9	12.5m×3.3m
		Subtotal	522.1	
	Total		1,499.4	
	Shaft, maintenance corridor, etc.		116.6	
	Total (5th Floor)		1,616.0	

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
6th floor	ICU wards	ICU	410.0	30 beds
		ICU (private (one-bed) room)	112.2	6 rooms
		Staff station	86.6	1.5m×5.8m
		Conference room	18.9	4.7m×4.1m
		Primary washing room	14.3	4.5m×3.2m
		Linen room	21.3	3.2m×6.6m
		Night duty room	34.8	3.2m×5.4m, 2 rooms
		Locker room	42.2	3.2m×6.6m, 2 rooms
		Preparation room	29.8	3.2m×9.2m
		Equipment room	29.8	3.2m×9.2m
		Department manager room	14.0	4.7m×3.0m
		Deputy department manager room	13.2	4.7m×2.8m
		Family waiting room	25.9	8.6m×3.0m
		Refuse and waste treatment room	9.8	4.7m×2.1m
		Staff room	18.9	4.7m×4.1m
		Subtotal	881.7	
	Common	Pre-clean room	39.4	
		Elevator hall	35.2	
		Common corridor, etc.	345.4	
		Common toilet	41.9	12.5m×3.3m
		Subtotal	461.9	
	Total		1,343.6	
	Shaft, maintenance corridor, etc.		172.6	
	Total (6th Floor)		1,516.2	
7th floor	Ward for serious patient	6-bed room	314.2	7.5m×6m, 7 rooms
		2-bed room	44.7	7.5m×3m, 2 rooms
		1-bed room	88.7	7.5m×3m, 4 rooms
		Staff room	22.5	7.5m×3m
		Treatment room	18.0	5.7m×3.2m
		Equipment room	19.8	4.7m×4.2m
		Linen room	19.8	4.7m×4.2m
		Night duty room	31.4	4.7m×3.3m, 2 rooms
		Locker room	35.3	8.7m×4.1m
		Conference	65.2	9.5m×7.4m
		Department manager room	13.7	4.7m×2.9m
		Deputy department manager room	13.7	4.7m×2.9m
		Family waiting room	28.5	8.6m×3.3m
		Staff station	33.4	
		Subtotal	748.9	
	Common	Elevator hall	11.0	
		Common corridor, etc.	510.5	
		Common toilet	73.2	Including the shower room, etc.
		Subtotal	594.7	
	Total		1,343.6	
	Shaft, maintenance corridor, etc.		116.6	
	Total (7th Floor)		1,460.2	
Roof	Warehouse, etc.		47.0	
	Landing space, etc.		19.4	
	Total		66.4	

Mechanical Building

Floor	Division or department	Room	Planned floor area (m^2)	Design standard, note
1st floor	Mechanical Building	Operation room	21.9	3.2m×7m
		Medical pump room, etc.	387.7	
		Total	409.6	

Planned floor area of each facility

Building	Story	Planned floor area
Building for Outpatient Department and Emergency Department	1st floor	1,380.1 ㎡ (1,340.1 ㎡)
	2nd floor	1,280.7 ㎡ (1,149.2 ㎡)
	3rd floor	1,329.8 ㎡ (1,214.7 ㎡)
	Total	3,990.6 ㎡ (3,704.0 ㎡)
Central Examination Unit	1st floor	1,608.2 ㎡ (1,501.6 ㎡)
	2nd floor	1,603.3 ㎡ (1,486.7 ㎡)
	3rd floor	1,603.3 ㎡ (1,486.7 ㎡)
	4th floor	1,616.0 ㎡ (1,499.4 ㎡)
	5th floor	1,616.0 ㎡ (1,499.4 ㎡)
	6th floor	1,516.2 ㎡ (1,343.6 ㎡)
	7th floor	1,460.2 ㎡ (1,343.6 ㎡)
	Roof	66.4 ㎡ (47.0 ㎡)
	Total	11,089.6 ㎡ (10,208.0 ㎡)
Mechanical Building	1st floor	409.6 ㎡ (409.6 ㎡)
	Total	409.6 ㎡ (409.6 ㎡)
Grand total		15,080.2 ㎡(14,321.6 ㎡)

(4) Facility Configuration (Function)

The facilities and equipment of this cooperation project will be assigned to each department, and each department will be deployed as shown below.

Table 2-12 Facility Configuration

Building and story		Function
Building for Outpatient Department and Emergency Department	1st floor	Outpatient Division (orthopedics, emergency rescue, recovery room), medical matter and accounting, dispensary
	2nd floor	Outpatient Division (general internal medicine, specialized internal medicine, general surgery, specialized surgery, pediatrics, traditional medicine)
	3rd floor	Outpatient Division (ophthalmology, otolaryngology, dentistry, laser therapy)
Central Examination Unit	1st floor	X-ray Department
	2nd floor	Physiological examination, endoscope examination, bacteriological examination
	3rd floor	Blood examination, biochemical examination, pathological examination
	4th floor	Operation Department, washing and sterilization room
	5th floor	Recovery ward
	6th floor	ICU ward
	7th floor	Serious patient wards
Mechanical Building		Medical pump room, etc.

(5) Floor Planning

Building for Outpatient Department and Emergency Department

The entrance door and emergency entrance will be provided to the Hai Ba Trung Road side of the building to facilitate access of the patients. In the general outpatient portion of the building, traffic lines of the hospital staff and those of the patients are clearly distinguished to keep the function of the hospital high. The waiting rooms for the patients will have openings on two sides to facilitate natural ventilation. The hospital's various diagnosis and treatment departments will be placed separately on three floors; however, the layout considers coordination among different functions. Take the first floor for example, the orthopedics, a function closely related with the X-ray Department, will be placed, in addition to such functions as emergency rescue, medical matter, accounting, dispensary. The diagnosis and treatment rooms of internal medicine, surgery and pediatrics that handle large numbers of patients will be the main functions placed on the second floor. The main functions of the third floor will be ophthalmology, otolaryngology and dentistry.

The emergency outpatient function will have night diagnosis rooms, emergency treatment rooms and recovery rooms, and the layout considers coordination with the X-ray Department and the Operation Department.

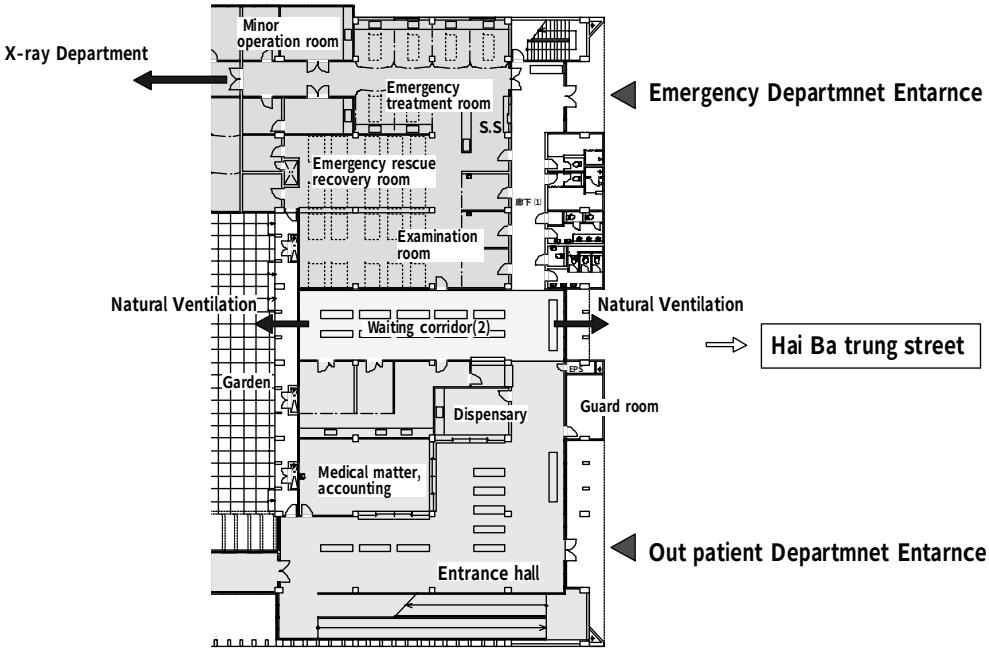


Figure 2-3 Building for Outpatient Department and Emergency Department, 1st Floor

Central Examination Unit, X-ray Department

Rooms containing precise facilities and equipment need air conditioning. The rooms concerned with radiography will be laid out in the central portion of the building where the effects from the outsides are minimum and the temperature and humidity are relatively stable. In a manner surrounding these radiography-related rooms, patients' waiting spaces with natural ventilation will be placed. The traffic lines of the hospital staff and patients will be clearly distinguished to secure functionality and effectiveness of the hospital activities.

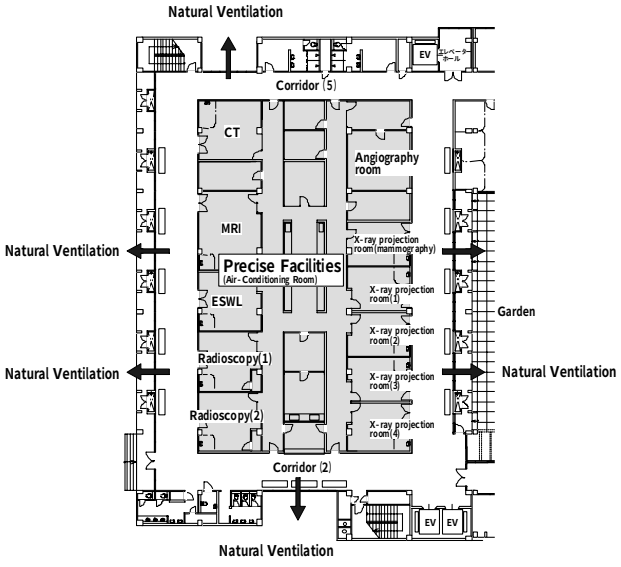


Figure 2-4 Central Examination Unit, 1st Floor

Central Examination Unit, Physiological Examination and Endoscopy Department

Various rooms for the Physiological Examination Department will be grouped by function to realize a floor planning that will facilitate patients to know the locations of these rooms, and to facilitate the hospital staff to work efficiently.

Central Examination Unit, Specimen Examination Department

The Specimen Examination Department has functions of blood examination, biochemical examination, pathological examination, and bacteriological examination. The test rooms of these functions will be designed to be large multi-functional rooms having external walls with windows open to the outside, to achieve high workability and efficiency. Also, other rooms jointly used by these functions will be placed close to the test rooms near the center of the building.

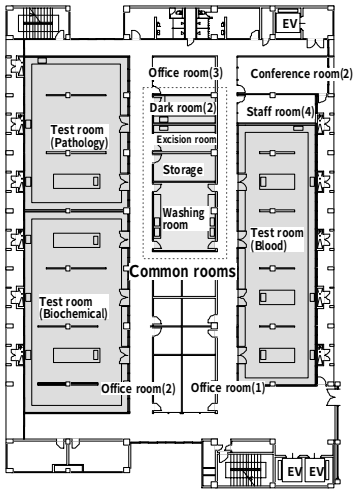


Figure 2-5 Central Examination Unit, 3rd Floor

Central Examination Unit, Operation Department

The system of dual corridors will be applied to the Operation Department to ensure prevention of contamination. By this system the traffic lines of postoperative equipment and matters will be strictly distinguished from those of the medical staff and patients. Since this hospital conducts organ transplants and orthopedic operations, the hospital needs at least one operation room of very high cleanliness. The plan therefore includes an operation room with a pre-clean room. Further, the pre-clean room will be connected to general operation rooms as a provision for transplant operations.

The postoperative recovery rooms are not accommodated on the same floor as the operation rooms. An emergency vertical traffic line will be provided for anaesthetists and other staff between the Operation Department and the recovery rooms.

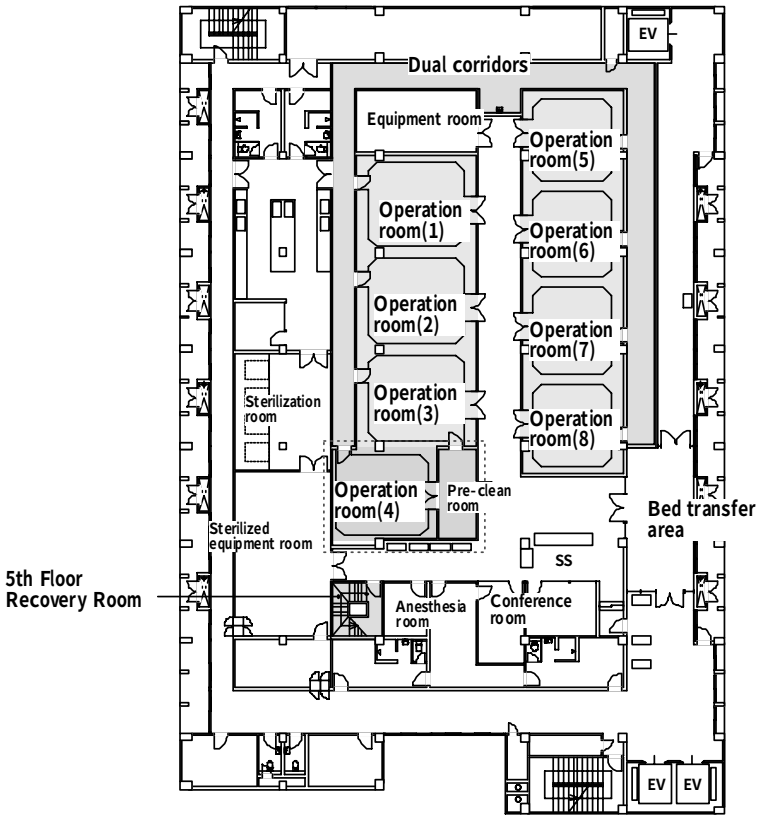


Figure 2-6 Central Examination Unit, 4th Floor

Central Examination Unit, Ward Department

The recovery rooms and ICU are designed to be easily visible from the staff station. The design calls for passing the cloak room to change clothes before entering the recovery rooms from the ordinary corridor. The postoperative patients stay in the recovery rooms for 24 hours on average, and a maximum of 48 hours. The ICU mainly accommodates serious postoperative patients, patients who have stayed in the recovery room and serious patients of the internal medicine. Some private (one-bed) rooms are necessary to be used as clean room for patients after organ transplant, or for patients of infectious diseases. The private (one-bed) rooms will be attached to the ICU.

The ward for serious patients accommodate patients after convalescing in the ICU, or after staying in the recovery room whose conditions are not as serious as deserving the ICU wards but too serious to be sent to the general wards. In this sense the ward for serious patients plays an intermediate role.

(6) Elevation Planning (Shape, finishing material)

Almost all relatively nice-looking buildings have cement motor outer walls finished with paints. This project will also adopt cement outer walls finished with paints for portions that can be reached by hand. Portions that cannot be reached easily by hand will be finished with porcelain tiles to make them as maintenance-free as possible.

Hue is a very hot and humid place, and the direct sunlight is also intense. In Hue, a number of buildings apply vertical or horizontal concrete louvers to the external walls to fend of the direct sunlight. This project will also adopt such louvers to the external walls, which should serve natural lighting and natural ventilation functions, to reduce the conduction heat load from the external wall.

(7) Section Planning

The planned site has been inundated a number of times. The Huong River that has caused the floods flows just on the north of the hospital premises. This cooperation project will set the elevation of the first floor higher than the past flood level record so that the hospital may not be inundated in the future. Specifically, the floor of the first floor, including machine rooms and various other rooms, will be about 1.2 meters above the ground level.

The common areas, such as corridors and patients' waiting rooms are planned mainly for natural ventilation. Therefore, the hospital buildings should be designed to have sufficient openings. An inner court will be provided between the Outpatient Diagnosis and Treatment Building and the Central Examination Unit to promote natural ventilation.

The Outpatient Diagnosis and Treatment Building is a three-storied building. To reduce the operation cost, elevators will not be provided. Instead, wheelchair slopes will be provided as a main vertical traffic line.

The Central Examination Unit is a seven-storied building. Since wards, operation rooms are placed on the upper floors, elevators will be provided. Also, other elevators will be provided exclusively to directly connect the Emergency Department and the Operation Department, ICU for transporting patients who urgently need treatments.

The story height will be 4.2 meters for the Central Examination Portion, where pipes for air conditioning, water supply and wastewater drainage are packed in the false ceilings, and for the Outpatient Diagnosis and Treatment Potion, standing abreast with the former. The ward section will have a little lower story height of about 3.9 meters.

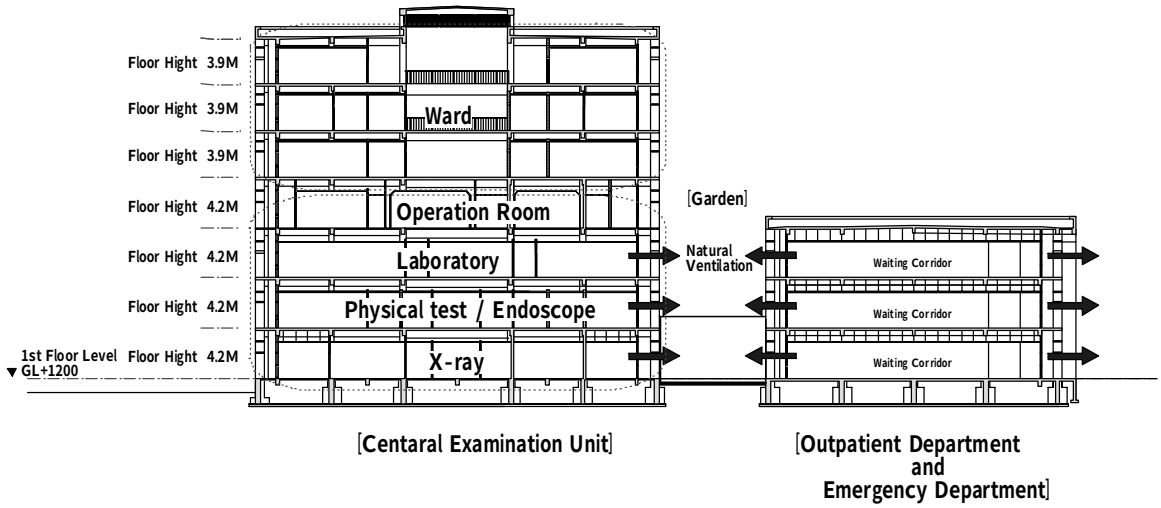


Figure 2-7 Section Diagram

2-2-2-4 Structural Plan

(1) Structural Plan

Major new facilities to be constructed by this project are three buildings: the three-storied Building for Outpatient Department and Emergency Department on the north of the site, the seven-storied Central Examination Unit to the south of the former across the inner court, and the Mechanical Building on the southeast of the site.

The Building for Outpatient Department and Emergency Department and the Central Examination Unit will differ greatly in height; therefore, these two buildings will be different structures, separable by the expansion joint. The breezeway connecting these two buildings, situated to the east and west of the inner court, will be structurally a part of the Building for Outpatient Department and Emergency Department. The expansion joint will be installed at the connecting point with the Central Examination Unit.

1) Building for Outpatient Department and Emergency Department

The Building for Outpatient Department and Emergency Department is a three-storied building measuring 48 meters times 25 meters wide in rectangle. The basic span of the building is 6 meters times 6 meters, and the story height is 4.2 meters for all stories. The building will be of reinforced concrete structure, a structure common in Vietnam. The building is of a earthquake resistant design, of a rigid frame structure, with an earthquake resisting reinforced concrete wall constituting a portion of the stairwell, etc.

2) Central Examination Unit

This is a seven-storied building measuring 48 meters times 33 meters wide in rectangle. The basic span is 6 meters times 6 meters, with a portion of 9-meter span in the center of the building. The story height is 4.2 meters from the first floor to the fourth floor, and 3.9 meters from the fifth floor upward. As is the case with the Building for Outpatient Department and Emergency Department, the building is of reinforced concrete structure, of the rigid frame design, with earthquake resisting reinforced concrete walls in the cores at the four corners of the building.

3) Mechanical Building

This is a one-storied building measuring 12 meters times 33 meters wide in rectangle. The story height is 5.1 meters. The building is of reinforced concrete structure, of rigid frame design.

(2) Foundation Plan

The planned site is close to the Huong River flowing through the City of Hue, and is on a type of ground consisting mainly of clayish formations.

The N-value of the clayish sand layer about 16 meters deep from the ground surface is from 30 to 40, and is therefore qualified as bearing ground of the buildings. The depth of the layer varies within the planned site from 16 meters to 20 meters, and is furthermore slanted downward from south to north. The southern part of the site can secure an average N value of about 30 at about 20 meters from the ground surface. In the northern part of the site, the sand layer contains layers of silt and therefore the N value is not stable. To secure an N value of about 30, it is necessary to go down to about 30 meters deep.

The foundations will be pile foundations, because the bearing ground is deep. It is locally common to drive 400mm to 500mm square RC piles. However, supposing the length of the piles to be 20 meters, three piles must be connected with two joints to secure the necessary length. There will be a problem of reliability of joints with the methods locally adopted. For this reason, the cast-in-place concrete piles will be adopted, a method more reliable and also used locally in many cases.

1) Building for Outpatient Department and Emergency Department and Mechanical Building

The cast-in-place concrete piles will be driven with their tips at about 20 meters from the ground surface.

2) Central Examination Unit

Since the bearing ground is slanted downward to the north, and the bearing ground contains silt layers of weak bearing strength, the cast-in-place concrete piles will be driven, with their tips at about 30 meters from the ground surface.

(3) Basic Policy of the Structural Plan

The following are basic policies of the structural plan for this project.

- The magnitudes of forces and loads acting on the buildings will be determined from such factors as local climatic condition, topography, ground conditions, and uses of the buildings.
- The allowable stresses of the materials used will basically conforms to the various standards of Vietnam. However, quality of each material will be taken into consideration in determining the allowable stresses.

・The stress analysis and cross section analysis of the frame will be done according to the various standards of Vietnam and Japan.

(4) Load and External Force

The allowable loads and forces will be calculated according in principle to the architectural standards of Vietnam.

1) Dead load

The dead load will be determined by summing the calculated results for all materials and members.

2) Live load

The live load will be determined according to the design standards on load, TCVN2737, of Vietnam, and conditions of the buildings. The typical live loads are shown in the table below.

Table 2-13 Typical Live Load

Room	Live load, (N/m^2)
Ward	2,000
Examination room, operation room Various test rooms and offices	3,000
Machine room	5,000
Warehouse	8,000
Roof	1,000

3) Wind load

The previously mentioned design standard, TCVN2737, is used to calculate the wind loads. The reference wind pressure that should be used for calculation is available for each area. Hue City falls under the II. B area, for which the design reference wind pressure is $950N/m^2$.

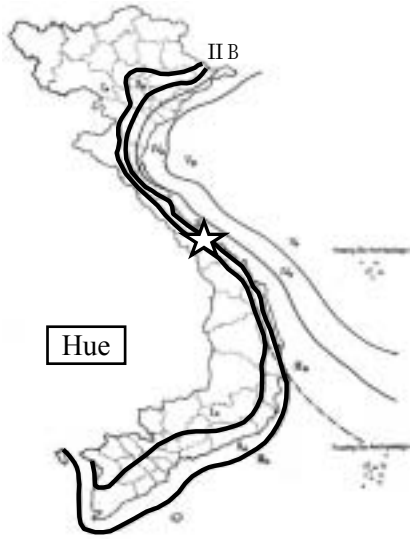


Figure 2-8 Area Classification for Wind Pressure in Vietnam

4) Seismic load

The architectural standard of Vietnam requires buildings to be designed incorporating the seismic load. However, the standard does not indicate practical methods for setting the seismic force.

For the past 300 years, only seven earthquakes are recorded near Hue City. Only four of them exceeded 4 in Richter scale of magnitude, with the strongest at Magnitude 4.8 of the source deeper than 10 kilometers. The latter earthquake may be considered to be about 3 of the seismic intensity scale of the Japan Meteorological Agency.

The design of this project will consider seismic load value of about one-fifth of those used in Japan, in view of the past earthquake record and frequency of occurrence in Hue.

(5) Material

1) Concrete

The plain concrete will be used. A design strength, Fc=24N/mm^2, will be used except for the lower floors of the seven-storied Central Examination Unit where axial force is large, for which another design strength, Fc=27N/mm^2, will be used. The size of the pillars will be the same for the higher and lower floors.

2) Reinforcing bar

The deformed bar will be used. The bar will be the one conforming to the Japanese Industrial Standards (JIS) G3112, which is easily procurable locally. Two types of different strengths, SD295 (yield point strength at 295N/mm^2 or more) and SD345 (yield point strength at 345N/mm^2 or more), will be used.

2-2-2-5 Mechanical and Electrical Plan

(1) Electric Facility

1) Electric power supply system

The electric power will be supplied from the nearest substation of the electric company run by Thua Thien - Hue Province to the hospital's existing electric room, and then to the new electric room in the planned site in a circuit of three cables at 22kV in three phases. This project will require an additional power supply of about 1,500kVA. Transformers, distribution panels, and other facilities will be installed to distribute electric power where it is needed.

The distribution system will follow the standard distribution scheme of Hue City, namely, a circuit of four cables at 380/220V in three phases. The results of field surveys have confirmed that the voltage of commercial utility electric power fluctuates in a range of ± 10%. AVRs (automatic voltage regulator) are used for the existing precision equipment, such as ICU or angiography. Accordingly, a minimum required number of AVRs will be installed for protection of precision medical equipment, etc.

Besides, power failure is expected to occur two or three times a month on an average for a maximum of 30 minutes. Accordingly, a diesel-engine-driven power generator will be installed to keep the minimum required functions of the project in operation. The diesel-engine-driven power generator and the generator room will be equipped with proper facilities for sound and vibration insulation to reduce adverse impacts upon the surrounding environments. A service tank with a capacity to hold fuel to run the generator for about two hours and an underground fuel tank to serve both the generator and the boiler will be installed to enable the power generator to run for an extended period.

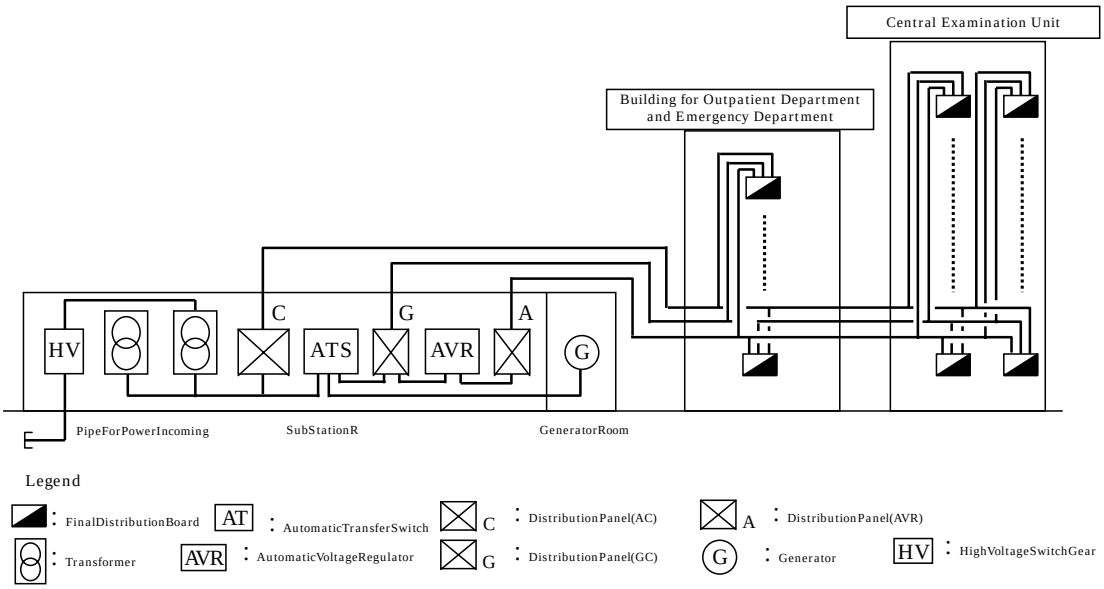


Figure 2-9 Main Power Line System

2) Power outlet for lighting

The design illuminance will be set at 60 to 70 percent of the JIS standards, considering the present local conditions. The light source will mainly be fluorescent lamps because of their high illumination efficiencies. However, the lighting equipment installed in the clean rooms will be selected so that the specifications may fit the particular conditions of each room. Switches will be installed on distributed branches to save the running cost of electric power.

The wall outlet will be basically of the type commonly used in Vietnam, two rod pins with a ground slot - two parallel flat blades, but the location and specifications of a given wall outlet will be finally determined considering the required power source, capacity, connection of the equipment to which the electric power is supplied from the subject wall outlet.

3) Lightning arrester, grounding device

To protect the facilities from lightning, lightning rods and roof conductors will be installed. The medical facilities and equipment, electrical facilities, communication facilities and similar facilities and equipment will be equipped with a grounding device as indicated by their specifications.

4) Telephone system

The telephone cable will be branched from the existing underground main of the Thua Thien - Hue Province's telephone company on the east of the site to the main distribution

frame (MDF) of the planned site of the project. The capacity of the cable will be about 30 lines, considering future plans.

The capacity required of the project is about 30 outside lines and about 300 inside lines. Accordingly, a new private automatic branch exchange (PABX) will be installed. The study team sought the possibility of modifying the existing PABX and connecting it with the new PABX to enable all the telephones of the hospital to communicate with each. It was found, however, that the existing PABX is too obsolete to accommodate such a modification. Therefore, the new PABX will have a capacity and a space including the existing one.

The installation of the telephone cable from the main to the new MDF of the planned site, addition of the circuit board, etc. for the capacity of the existing PABX in the new PABX, and installation of a cable from the new PABX to the existing buildings will all be obligation of the Vietnamese side.

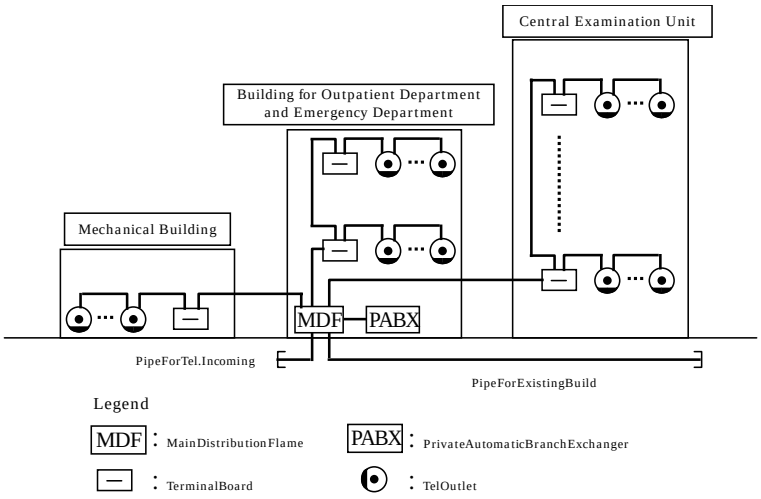


Figure 2-10 Telephone System Scheme

5) Public address system

A main part of the public address system will be installed to enable central control for paging of doctors and staff members over the entire hospital facility, and for emergency announcing for evacuation and escape guiding in case of fire.

In addition, the waiting rooms for the Outpatient Division and the X-ray Department will be equipped with paging system separate from the public address system for paging of patients.

6) Interphone facility

The simplest interphone facility with one line to one ward will be installed between the nurse station and the wards for communication between the nurse station and the wards.

The operation rooms will also be equipped with a two-way interphone system to permit simultaneous two-way conversation with persons outside the operation rooms.

Also, the electric room, generator room, machine rooms, etc. will be equipped with an interphone for communication with the maintenance staff.

7) Automatic fire alarm system

Automatic fire alarm systems will be installed in principle according to the Vietnamese laws, regulations and standards concerning firefighting and fire prevention to enable early detection of fire and to prevent fire damages from spreading.

In case pertinent standards do not exist in Vietnam, the Japanese firefighting standards will be referred to. Push-button fire alarms and escape gate indicators will be installed.

8) Television common antenna system

TV outlets will be provided in the waiting halls and private (one-bed) rooms of the ward. A television common antenna system will be installed for the planned facilities. The antenna will be for VHF receiving. As part of social education activities targeted for the patents and their families, the television common antenna system will incorporate a function to play the ready-made tapes, etc.

9) Cable piping for computer network

Cable pipes and boxes will be installed as necessary to appropriate locations from the shaft of each floor to connect the new LAN system with the existing one. Installation of the instruments for computer network system, cables and circuit jacks will be the obligation of the Vietnamese side.

(2) Machines

1) Water supply system

From the field survey and the talks with the Waterworks Bureau of Hue City, it was confirmed that water supply of the running water system is relatively stable. Therefore, a substitute water supply source for water failure will not be planned. This cooperation project will need an estimated amount of about 200 m^3/day of water supply. HCH

presently consumes about 1,100 to 1,500 tons of water a day, and the storage capacity is only 200m^3. Obviously, the present facility cannot supply enough water to this cooperation project, and a new receiving system is necessary.

The plan calls for installation of a 75mmφ receiving pipe from the 500mmφ main installed under the Hai Ba Trung Road. The reservoir tank assumes water failure of one whole day, and will have a capacity of 200m^3, or a day's consumption. The reservoir tank will be an aboveground concrete tank to prevent contamination. A cistern will be placed on the room of newly built buildings to distribute water principally by gravity. To portions where the pressure is not enough by this system, pressure is supplemented by pumping.

The water supply system within the site is the Japanese side work; however, installation of the receiving line to the site border is the obligation of the Vietnamese side.

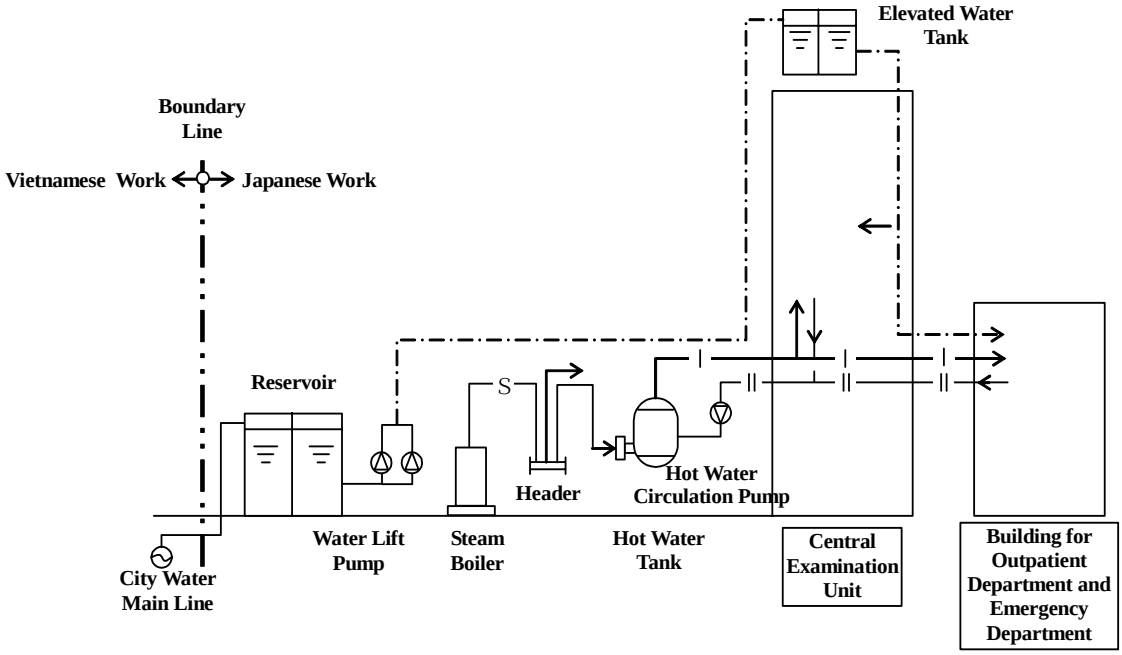


Figure 2-11 Water and Hot Water Supply System

2) Wastewater system

HCH treats the entire general wastewater (foul wastewaters and miscellaneous wastewaters) in a sewage treatment tank and discharges the treated water to a river. The present wastewater treating facility cannot treat an estimated amount of wastewater from this cooperation project, or 160 m^3/day; therefore, the project needs a new sewage treatment tank.

The general wastewater to be discharged from this project will be treated in a sewage treatment tank, as is the case with the present general wastewater, and will be discharged to the nearby Huong Giang River, with the present wastewater.

The special wastewaters from the examination or infectious disease sections will be separately neutralized and disinfected, followed by treatment in the sewage treatment tank with the general wastewater. Stormwater will be drained directly to the nearest existing closed culvert.

Installation of the sewage treatment tank within the project is the Japanese side's work; however, wastewater facilities outside the site boundary are obligation of the Vietnamese side.

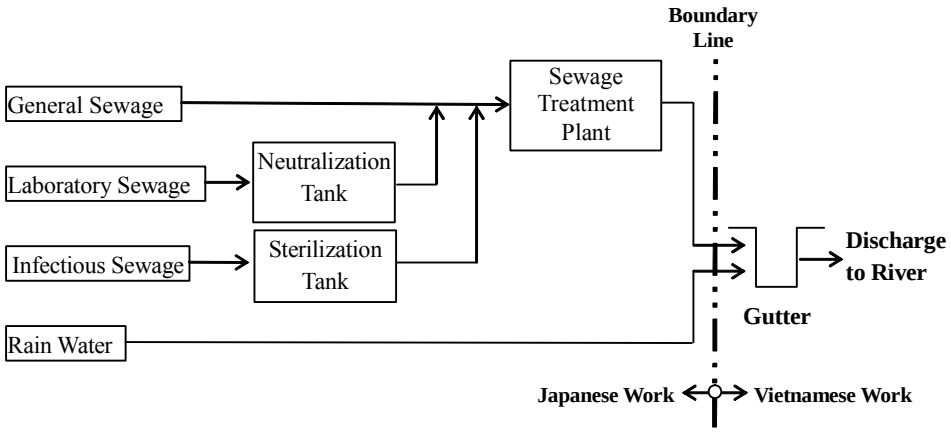


Figure 2-12 Flow of the Wastewater System

3) How water supply system

Hot water will be supplied in principle by a central supply system to such facilities as showers, wash stands, wash rooms where hot water is needed. Steam from the boiler will be used as heat source of the hot water. In addition, electric water heaters will be separately provided as necessary.

4) Sanitary fixture

Water closet bowls of the toilets used by patients and the hospital staff will be of the Western style, attached with a water spray for washing and a roll paper holder. The toilets to be used by a number of unspecified people will be of the Asian style, attached with a water faucet for cleaning. The flushing unit for the water closet bowl will be of the flush valve type, that is more durable. For the toilet for the private (one-bed) room, the quieter low tank system will be considered. The urinals will be of wall hung type, though urinals for small boys will be of floorstanding type attached with a flush valve.

The wash stands and sinks in clean zones will be provided with elbow faucets as a measure to prevent nosocomial infection. The hand washer disinfectors to be provided in the pre-clean rooms to the operation rooms will be considered within the scope of the medical equipment plan. The showers will be in principle of wall-mounted type, instead of hand-held type, in view of durability.

5) Firefighting facility

As a result of a meeting with the Fire Bureau of Hue City, it has been agreed that the firefighting facilities will in principle conform to the standards of Vietnam, but the Japanese standard will be applied to supplement the standards of Vietnam as necessary. The firefighting facilities to be installed are outdoor hydrants, indoor hydrants, continuous water supplying pipes, and fire extinguishers. Two fire pumps will be provided for outdoor and indoor hydrants, and 50m^3 of water is maintained for the fire pumps. The fire extinguishers will be dry chemical extinguishers.

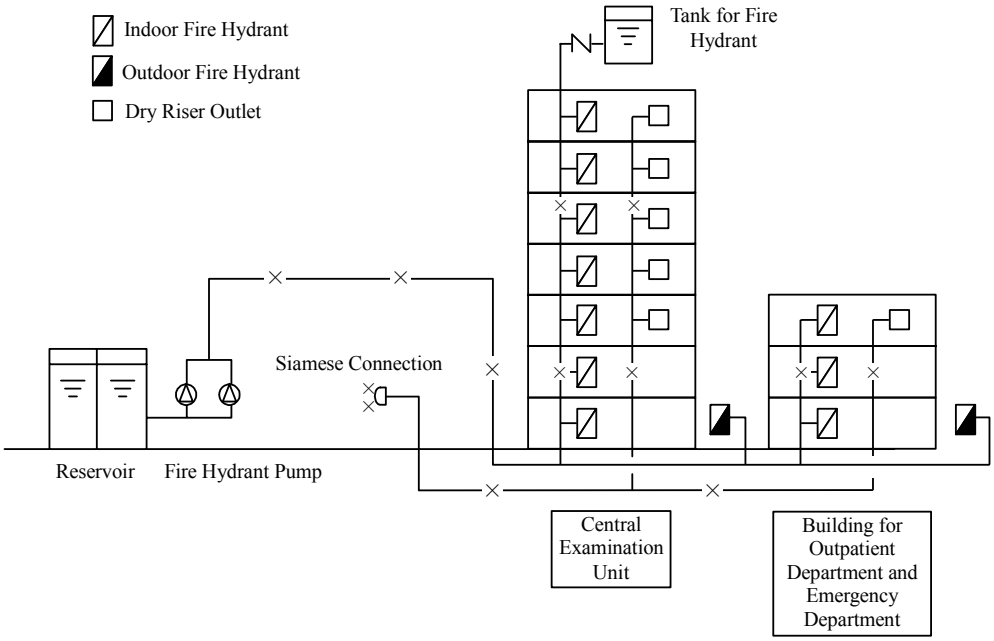


Figure 2-13 Firefighting System

6) Medical gas facility

HCH is beginning to have organized central systems of oxygen supply, vacuum suction, and compressed air. These systems will be limited only to the existing facilities and would not cover this project. Accordingly, new medical gas system facilities will be installed for this project.

The medical gas system normally consists of oxygen gas supply, vacuum suction, compressed air, and nitrous oxide supply pipes. Of these, the nitrous oxide gas supply is difficult to realize with the central system because of the cost. Therefore, nitrous gas will be supplied individually from the cylinder.

The basic policy for the medical gas facilities is to install a central system from the standpoints of safety, operability, and maintenance. Oxygen will be supplied to the new central system from cylinders. The Vietnamese side may change in the future the oxygen source to either a liquid oxygen tank or an oxygen generator. Therefore, the new central medical gas system will be designed to accommodate such a change. The gas outlets will conform to the British Standards (BS). The number of oxygen humidifiers and vacuum suction units will be about 50 percent of the numbers of these outlets.

The table below shows the rooms requiring medical gases.

Table 2-14 Rooms Requiring Medical Gas System

Room	Oxygen	Vacuum suction	Compressed air	Note
Operation room	○	○	○	Installed on the ceiling and wall
Recovery room	○	○	○	
ICU	○	○	○	
Emergency room	○	○	○	
Examination room	○	○		Limited to rooms that require the system
Treatment room	○	○		Limited to rooms that require the system
Private (one-bed) room	○	○		
General ward	○	○		Partially needed

7) Sewer treatment facility

The sewer treatment tank will adopt biological treating system for easiness of maintenance and lower operating cost. The contemplated capacity of the sewer treatment tank is 160m^3 a day. As agreed with the Environment Department of the Hue City Government, the standards for the treated wastewater to be discharged to the river will be 50ppm, 30ppm and 50ppm for COD (chemical oxygen demand), BOD (biochemical oxygen demand) and suspended solids (SS), respectively.

8) Air conditioning facility

This project will depend mainly upon the natural ventilation system. However, air conditioning will be provided to rooms where air conditioning is indispensable to enabling the room to be properly functional. The air conditioning system commonly adopted for cooling in Hue, individual air-cooled air conditioning for cooling, will mainly be adopted. However, the temperature can go down close to 13°C in winter (from November to February); therefore, the operation rooms, recovery rooms and ICUs need heating. These rooms will adopt air conditioning by air-cooled heat pump that can heat the rooms as well as cool them. The air conditioners can be of wall type, ceiling suspended type, ceiling cassette type、or floor standing type, depending upon the purpose of the room.

The operation rooms, requiring the utmost cleanliness as they are, will adopt air conditioning systems equipped with high-performance filters, and will also maintain a positive pressure to avoid cross contamination from the surroundings. The recovery rooms, ICUs, and the pre-clean rooms to the operation rooms also require high degree of cleanliness; therefore, these rooms will adopt air conditioners of ceiling cassette type equipped with a medium-performance filter, and will keep the rooms under positive pressures. Those rooms which can use general specification air conditioners will use air conditioners of wall type or ceiling suspended type, equipped with an ordinary filter. The filters used for air conditioners will be of long life type with wide filtration areas to reduce the frequencies of cleaning works.

Rooms without air conditioning will be equipped with ceiling fans or wall fans, and have natural ventilation with opening of windows. Mechanical ventilation will be provided to rooms without windows or to rooms where heat, vapors or odors are generated.

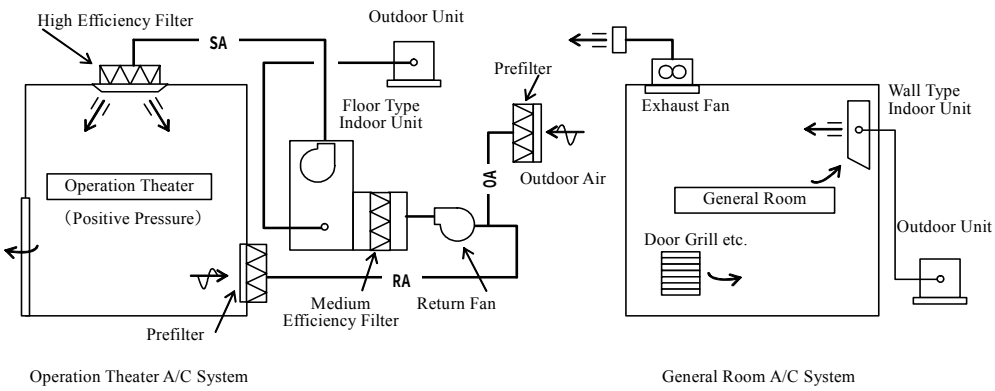


Figure 2-14 Conceptual Drawing of Air Conditioning

Air conditioning will be provided in the rooms shown in the table below.

Table 2-15 Rooms to be Provided with Air Conditioning

Room	Air conditioner[1)]	Room pressure[2)]	Air filter[3)]	Note[4)]
Operation room	F	P	H	Heating and cooling *
Recovery room	C	P	M	Heating and cooling *
ICU	C	P	M	Heating and cooling *
Pre-clean room to the operation room	C	P	M	Cooling *
Central sterile supply department (CSSD, clean zone)	C	P	M	Cooling
Emergency room	W	E	L	Cooling *
Radiography related rooms	W	E	L	Cooling
Specified examination room	W	E	L	Cooling
Specified treatment room	W	E	L	Cooling
X-ray room	W	E	L	Cooling *
Test room (general)	W	E	L	Cooling *
Test room (bacteriological examination)	W	N	L, H (exhaust)	Cooling *
Private (one-bed) room	W	E	L	Cooling
Conference room	W	E	L	Cooling
Equipment storage room	W	E	L	Cooling

Note: 1) F: floor standing type with duct, C: ceiling cassette type, W: wall type
2) P: positive pressure, N: negative pressure, E: ambient pressure
3) H: high-performance, M: medium-performance, L: general-performance
4) *: Operable during power failure by the power of emergency generator

9) Heat generating facility

An oil-fired steam boiler will be installed to provide heat to autoclaves and the hot water supply system. The boiler will be of once through type, a type easier to operate and maintain. The boiler fuel will be diesel fuel so that the fuel may be shared with the emergency generator. An underground tank, with a capacity of about one week for both the boiler and the emergency generator, will be installed near the Mechanical Building.

2-2-2-6 Construction Material Plan

In selecting construction materials, the materials and construction methods established in Vietnam will mainly be selected for the sake of facilitating maintenance after commissioning of the project.

The following are important considerations for the selection of construction materials.

(1) Exterior Finishing Material

1) Roof

The roofs of the buildings will be flat roofs, considering harmony in design with the surrounding buildings and water proofing. The flat roofs will have a gradient of about 1/75 to facilitate drainage. The roofing material will be asphalt, commonly used locally, for its reliability in water proofing performance and facilitating future maintenance works. The roofs will adopt external heat insulation.

2) External wall

Locally, the ordinary exposed concrete finish, concrete blocks and bricks finished with cement mortar are common. The portions of the brick walls exposed to rain will be double layered to improve water resistance. For such rooms of high story heights as the elevator machine room, the high portions where maintenance work is difficult will be finished with virtually maintenance-free porcelain tiles.

(2) Interior Finishing Material

1) Floor

In the hospitals in which traffics of hospital staff and patients are particularly busy, the floor must be very durable. This project will use tiles for floors which are durable and commonly used locally.

2) Wall

Such portions of the walls of toilets, rooms where wastes are handled, shower rooms and similar rooms that are close to sinks, washstands, stools, urinals or faucets that can be contaminated, or are apt to be stained, will be finished entirely with tiles, that are easy to clean by wiping the entire portion. Regarding other walls, portions that can be reached by hand will be finished by tiles to facilitate cleaning; the upper portions will be cement mortared finished with paints.

The radiography rooms will be made of reinforced concrete capable of shielding radiation. The electroencephalography test is susceptible to the effects of electrostatic induction or electromagnetic induction. The room conducting electroencephalography will have electromagnetic wave shields. The walls, inside walls and corners of pillars of the corridors that could be hit by stretches or similar objects will have stretcher guards, that can also serve as hand rails, or corner guards.

3) Ceiling

The ceilings of air-conditioned rooms need to be reasonably airtight. The light gauge steel structures generally used locally (T bar), with rock wool sound insulation board, or ordinary ceiling board, applied on them, will be used. The rooms without air conditioning rely on natural ventilation; therefore, these rooms will not have ceiling to have greater air spaces. Instead, the concrete slabs will be finished with paints for these rooms.

Ceilings of such rooms as toilets where water is used will be made of light steel (T-bar) frames and calcium silicate boards, finished with paints, methods commonly used locally. This is because, although these rooms will be naturally ventilated, they have a number of water pipes overhead.

4) Fixture and likes

External fixtures will be aluminum sashes to ensure durability. However, the entrances where personal traffic is busy, and operation rooms and similar rooms requiring easy cleanability and durability, will have stainless steel doors. Regarding internal fixtures, doors that may be frequently hit by stretchers, ward doors for example, will be steel or light steel doors, and other doors will be wooden. Rooms that need radioactivity shielding will have steel doors with lead lining. Rooms that need electromagnetic wave shielding will have steel doors with copper wire lining.

The table below summarizes exterior finishing materials and application methods.

Table 2-16 Summary of Exterior Finishing Materials and Application Methods

Building element	Local method (including the existing buildings)	Adopted method	Reason for adopting the method
Roof	Slanted roof Flat roof (asphalt)	Flat roof (asphalt, exterior heat insulation)	This method is excellent in water proofing and heat insulating properties.
External wall	Cement mortar finished with paints	Cement mortar finished with paints Porcelain tiles	This method is common in the subject area, and the local people are accustomed to the maintenance of this type of wall. The portions out of the reach of workers' hand use materials that do not require maintenance often.
Floor	Tiles	Homogeneous porcelain tiles	The homogeneous porcelain tiles are common materials in the subject area. These materials are easy to clean and durable.
Interior wall	Tiles Paints	Tiles Paints Panel	These are common materials in the subject area, and relatively easy to maintain. Panels will be used only for rooms that require high levels of cleanliness.
Ceiling	Paints, Rock wool sound insulation board	Paints Rock wool sound insulation board	These materials are common in the subject area, and are relatively easy to maintain. Boards are used to improve air conditioning efficiency, to conceal piping, etc. and to prevent dust from accumulating in particular spots.
Fixture	Aluminum made Steel made Wooden	Aluminum made Steel made Wooden Stainless steel made	These are commonly used in the subject area. Portions of the buildings where human traffic is busy, or that require high levels of cleanliness, will use stainless steel fixtures.

(3) Associated Facility for Construction

Usable lives of many of the associated facilities for construction, such as air conditioners and ducts, are from 10 to 15 years, markedly shorter than those of construction materials. Therefore, selection of such facilities must be made so as to facilitate maintenance, including renewals, by the Vietnamese side after these facilities have been handed over to the Vietnamese side. In this context, these facilities will be procured locally, or from third countries near Vietnam, to the extent possible, while ensuring acceptable levels of quality.

2-2-2-7 Equipment Plan

The equipment plan basically intends to renew decrepit equipment and supplement those pieces of equipment that are insufficient in quantity. Due consideration will be given to the executing organization (personnel allocation, budget, technology level, etc.) of the beneficiary part, in order not to place too heavy a burden on the executing organization. The equipment specifications will be basically of the same grade of the existing one. However, in case the technological level has advanced and the advanced technology is considered as norm, the specifications will be changed.

(1) Standard for Equipment Selection

The basic policies for selection of the equipment are as follows.

1) Basic policy for equipment selection
   a) Decrepit equipment that urgently needs renewal
   b) Equipment that is insufficient in number
   c) Equipment that is needed for diagnosis and treatment
   d) Equipment that is used frequently
2) Priority agreed in the Minutes of Discussion (M/D)

   Priority A: equipment that is considered essential

   Priority B: equipment that should be studied further

   Priority C: equipment that is preferably provided

(2) Policy for selection by division and department
   1) Outpatient Division
      - The Emergency Department will have a treatment table, an astral lamp (mobile), an electrocardiograph, etc. as indispensable equipment for emergency treatment for each small operation room.
      - The decrepit casting table of the Surgery Department will be renewed.
      - The Dentistry Department will have its Dental X-ray equipment, X-ray film processor, too decrepit to repair, and equipment for dental technician renewed. The dental units are now too many for the number of patients. The appropriate number of the dental units calculated from the number of patients will only be replaced.
      - The Ophthalmology Department will have its essential refract meter unit and slit lamp, both essentially needed for diagnosis and treatment, renewed.
      - The ENT Department will have an ENT treatment unit and treatment chair installed, both essential to diagnosis and treatment. The audiometer will also be renewed.

2) Function Examination Room

- Regarding ultrasound diagnostic unit, of the existing equipment, two general purpose ultrasound diagnostic units now not usable will be renewed, excepting the color dopplers that can be used.
- The endoscopy for upper digestive organs and that for the colon will be renewed. In addition, a much demanded endoscope for the broncho-fiber scope will be provided.
- The electrocardiograph and electroencephalograph, both being very decrepit, will be renewed.

3) Operation Department

- The eight operation rooms will have the required number of required quantity of equipment.
- The equipment specifications will be comparable to the existing ones.
- An X-rays equipment (C-arm type) will be introduced, in view of the technology level, substances of surgeries and patients' demands.
- Together with the general-purpose operating table, an orthopedic operating table will be provided.
- The cryosurgery unit will be excluded from the plan, because it will not renew the existing unit.
- The items of surgery equipment will be included in the plan, because they intend to renew the existing ones.
- The Scrub unit will be provided to the eight operation rooms in number that allows four persons to use simultaneously.

4) Central Supply Room

- The high pressure steam sterilizer is included in the plan as an indispensable equipment.
- The ultrasonic cleaner, tube cleaner and jet cleaner will not be included in the plan.
- The Autoclave is removed from the plan, because its necessity is not confirmed.

5) ICU

- There are duplications between some of the functions of ICU with those of the recovery rooms. These functions will be centralized.
- The number of required equipment will be calculated assuming 30 beds.
- A central monitoring system will be installed to enable monitoring of the private (one-bed) rooms.

- The cardiac pacemakers are removed from the plan, because they do not replace the existing ones.
- The ICU beds will be provided to meet the assumed number of beds, or 30.

6) Recovery room
   - The functions now in duplication with those of ICU will be concentrated in ICU. Therefore, the equipment for the recovery rooms will mainly be those required for observation of patients after surgery.
   - The number of pieces of equipment to be provided will be determined, assuming 30 beds.
   - The beds for the recovery rooms are assumed to be general purpose ones, and the Vietnamese side should procure them.
   - Other items that should be renewed should be provided in the minimum required number.
   - Equipment plan should be formulated assuming that patients that need intensive care should be transferred to ICU.

7) Diagnostic Imaging Division
   - The CT multi-slice tomography unit and the angiography unit will be removed from the plan, because their maintenance costs are very high.
   - The general X-ray apparatus and fluoroscopy apparatus will be provided in the required number to improve the condition in which the hospital is now unable to cope with an increasing number of patients.
   - The existing X-ray film processor is decrepit and will be renewed.

8) Clinical Examination Department
   - The plan should be limited to renewal of the existing equipment.
   - The functions distributed among different examination departments should be integrated and centralized.
   - The equipment plan will be formulated with renewal of the present decrepit but essential automatic biochemical analyzer apparatus as the core of the plan.
   - Regarding equipment for blood examination, it is difficult to share the same equipment between the Heamatology Department and Blood Center. Accordingly, equipment needs to be renewed will be renewed.
   - Regarding the equipment for bacteriological examination, the plan will be formulated limited only to provision of equipment that needs renewal.

- Regarding the equipment for pathological examination, the plan will be formulated limited only to provision of equipment that needs renewal.

9) Pediatrics Department
   - The equipment plan should be adequate to the present manning and operation rates.
   - Renewal of the decrepit incubators, light therapy units and respirators for the newborns will be planned.
   - Pieces of equipment placed in the neonatal intensive care unit (NICU) and the Pediatrics Department will be sorted out to work out a layout plan that should realize effective utilization of all items.

10) Obstetrics and Gynecology Department
   - The operation rooms are relatively well equipped; therefore, the operation rooms are excluded from the study.
   - Deterioration of the existing equipment in the newborn nurseries is noticeable; therefore, the incubators and light therapy units will be renewed.
   - For delivery rooms, the fetal doppler, CTG monitor, laryngoscopes for the newborn will be renewed.
   - The colposcope in the examination room may be regarded to be continuously usable and is therefore removed from the plan.
   - The ultrasound apparatus may be regarded to be continuously usable and is therefore removed from the plan.
   - The portable ultrasound apparatus is used for technology transfer to surrounding medical facilities. The maintenance cost is not high. For these reasons, a new unit will be provided.

11) Dispensary Department
   - The decrepit water distilling apparatus will be renewed.
   - The high pressure steam sterilizer may be regarded to be continuously usable and is therefore removed from the plan.

(3) Planned Equipment List

The table below shows the planned equipment list for this project.

Table 2-17 Planned Equipment List

No.	Name of Equipment	Q'ty	No.	Name of Equipment	Q'ty
1	ENT Treatment Chair	3	54	Slit Lamp Microscope	1
2	ENT Treatment Unit	3	55	Fetal Doppler	2
3	ICU Bed	30	56	Central Monitor	1
4	C-arm X-ray Unit	1	57	Color Ultrasound	3
5	General X-ray Sysem	4	58	Portable Echo Machine	2
6	Mobile X-ray Unit	1	59	Ultrasonic Nebulizer	2
7	Fluoroscopic X-ray TV System	1	60	Audiometer	1
8	Automatic Film Processor for Dental	1	61	Surgical Scrub Station	4
9	Automatic Film Processor	2	62	Electro Surgical Unit	8
10	Ambu bag	2	63	Electronic Balance	1
11	Drying Oven	10	64	Dental Chair Unit	8
12	Infant Warmer	2	65	Precision Balance	1
13	Table Top Centrifuge	3	66	Broncho Fiberscope	1
14	Centrifugal Casting Machine	1	67	Colono Fiberscope	1
15	Rotary Microtome	1	68	Gastrointenstinal Fiberscope	1
16	Patient Monitor	30	69	EEG	1
17	Fundus Camera	1	70	Pulse Oximeter	3
18	Orthopedic Instrument Set	2	71	Universal Operating Table	8
19	Delivery Instrument Set	1	72	Programmable Plastic Furnace	1
20	General Surgery Instrument Set	2	73	CTG Monitor	3
21	Thoracic Surgery Instrument Set	2	74	Delivery Table	5
22	Minor Surgical Instrument Set	2	75	Perimeter	1
23	Pediatric Surgery Instrument Set	2	76	Infant Incubator	11
24	Small Operating Instrument Set	7	77	Anesthesia Apparatus with Ventilator	7
25	Digestive Instrument Set	2	78	Operating Light	8
26	Neurosurgery Instrument Set	2	79	Operating Light, mobile	1
27	Urology Instrument Set	2	80	Autoclave	1
28	Micro Surgery Instrument Set	2	81	Table Top Steam Sterilizer	2
29	Plaster Bandage Table	1	82	Vertical Sterilizer	2
30	Suction Unit	0	83	Model Trimmer	1
31	Portable Suction Unit	1	84	Hydraulic Flask Press	1
32	Vacuum Extractor	2	85	Infusion Pump	19
33	Ambulance Car	2	86	Laboratory Micromoter	1
34	Blood Gas Analyzer	1	87	Refrigerated Centrifuge	1
35	Operating Microscope	1	88	Refracting Unit	1
36	High Pressure Steam Sterilizer	4	89	Automatic Power Source Stabilizer 2kV	1
37	Water Bath	1	90	Automatic Power Source Stabilizer 1kV	3
38	Phototherapy Unit	5	91	Automatic Power Source Stabilizer 0.5kV	28
39	Laryngoscope for Infant	2	92	Jaundice Gauge	1
40	Laboratory Lathe	1	93	Chair, Table	0
41	X-ray Unit for Dental	1	94	Chair for Patient	110
42	Automatic Biochemical Analyzer	1	95	File Shelf	0
43	Automatic Tissue Processor	1	96	Material Shelf	23
44	Orthopedic Operating Table	1	97	Apparatus Cabinet	29
45	Water Distillation Apparatus	3	98	Bed for Patient	88
46	Defibrillator	5	99	Bedside Cabinet	50
47	Treatment Table	1	100	Examination Table	32
48	Syringe Pump	13	101	Stretcher	14
49	Ventilator	15	102	Wheelchair	8
50	Infant Ventilator for child	1	103	Bedpan Washer	4
51	Infant Ventilator for new born	1	104	X-ray Examination Apparatus	24
52	ECG 6 Channels	5	105	Recovery Bed	30
53	Sprirometer	1	106	Anesthesia Apparatus with Ventilator for child	1

Table 2-18 List of Main Equipment

No.	Name of Equipment	Q'ty	Main Specification	Purpose of Use
2	ENT Treatment Unit	3	Spray: 4 Suction Hanger type with Compressor	Basic equipment for the treatment in the otolaryngolory
4	C-arm X-ray Unit	1	X-ray generation system: Inverter type Image intensifier: More than 7 inch TV monitor: More than 16 inch	X-ray fluceroscope equipped with C-head which has a lot of flexibility in setting. It is used in surgery and makes the identification of site in real time possible.
5	General X-ray System	4	Output: More than 32kW Tube voltage: 40 ~ 150kV Bucky Table, Stand	Equipment with which an X ray can be taken in standing position and lying position. Versatile diagnostic unit which is used in head, chest, abdomen and plastic surgery.
6	Mobile X-ray Unit	1	X-ray generation system: Inverter Tube voltage: 50kV ~ 120kV Mobile type, Cordless	X-ray equipment which can be moved. For a patient who has difficulty in moving to a radiation room.
7	Fluoroscopic X-ray TV System	1	X-ray generation equipment: 32kW Inverter type Remote control type, Serial radiography function	X-ray equipment which makes real-time diagnosis possible by using X-ray camera. Mainly it is used in the diagnosis of digestive system.
9	Automatic Film Processor	2	Use: General X-ray film Film size: 4x5 ~ 14x17 inch Number of developing: 220 / hour (10x2 inch)	Equipment which develops, fixes and dries X-ray film. It develops general X-ray equipment film.
17	Fundus Camera	1	Operating distance: More than 39mm Light source for examination: Halogen For radiograph: Xenon	Equipment with which the eyeground is examined and radiographed, and blood pressure optic nerve and retina in the eyeground are checked and diagnosed.
18	Orthopedic Instrument Set	2	A set of instrument for orthopedic surgery	A set of instrument which is used in orthopedic surgery
21	Thoracic Surgery Instrument Set	2	A set of instrument for thoracic surgery	A set of instrument which is used in thoracic surgery
25	Digestive Instrument Set	2	A set of instrument for digestive surgery	A set of instrument which is used in digestive surgery
26	Neurosurgery Instrument Set	2	A set of instrument for cerebral surgery	A set of instrument which is used in cerebral surgery
27	Urology Instrument Set	2	A set of instrument for urinary organs	A set of instrument which is used for examination and treatment of urinary organs
33	Ambulance Car	2	Displacement volume: More than 2000cc With stretcher, siren-bullhorn and revolving light	Vehicle for transfer of an emergency patient
34	Blood Gas Analyzer	1	Measurement item: PO2, PCO2 and pH Calibration: Automatic calibration in one point and two points Suction of sample: Response to syringe / capillary	Equipment with which oxygen and carbon dioxide in the blood are measured. It helps respiratory management and homeostasis ascertainment of the patient.
35	Operating Microscope	1	For brain surgery Floor type	Equipment with which the target site can be magnified and examined in the microdissection.
36	High Pressure Steam Sterilizer	4	Sterilization type: High-pressure steam Capacity of chamber: More than 550L Sterilization Temperature: 121℃, 132℃	Equipment with which instruments, forceps and drape are sterilized by using high-pressure saturated steam. Because of many treatments, it is suitable for setting in the central material room.
42	Automatic Biochemical Analyzer	1	Capacity: 180 tests / hour Automatic sample table: More than 25 Reagent opening, Automatic supply system of reagent	Equipment with which all processes from the injection of reagent to measurement can be automatically conducted in many items in the blood and the urine such as oxygen in the blood, cholesterol, uric acid and blood sugar.
43	Automatic Tissue Processor	1	Paraffin tank: 2 Drug solution 1.2L With timer	Equipment for displacement with which water in the cell is dipped in paraffin in preparation for coloring operation in the pathology.

No.	Name of Equipment	Q'ty	Main Specification	Purpose of Use
44	Orthopedic Operating Table	1	Operation: Electric hydraulic type	Surgical bed for orthopedic surgery and treatment.
46	Defibrillator	5	Set-up energy: 2 ~ 360J Range of measurement of heart rate: 15 ~ 300bpm	Equipment whose aim is to remove ventricular fibrillation by electric shock. Electrocardiography can also be measured.
49	Ventilator	15	Mode: CMV/CPAP Amount of ventilation / time: 200 ~ 1000ml With humidifier	Equipment which is used to sustain life of patients who have problems in spontaneous respiration.
50	Infant Ventilator for child	1	Mode: CPAP/IMV Number of respiration: 0 ~ 180 Inspiration time: 0.1～2.0 minute	Equipment which is used to sustain life of infants who have problems in spontaneous respiration.
51	Infant Ventilator for new born	1	Mode: CPAP/IMV Number of respiration: 0 ~ 180 Inspiration time: 0.1～2.0 minute	Equipment which is used to sustain life of newborn babies who have problems in spontaneous respiration.
56	Central Monitor	1	Number of monitor: 8 patients Display: More than 15 inch	Equipment with which the information from the monitors of patients is controlled collectively and efficiently.
57	Color Ultrasound	3	Operation method: Linear, convex and sector Site of examination: Abdomen, heart and superficies Monitor: 15 inch Mode: B, M, B/M	Equipment with which the tissue image of the interior of the body is reconstructed by using ultrasonic wave. The direction and velocity of blood can be measured by using Doppler effect of sound wave, so it contributes to the diagnosis of circulatory system.
58	Portable Echo Machine	2	Mode: B, MB/M Probe: Linear, convex Black and white, 9 inch monitor	Equipment with which the tissue image of the interior of the body is reconstructed by using ultrasonic wave. The form of organ and disease and the characteristic of tissue can be checked.
60	Audiometer	1	Number of channel: 2ch Measurement item: Pure-tone audiometry, SISI, ABLB	It is used in the audiometry. The audibility of a patient is diagnosed in the wide-ranging measurement items.
61	Surgical Scrub Station	4	Sterilization method: Filter and ultraviolet ray Number of faucet: 2	Equipment for operating room by which sterilized water for washing hands is provided. It helps medical staff to keep the cleanliness.
64	Dental Chair Unit	8	With air handpiece, micro handpiece, 3-way syringe, suction, light and washstand	Dental chair which is equipped with basic instruments required for the diagnosis and treatment and power.
66	Broncho Fiberscope	1	Soft mirror With light source	It is used in the diagnosis of disease of lungs and bronchus. It is used in the examination and biopsy inside of bronchus.
67	Colono Fiberscope	1	Soft mirror With light source	It is inserted into the colon of a patient and it helps the diagnosis of the condition of the colon and the treatment.
68	Gastrointenstinal Fiberscope	1	Soft mirror With light source	It is inserted into the upper gastrointestinal tract of a patient and it helps the diagnosis of the condition of affected part and treated.
69	EEG	1	Number of input terminal: 25 (brain wave) Sensibility: 1 ~ 200mV/min Number of channel: 64ch +1 mark	Equipment with which the medical history of central nervous system caused by not only epilepsia, but also brain tumor, cerebrovascular disorder and head injury can be understood.
71	Universal Operating Table	8	Range of lifting: 700～1000mm Vertical turning angle: 15 ° Manual operation	Bed on which a patient is fixed in the most suitable position and angle for operation.
77	Anesthesia Apparatus with Ventilator	7	Gas: N2O, O2, air Capacity of respiratory apparatus: 100 ~ 1200ml	Equipment which is used when general anesthesia is given by using suction anesthetic. With respiratory apparatus.
88	Refracting Unit	1	With ophthalmic stand, chair, sliding table and sight tester	Counter which ophthalmic instruments are put on and provides the best position for a patient.

2-2-3 Basic Design Drawing

Table 2-19 List of Drawings

	Unit Name	Drawing Name	Scale	No.
1	Facility Layout	Site Plan	1/400	73
2	Building for Outpatient Department and Emergency Department/ Central Examination Unit/ Mechanical Building	1st floor plan	1/300	75
3		2nd floor plan	1/300	77
4		3rd floor plan	1/300	79
5		4th floor plan	1/300	81
6		5th to 7th floor plan	1/300	83
7		Roof plan	1/300	85
8		Elevation	1/400	87
9		Section Mechanical Building/ Elevation, Section	1/400・1/250	89

Drawings

P.73～P.89

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Organization for Project Implementation

This project will be implemented according to the system of Japan's grant aid program, after cabinet approval of the government of Japan, and after the exchange of notes (E/N) on this project has been effected between the two governments.

The responsible organization and the executing agency on the part of the government of Vietnam for this project are the Ministry of Health (MOH) and HCH, respectively. The Vietnamese contracting partner is HCH, which will seal the consulting contract with the consultant, and seal the construction and equipment procurement contract with the contractor. HCH will also execute obligations of the Vietnamese side, including the works to be borne by the Vietnamese side.

The relation between the responsible organization or the executing agency and the contractors are shown by the diagram below.

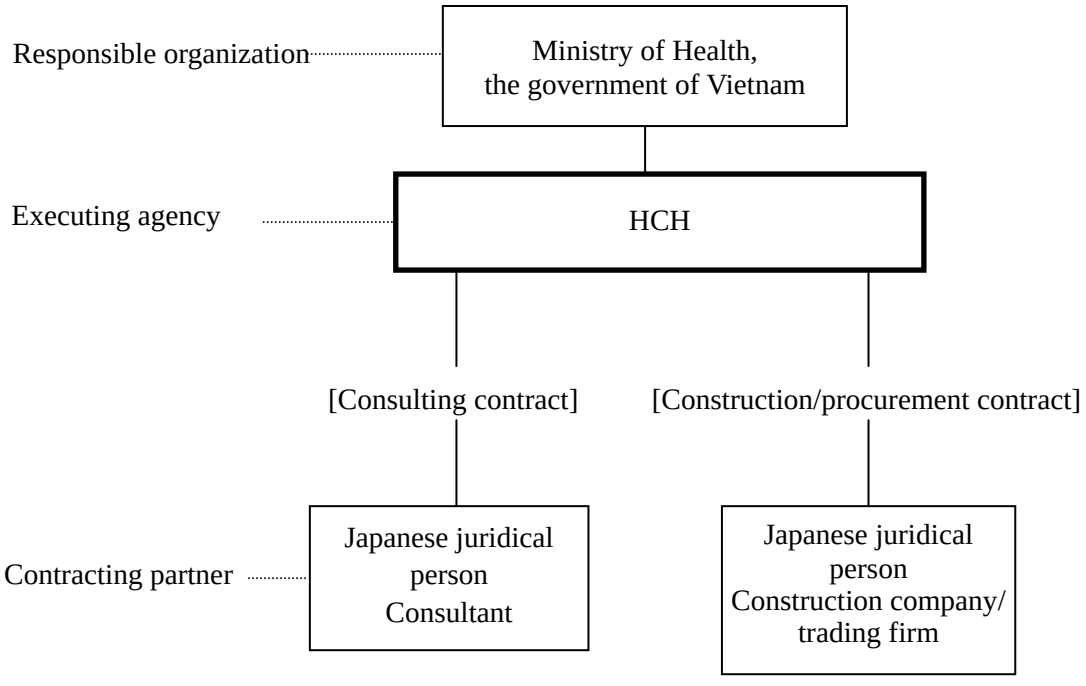
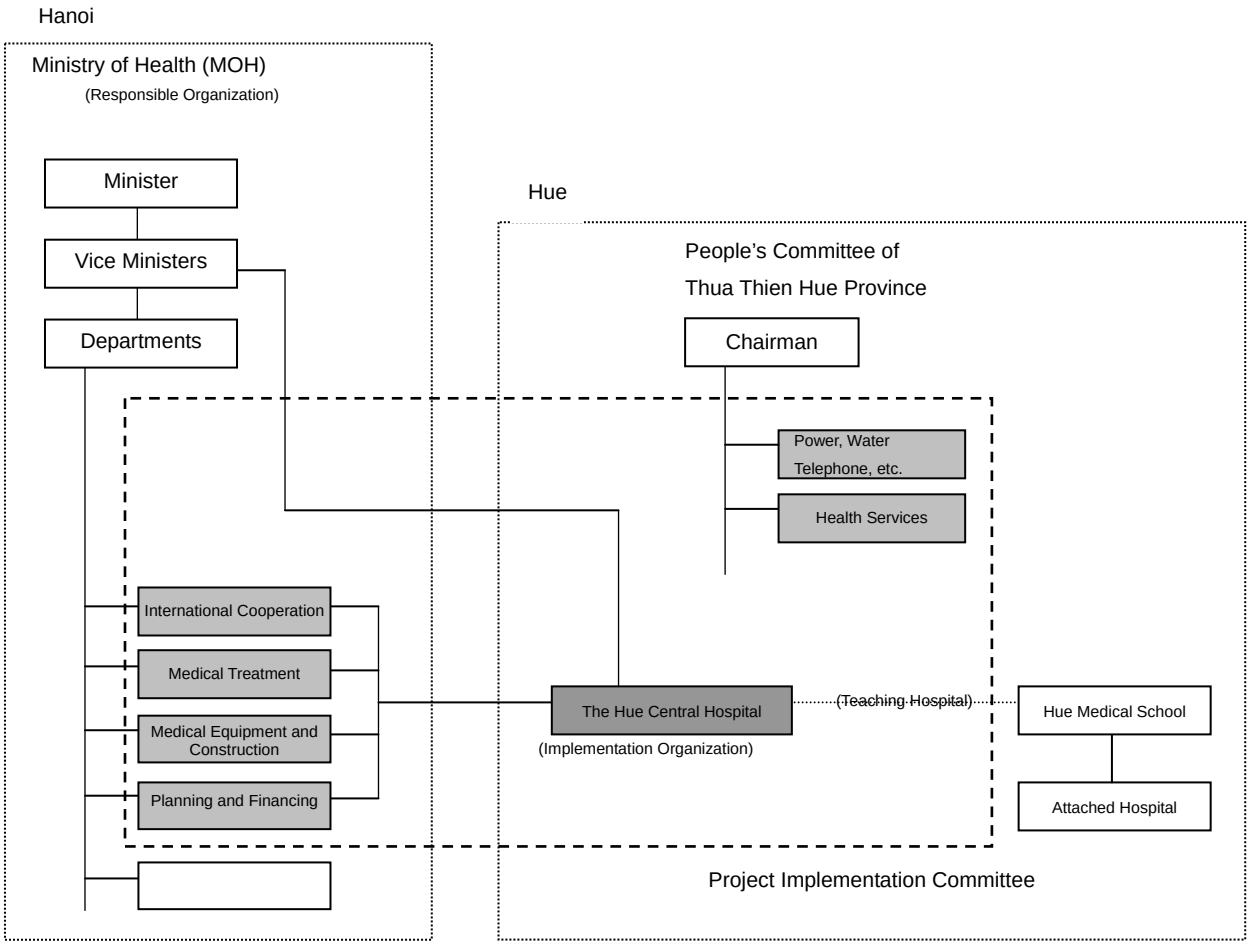


Figure 2-15 Relation among Project Executing Organizations

Hue being a local city remote from Hanoi where MOH is located, it has been confirmed that the Project Implementation Committee will be established as shown below. The committee members and their major roles are also shown.



Proposed Members of Project Implementation Committee will be as follows:

- Chairman : Director, HCH

- Director, Department of International Cooperation, MOH
- Director, Department of Medical Treatment, MOH
- Director, Department of Medical Equipment and Construction, MOH
- Director, Department of Planning and Financing, MOH

- Vice Director, HCH (Economics)
- Vice Director, HCH (Medical Treatment)
- Vice Director, HCH (Para-medical & Examination)

- Persons in Charge from People's Committee of Thua Thien Hue Province

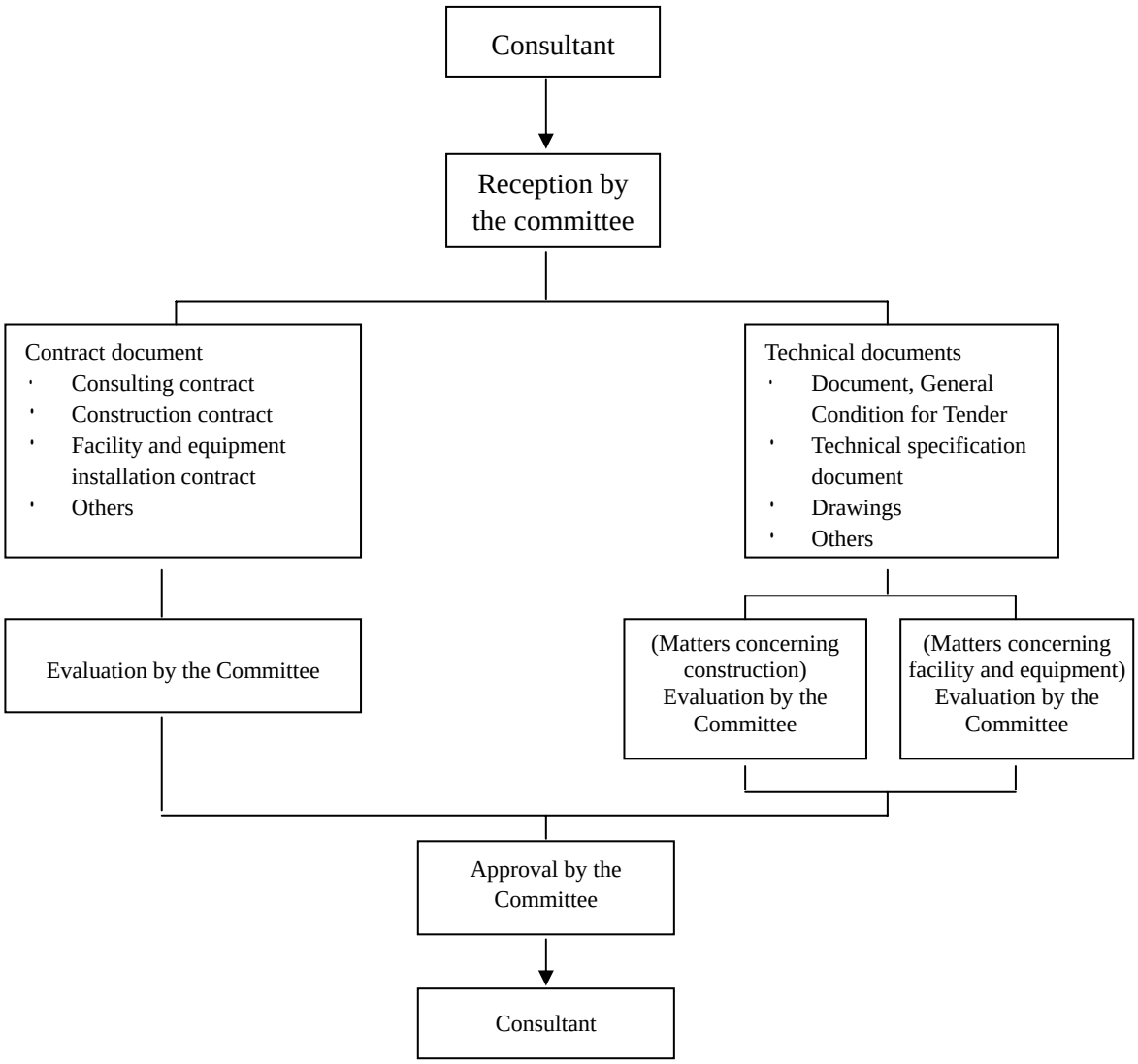
Major Functions of Project Implementation Committee

- Implementation of the Project, incl. Tender, Signing for Contracts etc.
- Getting tax exemption, building permission and other necessary permissions
- Appointment of registered persons (incl. fee) in relation to the Project
- Other necessary functions for smooth implementation of the Project

Figure 2-16 Organization Chart of the Project Implementation Committee

In order to execute the project at the hospital level, the Project Promotion Committee will be established in HCH. The Project Promotion Committee studies the tender documents (detailed design drawings, specification documents, etc.), and inspects the construction works, while coordinating the concerned divisions and departments, as the representative of the

hospital. Any decision by HCH will be made after hearing the opinion of this committee. This procedure is schematically shown below.



Major functions of the Project Promotion Committee:

Affixation of signature on contract documents and other important documents
Promotion of project, including works concerning tenders
Procedure for duty and tax exemption, acquisition of permissions for building confirmations
Appointment of personnel required by the project

Figure 2-17 Procedure for Approval of Tender Document

HCH will execute the procedures for construction permit legally specified in Vietnam.

(2) Consultant

After the exchange of notes having been effected, HCH shall seal a contract with a consultant, having a status of Japanese juridical person, on detail design and consultant supervision. The contract becomes effective after verification by the government of Japan. In order to promote this project smoothly, it is important that the consulting contract be sealed as quickly as possible after the exchange of notes has been effected. The consultant, after the contract has been sealed, prepares the tender document (detail design drawings, specification documents, etc.) based on this basic design study report, in consultation with HCH, for approval by the Vietnamese side according to the above-mentioned procedure for approval. The tender work and the consultant supervision will be executed according to the contents of the tender documents.

(3) Contract of Construction Work/ Facility and Equipment Procurement

The construction work consists of the construction work per se in which the facilities are constructed, and procurement work in which facilities and equipment are procured, installed and test operated. The eligible candidates for the contractor are limited to Japanese juridical persons meeting certain qualifications. The contractor will be selected by the general competitive bidding with limited qualifications.

HCH shall seal a contracting contract with each of the contractor for construction and that for procurement duly selected by bidding, and receive verification of the contract document from the government of Japan. Thereafter, the contractors shall begin their respective works without delay, and shall complete their works according to the contract.

(4) Commissioning of Local Consultant

More than one building will be constructed simultaneously; therefore, it is necessary to retain local architectural engineers for supervision of the construction works, to work with the Japanese manager stationed locally. Since the construction of the Central Examination Unit involves more machine works and electrical works than ordinary hospital buildings, the local engineers for facility installation will be employed.

(5) Commissioning of Local Architectural Engineer and Dispatch of Japanese Specialist

The largest construction company of Vietnam has a payroll of 18,000 (including 5,000 employees working overseas), of which about 1,000 are engineers. The annual construction is about 16 billion yen. There are five relatively large construction companies in Hue City, either local companies or branch offices of Hanoi-based companies. These companies are alike, with about 2,000 employees, each having about 20 subcontractors.

These local companies have had experience in construction works for companies of Japanese capitals, and hence have understandings in construction methods of Japanese construction companies. However, they have only few engineers who can actually implement Japanese methods of construction. Therefore, technology transfer by the Japanese general contractor is indispensable. In short, the main contractor shall employ local architectural engineers who work under the supervision of Japanese engineers to minutely conduct detailed examination of process, quality, safety management of the project implementation.

And the project includes the construction which requires the advanced quality control because the facility of the project is sophisticated one such as intensive-care unit in the hospital facility. Therefore, specialized skills are required for the interior finish work of an operating room, a clean room and others in which the construction is relatively difficult and the waterproofing work in which the construction is based on Japanese specifications to maintain the quality. So Japanese technicians will be invited and instruct the local engineers in the construction.

2-2-4-2 Implementation Conditions (Precautions for Construction and Procurement)

(1) Temporary Work Plan

This project will install temporary offices for the consultant, contractor and subcontractor, material depot and processing shop, and a warehouse on a vacant lot adjacent to the project site.

There is a ready-mixed concrete plant in the suburbs of Hue which transports ready-mixed concrete by concrete mixer truck. The concrete mixer truck takes about 30 minutes from the plant to the project site. Therefore, the project does not need to install a temporary batcher plant.

The project site is about 10,000m^2 wide. It is important to effectively utilize the peripherals of the site, in view of the fact that the hospital facilities surrounding the site will be operational during the construction period, and that works of Vietnamese obligation will be concurrently done. In planning the traffic lines for construction, the routes for bringing in the construction materials and work areas will be thoroughly studied to secure safety and efficiency of the construction work. It is necessary to hoard the site and post guards at all approaches to prevent the hospital staff, third persons from entering, and also to forestall thefts. In order for the construction vehicles not to interfere with traffic in the surroundings, and to prevent traffic accidents, traffic guides will be posted on the front road.

(2) Material Procurement

Locally produced construction materials are available in the market in large numbers. If too much importance is not attached to quality, almost all construction materials are locally available. The locally available products are of a number of origins: Vietnam, Japan, Europe, China, Southeast Asian countries, for example.

There are a number of shops for construction materials, selling such materials as domestic and imported tiles, window panes or glass products, flooring materials, sanitary ware, lighting equipment, furniture, kitchen fixtures. Local construction companies operate various construction material companies under their umbrellas. This project will positively use such locally available products. However, procurement from Japan or from third countries will be studied for materials of which quality is particularly important, because locally marketed products are not necessarily available in various kinds or in large quantities, and some of them have quality problems.

(3) Construction Method

In principle, the buildings of this project will have pile foundations, and the buildings will be of concrete rigid frame structure, with brick walls, with the exception of radiography rooms which have reinforced concrete walls to shield radiations. The roofs will be flat roofs, made of concrete slabs on which are applied heat insulation and water proofing.

(4) Legal Consideration

In Hue City there is a regulation on building shape specifying the number of stories, setback of wall surface from the road, angles from the front road. Within 100 meters in both directions from the Nguyen Palace axis, buildings higher than three stories are not permitted. The project site is outside the above controlled area, and buildings higher than three stories are permitted, but limited to seven stories. The regulation on wall surface setback is nine meters. The buildings should be lower than the plane of 50 degree angle of elevation from the opposite side of the front road.

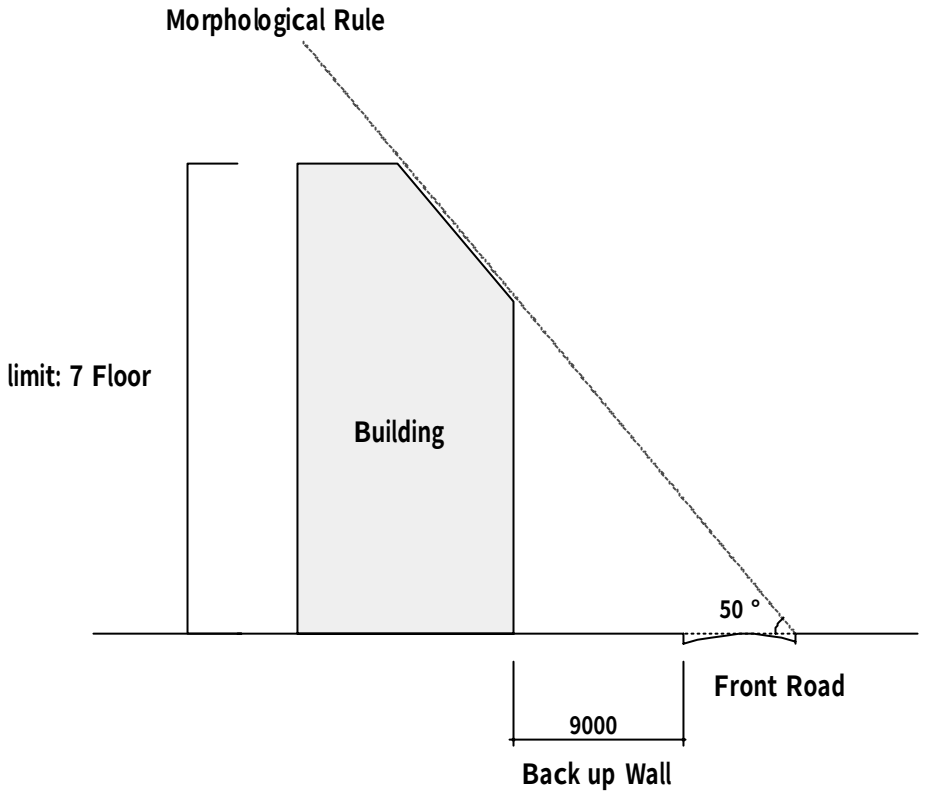


Figure 2-18 Law's Control

2-2-4-3 Scope of Works

The following pages clearly define the Japanese side works and the Vietnamese side works to help promote this project smoothly. The Japanese side works and the Vietnamese side works are shown in the table below.

Table 2-20 Japanese Obligation and Vietnamese Obligation

To be covered by Japanese Side	To be covered by Vietnamese Side
	To secure and prepare land
	To clear, level and reclaim the site when needed 1) Dismantle of unexploded bomb 2) Dismantle of existing building within the site 3) Dismantle of existing electrical power cable crossing the site 4) Dismantle of existing PABX and telephone line crossing the site 5) Dismantle of existing water pipe crossing the site when needed 6) Dismantle of existing sewage pump pit and sewage pipe crossing the site
	To construct gates and fences in and around the site
To construct the parking lot 1) Within the site	To construct the parking lot 1) Outside the site
To construct roads 1) Within the site	To construct roads 1) Outside the site
To construct Exterior Work within the site 1) Planting in Court Yard, Grading, Lighting	To construct Landscaping 1) Landscaping and planting (except court yard)
To construct the building 1) Architectural Work including fixed furniture, fit up and medical curtain in the Ward 2) Electrical Work Power Supply, Lighting and Socket Outlet, Lightning Protection and Earthing, Telephone, Public Address, Intercom, Fire Alarm, Master TV Antenna, Piping for PC Network 3. Mechanical Work Water Supply, Drainage, Hot Water Supply, Sanitary Fixture, Fire Fighting, Air Conditioning 4. Other Utilities Generator System, Medical Gas System, Sewage Treatment Plant, Boiler System, Elevator System	
To provide facilities for the distribution of electricity, water supply, drainage and others 1) Electricity a. The drop wiring and internal wiring within the site b. The main circuit breaker and transformer c. The conduit pipe from main breaker to the site boundary including man hole or hand hole for the wiring	To provide facilities for the distribution of electricity, water supply, drainage and others 1) Electricity a. The distributing line to the main circuit breaker of the building
2) Water Supply a. The supply system within the site (reservoir and elevated tank)	2) Water Supply a. The city water distribution main to the site
3) Drainage a. The drainage system within the site b. The sewage treatment plant	3) Drainage a. The drainage system outside the site

To be covered by Japanese Side	To be covered by Vietnamese Side
4) Telephone system a. The MDF and the extension after the flame/panel b. The conduit pipe from main distribution frame/panel (MDF) to the site boundary including man hole or hand hole for the wiring	4) Telephone system a. The telephone trunk line to the main distribution frame/panel (MDF) of the building
5) Furniture and Equipment a. Curtain Rail b. Project furniture c. Supply and installation of Medical Equipment	5) Furniture and Equipment a. Curtain , Blind b. General furniture c. Move and installation of existing Equipment

Important considerations to promote this project smoothly include schedule controls of construction works and installation works concerning buildings per se, electric facilities and machine facilities. People engaged in construction need to understand the works of medical equipment installation and adjust the construction work schedule to the requirement of medical equipment installation. As this project includes removal of existing buildings, preparation of infrastructure, and exterior works by the Vietnamese side, coordination between the Japanese side construction work and the Vietnamese side construction work is important. It has been confirmed with the Vietnamese side that the infrastructure works (electric power, city water supply, water supply and wastewater facilities, etc.) will be completed by the time the main facility construction starts. Nevertheless, it is important that both parties coordinate with each other in detail to ensure that the above works have been done before the start of the main facility construction, to avoid any adverse effect.

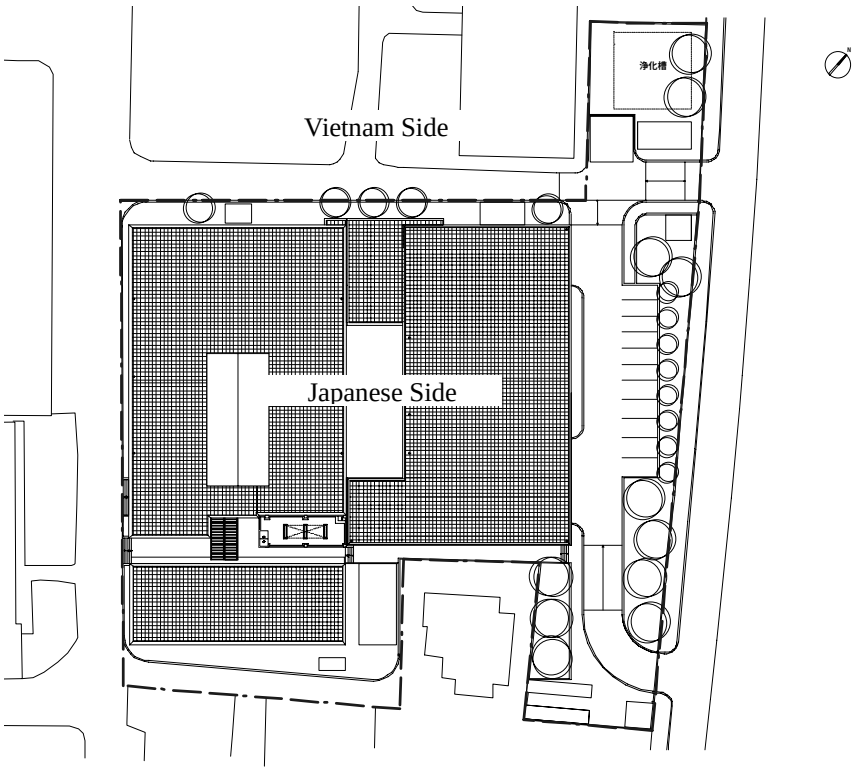


Figure 2-19 Demarcation between the Japanese Side Work and the Vietnam Side Work

2-2-4-4 Consultant Supervision

A Japanese consultant firm will conclude the Agreement for Consultants Services with HCH and the said consultant will prepare the tender documents for construction and equipment procurement. After assisting in tendering of the Project, upon the award of construction and equipment procurement contract(s), the consultant will commence the construction supervision services. The purpose of supervision services executed by the consultant is to oversee the construction and the procurement and installation of equipment to ensure quality and construction progress is consistent with the contents of contract documents. To secure this, the consultant as a supervisor will issue guidance, advice and coordination to the contractor(s) regarding quality of works and progress of construction schedule. The consultant services includes the following items:

(1) Assistance in tendering of construction and equipment procurement contract(s)
This item includes the preparation of tender documents necessary to select the contractor(s) for construction and equipment procurement and also the issuance of Tender Notice, acceptance of tender applications, pre-qualification of applicants, holding of explanatory meeting for tendering, distributes tender documents and accepts and evaluates tenders. Furthermore, the consultant will lend guidance and assistance for the contract signing procedure between the successful tenderer and HCH.

(2) Issuing guidance, advice and coordination to contractor(s)
The consultant will examine the construction schedule, construction plans, procurement plan of construction materials and procurement & installation plans for equipment submitted by the contractor and issue guidance, advice and provide coordination.

(3) Inspection and approval of working drawings and shopdrawings prepared by contractor(s), subcontractors and suppliers.
The consultant will inspect the work drawings, shop drawings and other construction documents and provide approval along with any necessary guidance.

(4) Confirmation and approval for construction materials and production equipment
The consultant will inspect the proposed construction materials and equipment for conformity with the contract documents and issue approval of their use and procurement.

(5) Inspections of works

The consultant will conduct factory inspections of construction materials and procured equipment, attend construction tests and conduct tests to measure quality and performance compliance as necessary.

(6) Progress report of construction and installation.

The consultant will ascertain the status of construction schedule and site conditions and report on the construction progress to concerned agencies of both countries.

(7) Confirmation and verification of trial run results and final inspection upon completion.

The consultant will conduct completion inspections for buildings, ancillary systems and equipment procurement and conduct trial runs of the equipment to confirm that the completed facilities meet the performances stipulated in the contract documents and submit a completion inspection report to HCH.

(8) Construction Supervision Organization

The consultant will assign one resident engineer to perform the activities described above. In addition, the consultant will send experts in relevant fields to the site, as necessary, following the progress of the construction works. The experts will conduct discussions, inspections, guidance and coordination necessary for project implementation. Furthermore, the consultant will assign experts in Japan to establish a back up system. Finally the consultant will report to the concerned agencies of the Government of Japan concerning relevant matters on the progress of the Project, payment procedures, completion and handing over and other matters.

A draft Supervision Organization is shown in the following figure.

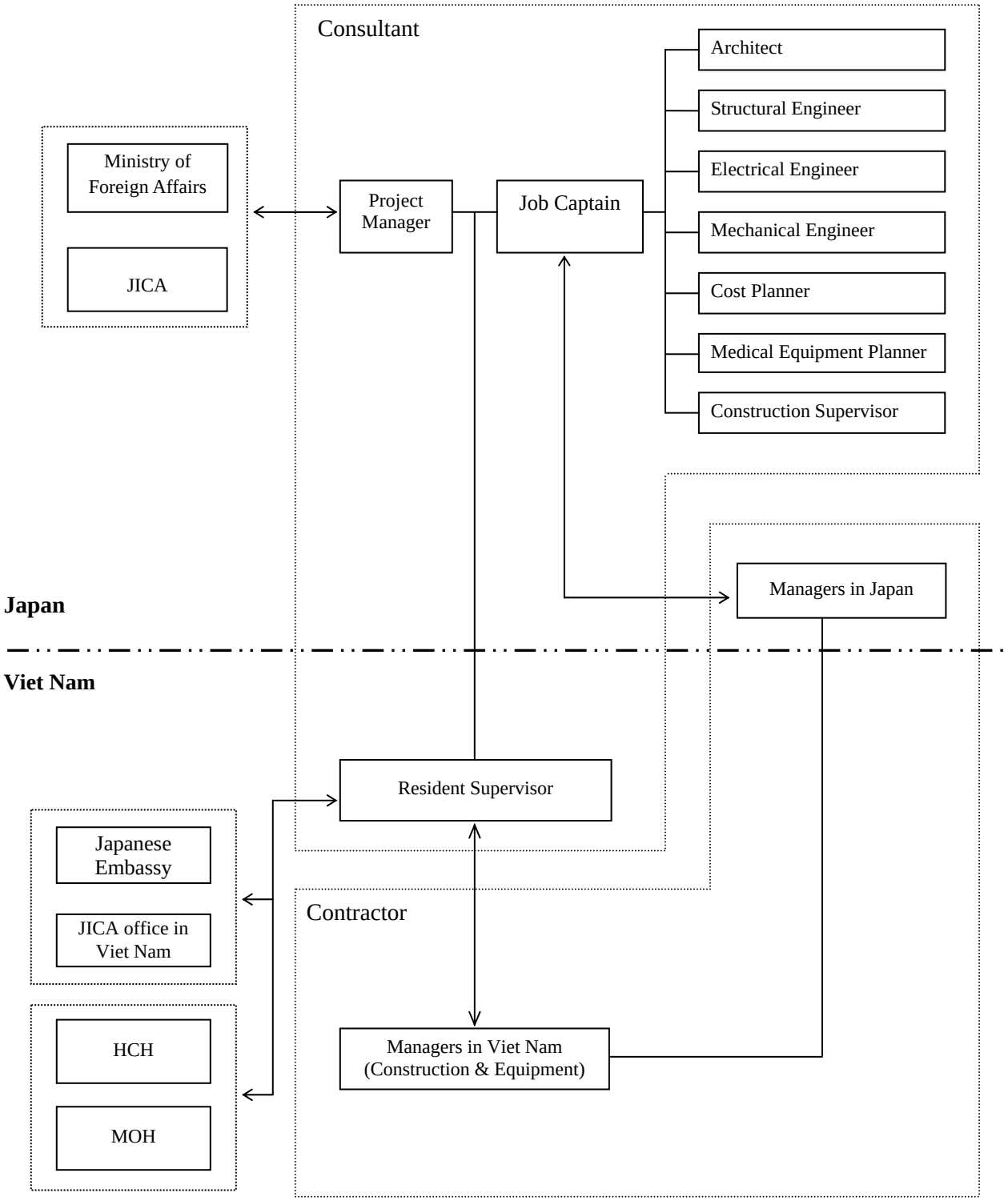


Figure 2-20 Supervision System

2-2-4-5 Quality Control Plan for Concrete

(1) Materials

1) Cement

Ordinary Portland cement will be used.

2) Aggregate

・Fine Aggregate

Crushed stones or sand will be used as fine aggregate. When using sea sand, the chloride ion content must be below the standard set in JASS 5.

・Coarse Aggregate

River gravel or crushed stones will be used as coarse aggregate. The maximum size of coarse aggregate will be 20mm.

・Admixture

Standard AE water-reducing agent or equivalent will be used.

・Water

Water from city water mains or equivalent will be used. Recycled water will not be used in general.

(2) Mix Proportion Plan

・The required quality is for the strength of the structural concrete after 28 days to be equal to or above design standard strength. To achieve the required quality, the ratio of components will be determined by trial mixings, with reference to the following.

① Water Content

AE water-reducing agent will be used when appropriate to ensure a good workability with water content of 185kg/m^3 or less.

② Cement Content

The cement content should be a minimum of 270kg/m^3 and a maximum water/cement ratio of 65%, with the water/cement ratio as small as possible.

③ Air Content

Air content of 4.5% will be the standard.

④ Chloride Content

The chloride content, measured as the chloride ion content, should be 0.3kg/m^3 or less, taking into account the volume of chemical admixture.

・Establishment of Mix Proportion Strength

In principle, the mix proportion strength will be set following JASS 5. The mix proportion

strength is expressed as the compressive strength of normally cured samples after 28 days. The larger of the values calculated from the equations given below is regarded as the mix proportion strength of the sample.

$$F = Fc + T + 1.73\ \sigma$$

$$F = 0.85\ (Fc + T) + 3\ \sigma$$

where

F: Mix proportion strength of concrete (N/mm^2)

Fc: Standard design strength of concrete (N/mm^2)

σ: Standard deviation of strength of concrete used (N/mm^2)

T: Correction factor for estimated average temperature for the 28 day period following concrete placement (N/mm^2)

(3) Receipt of Concrete at the Site

When using ready-mixed concrete from a factory, it must be confirmed that the following points are conformed to.

1) The factory must have permanently-stationed engineers who have a thorough knowledge of concrete techniques.
2) The factory must be located close enough for it to take less than 120 minutes from the start of mixing till completion of casting when the temperature is below 25℃, or less than 90 minutes when the temperature is above 25℃.
3) The product must be of the quality required in the Project documents.

(4) Quality Control for Concrete

1) System of Quality Control for concrete work

Quality control for concrete will conform to the procedures shown in the table below.

Table 2-21 Quality Control for Concrete Works

Process	Test Item	Control Items	Record Method
Supervision of concrete placement	Quality of fresh concrete	Slump test, Flow test, Air content, Concrete temperature, Chloride content	Concrete Casting Control Table
Supervision of sample curing	Ambient temperature	Average temperature	Temperature Control Table
	Temperature of curing water	Average water temperature	Temperature Control Table
Control of strength	Confirmation of strength at removal of formwork	Equal to or greater than required strength obtained from calculation	Strength Control Table
	Judgement of strength of structural concrete	Equal to or greater than required strength obtained from calculation	Strength Control Table

2) Test for Quality Control of Fresh Concrete

Pre-casting inspection and confirmation will be carried out for the items given in the table below.

Table 2-22 Quality Control Tests for Fresh Concrete

Test Item	Test Method	Timing / Frequency	Criterion of Judgement
Slump Value	JIS A 1101 equivalent	Each batch	Tolerance of ±2.5cm
Slump Flow Value	JASS 5 T-503 equivalent		Tolerance of ±7.5cm
Air Content	JIS A 1128 equivalent		Tolerance of ±1.5 %
Temperature of concrete	Measurement by thermometer		35℃ or below
Segregation	Visual Inspection		No segregation visible
Chloride Content	JASS 5 T-502 equivalent	First batch each Day	Chloride ion content of 0.3kg/m^3 or less

3) Control of Concrete Strength

Sampling methods and methods of curing used to test the strength of concrete are summarized in the table below.

Table 2-23 Control of Concrete Strength

Purpose of Test		Confirmation of Strength of Structural Concrete	Confirmation of Strength at Removal of Formwork
Sampling	Sampling Method	JASS 5 T603 Equivalent, Samples Taken on Site	JASS 5 T603 Equivalent, Samples Taken on Site
	Frequency of Test	Every casting day and every 100m^3 cast	Every casting day Normally twice a day, three samples each time
	Number of samples	Three each time	Three each time
	Form of sample	15cm Cylinder	15cm Cylinder
Curing of Samples	Method of curing	On site curing in water	In sealed condition on site
	Place of curing	On Site	On Site
Strength Test	Place of Test	At an official institution or on Site	At an official institution or on Site
	Witness to test	Consultant Supervisor	Consultant Supervisor

- Judgement and Confirmation of Concrete Strength

a) Judgement Standard for strength of structural concrete

$\overline{X_{28}} \geqq F_C + 3$ (N/mm^2)

b) Judgement Standard for strength at removal of formwork.

$\overline{X} \geqq F_N$ (N/mm^2)

where, $\overline{X_{28}}$: average crush strength of three samples at 28 days (N/mm^2)

$\overline{X}$: average crush strength of three sealed-cured samples (N/mm^2)

F_C: design strength of concrete

F_N: required strength for formwork removal according to JASS 5

2-2-4-6 Procurement Plan

(1) Procurement of Construction Material

This project is to provide hospital facilities; therefore, the special facilities and construction materials will be selected for easiness of keeping performance, of maintenance, of cleaning, and sturdiness, so that the materials meet the purposes of hospitals. Specifically, the following methods will be followed.

1) Local procurement

The materials to be used will be ones locally procurable to the extent possible so that repairs and maintenance works may be facilitated after commissioning. The local availability will be confirmed for each product that it conforms the required quality and quantity. Imported products that are freely available in the domestic market (always available in the domestic market without going through import procedures) will be regarded as equivalent to domestic products and positively adopted.

2) Overseas procurement

Those materials which are considered difficult to procure in the domestic market, of which domestic products do not meet the required quality, of which domestic products are not stable in supply, will be procured in Japan or in third countries and imported. In the case of overseas procurement, the contractor should coordinate with the Hue Central Hospital about import and customs clearance so that procedures of duty exemption and other procedures may be executed smoothly.

Also, if the “price + packing and transportation cost” of importation from Japan or third countries is found lower than the “locally procured price” of a given product, the product will be procured overseas and imported.

3) Transportation plan

Products procured in Japan or third countries and imported will be marine transported to the Da Nang Port, Da Nang City of Vietnam, and transported on land to the planned site in Hue by vehicle. There is regulation in Hue City on the use of large vehicles; however, it has been confirmed that this project is exempted from this regulation. Notwithstanding, use of large vehicles is banned in the morning and evening in Da Nang City. The land transportation from the Da Nang Port should consider this regulation.

Facilities and equipment of which performance can suffer from physical shocks, temperature, humidity, should be packed in such a way to avoid influences of such effects.

4) Procurement plan

The table below shows major facilities and equipment broken down into local procurement, third country procurement, and procurement in Japan. Major electrical and machine facilities and equipment are procured mostly in third countries or in Japan, with few exceptions.

Table 2-24 Procurement Plan of Major Construction Materials

Type of work	Material	Source of procurement			Note
		Local	Third country	Japan	
Reinforced concrete work	Portland cement	○			Local products conforming to the JIS standard are available
	Fine aggregate (sand)	○			Local procurement
	Coarse aggregate	○			Local procurement
	Deformed bar	○			Local specification products conforming to the JIS standard are available
	Frame	○			Including steel frames
Steel work	Steel member	○			Local specification products conforming to the JIS standard are available
Masonry	Concrete block	○			Producible near Hue
	Bricks	○			Local procurement
water-proofing work	Asphalt water proofing	○		○	Local installation using imported material
	Liquid-applied membrane waterproofing	○		○	Local installation using imported material
	Sealing compound	○			Local installation using imported material
Plastering work	Terrazzo	○			Local procurement
Tile work	Earthenware tile	○			Third country product depending upon requirement
	Porcelain tile	○			Third country product depending upon requirement
Carpentry	Wood	○			Local hard wood liable to bend and deform
	Glued laminated wood		○		Quality problems with local product, third country product selected
	Plywood	○			Quality problems with local product, third country product selected

Type of work	Material	Source of procurement			Note
		Local	Third country	Japan	
Metal work	Light steel frame backing	○			Local procurement
	Decorated metal product	○	○	○	Third country product depending upon requirement
	Finished metal product	○	○	○	Third country product depending upon requirement
Plastering	Cement mortar	○			Local procurement
	Plaster	○			Local procurement
Wood fixture work	Hinged door	○			Third country product in case local product has quality problem
	Wooden fixture frame	○			
	Fixture metal	○			
Metal fixture works	Aluminum window		○		Third country procurement because of quality problem of domestic product
	Steel fixture	○		○	Third country product depending upon requirement
	Stainless steel fixture			○	Third country product depending upon requirement
Glass work	Plain sheet glass	○		○	Third country product in case local product has quality problem
	Glass block			○	Third country product in case local product has quality problem
Paining work	Interior painting	○			Third country procurement for durable products
	Exterior painting	○			Third country procurement for durable products
Interior finish work	Plaster board	○			Basically local procurement、Third country or Japanese product in case local product has quality problem
	Rock wool sound insulating board	○			
	Glass wool	○			
	Glazed board			○	
	Lead containing board			○	
Furniture, fixture	Table, chair	○			Third country product in case local product has quality problem
	Locker	○			
Miscellaneous work	Sink, test table	○		○	Japan procurement for product of high performance
Exterior work	Paving material	○			Local procurement
Electrical work	Wiring accessory		○		Local procurement
	Lighting equipment		○	○	Japan procurement for specialty product
	Board		○		Japan procurement for specialty product
	Emergency generator		○		Japan procurement for specialty product
	Cable, wire, etc.	○		○	Japan procurement for specialty product
	Telephone exchange		○		No local product
	Nurse call			○	Local product not meeting the requirement
	Public address system			○	Local product not meeting the requirement
	Fire alarm			○	Local product not meeting the requirement

Type of work	Material	Source of procurement			Note
		Local	Third country	Japan	
Machine facility work	Boiler		○		No local product
	Pump			○	No local product meeting the performance requirement
	Air conditioner		○	○	Decided by specification
	Forced and exhaust fan		○	○	Decided by specification
	Ventilation, ceiling fan		○	○	Decided by specification
	Air intake exhaust fitting		○	○	Decided by specification
	Sanitary ware		○	○	Decided by specification
	Water treating facility			○	No local product
	Duct materials		○		Decided by specification
	Piping materials			○	Decided by specification
	Heat insulating material	○		○	Decided by specification
	Automatic controlling equipment	○		○	Japan procurement because of the high performance required
	Cooking appliance		○	○	Decided by specification
	Sewage treatment tank			○	No local product
Elevator installation work	Elevator		○	○	Decided by maintenance system of the manufacturer
	Dumbwaiter		○	○	Decided by maintenance system of the manufacturer

(2) Procurement of Medical Equipment

This plan calls for procurement of medical equipment from manufactures having a local agent in Vietnam to ensure prompt maintenance after commissioning of this project. Competition would be restricted if procurement were limited to Japanese manufacturers or local manufacturers. There exist a number of local agents of foreign manufacturers in Vietnam; therefore, the source of procurement includes third countries.

1) Possibility of procurement of locally manufactured product

The medical equipment in common use in Vietnam is either made in Japan, USA, or European countries. The medical equipment this project will procure are not locally produced; therefore, local procurement is not considered.

2) Possibility of procurement from third countries

Third country procurement will be considered for the products, of which manufacturers' agents exist in Vietnam, and of which no problem is expected with maintenance system or procurement of replacement parts or consumables, and which are competitive in terms of price.

3) Transportation period

The period of transportation of medical equipment is expected to be about 1.5 months, including various procedures for embarkation.

2-2-4-7 Implementation Schedule

The implementation schedule after the exchange of notes has been effected is as shown below. Specifically, the detailed design work by the consultant, execution of the tender, execution of construction by the contractor, and supervision by the consultant will be done.

(1) Detailed Design Work

First, HCH and the consultant, Japanese juridical person, seal a contract on the detailed design of this project (preparation of the tender document), followed by the approval of the contract by the government of Japan. Thereafter, the consultant prepared the tender document based on this basic design study report, while collaborating with HCH. The completed tender document needs to be approved by HCH.

The detailed design work (preparation of tender document) is expected to take six (6) months.

(2) Tender Work

The tender work is expected to take four (4) months.

(3) Construction Work by the Contractor and Supervision by the Consultant

The contractor starts construction work after the contract for the construction has been sealed and the said contract has been approved by the government of Japan. At the same time, the consultant starts supervision of the contractor.

The construction is expected to take twenty two (22) months.

Because of the magnitude and schedule of the project, the project will be implemented over four fiscal years, with the detailed design work for fiscal 2003, tender and construction for fiscal 2004 to 2006. The content of the construction work is shown in the table below.

Table 2-25 Content of the Construction Work

Facilities to be constructed	Central Diagnosis and Treatment Building 1st floor: X-ray Department 2nd floor: Physiological examination and endoscope divisions, bacteriological examination 3rd floor: Blood examination, biochemical examination, pathological examination 4th floor: Operation Department, washing and sterilization room 5th floor: Recovery ward 6th floor: ICU wards 7th floor: Serious patient wards (Roof: Warehouse, etc.) Outpatient Building 1st floor: Outpatient Division (orthopedics, emergency rescue, recovery room), medical matter and accounting, dispensary 2nd floor: Outpatient Division (general internal medicine, specialized internal medicine, general surgery, specialized surgery, pediatrics, traditional medicine) 3rd floor: Outpatient Division (ophthalmology, otolaryngology, dentistry, laser therapy) Machine Building Machine Building: Machine room (boiler, refrigerating machine, pump, etc.), transformer room, facilities for the generator room
Procurement of facilities and equipment	Medical facilities and equipment necessary for operation of the above medical facilities, etc. (X-ray equipment, hot-air sterilizer, centrifuge, electrocardiograph, etc.)

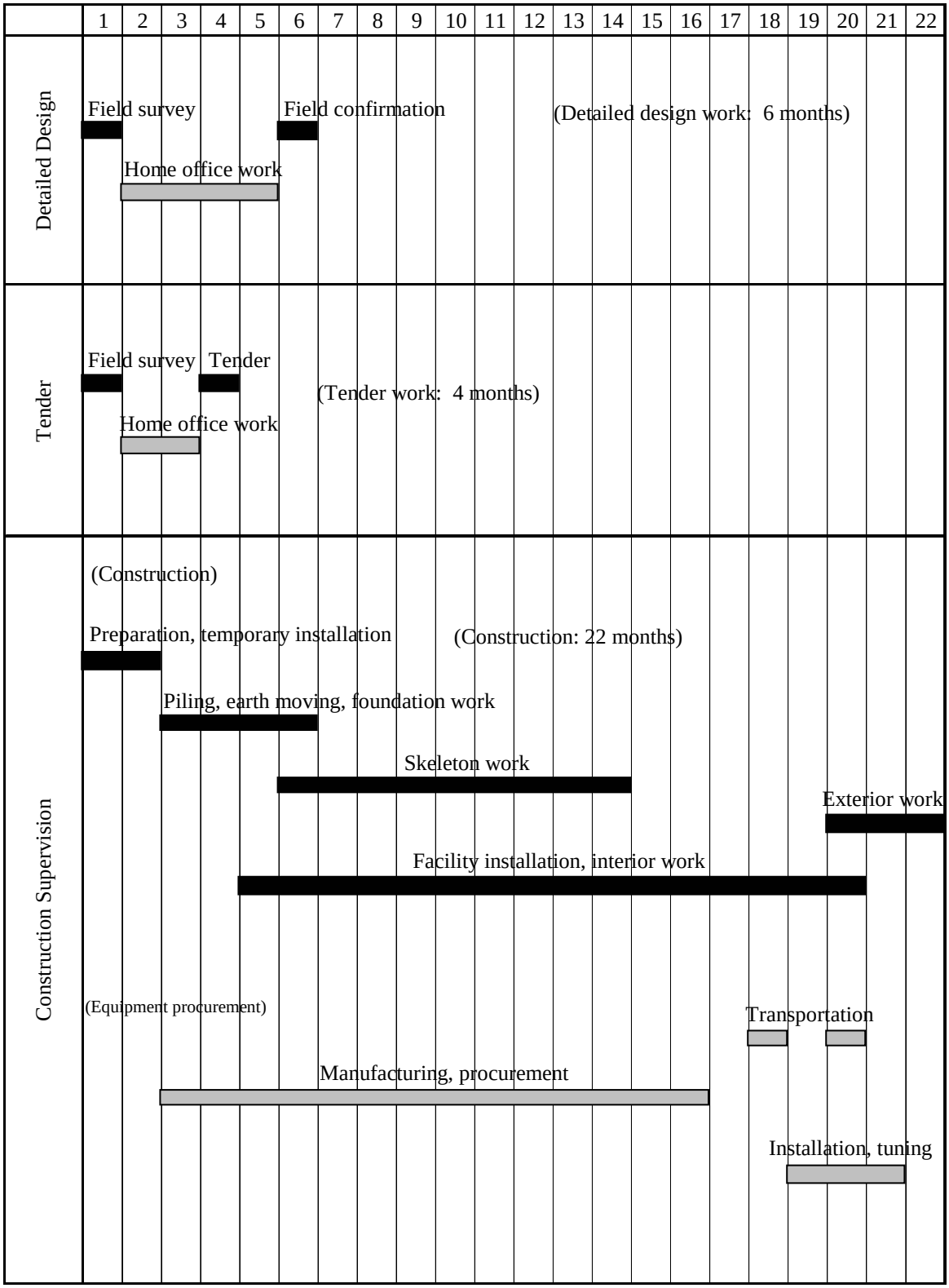


Figure 2-21 Work Schedule

2-3 Obligations of Recipient Country

The following are the obligations of the government of Vietnam.

1) Exemption of any tax or duty on every item or act concerning this project
2) Application for and acquisition of approvals necessary for this project
3) Issuance of the banking arrangement (B/A) and the authorization to pay (A/P), and bearing of commission fees associated with it
4) Prompt landing of facility and equipment cargoes at port, procedure for exemption of duties, customs clearance, and assurance thereof, and securing of prompt domestic transportation
5) Provision of convenience necessary for entry to and stay in Vietnam to the Japanese nationals who intend to execute provision of facilities and equipment and other works according to the certified contract
6) Exemption of all duties, all taxes in Vietnam to the Japanese nationals who intend to execute provision of facilities and equipment and other works according to the certified contract
7) Realization of the budget required for effective use and maintenance of the facilities and equipment constructed and procured by this grant aid program
8) Removal of existing facilities in the plant site and ground preparation of the site
9) Construction of hoarding walls, gates and exterior works
10) Laying of the electric power cables, city water facility, sewerage facility, telephone trunk lines to the boundary of the site
11) Transportation of the existing facilities and equipment, which should be moved to the new building, and installation therein
12) Purchase of general furniture and installation
13) Bearing of expenses that become necessary for reasons other than those procured in the grant aid program

The cost to be borne by the Vietnamese side is as follows.

Table 2-26 Cost of the Vietnamese Obligation Works

(US Dollras)

	Category	Cost
Hardware (Building construction and equipment procurement)	1. Removal of bombs and mines	8,500
	2. Dismantling of the existing buildings	34,200
	3. Mounting of new equipment	78,200
	4. Exterior work	23,200
	5. Others(Lead-in Works and connection of utilities, Curtains and Blinds, others)	199,000
Total		343,100 (about 41million yen)

2-4 Project Operation Plan

2-4-1 Approximate Cost of the Cooperation Project

The cost to be borne by the Japanese side is as follows.

Table 2-27 Approximate Cost of the Japanese Obligation Works

(Approximate 3,011 million yen)

<table>
<tr><th colspan="2">Item of Expenditure</th><th colspan="3">Approximate Cost
(million yen)</th></tr>
<tr><td rowspan="5">Facilities</td><td>Central Diagnosis and Treatment Building</td><td>1,261</td><td rowspan="5">2,246</td><td rowspan="7">2,673</td></tr>
<tr><td>Outpatient Building</td><td>723</td></tr>
<tr><td>Connecting Corridor</td><td>2</td></tr>
<tr><td>Mechanical Building</td><td>253</td></tr>
<tr><td>Furniture & equipment</td><td>7</td></tr>
<tr><td rowspan="2">Equipment</td><td>Central Diagnosis and Treatment Building</td><td colspan="2" rowspan="2">427</td></tr>
<tr><td>Outpatient Building</td></tr>
<tr><td colspan="2">Detailed Design / Construction Supervision</td><td colspan="3">338</td></tr>
</table>

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

2-4-2 Project Operation and Maintenance Plan

(1) Manning plan

In principle, the existing medical departments will be transferred to the new facilities; therefore, recruiting of new members is not planned.

(2) Operration and Maintenance Plan

1) Present State of Operation and Maintenance

In HCH, the Equipment Department and the Management and General Affairs Department are mainly engaged in management and maintenance of facilities and medical equipment. The Equipment Department is manned by 27 people, and is in charge of electrical system, air condition system, medical equipment and medical gases. One person each for electrical system and for medical gas works overnight. In this sense, HCH conducts a round-the-clock maintenance. HCH has two workshops, in which minor repair works are done. HCH uses a control ledger to manage equipment. The workshops are moved to the first floor and the second floor of the Pediatrics Building before long. The remodeling works are now rapidly underway.

The Management and General Affairs Department has a staff of about 30 people and is in charge of maintenance of the water supply system (including the boiler), wastewater system (including the sewage treatment tank and the incinerator), the telephone system, buildings. If such persons as gardeners, cleaners, sewing staff, drivers and clerks are added, the Management and General Affairs Department has a total of 73 persons. The working hours are from 7:00 a.m. to 4:30 p.m.; however, one person each for water supply and for telephone works overnight. The offices and workshops now distributed in three locations will soon be moved to the first floor and the second floor of the Pediatrics Building, together with the Equipment Department.

Purchase of spareparts for maintenance is first requested by the department manager in charge to the general manager of the hospital. After general manager’s approval was obtained, the purchase request is transmitted to the Accounting Department. In case of an emergency repair, the purchase request is handled separately.

Many of the tools used for repair works in the workshops are very old. Some tools are out of order and not usable. This project will supplement a minimum required number of tools at the time of the completion of this project.

Most pieces of existing equipment are 15 years old or older, and significantly obsolescent. There are a number of problems with these pieces of equipment, impossibility to obtain technical information or spareparts, for example. The major problems with such equipment may be summed up as follows: ①significant obsolescence, ②absence of an agent of the manufacturers or dealers in Vietnam, ③dearth of technical information, and ④inavailability of spareparts. Presently, HCH does not have a maintenance and management system able to properly cope with such problems. HCH tides over these problems in the following manners. The concrete contents are as below.

① Significant obsolescence: HCH does not have enough budget to renew the obsolescent equipment, and is obliged to carry out improper repairs or modifications on the equipment.

② Absence of agent in Vietnam: Most pieces of equipment donated by other donors have been procured in the countries of donors. In case of failures of such equipment, HCH is obliged to contact the manufacturer or agent in the donor's country and to procure spareparts from them, or even to invite technicians, with a heavy financial burden on HCH.

③ Dearth of technical information: There is so very little technical information on the obsolescent equipment or equipment donated by other donors that HCH cannot take proper technical measures to such equipment.

④ Inavailability of sparepart: HCH may contact the manufacture to inquire about the spareparts for old and obsolescent equipment, only to find that the spareparts are no longer manufactured. HCH is obliged to abandon such equipment or to carry out improper repairs or modifications on them, and to keep on using the equipment. The latter practice can be hazardous to the patients.

Viewed from the standpoint of equipment management, HCH does not have a system to collect information on the deployment, number, state of use of the existing equipment. Under such a circumstance, HCH urgently needs to improve the system of equipment maintenance and management. Although HCH now inputs some data on the equipment in the personal computer system, HCH is yet to establish a system of information collection and periodic inspection needed to grasp the present conditions.

2) Formulation of maintenance plan

① Maintenance of facilities

The buildings will not use interior or exterior materials that require special maintenance. However, among the facilities to be installed, the steam-type boiler is the first one for HCH. The air-conditioning system for the operation rooms has floor-sitting type ducts equipped with a high-performance filter, and is designed to keep the operation rooms under positive pressure. Although such new systems will be introduced, HCH now plans to deal with them with the present maintenance staff. Regarding the sewage treatment tank, HCH plans to add two or three persons, because the present staff cannot deal with it.

② Maintenance of medical equipment

Presently, information on deployment, number, operation conditions is not centrally controlled. Establishment of maintenance management system is considered necessary, including improvement of the present problems.

The present plan intends to establish a system whereby the operation manuals, maintenance manuals, and other materials of the equipment procured by this project are orderly placed and retained in a predetermined location. It is important to know the deployment and operation conditions of equipment at all times, and to be able to take a proper and prompt measure with an accurate understanding of the problem if a problem occurs. For this purpose, periodic inspections are indispensable, as a means of maintenance incorporating the concept of preventive maintenance. Establishment of a well organized comprehensive maintenance system as mentioned above is necessary for properly maintaining the equipment of this project. In this respect, maintenance system should be studied, keeping in mind the possibility of Japan’s technical cooperation.

2-4-3 Management, Maintenance and Operation Costs

(1) Maintenance and Operation Costs

The following pages show the result of a calculation of maintenance and operation cost after completion of the project.

Table 2-28 Calculation of Maintenance and Operation Costs

Unit: Vietnamese Dong (VND)

Item	Initial fiscal year	Following fiscal years	Note
1) Electricity charge	2,223,936,000	2,223,936,000	
2) Telephone charge	82,448,000	82,448,000	
3) Water charge	198,000,000	198,000,000	
4) Gas charge	0	0	
5) Medical gas charge	120,960,000	120,960,000	
6) Diesel fuel cost	297,600,000	297,600,000	
7) Building maintenance cost	0	450,000,000	two years after completion and onward
Subtotal	2,922,944,000 (Yen 23,383,000)	3,372,944,000 (Yen 26,983,000)	
8) Equipment maintenance cost	3,285,000,000 (Yen 26,280,000)	3,285,000,000 (Yen 26,280,000)	
Total	6,207,944,000 (Yen 49,660,000)	6,657,944,000 (Yen 53,260,000)	

(Exchange rate: 1VND/0.008 yen)

1) Electricity charge 2,223,936,000 VND/year

According to the electricity tariff of the utility electric company of Thua Thien - Hue Province, the following electric rate is applied to HCH.

Minimum charge: not applicable

Meter rate: 780 VND/kWh

The contract capacity of HCH is estimated at about 1,500kW from the capacities and types of its facilities. Average electric power consumption is estimated at about 900kW, assuming the normal consumption rate of 60% on the contract capacity.

The electricity charge is estimated as follows.

Meter rate charge:

780 VND/kWh × 900kW × 8h × 30 days × 12 months = 2,021,760,000 VND/year

Total (including 10% tax):

1,684,800,000 VND/year × 1.1 = 2,223,936,000 VND/year

Therefore, the annual electricity charge is 2,223,936,000 VND/year.

2) Telephone charge: ·····82,448,000 VND/year

The frequencies of telephone line uses are assumed as follows.

Hue city call: 3 minutes/one call, 120 calls/day

Domestic long distance call: 5 minutes/one call, 5 calls/day (mainly to Hanoi)

Overseas long distance call: 10 minutes/one call, 1 call/day (mainly to Japan)

The telephone charge is estimated as follows.

Hue city call:

120 VND/minute × 3 minutes/call × 120 calls/day × 30 days × 12 months = 15,552,000VND/year

Domestic long distance call:

1,200 VND/minute × 5 minutes/call × 5 calls/day × 30 days × 12 months = 10,800,000VND/year

Overseas long distance call:

13,500 VND/minute × 10 minutes/call × 1 call/day × 30 days × 12 months = 48,600,000VND/year

Subtotal:

15,552,000＋10,800,000＋48,600,000 = 74,952,000 VND /year

Total (including 10% tax):

74,952,000 VND /year × 1.1 = 82,448,000 VND /year

Therefore, the annual telephone charge is 82,448,000 VND/year.

3) Water charge: ·····198,000,000 VND/year

According to the tariff of the Waterworks Bureau of Thua Thien - Hue Province, the following rate will be applied to HCH.

Minimum charge: not applicable

Meter rate: 2,750 VND/m3 (including the 10% tax)

The consumption of water by HCH is estimated at about 200m^3/day from the types and capacities of the facilities.

The water charge is estimated as follows.

Meter rate charge:

2,750 VND/m^3 × 200 m^3/day × 30 days × 12 months = 198,000,000 VND/year.

Therefore, the annual water charge is 198,000,000 VND/year.

4) Gas charge:·····0

In this facility, gas is used for an examination. However, it is not budgeted because only a small amount of gas is consumed.

5) Medical gas charge:·····120,960,000 VND/year

The medical gas HCH uses is oxygen. HCH uses oxygen at the operation rooms, delivery rooms, ICUs, recovery rooms, wards, etc.

The medical gas charge is estimated as follows.

Consumption of oxygen is assumed at 40 m^3/day.

Annual consumption

Oxygen:

40 m3/day × 30 days × 12 months = 14,400m3/year

Unit price of the medical gas (oxygen):

8,400VND/m3 × 14,400m3/year = 120,960,000 VND/year.

Therefore, the annual medical gas charge is 120,960,000 VND/year.

6) Diesel fuel cost:·····297,600,000 VND/year

Diesel fuel is used as fuel for the boiler and for the emergency electric power generator. Consumption of boiler fuel is assumed at 200 ℓ/day. The emergency power generator is assumed to operate for four hours a month, for an assumed frequency of power failures of four times a month plus test operation time. The unit price of diesel fuel is 4,000 VND/ℓ.

Monthly fuel consumption:

200ℓ/day × 30 days/month ＋50 ℓ/hour × 4 hours/month = 6,200ℓ/month.

Annual fuel cost:

4,000 VND/ℓ × 6,200ℓ/month × 12 months/year = 297,600,000 VND/year.

Therefore, the annual fuel cost is 297,600,000 VND/year.

7) Building maintenance cost:·····450,000,000 VND/year

The project has selected exterior and interior finishing materials that facilitate maintenance and housekeeping of the buildings, or maintenance free so to speak. The exterior finishing materials are designed to require nothing but periodic cleaning. Regarding the interior finishing materials, the floors are finished with stones or local terrazzos, and walls with tiles or paints. With such materials, maintenance cost of the

buildings, -- including the costs for exterior and interior maintenances, repairs and replacement parts purchase of electric, water supply and drainage systems, air conditioning facilities --, is assumed to be 30,000 VND/m^2/year, or one half or one third of Japan's unit cost.

Therefore, the annual maintenance cost of the buildings is 30,000 VND/m^2/year × 15,000m^2 = 450,000,000 VND/year. Since these buildings are new, this maintenance cost arises two years after the completion onward.

8) Equipment maintenance cost: ·····26,280,000 yen/year

This project envisages as policy for selection of equipment renewal of the existing equipment and supplementing equipment that is not sufficient in number. In reality, equipment is provided mainly for supplementing equipment that is insufficient in number. Therefore, cost of procurement of consumables may be considered not greatly different from the present maintenance cost. However, procurement cost of the replacement parts that are not procurable because the equipment is too obsolete is necessary for maintenance of newly purchased equipment. Therefore, sufficient budget must be secured for replacement parts.

The past record shows that the budget for replacement parts for medical equipment was about 15 million yen per year for the entire hospital. Additional budget required for the newly planned equipment is estimated at 28 million yen. The incremental maintenance cost for medical equipment is estimated close to twice the present maintenance cost for medical equipment. MOH of the government of Vietnam and HCH are required to secure the estimated budget for the equipment.

The maintenance cost of equipment does not include the costs of recording papers, reagents, consumables, etc. However, HCH is able to purchase these pieces. Costs for these items would not greatly increase as a result of this project.

The attached list below shows the result of a calculation of the medical equipment maintenance cost.

Table 2-29 Breakdown of Equipment Maintenance Cost

Code No.	Division, department	No.	Equipment	Planned Q'ty	Maintenance and operation unit cost (yen/year)	Maintenance and operation total cost (yen/year)
4	Surgery	1	X-rays equipment, C arm	1	2,000,000	2,000,000
5	Diagnostic imaging	3	X-rays equipment, general roentgenography	4	1,500,000	6,000,000
6	Diagnostic imaging	5	X-rays equipment, portable	1	800,000	800,000
8	Diagnostic imaging	2	X-rays equipment, for radioscopy	1	2,500,000	2,500,000
9	Dentistry	2	X-ray film processor, for dentistry	1	200,000	200,000
10	Diagnostic imaging	6	X-ray film processor	2	300,000	600,000
17	Surgery ICU Infant	7 2 6	Patient monitor	30	50,000	1,500,000
34	Emergency Department	16	Ambulance	2	800,000	1,600,000
35	ICU (transferred from operation rooms)	27	Blood gas analyzer	1	200,000	200,000
37	Sterilization room	1	High pressure steam sterilizer, central supply room	4	400,000	1,600,000
39	Infant Obstetrics and gynecology (newborn nursery)	5 3	Light therapy unit	5	30,000	150,000
43	Biochemical examination	9	Automatic biochemical analytic apparatus	1	600,000	600,000
46	Blood test Bacteriological examination	11 8	Water distilling apparatus (A)	2	70,000	140,000
48	Surgery ICU Recovery room	13 4 11	Cardioverter	3	50,000	150,000
50	ICU	10 6	Syringe pump	5	40,000	200,000
51	ICU	7	Respirator	12	200,000	2,400,000
54	Emergency Department Surgery Physiological function examination	7 15 12	Electrocardiograph, 12 leads	5	100,000	500,000
	ICU	5				
59	Physiological function examination	11	Ultrasonography unit, color	2	300,000	600,000
60	Emergency Department Obstetrics and gynecology (diagnosis and examination room)	4 23	Ultrasonography unit, portable	2	200,000	400,000
61	Otolaryngology ICU	6 11	ultrasonic nebulizer	6	20,000	120,000
64	Surgery	6	Electric cautery	8	20,000	160,000
66	Dentistry	15	Dental unit	8	20,000	160,000
76	Obstetrics and gynecology (delivery room) Obstetrics and gynecology (diagnosis and examination room)	12 22	Tocomonitor	3	40,000	120,000

Code No.	Division, department	No.	Equipment	Planned Q'ty	Maintenance and operation unit cost (yen/year)	Maintenance and operation total cost (yen/year)
79	Recovery room Infant Obstetrics and gynecology (newborn nursery)	3 4 1	Incubator	11	50,000	550,000
80	Surgery	8	Anesthesia machine, equipped with a respirator	8	160,000	1,280,000
81	Surgery	4	Astral lamp	8	30,000	240,000
	Other items			1 set		1,510,000
						26,280,000

* Those items which are not shown in the table are considered not to require maintenance cost.

(2) Financial Status

The table below shows the income and expenditure balance of HCH for fiscal 2000 to 2003. HCH is under the direct control of MOH; therefore, the government's budget is from the subsidy by MOH only, with no input from the provincial government.

The financial status of hospitals in Vietnam has undergone drastic changes as a result of introduction of a new system in 1989 in which patients pay user fees, and introduction of a health insurance system in 1993. The subsidy by MOH now represents less than 50 percent of the income of HCH. The ratios of user fees paid by patients and health insurance income to the total incomes are gradually increasing, and the positive income expenditure balance is also increasing.

Table 2-30 Income Expenditure Balance of HCH

Income and expenditure item	2000		2001		2002		2003 (estimated)	
	Mil. VND	%	Mil. VND	%	Mil. VND	%	Mil. VND	%
Income	**52,901**	**100**	**61,072**	**100**	**69,075**	**100**	**78,601**	**100**
User fee	12,789	24.2	16,937	27.7	21,533	31.2	25,733	32.7
Health insurance income	6,567	12.4	7,692	12.6	10,997	15.9	12,547	15.9
Subsidy by MOH	29,334	55.4	31,460	51.5	34,051	49.3	37,456	47.7
Others	4,211	8.0	4,983	8.2	2,494	3.6	2,864	3.6
Expenditure	**51,265**	**100**	**61,119**	**100**	**65,937**	**100**	**75,223**	**100**
Salary	9,986	19.5	11,813	19.3	12,628	19.1	14,643	19.4
Equipment maintenance	1,811	3.5	1,736	2.8	1,173	1.8	1,429	1.9
Facility maintenance	1,187	2.3	645	1.1	500	0.8	550	0.7
Utility	3,015	5.9	3,430	5.6	3,156	4.8	3,571	4.8
Medicine	12,299	24.0	14,437	23.6	19,507	29.6	22,376	30.1
Consumable, reagent	10,016	19.5	10,425	17.1	10,228	15.5	12,031	15.9
Education, training	135	0.3	227	0.4	92	0.1	101	0.1
Others	12,816	25.0	18,406	30.1	18,653	28.3	20,519	27.3
Income expenditure balance	**1,636**		**▲47**		**3,138**		**3,378**	

Source: answer to the questionnaire
Maintenance and operation cost

(3) Financial Status and Maintenance Cost

The maintenance cost of this cooperation project after commissioning is estimated at 6,657,944,000VND every year, of which the facility maintenance cost is 3,372,944,000VND and the equipment maintenance cost is 3,285,000,000VND.

The maintenance cost of HCH in 2003 is 5,311,000,000VND, representing about 7.4 percent of the expenditure. After commissioning of this cooperation project, the maintenance cost could become twice the present cost. HCH and MOH promised to secure the necessary management and maintenance costs (6,657,944,000VND). Meanwhile, the income of HCH is increasing every year at a rate of about 10 percent.

Chapter 3 Project Evaluation and Recommendations

CHAPTER 3. PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effect

(1) Expected Direct Effect

This project is expected to bring about the following direct effects.

1) Provision of high-quality tertiary medical service

Renewal of the obsolete facilities and equipment of the Hue Central Hospital will intensify its hospital functions as tertiary medical institution (specifically, functions of the Examination Department, operation rooms, ICU, Outpatient Division, etc.). The intensified medical functions thus realized of the Hue Central Hospital will enable the hospital to adequately and promptly cope with patients who come to receive high-quality medical services not available elsewhere in this region. In short, the Hue Central Hospital will become able to provide high-quality tertiary medical services.

2) Enhanced efficiency of medical services by centralization of the central diagnosis and treatment functions

The project will centralize the central diagnosis and treatment functions, and the outpatient functions including the emergency rescue functions, presently separately located in the hospital premises. The centralization of these functions will improve the efficiency of medical services. The effects of centralization include shorter waiting time and distances of movements of the patients in the hospital, shorter period from order to completion of medical examinations, and shorter average inhospital days of patients.

3) Improvement of services of the hospital realizable by increase in medical treatment fee

The numbers of surgical operations and medical examinations, and private (one-bed) rooms will increase, on completion of the construction of the new buildings and renewal of equipment. Consequently, the medical treatment fees collectable from patients will increase. The hospital is allowed to spend 70 percent of the medical treatment fees for purchase of medicines, consumables and equipment. This will enable the hospital to further improve itself, and to increase the degree of financial independence of the hospital from the present state.

(2) Expected Indirect Effect

This project is expected to bring about the following indirect effects.

1) Improvement of services of the hospital realizable by increase in medical treatment fee

The numbers of surgical operations and medical examinations, and private (one-bed) rooms will increase, on completion of the construction of new buildings and renewal of equipment. Consequently, the medical treatment fees collectable from patients will increase. The hospital is allowed to spend 70 percent of the medical treatment fees for purchase of medicines, consumables and equipment. This will enable the hospital to further improve itself, and to increase the degree of financial independence of the hospital from the present state.

2) Upgrading of the level of medical and healthcare services in entire Central Vietnam

Upon completion of this project, the medical service functions of the Hue Central Hospital, the core tertiary medical institution of Central Vietnam, will be strengthened and improved. Naturally, the level of medical and healthcare services, now inferior to those of North Vietnam and South Vietnam, will be improved. The facilities for DOHA (community health direction activity) to be installed in vacant spaces to be created in the existing space as a result of construction of new buildings will be able to better assist hospitals under the umbrella of HCH in their activities for improvement of medical techniques and upgrading of regional medical services.

(3) Use of Performance Indicator

The number of surgical operations per year and occupancy rate of the beds of the subject hospital will be used as parameter for evaluation of this project.

3-2 Recommendations

In order for the project to be smoothly and effectively managed, it is recommended that the following improvements or arrangements be done.

(1) The hospital staff should receive sufficient training on proper operation and maintenance of the facilities to be built or modified by this cooperation project, with a sufficient budget secured specifically for this purpose.

(2) It is necessary to strengthen the referral function, which is not sufficient enough now, and to intensify the DOHA activities to reinforce the ties with hospitals under the umbrella of HCH, thereby upgrading the quality of regional medical services, including the preventive medical services.

(3) Many pieces of medical equipment are older than 20 years. Some of them have been modified by the maintenance technicians, because spareparts or consumables for such pieces are no longer available. However, such practices could be hazardous to the patients. Hereafter, establishment of a sound management system of medical equipment is urgently desired, including securing of a proper budget and a long-range procurement plan of medical equipment.

(4) Normally, a maintenance agreement should be sealed with the suppliers for purchase of such expensive facilities or equipment as X-ray equipment. Presently, some are used without such an agreement. This presents a risk of some pieces of medical equipment being not effectively used in the future. The management system of medical equipment is desired also from this viewpoint.

(5) HCH is located in Hue city which is far away from Hanoi where Ministry of Health is. Close cooperation is desired so that the information exchange and decision making (mainly securing of budget) between HCH and Ministry of Health can be conducted on schedule without arrears.

Appendices