

Japan International Cooperation Agency  
Ministry of Health  
Kingdom of Cambodia

No. 1

**Basic Design Study Report**  
**on**  
**The Project for the Construction**  
**of**  
**National Maternal and Child Health Center**  
**in**  
**Kingdom of Cambodia**

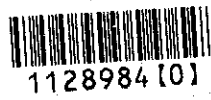
**May 1995**

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## PREFACE

In response to a request from the Government of the Kingdom of Cambodia, the Government of Japan decided to conduct a basic design study on the Project for the Construction of National Maternal and Child Health Center and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Cambodia a study team headed by Mr. Akira Kasai, Technical Special Assistant to the President, JICA and constituted by members of International Medical Center of Japan and Nihon Sekkei, Inc., from November 27, to December 24, 1994.

The team held discussions with the officials concerned of the Government of Cambodia, 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 Cambodia in order to discuss a draft report, 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 Kingdom of Cambodia for their close cooperation extended to the teams.

May, 1995



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Kimio Fujita  
President  
Japan International Cooperation Agency

May, 1995

Mr. Kimio Fujita  
President  
Japan International Cooperation Agency  
Tokyo, Japan

Letter of Transmittal


We are pleased to submit to you the basic design study report on the Project for the Construction of National Maternal and Child Health Center in the Kingdom of Cambodia.

This study was conducted by Nihon Sekkei, Inc., under a contract to JICA, during the period November 18, 1994 to May 31, 1995. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Cambodia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

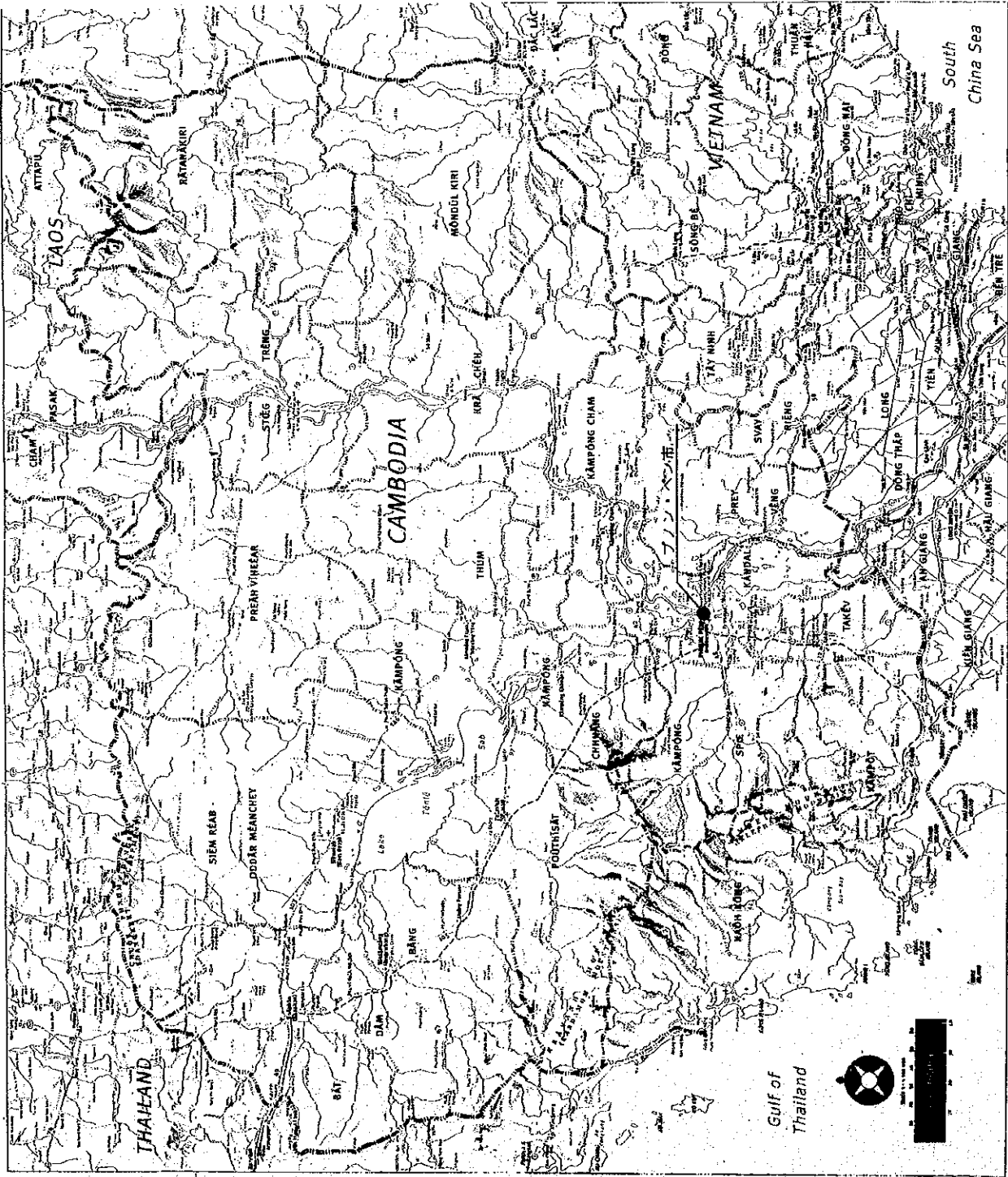
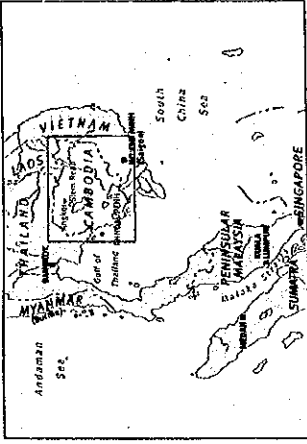
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, Ministry of Health and Welfare and International Medical Center of Japan. We would also like to express our gratitude to the officials concerned of Ministry of Health, the JICA Cambodia Office, the Embassy of Japan in Cambodia for their cooperation and assistance throughout our field survey.

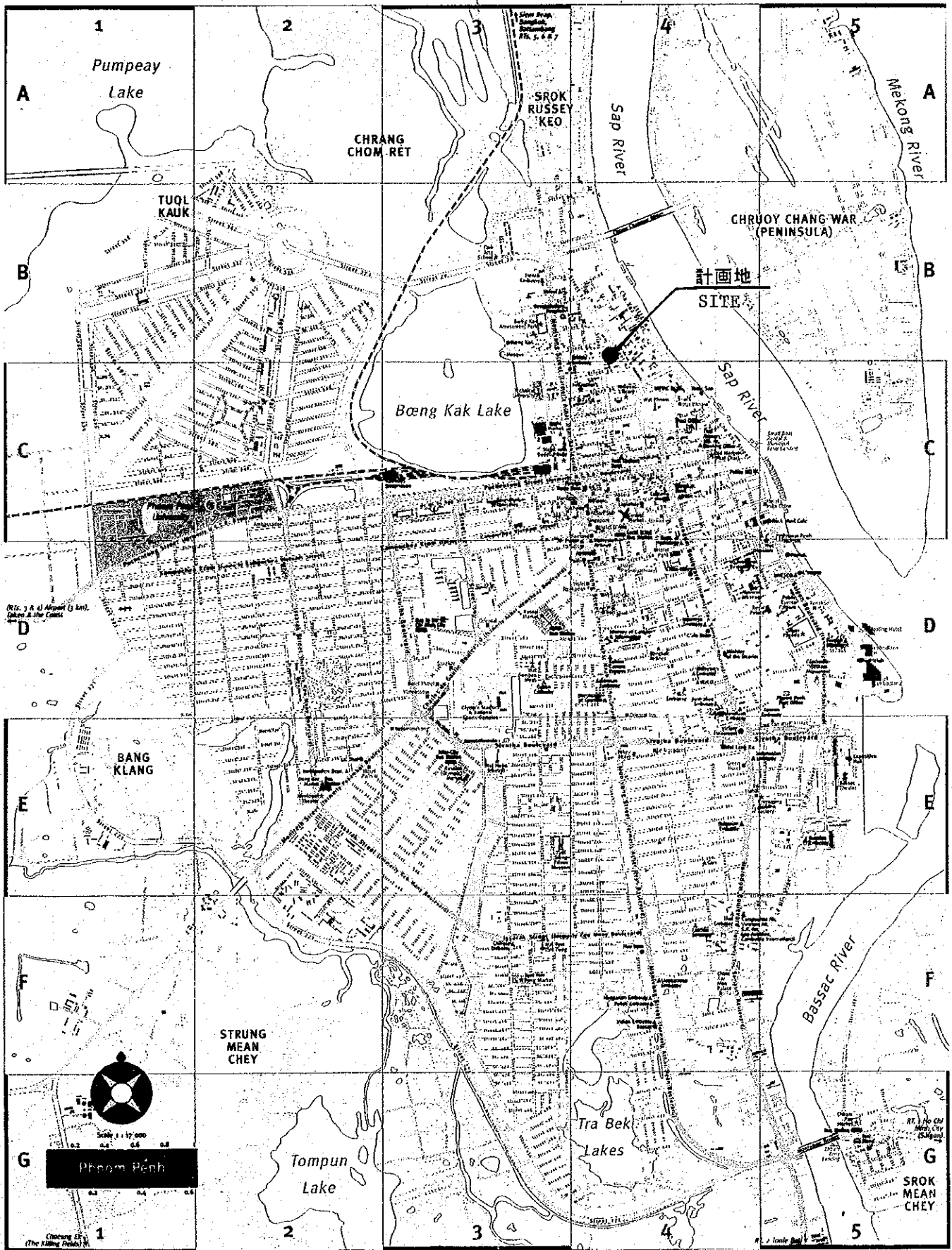
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



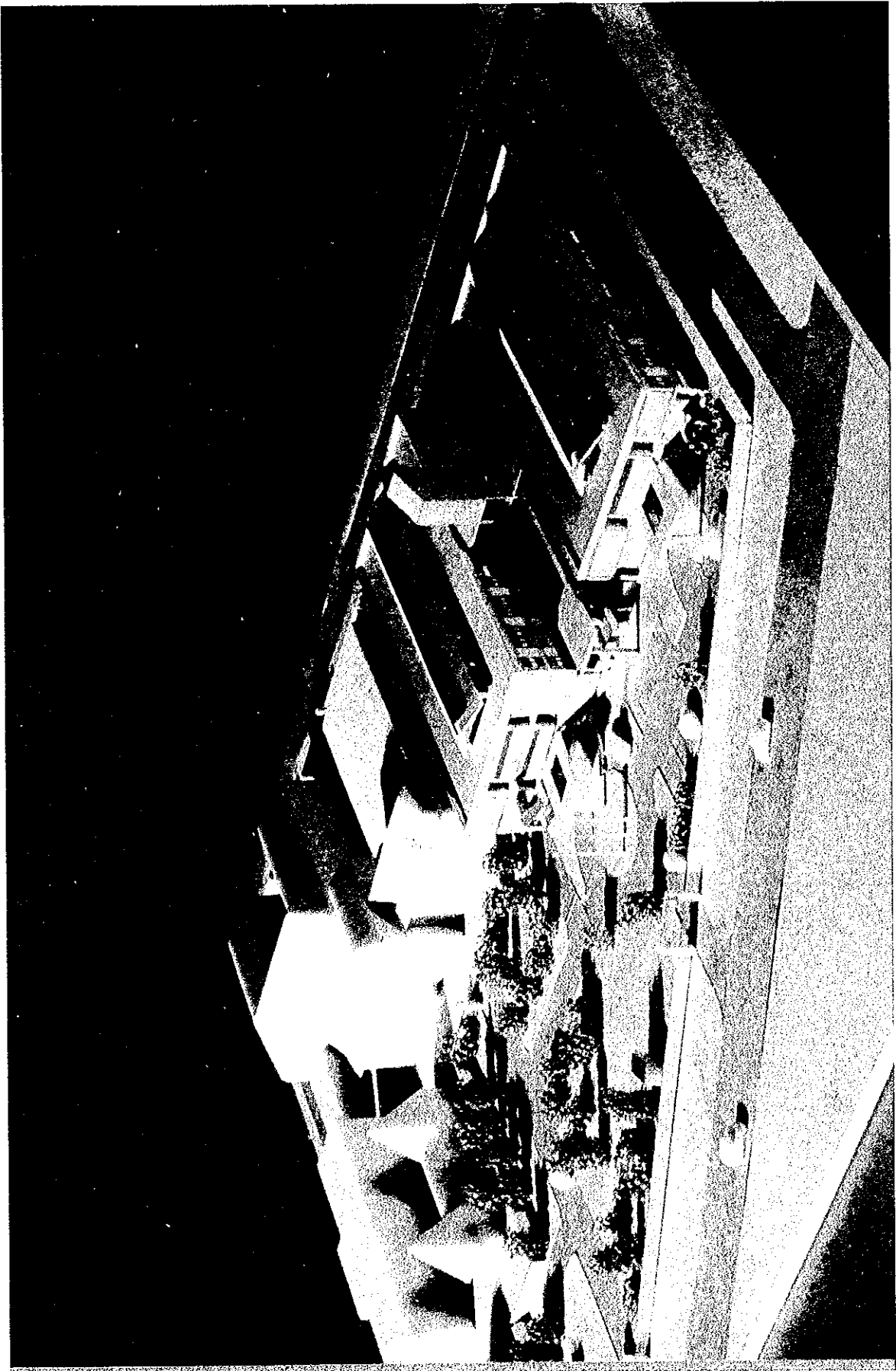
Ichiro Kanagawa  
Project Manager,  
Basic Design Study Team on  
The Project for the Construction of  
National Maternal and  
Child Health Center  
Nihon Sekkei, Inc.













## **SUMMARY**

Maternal and Child Health Center, the existing major facility offering maternal and child health (MCH) care services in the Kingdom of Cambodia, holds 200 beds in an 8,245m<sup>2</sup> facility at the January 7 Hospital. Each year, 39,000 outpatients and 8,000 inpatients are treated with 4,500 babies born at the center. The need for its services has grown since the end of the civil war. With assistance from international aid, the center also conducts training for health care personnel.

The Center's hospital functions have deteriorated sharply since it was built 30 years ago. Located at ground level far lower than nearby roads, it is subject to flooding by rain water and is unsanitary. Its inadequate electric power supply interferes with its operations. For these reasons it must be relocated to a new building.

When it was established, the new government of Cambodia stressed the importance of MCH, drafting the National Health Development 1994/1996 and the Maternal and Child Health Plan 1994/1996.

Since 1992, Japan has dispatched advisors to Cambodia to assist the Ministry of Health with efforts to resolve problems plaguing MCH. Thanks to their efforts, MCH is now one of the top priorities of Cambodian health care officials, who now view the training of qualified personnel, the provision of the needed infrastructure, and the improvement of administrative organizations as urgent tasks.

The Government of Cambodia has asked Japan for technical cooperation with its Maternal and Child Health Project. Japan has agreed to provide technical cooperation for a period of five years beginning in April 1995.

On the premise that technical cooperation will be provided for this Project, the Government of Cambodia has established plans to construct a new building to house the Maternity Department, the Training Department, lodging accommodations, and administrative offices of the National Maternal and Child Health Center (NMCHC) and to procure all required equipment. and the Government of Cambodia has asked the Government of Japan to provide grant aid to finance the implementation of this Project.

Responding to this request, the Government of Japan decided to conduct this study. In November 1994, the Japan International Cooperation Agency (JICA) dispatched a basic design study team to Cambodia. The team conferred with concerned officials of the Government of Cambodia, surveyed related facilities, gathered required documents, and studied the background and details of the Project, as well as the planned construction site. The team analyzed their findings in Japan. In April 1995, they returned to Cambodia to explain the content of the draft report, and prepared this final basic design study report.

Based on their study, the team has concluded that it is necessary to improve MCH and treatment services not only in Phnom Penh, but throughout Cambodia, by constructing the

facilities and procuring the equipment that are needed to provide or improve the following MCH services at the NMCHC.

- 1) Treatment and diagnosis in the MCH field.  
Maternal clinic, operation theaters, delivery rooms, central sterilization supply departments, X-ray rooms, examination rooms, etc. in the Maternity Department.
- 2) Top referral hospital for MCH.  
Function as the core hospital accepting referrals of difficult cases in Cambodia.
- 3) Training of MCH specialists.  
Training facilities, auditorium, classrooms, library, lodging facilities, etc. for medical personnel from throughout Cambodia.
- 4) Assistance for drafting and implementing MCH policies.  
Meeting rooms, staff rooms, preparation rooms for the advisor group to train, formulate and implement MCH policies.
- 5) After the study, we agreed to have one 40 seat class room instead of two, and to reduce the dormitory beds from 80 to 30 considering the curriculum and schedule of training.

The new NMCHC building will be constructed on a site adjoining the Kuntha Bopha Hospital in Phnom Penh.

Site Area:	ca. 11,735m <sup>2</sup>
Building Floor Area:	ca. 9,118m <sup>2</sup>
Structure:	Reinforced concrete construction, 1-story, 2-story, and 3-story
Principal Rooms:	<ul style="list-style-type: none"><li>• 3rd Floor - Lodging facilities, class rooms, library, staff room</li><li>• 2nd Floor - Wards (A)(B) (C), delivery rooms and operation theaters, central surgical supply.</li><li>• 1st Floor - Outpatient department, X-ray, examination rooms, pharmacy, waiting rooms, doctors offices, doctors lounge, lecture hall, lockers, supply rooms, kitchen, cafeteria, laundry, work-shop</li></ul>
Equipment:	Medical equipment needed for basic diagnosis and treatment and basic equipment needed for training, research, and public information activities

The construction work will take 16 months to complete.

The Directorate of the NMCHC, General Directorate of Health, Ministry of Health will implement the Project. The NMCHC will manage the new hospital.

The Project will achieve the following benefits to improve the level of medical care for mothers and children in the Kingdom of Cambodia.

- 1) The new NMCHC will be large enough to provide MCH services to meet increases in the number of outpatients, hospital admissions, deliveries, and surgical patients forecasted for the next five years.

Outpatients	153/day
Deliveries	19/day
Wards	150 beds
Surgical Operations	10.1/day

With this, the NMCHC will improve its quality and increase its capacity of MCH services. These improvements will help prepare for the growing demand for MCH in the city of Phnom Penh.

- 2) The NMCHC will be able to share its achievements with the entire nation by offering training in MCH to medical personnel from all parts of Cambodia.
- 3) The political and economic stabilization of Cambodia will be accompanied by National Health Policy Making.

Furthermore, we believe that the Project will provide benefits to large numbers of Cambodian citizens including those with low incomes, thereby contributing to the stability of their daily lives. We have concluded that this project is fully qualified for grant aid from Japan.

The Ministry of Health will: assign personnel with sufficient academic training, educate medical staff to sufficient qualifications to operate the NMCHC, and to enhance the level of its activities, take steps to increase the needed hospital beds in Phnom Penh and work to achieve adequate communication between the new hospital and the Kunta Bopha Hospital. The Kunta Bopha Hospital is located on the same site and will serve as the NMCHCs pediatrics department to ensure smooth cooperation upon the completion of the new building.

To make the Project even more effective, the principles of sanitation should be taught to all medical personnel so they can improve the hospital environment.

To ensure the adequate maintenance and management of the new hospital, the Ministry should set aside a special budget as well as take other innovative steps such as having patients bear a portion of the cost of their medical care.

## Table of Contents

Preface

Letter of Transmittal

Location Map

Cutaway View Image Sketch

Summary

<b>Chapter 1. Background to the Project</b> .....	1
1-1 Background of the Project .....	1
1-2 Summary and Principal Components of the Request.....	1
<b>Chapter 2. Outline of the Study</b> .....	3
<b>Chapter 3. Project Environment</b> .....	6
3-1 Social and Economic Conditions in Cambodia .....	6
3-2 Development Plans in this Sector .....	6
3-2-1 Upper Level Plans.....	6
3-2-2 Finances.....	6
3-3 Projects Supported by Other Nations and International Organizations .....	7
3-4 Assistance Provided by Japan .....	8
3-5 Condition of the Project Site .....	9
3-5-1 Natural Conditions .....	9
3-5-2 State of the Social Infrastructure.....	9
3-6 Environmental Concerns .....	11
<b>Chapter 4. Detailed Description of the Project</b> .....	13
4-1 Basic Project Concept .....	13
4-1-1 Cooperation Policy.....	13
4-1-2 Conclusions of the Study of the Details of the Request.....	13
4-2 Project Objectives.....	27
4-3 Project Implementation Organization.....	27
4-3-1 Organization and Personnel .....	27
4-3-2 Maintenance and Management Plan .....	29
4-3-3 Budget and Fiscal Planning .....	36
4-4 Basic Design.....	38
4-4-1 Basic Guidelines .....	38
4-4-2 Study of the Design Conditions.....	39

4-4-3	Basic Plan .....	48
	(1) Site and Layout Plan .....	48
	(2) Building Plan .....	49
	1) Floor Plan .....	49
	2) Section Design .....	52
	(3) Structural Plan .....	53
	(4) Mechanical and Electrical Plan .....	55
	1) Electrical Plan .....	55
	2) Plumbing Plan .....	58
	3) Air-conditioning and Ventilation Plan .....	60
	(5) Building Materials Plan .....	61
	(6) Equipment Plan .....	62
	(7) Basic Design Drawings .....	72
4-5	Construction Plan .....	73
4-5-1	Construction Guidelines .....	73
4-5-2	Special Construction Conditions .....	75
4-5-3	Construction Supervision Plan .....	75
4-5-4	Materials and Equipment Procurement Plan .....	78
4-5-5	Implementation Schedule .....	82
4-6	Technical Cooperation and links with Other Donors .....	84
<b>Chapter 5. Project Evaluation and Suggestions .....</b>		<b>85</b>
5-1	Benefits and Effects of the Project .....	85
5-2	Examination of appropriateness .....	86
5-3	Suggestions .....	87

#### **Annexed Documents**

1. Basic Design Study Team (November 27 - December 24, 1994)
  - (1) Member List
  - (2) Survey Schedule
  - (3) Discussants
  - (4) Minutes of Discussions
  
2. Draft Report Explanation Team (April 18 - April 26, 1995)
  - (1) Member List
  - (2) Survey Schedule
  - (3) Discussants
  - (4) Minutes of Discussions
  
3. Photos of Project Site

## **Chapter 1. Background to the Project**

### **1-1 Background of the Project**

Cambodias long civil war has left its mark on the country. Public health and medical care services have sharply deteriorated, with the rates of life expectancy, infant mortality and maternal death indicators of the level of medical care, now one of the lowest in Asia. Currently almost half of the country's health care and medical treatment facilities are unusable.

Since 1992, Japan has dispatched the advisors to the Ministry of Health of the Government of Cambodia to help the nation deal with problems in the administration of its medical treatment and health care services. Following the general election of May 1993, the new government, which was officially established in September of the same year, enacted the National Health Care Plan 1994-1995 and the National Maternal and Child Health Plan 1994-1996. Now being implemented, these plans emphasize the important position MCH occupy in health care and medical treatment planning in Cambodia. As a result of the introduction of these plans, maternal and child care is now one of the top priorities of Cambodian health care officials, who now view the training of qualified personnel, the provision of the needed infrastructure, and the improvement of administrative organizations in the MCH field as urgent tasks.

The Government of Cambodia then asked Japan for technical cooperation with the Maternal and Child Health Project. In July 1994, Japan sent a preliminary study team to Cambodia where it reached an agreement with the government on the broad outlines of cooperation. In February 1995, another team was sent to study the implementation and discuss it with the Cambodian officials. In April 1995, Japan began a five-year program of technical cooperation with the NMCHC Project.

On the premise that technical cooperation will be provided for this Project, the Government of Cambodia has asked the Government of Japan to provide grant aid to finance the construction of a new building to house the Maternity Department, Training Department, lodging facilities, and administrative offices of the NMCHC as well as to cover the cost of procuring all required equipment.

When the above facilities are moved to the new NMCHC, the technical cooperation with the Project will also move to the new building.

### **1-2 Summary and Principal Components of the Request**

#### **(1) Purpose of the Request**

To draft and plan policies for MCH services for the Kingdom of Cambodia, and to improve and strengthen personnel training, diagnosis and treatment in the MCH field throughout the nation by constructing a new building to house the NMCHC.

#### **(2) Implementation Body**

The NMCHC will implement the Project under the leadership of the Ministry of Health.



**(3) Details of the Implementation**

The government has requested grant aid to cover the costs of constructing a new home for the NMCHC, a maternal hospital with training and lodging facilities, and to supply the medical equipment for the new facility. The hospital facilities will serve as a center for training of medical personnel. These training facilities will help to educate and improve the skills of medical personnel while the attached lodging accommodations will allow trainees from all parts of the country to take part in this program. Kuntha Bopha Hospital will, as a part of the NMCHC, together with the new facility to offer comprehensive service in all areas of MCH.

## **Chapter 2. Outline of the Study**

As part of the process described in Chapter 1, in December 1993 the Government of the Kingdom of Cambodia asked Japan to provide grant aid to finance the Maternal and Child Health Center construction project. The Government of Japan responded by instructing JICA to carry out a study. JICA dispatched a basic design study team led by Mr. Akira Kasai, Technical Special Assistant to the President of JICA, from November 27 to December 24, 1994 to carry out a basic study needed to enact the best possible cooperation proposal for the Project and to determine what kinds and what quantities of equipment would be needed to implement the project.

A discussion of the study follows. The annexed documents include a list of the team members, the study itinerary, discussants, and the minutes of the discussion.

### **1. Discussions Based on the Inception Report**

The Cambodian officials presented the team with an explanation of the significance of MCH in the health care and medical treatment field and the progress already achieved in related programs. The study team then explained the procedures to be followed once grant aid is provided, and its relationship with the project type technical cooperation.

### **2. Confirmation of the Content of the Request**

The Cambodian representatives explained the background to the request and reasons for specific aspects of the request. The two sides then weighed the differences between the initial request and requests made to the preliminary design team. The Cambodian side had asked to increase the number of beds to 200 beds, but finally agreed that 150 beds was the most appropriate, considering the scale of the present center and the need to manage the new facility as a model hospital for training purposes. As requested by the Cambodian side, details of the surgery facilities were changed and an auditorium accommodating 200 people was approved.

### **3. Clarification of the Present Status of the NMCHC**

Dr. Eng Huot, and his staff explained the current operations of the NMCHC and their hopes for the new facility. The team was then given a guided tour of each department of the existing NMCHC.

### **4. Study of the Project Site (See 3.5)**

Dr. Eng Huot began by stating that they would like the former site of the Pasteur Research Institute, (adjacent to the planned Project site), to be included as part of the project site. The team welcomed this suggestion. When asked about the handling of existing buildings on the site, NMCHC officials stated that anything which interfered with the construction plans could be torn down. They also said that a number of buildings had been illegally torn down, but once this Project be confirmed, they would secure the land for the Project. Therefore they would like the team to come to a decision quickly. They also told the team there would not be any problems removing squatters, and guaranteed the team's safety during the length of the study.

Although the boundary line between the Site and the adjoining Kuntha Bopha Hospital had already been confirmed by the Ministry of Health, the Kuntha Bopha Hospital made a direct request to the study team that the Japan side not to construct any facilities on a part of the Site. The team checked with the Ministry of Health, and confirmed that the Site had been promised to the Japan side, thus reconfirming that there would be no changes made.

The team carried out a geographical and geological survey of the site.

5. Study of Financial Conditions

A study of the budget and expenditures showed that the National Budget System had been introduced in 1994, but because it does not show clearly about the income to support this Budget, the team questioned its financial capability. For this, the Ministry of Health explained that they have already begun negotiations with financial authorities concerning the increased operating costs of the new NMCHC.

Medical care is supposed to be free in Cambodia, but the study team expressed the view that the government should consider an appropriate fee system for patients in order to sustain hospital management. The NMCHC representatives agreed to consider the matter.

6. Personnel Study

Although the total number of the staff is sufficient, the specialists in some of the fields are needed to be increased. Especially the staff for the equipment maintenance are needed to be increased and trained.

7. Discussions of the Details of the Project

Based on the above studies, a draft plan was prepared as the basis for further discussions. The team discussed on the plan with representatives from every department. Modifications were made in the process of arriving at a basic agreement.

8. Study of the Costs to be Borne by Cambodia

When Japan provides grant aid, the country receiving this assistance is responsible for the cost of removing existing structures, land preparation, connecting the site to infrastructure services, and constructing gates and fences around the site. But Cambodia asked if Japan would bear these costs because it would be very difficult to set aside the necessary funds. The study team decided to study the matter further in Japan.

9. Study of Equipment Already Contributed

The two sides agreed that the equipment supplied to the January 7 Hospital as part of the Phnom Penh Medical Equipment Improvement Project conducted in 1992, would be moved to the new NMCHC as much as possible.

10. Discussions with Representatives of International Organizations and Aid Groups from Other Countries

The team explained the plan for the Project to the advisors sent to the NMCHC by UNICEF, AIDAB, UNFPA, and JICA. As supporters of the training and publicity activities of the NMCHC, these organizations operate in and out of NMCHC facilities. They gave

high marks to the Project and expressed their willingness to cooperate actively in its implementation.

## **Chapter 3. Project Environment**

### **3-1 Social and Economic Conditions In Cambodia**

Deleted in English edition.

### **3-2 Development Plans in this Sector**

#### **3-2-1 Upper Level Plans**

Following the promulgation of the new Constitution (September 1993), the Government of Cambodia enacted the National Development Plan and the National Health Care Plan (1994-1996). The following is an outline of the National Health Care Plan.

The major goal of the national health administration is to preserve the health of its citizens. It also requires that efforts be made to improve MCH, control communicable disease, and prevent and treat patients in outlying parts of the country. Its goals for the next three years include the prevention of epidemic outbreaks and to provide basic medical services in the outlying parts of Cambodia by improving and expanding the primary health care provided by the regional health care system. Regarding MCH, it refers to the high morality rate among pregnant women, particularly during delivery and declares that emergency measures must be adopted to deal with this problem.

Specifically, the proportion of children and mothers receiving vaccinations will be increased, medical care personnel, particularly midwives, nurses, and health care advisors, will be retrained and their numbers increased to improve the quality of the service and care they can provide.

The specific objectives that the Department of Primary Health Care would like to achieve in the next three years include the provision of a system which allows 80% of pregnant women living in the city and 50% of those residing in the rural areas to obtain treatment from medically qualified persons such as midwives throughout their pregnancies.

#### **3-2-2 Finances**

Until 1993, financial plan consisted of mostly payments of personnel costs.

In line with the new Financial Law, beginning in 1994, the budget was compiled by totaling the requests for funds from each administrative units.

While the total value of the 1994 budget was 889.6 billion riels (¥35.584 million), operating costs alone came to 577.6 billion riels (¥23.104 million).

In contrast to this, the Ministry of Health's operating budget was 45.898 billion riels (¥1.836 million), or approximately 8% of total government operating costs. Twenty-two percent of this operating budget was allotted to national programs (malaria, tuberculosis, AIDS, MCH,

CNHE, and the Blood Bank). The MCH related budget came to 1.575 billion riels or about 16% (¥63 million).

Seventy-one percent of the funds spent on MCH was used to obtain medical equipment and consumable supplies, 11% spent on training, and 12% used for health education and public relation activities. Personnel costs were not included.

### **3-3 Projects Supported by Other Bilateral and Multi-lateral Assistance and International Organizations**

#### **(1) International Organizations**

- 1) WHO: In addition to cooperating on Ministry of Health administrative and institutional projects (planning, finance, assistance coordination, and personnel requests), WHO works primarily at the policy level by dispatching consultants with expertise in important fields such as malaria, tuberculosis, AIDS, health education, pharmacology, SNIDS, (EPI) etc.
- 2) UNICEF: Along with EPI, MCH projects, and reports on medical treatment using essential drugs (AEDES), this organization has dispatched advisors to four provinces (Banteay Meanchey, Battanban, Kandal, and Svay Rien). It is also helping with a drinking water/well projects, the Family Find project (FFP), and WID projects, but these projects are being carried out in cooperation with the Ministry of Women's Affairs.
- 3) UNDP/CARE: A regional hospital improvement project is being conducted. In 1994, \$250,000 was spent primarily for building construction and to provide equipment and supplies. It is considering the dispatch of province-level advisors.
- 4) UNFP: A birth spacing project was scheduled to begin in 1994. The plan, centered at the Maternal and Child Health Center, involves the opening of clinics in Phnom Penh five other provinces and 25 districts, and provides support for IEC and training activities. UNFPA has assigned one advisor to the Maternal and Child Health Center. After training instructors to provide training, workshops will be held in each province. The program is expected to cost \$1.5 million over three years.
- 5) World Bank: In 1993, it will provide free drugs (total value of \$4.5 million) as an emergency aid measure. And it will provide emergency aid again in 1994 through its Social Fund. A medium-long term loan is under consideration.
- 6) Asia Development Bank: A public hygiene education/training project is now being studied. It is scheduled to begin sometime in 1994 or 1995. It encompasses the MCH field, and is focused on the training of persons to lead training programs. A medium-long term loan is under consideration.

#### **(2) Bilateral Assistance**

- 1) France: An aid provider since 1993, France is now assisting the Faculty of Medicine Faculty, the Calmette Hospital, and the Pasteur Research Institute. The total value of its support comes to \$6 million.
- 2) United States: It has dispatched a consultant to conduct a preliminary study of a family planning project, and is now seriously considering assistance in this field. Through WHO, the U.S. has contributed \$1 million to support the fight against dengue hemorrhagic fever, and is now providing aid through NGOs for a family planning project, (total value of \$5 million), a training project (National Childrens Hospital), and

a nutrition supplement project for children (vitamin A). A staffer of USAID began participating in COCOM at the end of last year. U.S. support for a district hospital in the north-west was suspended with the establishment of the new government.

- 3) Thailand: Thailand presented a plan for a nation-wide public hygiene education and training project (including MCH) to the Government of Cambodia and is now negotiating the issue with the Ministry of Health of Cambodia. It has also proposed to provide aid to the Nursing School in Battambang Province (including midwife training) and assistance for district hospitals in two north-western provinces.
- 4) China: Last year China decided to provide a total of \$1 million worth of medical aid and proposed rebuilding a pharmaceuticals plant as well as carrying out public hygiene training.
- 5) Germany: Germany has decided to supply drugs (total value of \$4.3 million).
- 6) United Kingdom: It is assisting in health policy making through WHO and supplying drugs (total value of \$1.5 million)
- 7) Australia: Until now, it has only provided aid through NGOs, but beginning in June 1994, AIDAB (Aus AID) reversed its policy by starting a direct project. One Australian advisor is now at the Maternal and Child Health Center (originally a member of the staff of SCF Australia). The other major activities by Australia are the supply of vaccines through UNICEF and financial support for the local NGOs by SCF Australia.
- 8) Sweden: It dispatched a study team in October 1993, but because Sweden has no embassy in Cambodia, it provides aid through UNICEF. Most of its aid is used to finance public hygiene projects.

### (3) NGOs

Many NGOs are active in the MCH field. Every month, representatives of the Ministry of Health and the NGOs hold a meeting to keep each other informed of their activities.

Three organizations supported by USAID are in the process of asking the Ministry of Health to take action on population problems. The FPIA has opened clinics in four provinces to conduct activities almost identical to those carried on by the UNFPA, and is now planning personnel development programs, contraceptive distribution, and IEC activities. About \$5 million has been budgeted over three years. The PSI, a social-marketing organization, intends to distribute condoms and oral contraceptives. This is also a project stressing IEC, and its budget is \$2.5 million over three years.

### 3-4 Assistance Now Provided by Japan

Following the Paris Accord of October 1991, the Embassy of Japan in Cambodia opened for the first time in 17 years in March 1992.

A team of experts (the Cambodia Health Care and Medical Treatment Cooperation Preliminary Survey Team) was dispatched to Cambodia in March 1992 to conduct a study of the need for technical cooperation in the fields of health. Based on their report, the following assistance is being provided.

- 1) The Project for the Improvement of Medical Equipment in Phnom Penh (1992)
- 2) Dispatch of Advisors to the Ministry of Health Cambodia

The main task performed by the advisors has been to encourage the transfer of technology of management aspect in the field of health by assisting with the enactment of health care and medical treatment administration projects, the preparation of budgets, and the enactment of annual plans, and by helping the Government of Cambodia draft policies: MCH project policies for example. They have also played an important role by coordinating the work of other aid agencies. The dispatched experts are:

Dr. Tateno (Sept. to Dec. 1992)

Dr. Kinoshita (Feb. to May 1993) (Sept. 1993 to March 1994)

Dr. Yamada (May to Sept. 1994)

Dr. Murakami (Oct. 1994 to April 1995)

- 3) A request for the project-type technical cooperation and grant aid from the Cambodian Government.(Dec. 1993)
- 4) Maternal and Child Health Project R/D signed March, 1995.  
(April, 1995 - March, 2000)
- 5) Dispatch of Specialists to MOH.  
Mr. Chiba for EPI technical assistance (Jan, 1995)  
Mr. Horie for Tuberculosis (Clinical laboratory)  
(April, 1995 - April, 1996)
- 6) Provision of Medical Equipment and materials  
Provision of Vaccine: BCG, Measles, Poliomyelitis (1992, 93, 94)  
Provision of Equipment: Ultra sonography, Operation sets etc.(1993)  
Provision of Equipment: Dental Kit, Midwife kit etc. (1994)

### **3-5 Condition of the Project Site**

#### **3-5-1 Natural Setting**

Phnom Penh, the capital of Cambodia, is located at 11° north latitude in the tropical monsoon zone. The rainy season lasts from June to October and followed by the dry season, which begins in November and continues to May. Almost no rain falls from December to February, but during the rainy season, the waters of the Sap River rise so high that the rain water can not be drained from the site, and the roads around the site are submerged.

The average temperature remains uniform most of the year at approximately 26°C. In April and May, just before the rainy season begins, the maximum temperature rises as high as 40°C. South-westerly winds are dominant during the rainy season, while northerly winds are most common in the dry season.

There is no record of earthquakes in the Phnom Penh region, and a study of geological data revealed that at the Project site, a stratum of soft clay with a depth of one meter lies above a strata of hard clay or firmly packed loamy clay. The ground water level is extremely shallow, at 0.2m below grade.

#### **3-5-2 State of the Social Infrastructure**

##### **(1) Planned Construction Site**

The planned construction site to the north of the city center in a part of Phnom Penh called Dong Penh Area. Dong Penh is historically an old area and stands between Boeng Kak Lake and the Sap River. This area is the location of the offices of many national organs and foreign embassies.



The Project site is an approximately 13,000m<sup>2</sup> plot owned by the Ministry of Health. The south side of the site is long and the north side is short and shaped like a short trapezoid. The Kuntha Bopha Childrens Hospital, which is the pediatric division of NMCHC, stands to the south of the site. A total of seven large and small deteriorated buildings now occupy the Project site, but the Cambodian side will demolish them all by the time the land is needed. The site is almost entirely at the same level as or a little lower than the surrounding roads, and there are always puddles at a few spots on the site. Main access is provided by Street 47 to the east, but it is also possible to drive on to the site from Street 86 on the North or from Street 61 on the West.

A concrete fence surrounds the site, but it has deteriorated to the point that parts of it have collapsed.

## (2) Condition of the Infrastructure at the Site

The electric power, telephone, water supply, and sewerage services, and other infrastructure elements in place at the moment are both qualitatively and quantitatively insufficient to meet the needs of the planned facility.

### 1) Electric Power Equipment

It will be possible to bring in electric power from a high voltage cable scheduled to be buried under Street 61 on the west side of the site by December 1995 with the support of the Asian Development Bank (ADB). But this power supply will have neither the capacity nor the reliability needed to meet demand, and it is not likely that it will be improved substantially by the time the facility is completed.

### 2) Telephone Service

A new telephone line has to be strung to the site from the nearest telephone exchange bureau, but right now the telephone companys exchange equipment is operating at full capacity, which means that it will be very difficult to obtain the needed telephone circuits. The telephone system in place is defective in terms of both its capacity and the quality of its service. When someone tries to make a call either he/she can not get through to the other party, or is cut off shortly after he/she does. And the lines are very noisy.

As a result, it is common practice to also use wireless telephones (cellular phones) supplied by a government-backed communications company.

### 3) Water Supply Facilities

Big improvements in the water supply service in the south-west part of the city are expected to follow completion of a water purification plant and water supply pipe improvement project now underway with support from Japan and France. Water will be taken from an existing water main with a diameter of 200mm buried under Street 47 to the east of the site, but the water supply pipes connecting the site to the purification plant have not been improved. Therefore, although the supply will improve a little, it is unlikely that either the quantity or quality will be satisfactory by the time the facility is completed.

The facility will have to use both city water and well water to stay in operation.

#### 4) Sewage Facilities

Because of the lack of a public Sewage treatment plant, waste water disposal processing equipment is installed on the site of each facility and the processed water is released into the sewage system along with rain water. This approach will be adopted at the Project site; waste water processing equipment installed on the site will be connected to an existing underground sewer pipe with a diameter of 800mm buried under Street 47 to the east of the site. It is said that more than half of the cross section of this existing sewer pipe is blocked, but it is assumed that during the dry season, it will be possible to drain the water from the site by restricting the amount of water discharged. So even if a full-scale improvement of the system is asking too much, at the very least, the main sewer pipe must be cleaned out. During the rainy season, the Sap River, which is the destination of the water drained into the sewer system will rise making it impossible to drain water from the site at that time.

#### 5) Gas Supply System

City gas is unavailable, with butane gas and LPG in wide use. But at older facilities in Phnom Penh, it is common practice to locate the kitchen in a detached building and burn wood in its oven.

#### 6) Waste Disposal Equipment

City-operated garbage trucks collect waste material and use it for landfill projects in the suburbs of Phnom Penh. The city treats medical waste material in exactly the same way as other kinds of waste, and does nothing to prevent contamination by this material. We believe that under certain circumstances, this practice is very dangerous.

### 3-6 Environmental Concerns

Cambodia has just established the Ministry of Environment, so environmental protection laws have not yet been enacted. This means that no specific rules governing the project have been announced.

The Project site was previously used as the site of a hospital about the same size as the one proposed by the Project plan. Because the building plans call for a three-story building similar to that housing the neighboring Kuntha Bopha Hospital, it will be in harmony with its environment and will not adversely effect its surroundings.

Specifically, the planned building will not block the flow of the wind nor obstruct television waves. And we do not expect that it will substantially increase the volume of traffic on nearby roadways.

People living nearby will not be bothered by noise or vibration produced at the facility. Not only will all machinery be installed in reinforced concrete buildings that provide good sound-proofing, it will be equipped with sound-proofing and vibration protection devices.

Waste will be separated by category (contaminated medical waste, other medical waste, and everyday waste) and collected separately. To the extent that a waste incinerator can be designed-in safely in light of environmental considerations, combustible waste should be disposed of on-premises. The incinerator should be equipped with an afterburner so medical waste can also be safely incinerated in it, and safeguards such as a chimney of no less than

10m height should be added to ensure against any adverse effects on the local environment.

A simple compound sewage plant that utilizes both biological treatment and soil filtration will be designed for the treatment of waste water from the site. After treatment, waste water will be discharged into the public sewer system.

## **Chapter 4. Detailed Description of the Project**

### **4-1 Basic Project Concept**

#### **4-1-1 Cooperation Policy**

The National Health Care Policy 1994-1995 and the National Maternal and Child Health Plan 1994-1996 emphasize the important position MCH occupy in health care planning in Cambodia, and the training of qualified personnel, the provision of the needed infrastructure, and the improvement of administrative organizations in the MCH field are now viewed as urgent tasks. Thus, Japan will provide technical cooperation to reinforce the capabilities of NMCHC, to upgrade training activities in medical care, and improve MCH activities.

The Project will be guided by the following basic implementation policies:

1. Construction of a new maternity hospital. This will include training facilities for medical treatment personnel, lodging, and for advisory groups dispatched by aid organizations in other countries. The equipment needed to operate these facilities will be supplied.
2. Clear identification of the level of medical care available in Cambodia, its maintenance and administrative capabilities, and its ability to bear recurrent costs, and the consequent establishment of the scale and the level of facilities appropriate thereto.
3. Planning for architectural functionality, durability, and ease of maintenance and administration, with due regard to energy conservation.
4. Provision of the best possible utilities (electricity, water, drainage) and steps to ensure stable supplies.
5. Maximum utilization of local construction methods and local materials.
6. Consideration of Cambodian, Japanese, and third-country sources for equipment; however, selected manufacturers must have complete maintenance and management organizations.

#### **4-1-2 Conclusions of the Study of the Details of the Request**

##### **(1) Contents of the Request**

A new building will be constructed to house the Maternal Department, the Training Department, and administrative offices of the NMCHC and all the required equipment will be supplied. The following is a description of the breakdown of what has been requested.

**Table 4-1 Breakdown of the Requested Facilities**

Maternity Department			
Patient ward	150 beds	Consulting rooms (gynecology)	2
3 nursing units (50 beds/unit)			
Operation theaters	3	Birth spacing	1
Delivery rooms	3	Consultation room	1
Labor room	1	Reception and waiting room	1
Neonatal room	1	Treatment, blood- & fluid-sampling rooms	2
Central surgical supply room	1	Health care consultation room	1
X-ray room	1	Pharmacy and storage	
		Administration Office.	
Physiological Exam rooms (ECG, ultrasound)	2	Medical-records store	
Laundry room	1	Equipment store	
Kitchen	1	Other related facilities and rooms	
Consulting rooms (obstetrics)	6		
Training and lodging facilities			
Auditorium (200 persons)	1	Administrative office	
		Lodging Accomodations	
20-seat classrooms	4	Dormitory (for about 80 persons)	
40-seat classrooms	2	Cafeteria	
Preparation rooms	2	Kitchen	
Store	2	Other related facilities and rooms	
Library	1		
Equipment			
Equipment for the above facilities			

(2) Study of the Content of the Request

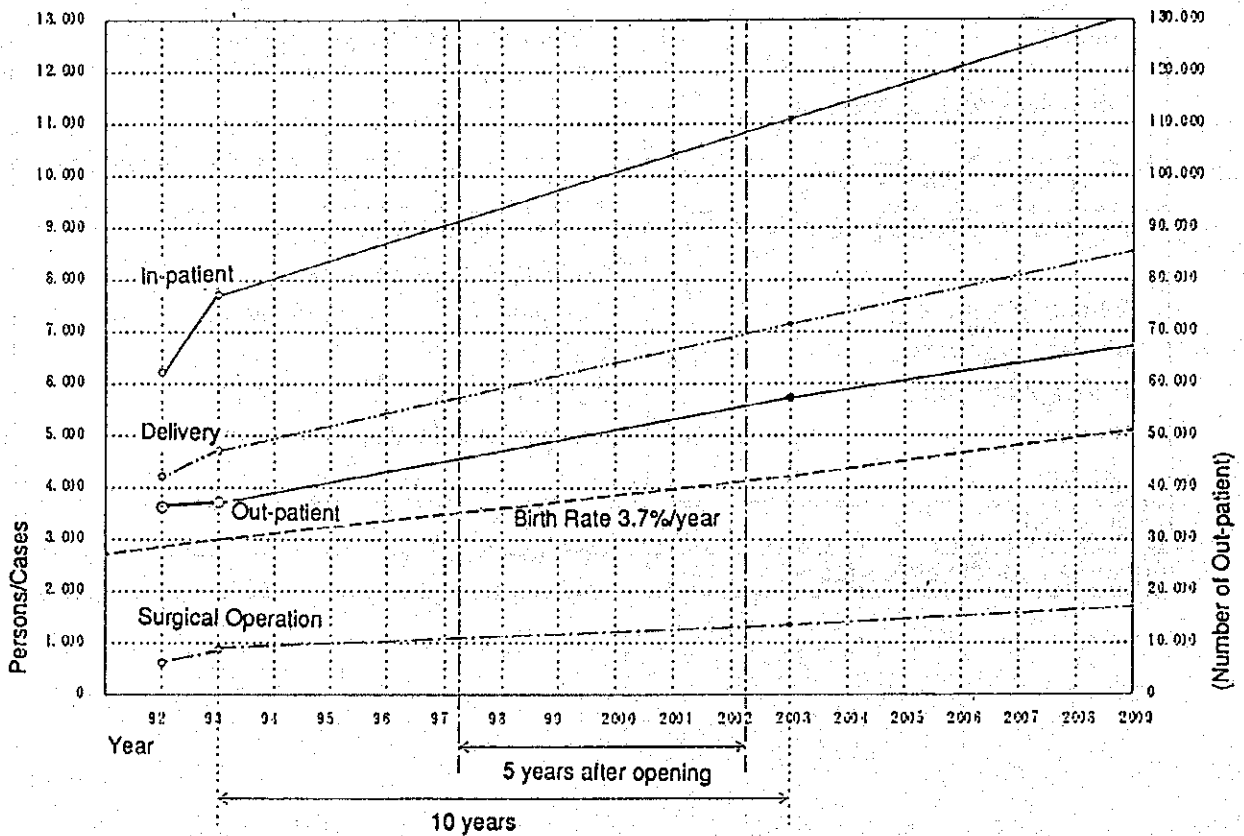
1) Requested facilities

The requested facilities are to house a maternity hospital, training facilities, and lodging accommodations, and along with the neighboring Kuntha Bopha Hospital, will constitute the new NMCHC. As a place where medical care personnel can receive training, it will benefit the entire country (Project Framework shown in Figure 4-3). Plans call for other aid organizations to be accommodated in the building, an approach sure to increase its effectiveness.

The NMCHC will be the new home of facilities now located at the "January 7 Hospital." By permitting the more effective utilization of facilities now scattered in deteriorated premises, the Project is sure to have far-reaching effects. It is therefore an appropriate project. The size of this facility will be determined as follows based on the level of medical activities of the existing hospital.

Table 4-2 shows the results of an estimation of the average number of patients based on the number treated during the past two years. Usage will rise 50% during the next five years as a result of two factors: A high birth rate of 3.7% and the growth in demand that will follow the completion of a new facility. The target size will be 50% greater than that provided now.

Fig. 4-2 Increase of Medical Treatment in NMCHC



The team studied each department of the planned facility as follows.

Fig. 4-3 Framework of NMCHC Project

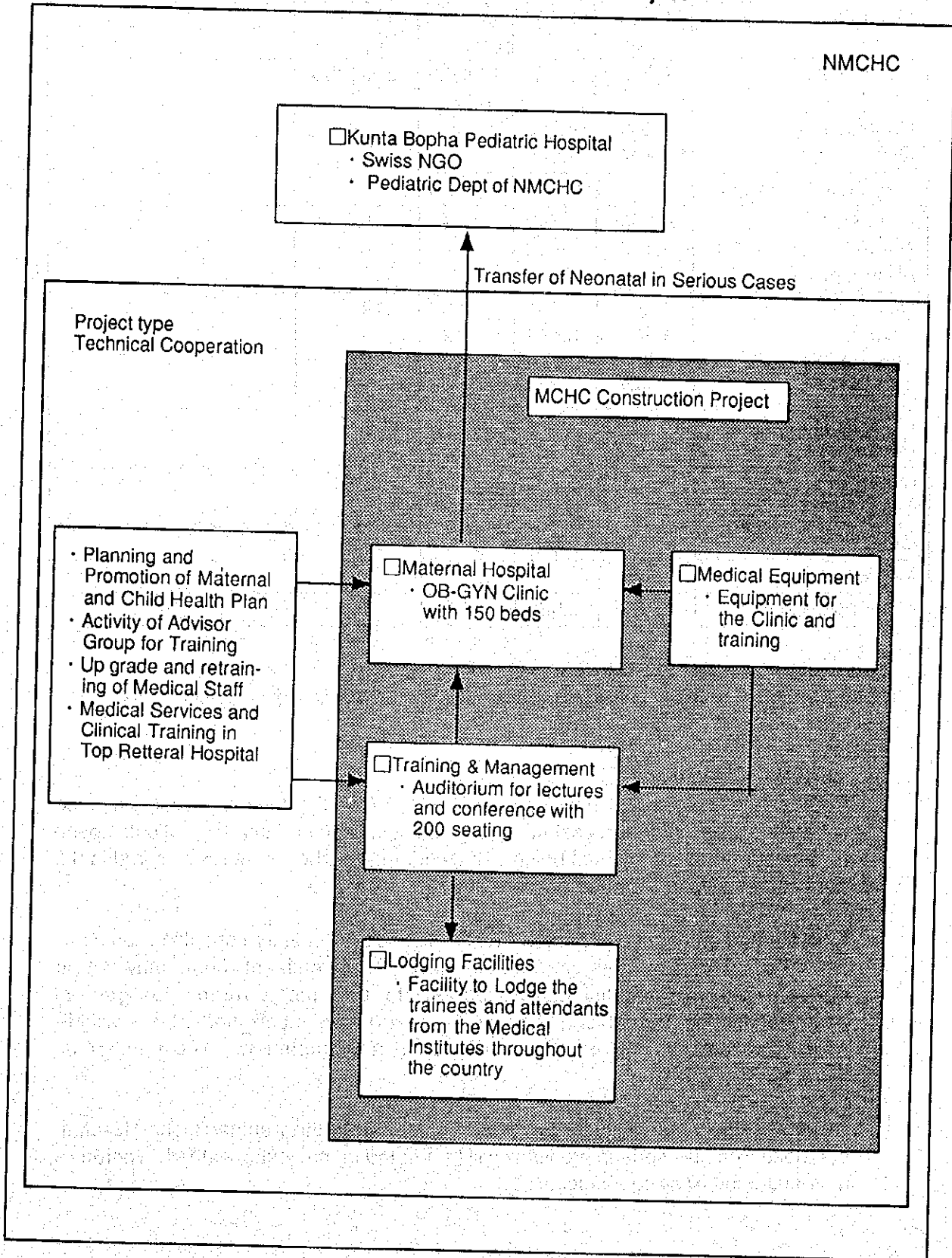


Table 4-4 Present patient levels at the NMCHC

	1992	1993	Average	Anticipated	Remarks
Outpatients	36,360	38,132	102 p/day	153 p/day	*
Admissions	6,233	7,727	19 x 6.3 = 177	265 beds	
Obstetrics	4,439	4,765	13		
Gynecology	1,884	2,962	5		
Length of Admission			9.28		
Newborns	4,336	4,742	12.4	18.6	
Normal	4,156	4,602			
Abnormal	180	140	0.4	0.6	
Deliveries	4,249	4,761	12.8	19	
Normal	3,467	3,463	9.9	15	
Abnormal	835	1,245	2.9	4	
Stillborn	47	57			
Mortality Rate (Mother's)	34	34			
Operations	622	944	2.1	3.2	
C/S	288	363			
Others	334	581			
Miscarriages	49	89			
Minor operations	1,364	2,025	4.6	6.9	

\* The opening of new NMCHC will be in 1997 spring. The target year is 5 years after the opening and it will be 2002. Generally the estimated 2002 numbers are about 50% increase of 1993.

i) Outpatient Department

Cambodia has requested six consulting rooms. When the number of rooms needed is computed based on forecast utilization, and it is assumed that the patients spend an average of 15-20 minutes being examined, the number of rooms required is  $0.3 \text{ hours} \times 122 \text{ persons/day} \div 7.5 \text{ (office hours)} = 8.1 \text{ rooms}$ .

First-aid and emergency treatment will be handled in ordinary consulting rooms so separate emergency rooms are unnecessary. Two treatment rooms may not be enough, but by establishing procedures to use these rooms for general examinations, obtaining blood/urine samples, and for immunizations, the available space can be utilized for efficient diagnosis and treatment. The number is, therefore, just about right.

Newborns with serious illnesses will be transferred to the Kuntha Bopha Hospital, but those with less serious problems will be treated in the center instead. Therefore a neonatal room will be needed.



So that this facility can fill its essential roles, the outpatient section will, be provided three rooms needed for counseling and education: a consultation room, family planning room, and a classroom for mothers.

As a maternity hospital, it must also be provided with the needed minimum facilities: one X-ray room and one physiological examination room (ECG, ultrasound).

The request for outpatient facilities includes a reception counter, waiting room, pharmacy, storage room, Administration and a storeroom for medical records, all standard in any hospital.

#### ii) Wards

The rate of birth in Cambodia, at 3.7%, is considered high. With a new NMCHC the numbers are forecasted. 50 beds is an appropriate number as the NMCHC will be a hospital offering high quality medical care and education for District medical staff to undergo training. In 1992, Phnom Penh had 332 obstetric and gynecology hospital beds, far from enough but a single facility can not possibly solve this problem. Measures to increase the number of beds in Phnom Penh should be introduced in the future.

The demand for three nursing units per ward comes to one nurse for every 50 patients, the same standard applied in the Japanese system. It is appropriate for a hospital where education and training will be supported by technical cooperation. The present level of one nurse for every seventy beds is insufficient to provide satisfactory nursing services.

#### iii) Delivery Department

Cambodia requested three delivery rooms and one labor room. One of the three delivery rooms will likely be equipped to handle patients with communicable diseases. At this facility, an average of 17 to 18 deliveries will be performed daily. Therefore two delivery tables will be required in each of the two delivery rooms.

#### iv) Operation and the Central Sterilization Supply Departments

It is forecast that three or more major operations and 7 minor operations will be performed each day. The operation theaters will also be used for emergencies. Time must be allowed to sterilize the operation theaters after being used by patients with communicable diseases. Minor surgical procedures will also be performed in one of the operation theaters. Therefore the request for three operation theaters is appropriate.

A central Sterilization supply department should be provided along with the operation theaters, and must be kept sterile and at all times be provided with sterilized surgical equipment. To support the functions of the operation theaters, dressing rooms, record storage rooms, a meeting room and instrument and equipment stores are also essential.

v) Service and Other Departments

The request includes a laundry room and kitchen: functions essential to the operation of a hospital. The building must also have storage rooms for the electric and mechanical equipment that will service the main building, store rooms, lockers, duty rooms, superintendent's offices, a building maintenance room, and a machinery maintenance room:

The records indicate there will be maternal deaths and stillbirths. Thus, a mortuary and morgue will be needed.

vi) Training Department

In addition to its standard hospital services, NMCHC must also have a training department to upgrade the skills of medical personnel.

The curriculum for running the department is extremely significant. Many activities and programs are now conducted by the NMCHC within frameworks such as preventive medicine at the national level.

Six committees are now functioning in this way.

1. Training of Trainer System Committee (AIDAB)
2. Health Information System Committee (AIDAB)
3. Birth Spacing/Safe Mother hood Committee (UNFPA)
4. Nutrition Committee (UNICEF)
5. Control of Diarrheal Diseases Committee (UNICEF)
6. Acute Respiratory Infection Committee (UNICEF)

The NMCHC is counting on the continued cooperation of these three aid organizations after it opens its new facility, and Japan will begin project type technical cooperation April 1995. And when the new hospital has been completed, the assistance of these groups will play a big role in the promotion of its regular training program.

The staff rooms listed and explained below will be needed to achieve these Project goals.

1. Director
2. Deputy Director (Another Deputy Director will have an office in the Kuntha Bopha Hospital)
3. Technical Cooperation Team from Japan (experts)
4. AIDAB (NMCHC advisor)
5. UNFPA (NMCHC advisor)
6. UNICEF (NMCHC advisor)
7. One room for 6 programs

The following in-service study projects are under consideration

**Table 4-5 Training projects at the NMCHC**

Trainees		Period	Trainees/Course	Courses/Year	Trainees/Year
1)	MDs and MAs*	4 weeks	4	6	24
2)	Midwives (secondary)	4 weeks	6	6	36
	(primary)	4 weeks	6	6	36
3)	Nurses (secondary)	4 weeks	6	6	36
	(primary)	4 weeks	6	6	36
4)	MDS Post graduate	2 months	6	6	36
Totals			36	204	
5)	Students: Medical	4 weeks	6	20	120
	Midwives	4 weeks	6	20	120
	Nursing	4 weeks	6	20	120

\* Medical assistants

- Training will emphasize practical training in the hospital setting, with lectures delivered in the afternoons.
- Because small group tutorials and bedside training will be incorporated, the standard classrooms used in the past will not be needed.
- Judging from the above plan, three or four courses will be conducted simultaneously, so four class rooms will be sufficient.

vii) Lodging Facilities

The Project includes a new lodging facility for trainees who will come from outlying regions of Cambodia to participate in the training program conducted by the Training Department and in the Clinic at the new NMCHC. By combining this training with that provided by the Phnom Penh Medical College and giving The trainees will have opportunity to gain personal experience of medical treatment, and the entire nation will benefit.

This training will be conducted with the support of Japan and other international organizations, but there are cases in which a daily allowance and lodging expenses will be paid or not be paid. The conditions facing the trainees will also vary, with some commuting from locations in Phnom Penh and others staying in the lodging facilities.

The lodging accommodations will be provided to trainees coming from outlying regions to train at the NMCHC.

The request asked for lodging facilities for 80 trainees, but accommodations for 30 will be sufficient because it will be more efficient to operate many courses for small groups of trainees continuously throughout the year.

2) Requested Equipment

All equipment requested are the basics needed to provide health care to mothers and children or to conduct education and training. Some of the equipment listed in the request is not suited to the level of medical care practiced in Cambodia, and will, therefore, not be provided. Equipment now in use at the January 7 Hospital which

were contributed as part of the the Project for the Improvement of Medical Equipment in Phnon Penh in February 1992 can still be used, once the moved to the NMCHC occurs only one computer and one printer can be used in the administrative office. Because the request list did not include specific quantities, the Japanese study team will estimate the quantities based on the results of a study of the number of patients treated, the functions of the facility, its management organization, and the quantities of equipment and material contributed during the earlier project. The following pages are a summary of the results of a study accounting for the conditions already described.

i) Outpatient Department

The equipment requested include gynecological examination table, gynecological examination unit, examination lamp, Examination table, medical refrigerator, manual resuscitator, oxygen inhaler set instrument cabinet, instrument carriage, forceps, sphygmomanometer, weighing scale, height scale, trash drum, forceps stand, other stainless steel instruments with training simulators needed for birth spacing. All of this requested equipment and material is basic equipment essential for outpatient treatment, we consider the request for this equipment to be entirely appropriate. Based don the size of the department and a projection of the number of outpatients that will use the department's services, four gynecological examination tables, four gynecological examination unit, four examination lamp, eight examination table, two medical refrigerator, with two instrument cabinets are considered appropriate. The quantity of forceps and other small stainless steel instruments has to determined according to the purpose for which each will be used.

Although a colposcopy was among the requested items, it was eliminated, as one was supplied during an earlier project. Also, the study revealed that few Collin speculums are in use in Cambodia. Grave, Sims, Jackson, and Mathiev speculums, widely used in Cambodia, will be provided, along with a Cusco speculum needed for training. Electric scalpels have also been crossed off the list, as there will be little need for them. A added some items not included in the request: one Doppler Fetal Heart Monitor for clinical training and a set of dental equipment.

ii) Radiology and Physiological Examinations.

The basic equipment requested included standard X-ray equipment needed for chest examinations of seriously ill patients and those awaiting surgery, pelvic measurements, manual developing tanks and accessories required to use X-ray equipment, electrocardiographs (ECGs), gynecological examination tables, footstools, examination tables, waste containers and other small stainless steel equipment. This request was appropriate. However, considering the size of the facility, two examination tables, one X-ray machine, one ECG, and one gynecological examination table will be enough to meet its needs. One ultrasorograph diagnostic machine was contributed as part of the earlier project, but one more should be added to meet the needs of the expanded facility and anticipated growth in its patient turnover.

iii) Laboratories

The equipment requested included a flame photometer, centrifuges, microscopes, and water still. A centrifuge and microscope were contributed as part of the earlier project, but to meet the needs of the expanded facility and the anticipated growth in its patient turnover, one of each will be provided this time. The flame photometer and water still are both basic equipment essential for laboratories of this type, so one of each will be needed. In addition, a minimum of two leukocyte classification devices, two test tube stands, and three waste containers will be required. The ELISA set used to perform examinations to diagnose HIV and Hepatitis B was included among the requested equipment, but because it is difficult to obtain the needed reagent in Cambodia, only the manual diagnostic equipment required for the testing sets will be supplied.

iv) Wards

The request included gadge beds for seriously ill patients, patient monitor, beds for patients, bay cot, sphygmomanometer, weighing scale, height scale, gynecological examination table, gynecological examination unit, examination lamp, X-ray film viewer, wheelchair, stretcher, oxygen inhaler, icecube machine, medical refrigerator, instrument carriage, instrument cabinet, forceps. All of this requested equipment and material is basic equipment required to operate a hospital ward. We consider the request for this equipment to be entirely appropriated. In accordance with the purpose and scale of the facility, 10 gadge beds, 140 ordinary beds, two patient monitor, three gynecological examination tables, and three gynecological units will be needed. An irrigator stand needed for infusion will also be supplied.

v) Operation Theaters

The request include anesthesia apparantus, gynecological operation tables, operation chairs, endotracheal sets, scrub stations, electrosurgical units, manual resuscitators, stretchers, instrument carriages, instrument cabinets, forceps, and other stainless steel instruments. Accessory equipment requested included high pressure steam sterilizer, sphygmomanometer, ultraviolet lamps to sterilize the operation theaters. All of this requested equipment and material is basec equipment used in the operation theater of an obstetric and gynecological hospital. We consider the request for this equipment to be entirely appropriate. However, ultraviolet lamps is eliminated to high operation cost compare from the performance. In accordance with purpose and scale of the facility, three anesthesia apparatus, three gynecological oepration tables, two scrub statons, and two high presure steam sterilizer will be provided.

Since suction facilities based on a centralized system have been chosen, wall-mounted suction sets that are connected to the central system have been adopted in lieu of other suction equipment, which have therefore been struck. Irrigation stands required for infusions will be supplied.

vi) Delivery Room, Labor Room, and Neonatal Room

The request included doppler fetal detectors, cardiotocographs, delivery tables, scrub stations, emergency carts, weighing scales for neonatal, oxygen inhalers,

instrument carriages, instrument cabinets, forceps, and sphygmomanometers. One doppler fetal detector, four cardiotocometers, five delivery tables, one scrub station (wall hanging type), and one emergency cart.

Requested neonatal room equipment included a phototherapy unit, portable X-ray equipment, X-ray film viewers, body cots infant warmers, infant incubators, infusion pump set, stands, and manual resuscitators. This equipment are the minimum required to operate delivery rooms and nurseries. It is appropriate to include it in the request. One phototherapy unit, one portable X-ray machine, one X-ray film viewer, 10 body cots, one infant warmer, two infant incubators, and one transfusion pump will be supplied.

Patient monitors for infant are to be eliminated as they will be used infrequently. Suction will be provided via the centralized system wall-mounted sets will be provided.

vii) Training

Equipment requested included overhead projectors, slide projectors, screens, copy machines, and personal computers printing machine, along with simulators used for training. This is basic equipment needed to prepare and present training materials and to conduct training activities. It is appropriate to include it in the request. As Overhead projectors are used frequently, two will be provided along with one of each requested equipment.

viii) Administration

For the operation of the hospital office, the requested equipment included photocopy machine typewriters (Khmer and English), and personal computers needed to process data. Since these are basic office equipment, we consider their inclusion in the request to be appropriate.

Because personal computers will be used frequently, two will be provided along with one each of the other types of requested equipment.

The above study confirmed that most of the equipment requested by each department is appropriate, and will be provided as requested.

(3) Results of the Study

Based on the results of the study of the details of the request described in the previous section, the following facilities and equipment have been deemed appropriate to be included in the framework of the Project. The following table indicates the floor surface area of each facility and the number of rooms that each will require.

**Table 4-6 Floor area of the facilities used (m<sup>2</sup>)**

Floor area of:	Rooms	Coridors	Exterior (under eaves)*	Total
PH 3rd floor	24.36	-	-	24.36
PH 2nd floor	24.36	-	-	24.36
PH 1st floor	24.36	24.00	-	48.36
3rd floor	1,367.64	90.99	81.30	1,539.36
2nd floor	2,811.36	239.22	163.38	3,213.96
1st floor	2,710.51	355.09	723.09	3,788.69
Sub-total	6,962.59	709.30	967.77	8,639.66
Annex	367.78	-	92.04	459.82
Total	7,330.37	709.30	1,059.81	9,099.48
	8,039.67		1,059.81	9,099.48

Main Building and Annex		9,099.48
Minor Buildings	Guard House	9.00
	Pump House	9.35
Total		9,117.83

\* Indicates pilotis, balconies, canopies, and emergency stairway areas.

Table 4-7 Principle departments and rooms

Fl.	Department	Equipment	
3rd	Training	Classroom (40 persons) x 1, classroom (20 persons) x 3, office x 7, auditorium, preparation room, lobby, library, storeroom, WS.	
	Lodging facilities	Bedrooms (6 persons) x 1, (8 persons) x 3, lobby, pantry, lounge, WS.	
2nd	Surgery	Operation theater x 3, quasi-corridor, N.S., changing room, preparation room, central surgical supply room, supply corridor, waste disposal room.	
	Delivery	Delivery room x 3, labor room, neonatal room, N.S., prep room, preparation hall, waste disposal room, night duty room, storeroom.	
	Ward A (46 beds)	8B x 5, 4B, 1B x 2, N.S., treatment room, conference room, day room, toilets, laundry room, waste disposal room, shower room, nursing room, baby bathroom, storeroom x 2.	
	Ward B (52 beds)	8B x 6, 2B x 1, 1B x 2, N.S., treatment room, conference room, day room, toilets, laundry room, waste disposal room, shower room, nursing room, baby bathroom, storeroom, night duty room.	
	Ward C (52 beds)	8B x 6, 2B x 1, 1B x 2, N.S., treatment room, conference room, day room, toilets, laundry room, waste disposal room, shower room, nursing room, baby bathroom, storeroom.	
1st	Outpatient Department	Reception, pharmacy, drug storage, waiting room, consulting room x 7, dentists office, treatment room x 2, pediatric consulting room, conference rooms x 3, toilets.	
	Central examination Department consulting	Reception, waiting room, examination room, treatment room, urine sample room, physiological examination room 2, X-ray room, X-ray control room, dark room	
	Study and Training	Auditorium (cpy: 200), lobby, storeroom.	
	Service section	Administration	Reception, administration, office manager's office, medical records room.
		Welfare	Doctors lounge, lockers (men, women), night duty rooms morgue, building superintendent's office X2, toilets.X2
	Services	Dining room, kitchen, laundry, work shop x 2, machine room, storeroom.	

Legend: WS: Rest rooms and shower rooms; N.S.: Nurse station; 8B, 2B, 1B: 8 beds, 2 beds, 1 bed.



Table 4-8 Principle equipment list

Fl.	Department	Main equipment
1st	Outpatient (Reception, pharmacy, birth spacing, examination and treatment)	Gynecological examination table, gynecological examination unit, X-ray film viewer, Doppler monitor, dental unit, suction set (wall hanging type), instrument cabinet, instrument carriage, emergency cart, vaginal speculum, stethoscope, instrument set, wheel chair, stretcher, video player, TV monitor
	Radiology physiological lab	General X-ray machine, gynecological examination unit, ultrasound diagnostic equipment
	Laboratory	Flame photometer, centrifuge, binocular microscope, water still.
	Medical Office	Photocopy machine, typewriter (Khmer, English), personal computers.
2nd	Patient wards	Gynecological examination unit, patient monitor, gadge beds, patient bed, X-ray film viewer, refrigerator, icecube machine, suction sets (wall hanging type), instrument carriage, vaginal speculum, stethoscope, etc.
	Operation theater, C.S.S.D	Operation table, anesthesia apparatus, electrosurgical unit, high pressure steam sterilizer, patient monitor, blood refregirator, patient bed, scrub station, suction set (wall hanging type), etc.
	Labor and delivery room	Delivery tables, Cardiotocograph, scrub unit (wall hanging type), Doppler monitor, patient bed, instrument carriage, vaginal speculum, finstrument cabinet, suction set (wall hanging type), etc.
	Nursery	Infant incubetor, infant warmer, mobil X-ray machine, refregirator, instrument carriage, emergency cart, phototherapy unit, baby cot, suction set (wall hanging type), etc.
3rd	Training	Photocopy machine, personal computer, training manekin for simulator, printing machine, overhead projector, slide projector, screen

(4) Feasibility of the Project and Suitability of Grant Aid

Based upon the results of the study of the detailed content of the request and the projected demand for the services of the new facility, the study team has concluded that almost all items in the request are suitable. However, the team has decided to eliminate one 40-seat classroom and reduce the capacity of the lodging facilities from 80 persons to 30 persons.

This change was made so that the lodging facilities will be better suited to the planned curriculum at the training center and residents will be limited to persons receiving training in the the NMCHC.

While projections of future demand for hospital beds indicate that there will be a severe shortage nationwide, the team decided that the request for 150 beds is appropriate, being well suited to the role that the NMCHC will play as a teaching hospital.

The number of personnel to be assigned to the NMCHC may seem excessive considering the situation at the present NMCHC. However, the number is suitable because staff will be rotated to the expanded training and lodging facility. Cambodia has just entered a period of national recovery. This means that the management and operation of the facility is being conducted in a trial-and-error fashion, and adequate budget measures have not yet been taken. Considering past achievements of the existing NMCHC and the technical cooperation that will be provided by Japan and other donors in the future, we are confident that it will eventually be fully capable of operating without outside support.

As a result of the above examination of the Project plan, we have confirmed that it will be effective and feasible of implementation. We have also verified that the benefits it will provide are in line with the grant aid system policy. Therefore the provision of grant aid by Japan has been adjudged appropriate. Consequently, on the premise that it will receive financial support from Japan, we have conducted the following study of the outline of the Project and prepared a basic Project design.

#### **4-2 Project Objectives**

##### **(1) Project Objectives**

The improvement of MCH is a high-priority aspect of health in Cambodia. The existing NMCHC now provides health care for mothers and children along with training for medical care personnel. But it is not achieving its objectives due to the deteriorated condition of its building, a shortage of instrument and so on. The new NMCHC will improve medical care for pregnant women, mothers and infants and offer improved training to health care personnel.

##### **(2) The Project**

The Project involves the construction of a new building to house the maternity hospital functions of the NMCHC, the construction of new training facilities for MCH workers, and the procurement of all the equipment required by the new facilities.

#### **4-3 Project Implementation Organization**

##### **4-3-1 Organization and Personnel**

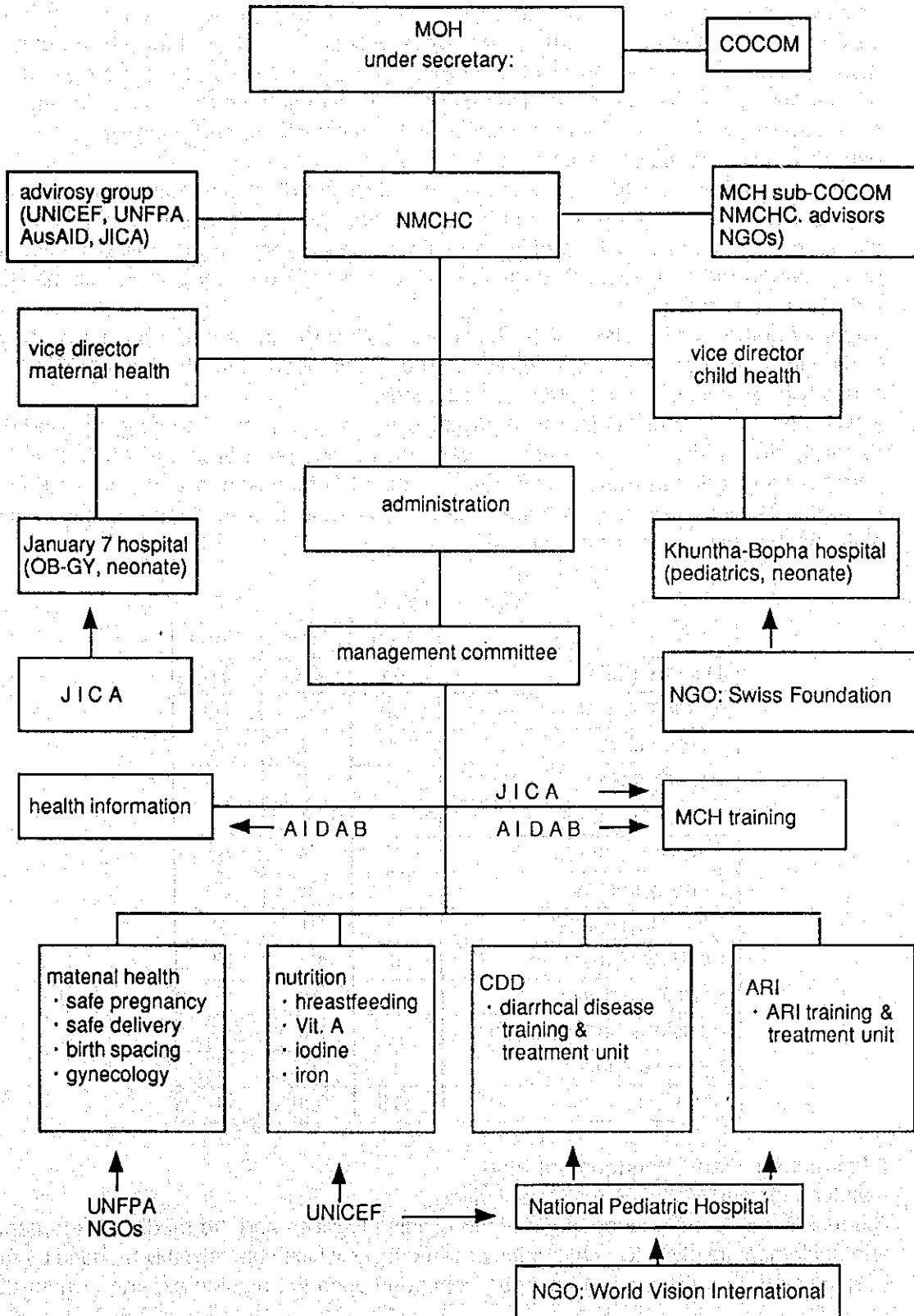
##### **(1) Organization**

The NMCHC is an agency affiliated with Ministry of Health; Figure 4-9 provides an overview of its organization. Recently, some training of MCH personnel has been supported by other donor agencies.

At the new NMCHC, a Management Committee will be set up under the Director of the Hospital to handle all matters related to the diagnosis and treatment policy, budget management, and personnel management.

The training division, with the help of technical cooperation provided by various donor agencies, will prepare a program to train midwives and nurses and retrain physicians.

Fig.4-9 NMCHC Organization



(2) Personnel

At the existing NMCHC facility, physicians (MDs) and medical assistants (MAs) are divided into five teams and work in shifts. During the day, all are on duty (from 7:30 - 11:00 a.m., and from 2:00 - 5:00 p.m.), while between 8 - 10 of them are on duty 24 hours a day. The nurses and midwives (both primary and secondary) are divided into four teams and work in shifts. Two teams are on duty during the day and one team is on duty 24-hours a day. The nurses, midwives, lab technicians, and pharmacists in other departments follow the same schedule.

On the wards, between 40 - 50 nurses and midwives are divided into three groups under the supervision of 8 - 10 doctors, and the wards are operated by three nursing units. In the operation theaters, each team includes five or six persons. Four or five nurses form each team in the Outpatient Department. One person is on duty in each examination room and X-ray room.

The staff at the existing NMCHC is shown on Table 4.10. In Japan, a hospital with 150 beds can be operated by a staff of about 100. This means that the new NMCHC will certainly be able to obtain the employees it needs.

It will, however, be necessary to reorganize the new improved training and lodging departments; add new personnel to manage the budget, personnel affairs, and to perform other administrative tasks; take on new lab technicians and pharmacists to upgrade the diagnosis and treatment capabilities; and find additional employees to maintain the building and its equipment.

Table 4-10 Staff

	Men	Women	Total
Doctors (MDs)	44	26	70
Medical Assistants (MAs)	22	37	59
Pharmacists	4	6	10
Assistant Pharmacists	0	1	1
Dental Assistants	1	0	1
Secondary nurses	35	51	86
Primary nurses	5	28	33
Physiotherapists	2	0	2
Secondary midwives	0	127	127
Primary midwives	0	10	10
Assistant lab technicians	2	10	12
Hygienic auditor	1	0	1
Total	116	296	412

**4-3-2 Maintenance and Management Plan**

(1) Maintenance and Management Organization

The maintenance and management of the building facilities and the medical instruments and equipment involves two categories of work: tasks which can normally be done by the hospital staff, and those which must be depended upon the outside experts. Under the

Project plan, advanced equipment and instruments will not be introduced, and a workshop will be built within the NMCHC so that as much of the required maintenance work as possible can be completed internally.

1) Maintenance of Building Facilities

Robust and durable finishing materials have been chosen for the building so that little maintenance will be required. Simple, easily maintained building facilities and machinery have likewise been selected. For the facilities, routine cleaning, inspection, and maintenance work; and for machinery, routine inspections and light repairs (such as fixing leaks) as per the instruction manuals, together with adequate replenishment and replacement of consumables, should be sufficient for keeping everything in working order. Hospital staff should contact manufacturers or qualified repair companies when more complicated repairs are required.

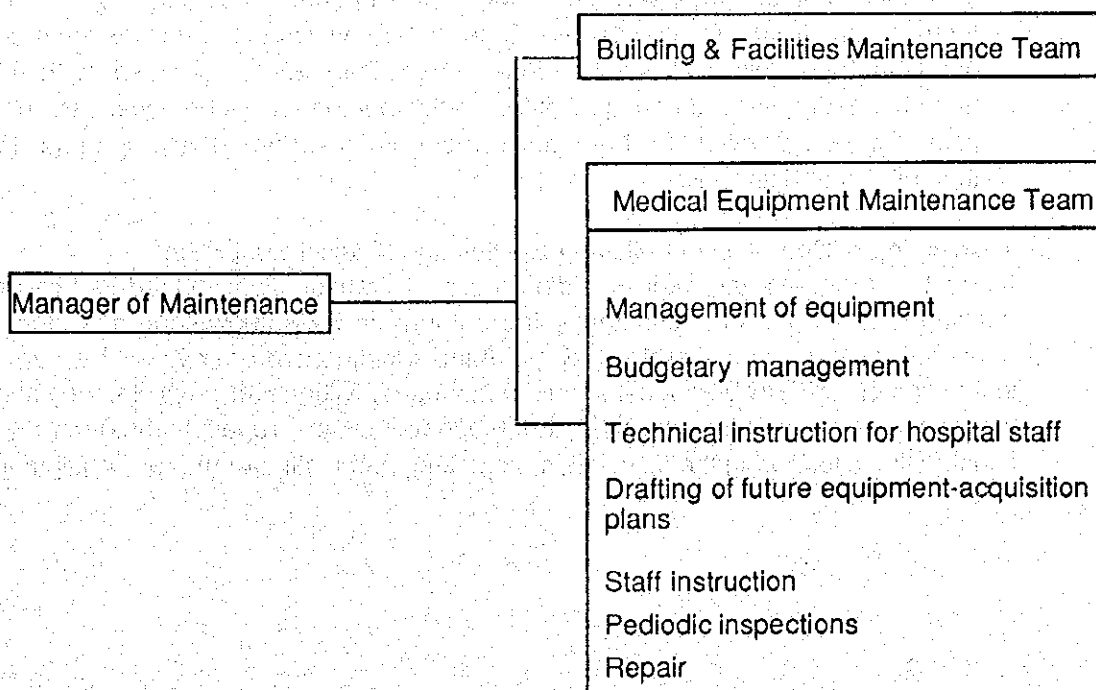
2) Maintenance and Management of Medical Equipment

a) System, methods, and qualified personnel

Only the medical staff (doctors, nurses, lab technicians) who use it, in principle, maintain and manage medical equipment at the January 7 Hospital. At present, any repairs they cannot handle themselves are turned over to a third-party repairman (electronic goods, not medical equipment) unrepairable equipment usually remains that way because of the unavailability of spare parts. Although the hospital employs an electrician, who maintains the generators and does in-house wiring; he does not work on the medical equipment. None of Cambodia's other national hospitals have technicians to take care of their medical equipment either, although some insitutions assisted by NGOs do.

In view of this, our plan deems it necessary to build an organization, as shown by the following diagram, for maintaining and managing medical equipment .

fig. 4-11 Maintenance and Management Systems



To ensure that users are well versed in the use of their equipment and that routine maintenance and management of the equipment is adequately carried out, the following will furthermore be necessary: regular inspection of medical equipment, instruction for users in the use of the equipment, repair of defective equipment, management and procurement of spare parts and certain consumables, drafting of budgets (budget planning) to ensure adequate funds to cover maintenance and management costs, and planning for future equipment acquisition.

Personnel will have to be recruited who can carry out these tasks, as they are beyond the capabilities of the hospitals current staff. The rub is that Cambodia has no institutions that provide technical training in the use and care of medical equipment, and university graduates with technical degrees in similar fields (electrical engineering, electronics, mechanical engineering, etc.) tend to shun low-paid civil-service jobs in favor of higher-paying jobs in private industry. The same holds true for graduates of technical high schools. Hence, the issue of training and thereby securing qualified personnel looms large. We therefore feel that the dispatch of experts and training in Japan and other third countries to nurture such personnel should be conducted as a part of the technical assistance offered in conjunction with the Project.

Another possible method of ensuring adequate maintenance and management of medical equipment within the hospital would be maintenance training for the operators of equipment. This would raise their skills so they could maintain their equipment themselves. Even if this method is adopted, though, it will be necessary to have someone in the hospital who will take overall responsibility for the maintenance of equipment throughout the institution.

b) Procurement of consumables and spare parts

In Cambodia, public hospitals order medical consumables, medical equipment and their consumables, and spare parts together with pharmaceutical supplies every three months from a Central Medical Store (CMS), which then supplies the ordered goods to the hospitals. It will therefore be necessary to control orders to the CMS and to control delivered goods. Administrative personnel will be necessary for this control work, as well as for the management of consumables and spare parts for the building and its facilities.

3) Training in the Operation of Building Facilities and Medical Equipment

Instruction manuals and their elucidation are conventionally provided just before a building is delivered, but considering the amount of basic knowledge operators will need before they can operate and maintain equipment properly, we believe that instruction of NMCHC personnel should begin early. Whenever possible, they should be trained in equipment operation, troubleshooting, and repair techniques on the construction site during the installation, adjusting, and testing of the new equipment.

(2) Maintenance Costs

**Table 4-12 Maintenance costs during the first, second, and subsequent years Unit: U.S.\$**

	First year	Second and later yrs	After 3 5 years
1) Electricity	66,402	66,402	66,402
2) Telephone	1,080	1,080	1,080
3) Medical Gas	5,040	5,040	5,040
4) Water	6,960	6,960	6,960
5) LP Gas	9,000	9,000	9,000
6) Generator Fuel	3,504	3,504	3,504
7) Incinerator Fuel	3,096	3,096	3,096
8) Laundry Detergent	1,080	1,080	1,080
9) Building Maintenance Cost			9,000
10) Equipment Maintenance Cost		21,320	32,434
Sub Total	96,162	117,482	137,596
11) Depreciation	38,500	38,500	38,500
Total	134,662	155,982	176,096

1) Electrical costs.....US\$66,402/year

According to the supply regulations of the Electricite Du Cambodge (EDC), the NMCHC will be billed for its electricity as described below.

Basic charge: US\$0/kW per month (no basic fee is required at this time.)

Usage charge: US\$0.14/kWh

The capacity specified in the agreement covering the facility is for 400kW, and the facility's estimated average consumption is about 240kW.

The annual cost is computed as follows; this includes 30kW for the operation theaters and other areas with the highest-priority load, 33kW as a special load for the outlets and illumination in the examination room and emergency treatment rooms, the minimum required level of illumination for corridors, the refrigerators, and the air-conditioning in the drug storerooms, 79kW as normal power, and 98 kW for ordinary illumination equipment and outlets.

The following formulae are used to compute the electric charges.

1. Highest-priority load:  $30\text{kW} \times 10 \text{ hours} \times 25 \text{ days} \times 12 \text{ months/year} \times \text{US}\$0.14/\text{kWh}$   
= US\$12,600/year
  2. Special Load:  $33\text{kW} \times 10 \text{ hours} \times 30 \text{ days} \times 12 \text{ months/year} \times \text{US}\$0.14/\text{kWh}$  =  
US\$16,632/year
  3. Ordinary Power:  $79\text{kW} \times 5 \text{ hours} \times 25 \text{ days} \times 12 \text{ months/year} \times \text{US}\$0.14/\text{kWh}$  =  
US\$16,590/year
  4. Ordinary Illumination and Outlets:  $98\text{kW} \times 5 \text{ hours} \times 25 \text{ days} \times 12 \text{ months/year} \times$   
 $\text{US}\$0.14/\text{kWh} = \text{US}\$20,580/\text{year}$
- Total of 1. to 4.      US\$66,402/year.

2) Telephone..... US\$1,080

At present, the charge for the use of telephone lines is fixed, regardless of the frequency a user places calls and the length of the calls.

This estimate foresees three lines being installed.

The following formulae are used to compute the telephone charges.

Telephone U.S.\$30/month  $\times$  3 lines = U.S.\$90/month

Therefore, annual telephone costs are:

$\text{US}\$90 \times 12 \text{ months/year} = \text{US}\$1,080/\text{year}$

3) Medical gas expenses ..... US\$5,040/year

Based on the anticipated number of patients treated, 40 bottles of oxygen will be required each month. The following is an estimate of the monthly oxygen consumption at the NMCHC.

Monthly Consumption

Oxygen  $7\text{m}^3$  cylinders  $\times$  40/month  $\times$  month, current price = US\$1.50/ $\text{m}^3$

Based on this estimate, the cost of a one-month supply of oxygen will be:

Oxygen  $\text{US}\$1.50/\text{m}^3 \times 7\text{m}^3/\text{bottle} \times 40 \text{ bottles} = \text{US}\$420/\text{month}$

Monthly cost                      US\$420/month

Annual cost  $\text{US}\$420/\text{month} \times 12 \text{ months/year} = \text{US}\$5,040$

4) Water supply costs ..... US\$6,960/year

Water consumption at the facility is estimated at  $110\text{m}^3/\text{day}$  ( $300\text{l} \times 180\text{p} + 100\text{l} \times 560\text{p}$ ). Some public hospitals are provided water for free, but in this case, the cost of water is computed in accordance with the normal amount charged for water. The water charges levied at this time are broken down into basic charges and usage charges as shown below.

Monthly water consumption                       $110\text{m}^3/\text{day} \times 30 \text{ days/month} = 3,300\text{m}^3/\text{month}$

Basic charge                      US\$250/month

Usage charge                       $\text{US}\$0.10/\text{m}^3 \times 3,300\text{m}^3/\text{month} = \text{US}\$330/\text{month}$

Total                       $\text{US}\$250 + \text{US}\$330 = \text{US}\$580$

Therefore:

Annual water charges                       $\text{US}\$580/\text{month} \times 12 \text{ months/year} = \text{US}\$6,960$



- 5) LPG costs ..... US\$9,000  
 Liquid propane gas (LPG) is primarily used as a heat source in the kitchen. Because the facility kitchen will provide three meals a day for the patients admitted to the hospital, its LPG consumption is estimated at 40kg/day. At this time, LPG is sold for approximately US\$0.625/kg.  
 Monthly LPG consumption  $40\text{kg/day} \times 30\text{days/month} = 1,200\text{kg/month}$   
 LPG price  $\text{US}\$0.625/\text{kg} \times 1,200\text{kg/month} = \text{US}\$750/\text{month}$   
 Therefore:  
 Annual LPG costs  $\text{US}\$750/\text{month} \times 12\text{ months/year} = \text{US}\$9,000/\text{year}$
- 6) Generator fuel costs ..... US\$3,504/year  
 Diesel fuel will be purchased to power the emergency generator. It is assumed that the power will fail four times per month for about four hours each time. Diesel fuel costs US\$0.215 per liter. The annual cost is computed as follows.  
 Amount of fuel consumed per month  $85\text{ l/h} \times 4\text{h} \times 4\text{ times/month} = 60\text{h} = 1,360\text{ liters/month}$   
 Fuel costs  $\text{US}\$0.215/\text{l} \times 1,360/\text{month} = \text{US}\$292/\text{month}$   
 Therefore:  
 Annual fuel costs  $\text{US}\$292/\text{month} \times 12\text{ months/year} = \text{US}\$3,504/\text{year}$ .
- 7) Incinerator fuel cost ..... US\$3,096/year  
 The facility will produce two kinds of waste material, ordinary and medical. Assuming that the incinerator will be used mainly to incinerate medical waste, approximately 40 liters of oil will be used to fuel the incinerator each day. Oil will cost US\$0.215 per liter.  
 Monthly consumption  $40/\text{day} \times 30\text{ days/month} = 1,200/\text{month}$   
 Price of oil  $\text{US}\$0.215/\text{l} \times 1,200/\text{month} = \text{US}\$258/\text{month}$   
 Therefore:  
 Annual oil cost  $\text{US}\$258/\text{month} \times 12\text{ months/year} = \text{US}\$3,096/\text{year}$
- 8) Laundry detergent ..... US\$1,080/year  
 It is assumed that the laundry cleaned at the facility will include that from the operation theaters and the central surgical supply unit and that done for the patients, the doctors, midwives, and nurses. Based on the forecast volume of laundry processed, daily consumption of laundry detergent is estimated at 3kg/day.  
 Monthly consumption  $3\text{kg/day} \times 30\text{days/month} = 90\text{kg/month}$   
 Price of detergent  $\text{US}\$1/\text{kg} \times 90\text{kg/month} = \text{US}\$90/\text{month}$   
 Therefore:  
 Annual detergent costs  $\text{US}\$90/\text{month} \times 12\text{ months/year} = \text{US}\$1,080/\text{year}$
- 9) Building maintenance costs ..... US\$9,000/year  
 Assuming that at the present time, the building maintenance costs covering the interior finish of the building, waterproofing of the roof, and the purchase of spare parts and parts used to repair the electric, water supply and drainage, and air-conditioning systems, etc. total US\$1/m<sup>2</sup>/year,

9,000m<sup>2</sup> x US\$1/m<sup>2</sup>/year = US\$9,000/year

10) Equipment maintenance costs ..... US\$29,059/year

Costs of maintaining medical equipment

The costs incurred maintaining medical equipment are categorized as the cost of consumables such as X-ray film, developer, chemical reagents for testing equipment, gel and recording paper for use with ultrasound diagnostic equipment, and the cost of maintaining the equipment; and replacement parts used to repair malfunctioning equipment and the cost of inspections and repair work. The estimate of the expenses does not include the depreciation of the equipment.

When the machinery is delivered, it will be accompanied by enough consumable supplies to operate the machinery for approximately one year and a five-year supply of replacement parts. Afterwards, it will be necessary to supply the following budget to cover the cost of the maintenance of the following equipment and supplies.

Chemical reagents and other consumables .....		US\$15,175/year
1. X-ray film	1,750 x US\$4.50 (average price) =	US\$7,875
2. Developer and fixing solution	85 cases x US\$23.00 (average price) =	US\$1,955
3. Ultrasound gel	60kg x US\$30.00 (average price) =	US\$1,800
4. Recording paper	15 rolls x US\$35.00 (average price) =	US\$525
5. Testing reagents (HIV, HB)	1 set	US\$3,300
6. Propane Gas		US\$300
	Total of 1. to 6	US\$15,755

Starting from the 3rd year after completion, the following maintenance cost will incur.

Maintenance costs .....	US\$13,304/year
1. Repair by agents	US\$6,120
2. Repair parts	US\$7,184
	Total of 1. to 2. US\$13,304

II) Depreciation for Medical Equipment ..... US\$38,350/year

1. Standard X-ray machine	US\$9,667
2. Portable X-ray machine	US\$9,500
3. Ultrasound machine	US\$6,500
4. Pressurized steam sterilizer	US\$12,833
	Total of 1. to 4. US\$38,500

#### 4-3-3 Budget and Fiscal Planning

When the new Cambodian Government took office in 1991, there was no formal national budget. From 1991-1993, the budget was spent on an as-needed basis, with some areas not receiving anything. Under the new Financial Law, established in 1994, a budget system was set up with each area of the government submitting skeleton budget plans which propose spending where deemed necessary.

Since medical care is free of charge for the citizens of Cambodia, all expenses incurred at the NMCHC is covered by the National Budget.

**Table 4-13. NMCHC operating budget (Excluding Kunta Bopha Pediatric Hospital)**

(in 1,000 Riel)

	1991	1992	1993	1994 (to October)	with annual 10% increase by 1997	Budget First year	
Personnel	39,433	149,702	223,237	231,440	399,900	399,900	-
Pharmaceutical and Med. consumables	24,519	34,804	66,051	143,123	247,300	247,300	-
Utilities	10,767	37,850	36,133	58,078	100,350	235,005	Derived from previsions section
Communications	112	112	112	2,500	4,320	2,700	- Ditto -
Administration	878	1,300	2,695	4,566	7,890	7,890	-
Maintenance	755	1,007	2,724	15,731	27,180	2,700	Derived from previsions section
Miscellaneous	381	477	270	50,152	86,660	86,660	-
Total Expenditure	76,845	225,251	331,221	505,590	-	-	
Budget	-	-	-	672,000	873,600	982,155	Additional Budget
in US Dollars				(268,800)	(349,440)	(392,862)	

Under the new Financial Law, an annual 10% increase is admitted. The budget estimate for 1997, the year when the new hospital is ready for use, the cost of personnel, administration and 'other' expenditures will be subjected to a maximum 10% annual increase based on the amount from 1994. One-third of the pharmaceuticals and medical costs are assumed to be medical consumables.

For utilities, communication and maintenance costs, our estimates are shown in the previous section.

Simple annual 10% increase from 1994 calculates to 873,000,000 riel. If we include our assumed increase, without the inflation factor, the budget will be 982,155,000 riel, or 11.0% (108,555,000 riel) more than the simple increased amount.

This means a special budget increase is needed.

MOH has started negotiations with the Ministry of Finance with the intent of procuring a special budget increase for the project. The MOH has stated specifically to the study team that they will receive an increase.

#### Medical Costs Covered by the Patient

Although medical is free, Calmet Hospital is experimenting with a payment system in which patients are billed for hospital services.

In order to maintain and upkeep the stability of the facilities, a payment system may be set up for special wards, laboratory tests, x-rays, etc. This incoming income may be regarded as part of the national increase and may not contribute to the increase in the budget.

#### 4-4 Basic Design

##### 4-4-1 Basic Guidelines

Design guidelines governing the basic design will be established on the basis of by the design features of the Project studied in Chapter 3 by taking account of local conditions and the unique characteristics of the environment at the Project site.

#### (1) Basic Direction with Regard to Natural Conditions

##### 1) Site

The site is bounded by roads on three sides and by the Kuntha Bopha Hospital, which will be part of the NMCHC, on the remaining side. The Project will include storm drainage system for the concentrated rainfall.

##### 2) Wind

The average wind speed in Phnom Penh is 9.7m/s. This average varies little throughout the year. Plans call for the maximum utilization of natural ventilation that conforms to local climatic conditions. This approach will not only keep cooling costs low, but provide a comfortable environment for those who will use the facility.

##### 3) Rain

The average annual rainfall in Phnom Penh is 1309.2mm, (average from 1984 to 1993) with heavy rainfalls occurring in short periods of time during the rainy season. To handle this heavy rainfall, openings in rooms and corridors will be provided with louvers, canopies, etc..

##### 4) Sunlight

Located near 12° North Latitude, buildings in Phnom Penh are subjected to sunlight from both the north and south sides. Because the sunlight is strong in Phnom Penh, the buildings roof will be fully insulated and openings on both its south and the north sides will be provided with louvers and canopies to protect the interior from direct sunlight.

##### 5) Climate

In Phnom Penh, the average monthly temperature throughout the year ranges from 24.9°C to 29.8°C and the average minimum daily temperature is 21.2°C. The floor plan and the section design must provide enough ventilation so that the interior of the building can be kept comfortable without the use of air-conditioning equipment.

#### (2) Guidelines on Dealing with Social Conditions

The basic design reflects the need to distribute and coordinate the functions of the two facilities that will comprise the NMCHC: the maternity (obstetrics and gynecological) services in the planned hospital building, and the pediatrics services in the adjoining Kuntha Bopha Hospital.

The design will also account for the fact that patients will be accompanied by numerous family members. Enough waiting space shall be provided for the family, and the access to the examination and consultation room should be limited. These family members will stay with the patient in the wards. They help and feed the patient while they are in the Hospital.

(3) Guidelines Concerning Construction Conditions

A wall-alignment regulations restrict the construction of privately-owned buildings, but do not apply to public buildings. The design of this project does, however, respect these regulations. The district is a designated scenic zone with low-story buildings. The design of the planned building would be better to conform to the traditional design characteristic of the area.

(4) Guidelines on the Use of Local Contractors and Material and Equipment Suppliers

Local construction methods and building materials will be used in order to simplify maintenance of the completed building, but some materials not available in Cambodia will be imported either from Japan or from neighboring Thailand.

Most of the medical instruments and equipment will be procured in Japan, because it is unavailable locally.

The construction materials and medical instruments and equipment will be procured from those makers with representative offices either in Cambodia or in Thailand and which have already established service systems.

(5) Guidelines on the Maintenance and Management

Maintenance costs should be kept low by using natural ventilation and by depending as little as possible on machinery. A cooling system selected in conformity with local conditions will be provided for the operation theaters, delivery rooms, wards (private wards), the auditorium (200 people), and the training room (40 persons), etc., but to keep electricity charges and other maintenance costs low, ventilation in common use areas will be natural ventilation.

To further cut down on later maintenance costs, the interior and exterior finishing materials selected will be durable and weather resistant.

#### 4-4-2 Study of Design Conditions

(1) Composition of the Facility

The planned hospital building will consist of a three-story south wing and a two-story north wing. Major functions will be concentrated on a single floor or a single wing.

1) Third floor of the south wing: training, residence, and administrative offices.

Training rooms, library, lodging facility rooms, offices, classrooms, etc.

2) Second floor of the north wing: wards

Operation theaters, central supply room, delivery rooms, labor rooms, neonatal room, inpatient room, treatment rooms, etc.

3) Second floor of the south wing: Wards

Inpatient rooms, treatment rooms, etc.

4) First floor of the north wing: Service section

Classrooms, dining room, kitchen, laundry, doctors lounge, superintendents office, duty rooms, locker room, etc.

5) First floor of the south wing: Outpatient Department

Reception, pharmacy, drug storage, consulting rooms, examination rooms, X-ray rooms, etc.

(2) Criteria Used to Determine the Size of the Facility

To determine the size of the facilities in the planned hospital building, the study team examined the functions and the size allotted to each in the existing NMCHC, referred to medical treatment facility floor area standard (documents compiled by the Architectural Institute of Japan, etc.), and examined the layout of the instruments and equipment that would be needed in each facility. The result was the following room plan.

1) First Floor, Outpatient Consulting Section and Service Area

Table 4-16 (1) First floor room list (1)

Room	Number	Calculated surface area (m <sup>2</sup> )	Criteria and remarks
<b>North Wing</b>			
Doctors lounge	1	140.29	4.5m <sup>2</sup> /person x 31 persons = 139.5m <sup>2</sup> Capacity for approximately 31 persons
Janitor's Office 1	1	28.70	2.8m x 6.7m = 18.76m <sup>2</sup> + emergency center (10m <sup>2</sup> ) including resting space
Mens dressing room (employees)	1	34.42	2-level locker, 120 persons; includes 1 shower room
Womens dressing room (employees)	1	82.50	2-level locker, 378 persons; includes 2 shower rooms
Night duty rooms	2	21.30	Men, 4 persons: 5.75m <sup>2</sup> /person x 4 persons = 23.0m <sup>2</sup> Women, 4 persons: 5.75m <sup>2</sup> /person x 4 persons = 23.0m <sup>2</sup>
Toilet (men)	1	14.06	2 privy toilets, 2 urinals, 2 sinks
Toilet (women) 1		18.42	3 privy toilets and 3 sinks
Lobby	1	153.42	Combines the staff lobby and lecture hall lobby
Storeroom (1)	1	37.60	
Storeroom (2)	1	72.00	
Storeroom (3)	1	36.00	
Dining room	1	90.00	1.2m <sup>2</sup> /person x 75 persons = 90.0m <sup>2</sup> Capacity for 75 persons
Kitchen	1	72.48	Floor area x 0.01 = 73.72m <sup>2</sup> Including employee rest and changing room.
Auditorium	1	178.95	0.9m <sup>2</sup> /persons x 200 persons = 180m <sup>2</sup>

Room	Number	Calculated surface area (m <sup>2</sup> )	Criteria and remarks
<b>North Wing</b>			
Workshop (M/E)	1	36.00	Combines the service staff locker room and stores
Workshop	1	57.15	Combines the service staff locker room and stores
Laundry room	1	72.48	14.7m x 5.8m = 85.26m <sup>2</sup> (??all same size??)
Corridors, etc.		184.67	Corridors: 2.4m provided to allow sufficient width for the passage of stretchers.
North Wing Total		1,351.74	

Table 4-16 (2) First floor room list (2)

Room	Number	Calculated floor area (m <sup>2</sup> )	Criteria and remarks
<b>South Wing</b>			
Waiting Room 1	1	42.30	Consulting waiting room
Waiting Room 2	1	57.00	General waiting room
Administrative office	1	116.17	Includes office managers room, reception counter
Pharmacy and drug storage	1	102.67	Includes preparation of small doses + counter, Chief of Pharmacies room
Medical records room	1	51.60	
Janitor's office 2	1	13.50	2.8m x 6.7 = 18.76m <sup>2</sup>
Reception	1	11.31	Only a counter.
Consulting room 1,2	2	19.20	5.0m x 4.5m = 22.5m <sup>2</sup> (Consulting room + gynecological examination room)
Consulting room 3 to 6	4	16.80	3.0 x 4.5m = 13.5m <sup>2</sup> (only Consulting room)
Consulting room 7 for emergency	1	21.00	5.0m x 4.5m = 22.5m <sup>2</sup> (Consulting room + gynecological examination room)
Consulting room 8 Dental	1	18.29	2.7m x 4.3m = 11.6m <sup>2</sup>
Intermediate waiting room	1	67.61	Including clinic reception.
Treatment room 1	1	18.73	3.0m x 4.5m = 13.5m <sup>2</sup> Including staff corridor.



**First floor room list (3)**

Room	Number	Calculated floor area (m <sup>2</sup> )	Criteria and remarks
<b>South Wing</b>			
Treatment room 2	1	19.20	3.0m x 4.5m = 13.5m <sup>2</sup> Including injection space
Treatment room 3	1	18.00	3.0m x 4.5m = 13.5m <sup>2</sup> Used as urine sample room, includes the flow to the urine sample room.
Physiological lab 1	1	18.00	Electrocardiograph examination.
Physiological lab 2	1	36.00	Ultrasound diagnosis
Clinical Laboratory	1	44.80	blood count and biological text
Urine sample room	1	6.80	Two toilets and 1 sink
X-ray room	1	36.48	5.3m x 5.2m = 27.6m <sup>2</sup> . Includes dressing room.
X-ray Operation room	1	7.73	
Meeting room	1	11.04	
Dark room	1	7.44	
Fore-room	1	36.96	
Infant examination room	1	16.80	
Matron's room	1	12.89	
Chief Medical Engineer	1	13.86	
Consultation room 1	1	14.52	
Consultation room 2	1	13.51	
Consultation room 3	1	13.20	
Classroom for mothers	1	51.60	≅ 2.0m <sup>2</sup> /person x 25 persons = 50.0m <sup>2</sup> . Includes instrument storage and instructors space.
Family planning consultation room	1	12.60	An internal examination table will be provided.
Toilet (staff)	1	8.20	1 toilet stalls, 1 urinals, 1 sinks
Toilet (women)	1	27.80	4 toilet stalls, 4 sinks
Toilet for handicapped persons	1	6.90	1 toilet stall, 1 sink
Corridors, etc.	1	298.66	Corridors will be 2.4m in width to accommodate stretchers.
<b>South Wing Total</b>		<b>1,358.77</b>	
<b>Ramps, stairs, etc.</b>		<b>1,078.18</b>	Corridors and ramps will be 2.4m in width to accommodate stretchers.
<b>First Floor Total</b>		<b>3,788.69</b>	

2) Second Floor, Central Consulting Department and Wards

Table 4-16 (3) Second floor room list (1)

Room	Number	Calculated surface Area (m <sup>2</sup> )	Criteria and remarks
<b>North Wing</b>			
Nurse Station 1	1	18.00	
Prep room and preparation corridor 1	1	7.20	
Dressing room 1,2	2	9.00	Employee use
Delivery room 1	1	40.20	3.6m x 4.3m = 15.48m <sup>2</sup> (1 delivery) Includes measurement, recording, working, and bathing space.
Delivery room 2	1	40.20	
Delivery room 3	1	18.00	
Labor room	1	40.20	Accommodates 6 people. Partially includes preparation corridor.
Neonatal room	1	39.00	2.63m <sup>2</sup> /bed x 8 beds = 21.04m <sup>2</sup> Includes bathing and nursing space. All occupants high-risk and premature infants.
Waste disposal room 1	1	18.24	Includes a toilet.
Storeroom 1	1	13.76	
Nurse Station 2	1	27.60	
Operation theater 1	1	36.00	5.0 x 6.0m = 30.0m <sup>2</sup> (internal dimensions) Includes space for distribution panel.
Operation theater 2	1	36.00	
Operation theater 3	1	36.00	
Conference	1	27.60	
Dressing room 3	1	13.80	For male employees, 2.1m x 6.6.m = 13.86m <sup>2</sup> (??all same size??)
Dressing room 4	1	13.80	For female employees, 2.1m x 6.6.m = 13.86m <sup>2</sup> (??all same size??)
Prep room 2	1	8.64	
Preparation corridor 2	1	34.56	
Night duty room 1	1	18.00	≅ 5.75m <sup>2</sup> /persons x 3 persons = 17.25m <sup>2</sup>
Supply corridor	1	24.30	
Central surgical supply room	1	89.38	15.0m x 6.0m = 90m <sup>2</sup> (same size)

Room	Number	Calculated surface Area (m <sup>2</sup> )	Criteria and remarks
<b>North Wing</b>			
Nurse Station 3	1	28.95	6.0m x 9.0m = 54.0m <sup>2</sup> Floor area standard allows room for discussion area.
Conference	1	14.48	3.2m x 3.8m = 12.16m <sup>2</sup> (for 8 persons)
Treatment room (1)	1	14.48	3.0m x 4.5m = 13.5m <sup>2</sup> includes dressing room space.
Ward 1, 2, 6 (8 beds)	3	46.20	6.53 m <sup>2</sup> /bed x 8 beds = 52.2m <sup>2</sup>
Ward 3, 7 (8 beds)	2	46.82	6.53 m <sup>2</sup> /bed x 8 beds = 52.2m <sup>2</sup>
Observation Room (4 beds)	1	46.20	6.53 m <sup>2</sup> /bed x 4 beds = 26.12m <sup>2</sup> Includes sink
Ward 4, 5 (1 bed)	2	18.00	3.0m/bed x 4.5m = 13.5m <sup>2</sup> 1) Includes sink, toilet, and shower.
Toilet (patients)	1	18.28	4 toilets and 1 sink
Washroom	1	6.40	3 sinks
Shower and dressing room	1	6.40	2 showers and 2 laundry tubs.
Waste disposal room 2	1	4.61	2.0m x 4.5m = 9.0m <sup>2</sup>
Nursing room 1	1	13.25	
Laundry room	1	6.62	
Bathroom for baby	1	6.62	
Storeroom (1)	2	18.00	
Day-room 1	1	36.00	
Corridor		240.85	Corridors will be 2.4m in width to accommodate stretchers.
<b>North Wing Total</b>		<b>1,443.72</b>	

Table 4-16 (4) Second floor room list (2)

Room	Number	Calculated surface Area (m <sup>2</sup> )	Criteria and remarks
<b>South Wing</b>			
Nurse Station 4, 5	2	28.95	6.0m x 9.0m = 54.0m <sup>2</sup> Floor area includes space for discussion area1)
Conference 2,3	2	14.48	≅ 3.2m x 3.8m = 12.16m <sup>2</sup> (for 8 persons) Includes sink.
Treatment room 2, 3	2	14.48	3.0m x 4.5m = 13.5m <sup>2</sup> Includes dressing room space.
Ward 9, 10, 15, 16, 19, 20, 23, 24,(8 beds)	8	46.20	6.53 m <sup>2</sup> /bed x 8 beds = 52.2m <sup>2</sup>
Ward 8, 17, 18, 25 (8 beds)	4	46.82	6.53 m <sup>2</sup> /bed x 8 beds = 52.2m <sup>2</sup>
Ward 21, 22 (2 beds)	2	18.00	6.53 m <sup>2</sup> /bed x 2 beds = 13.06m <sup>2</sup>
Ward 11 to 14	4	18.00	3.0m x 4.5m = 13.5m <sup>2</sup> Includes sink, toilet, and shower.
Toilet (patients)	2	18.28	4 toilets and 3 sinks
Toilet (male employee)	2	3.07	1 toilet stall and 1 sink
Washroom	2	6.40	3 sinks
Shower and dressing room	2	6.40	2 showers and 2 laundry tubs.
Waste disposal room 3, 4	2	4.60	2.0m x 4.5m = 9.0m <sup>2</sup> (toilet included)1)
Nursing room 2, 3	2	13.25	
Laundry room	1	6.62	
Bathroom for Baby	1	6.62	
Storeroom 4. 5	2	18.00	
Day-room 1	1	36.00	
Night duty room 2	1	18.00	≅ 5.75m <sup>2</sup> /person x 3 persons 17.25m <sup>2</sup> Includes shower and sink.
Corridor		385.84	Corridors will be 2.4m in width to accommodate stretchers.
South Wing Total		1,367.64	
Ramps, stairs, etc.		402.60	Corridors and ramps will be 2.4m in width to accommodate stretchers.
Second Floor Total		3,213.96	

3) Third Floor, Training Department, Lodging Facilities, and Administrative Offices

Table 4-16 (5) Third floor room list

Room	Number	Calculated surface Area (m <sup>2</sup> )	Criteria and remarks
Office 1	1	46.20	25m <sup>2</sup> /person x 2 persons = 50m <sup>2</sup> Room for 7 desks + reception space.
Office 2, 3, 5, 6	4	23.10	25m <sup>2</sup> /person (including reception space)
Office 4	1	69.3	25m <sup>2</sup> /person (including reception space)
Office 7	1	23.34	25m <sup>2</sup> /person (including reception space)
Classroom 1	1	85.35	2.0m <sup>2</sup> /person x 40 persons = 80m <sup>2</sup>
Classroom 2, 3, 4	3	46.20	2.0m <sup>2</sup> /person x 20 persons = 40m <sup>2</sup>
Meeting room	1	36.00	= 2.0m <sup>2</sup> /person x 27 persons
Library	1	55.80	≅ 47.5m <sup>2</sup> (space for 5,000 volumes, when it accommodates 6 persons.)
Workshop	1	46.82	Includes storeroom.
Toilet (men)	1	18.24	3 toilet stalls, 3 urinals, and 3 sinks
Toilet (women)	1	14.74	3 toilets and 3 sinks
Storeroom	1	21.74	
Lobby	1	57.90	
Lounge	1	36.00	
Pantry	1	18.00	
Bedroom 1 (6 persons)	1	36.00	≅ 5.0m <sup>2</sup> x 6 persons = 30.0m <sup>2</sup>
Bedroom 2, 3 (8 persons)	2	46.20	≅ 5.0m <sup>2</sup> x 8 persons = 40.0m <sup>2</sup>
Bedroom 4 (8 persons)	1	47.44	≅ 5.0m <sup>2</sup> x 8 persons = 40.0m <sup>2</sup>
Toilet (men)	1	17.55	2 toilet stalls, 2 urinals, and 2 sinks
Toilet (women)	1	15.85	3 toilets and 3 sinks
Shower and dressing room (men)	1	8.95	2 showers and 2 laundry tubs
Shower and dressing room (women)	1	8.95	1 shower and 2 laundry tubs
Corridors		380.07	Corridors have a width of 2.4m to accommodate stretchers.
South Wing Total		1,367.64	

Room	Number	Calculated surface Area (m <sup>2</sup> )	Criteria and remarks
Stairs, etc.		172.29	Corridors and ramps have a width of 2.4m to accommodate stretchers.
Third Floor Total		1,539.93	

#### 4) Annex

Table 4-16 (6) Annex room list

Room	Number	Calculated surface Area (m <sup>2</sup> )	Criteria and remarks
Generator room	1	69.87	
Incoming power breaker room	1	13.26	
Power reception room	1	100.76	
Medical-use gas room	1	18.86	
LPG bottle room	1	15.12	
Morgue	1	40.32	
Storeroom	1	63.00	
Water treatment room	1	46.59	
Water intake tank room	1	92.04	
Sub-total		459.82	

**Note.** Sources are as follows: Unmarked, Collected Papers of the Architectural Institute of Japan; 1), Configuration of Hospital Architecture (Yasuhiko Ogawa, Kajima Shuppankai)

#### 4-4-3 Basic Plan

##### (1) Site and Layout Plan

###### 1) Site Conditions

The planned construction site, a plot facing Street 47 which extends north north-west from Watto Phnom is bordered on the south by the site of the Kuntha Bopha Hospital. The site, located approximately 300 meters north of Watto Phnom, a symbol of the city of Phnom Penh, is part of the designated scenic district surrounding Watto Phnom.

###### 2) Layout

A hospital's functions are complex, so it is vital for planners to smoothly integrate the many activities conducted within its walls. In addition to the usual hospital functions, the NMCHC will also house training facilities. This means that in addition to the flow of patients, visitors, personnel, and service persons, trainees will be added to the flow of people and materials. The facility floor plan must take account of the characteristics of the site to prevent interference between these flows.

A study of the condition of the nearby roads and traffic conditions on these roads shows that the principle flow into and out of the site for both patients and employees will come in from Street 47. The main entrance and exit to the site will, therefore, face on Street 47. To prevent incoming emergency vehicles from interfering with the flow of outpatients visiting the hospital, an emergency vehicle entrance will be provided between the north and south wings.

Functional cooperation with the Kuntha Bopha Hospital will be indispensable. For this reason, an entrance will be provided on the south side of the building to form a link with the existing parts of the Kuntha Bopha hospital. The annex (machinery room, etc.) will be built on the west side of the hospital.

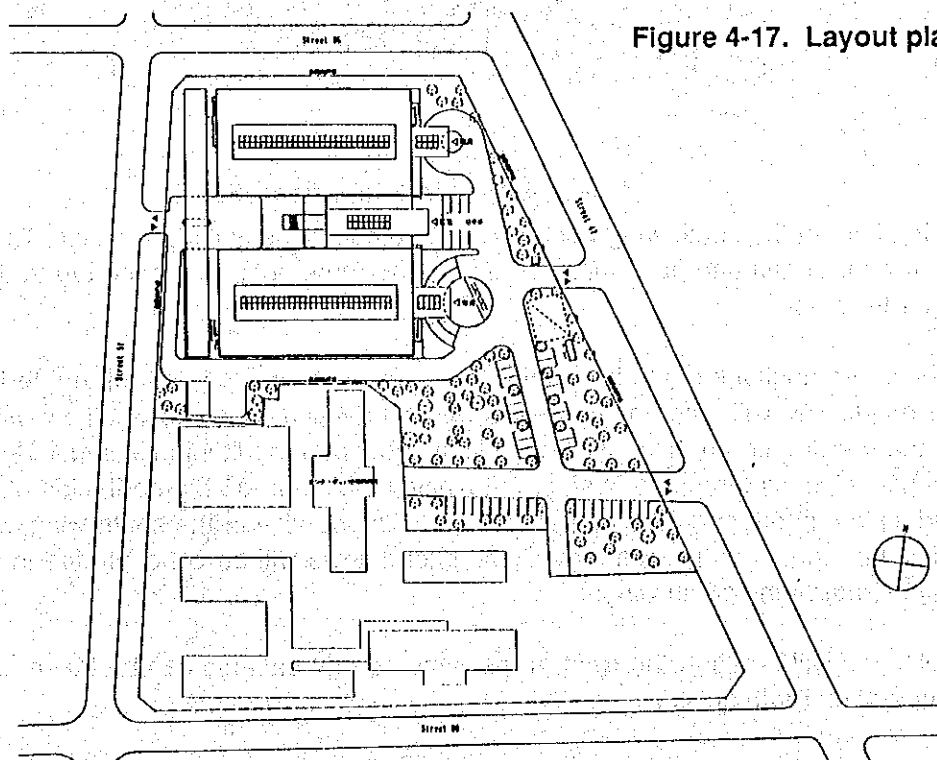


Figure 4-17. Layout plan

(2) Building Plan

1) Floor Plan

The following is a summary of the floor plans for each story of the building.

i) First floor

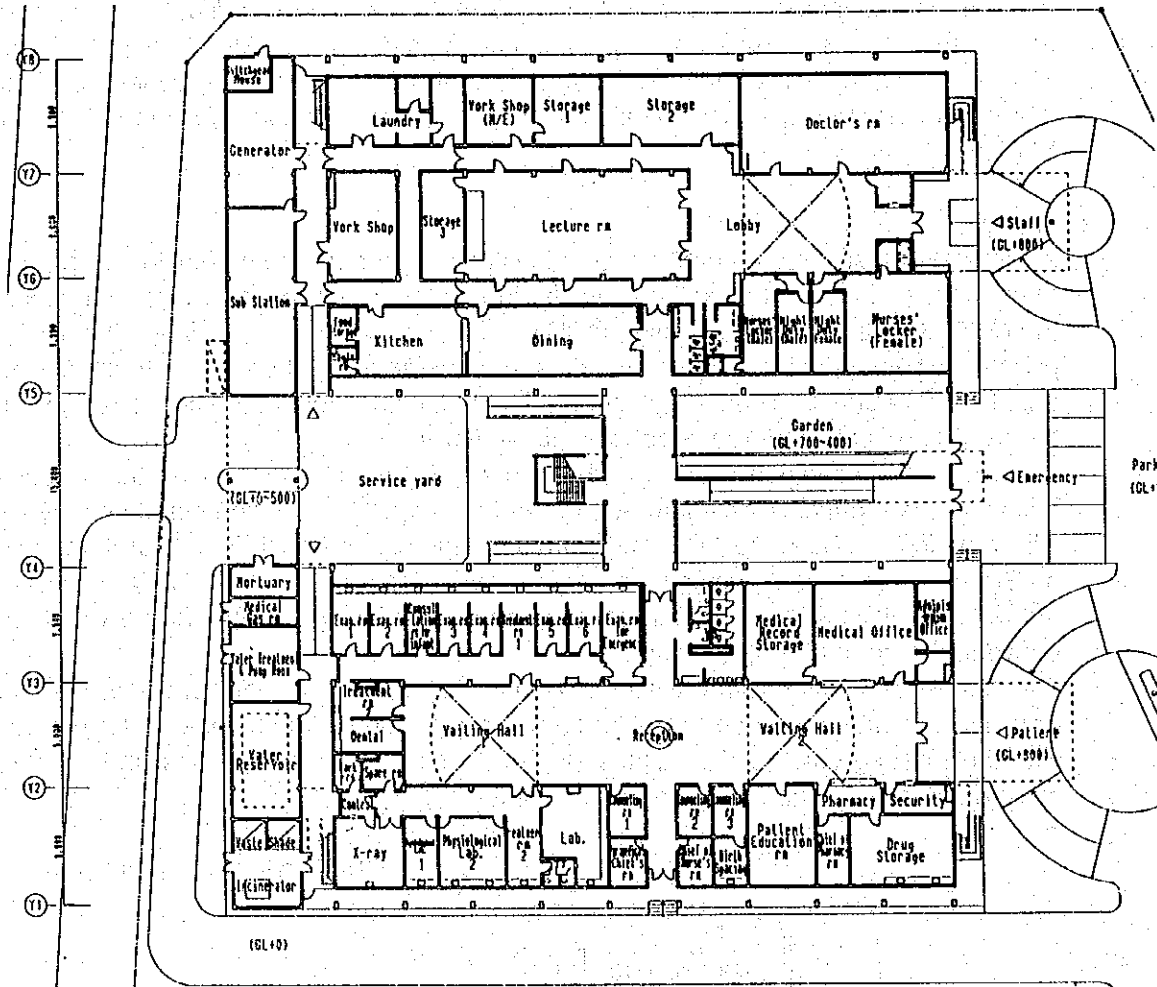


Figure 4-18. First floor floor plan

The first floor of the south wing will house the outpatient consulting services. The patients will enter from the east and pass through the waiting room before entering the treatment rooms for their treatment.

The back-up functions of the hospital will be located in the first floor of the north wing. Most of the employees will enter the hospital from the east side, but a service flow will be provided by another entrance on the west side. When the central auditorium is in use, large numbers of people will pass through this side, but placing this room on the north side of the first floor will minimize its effect on the outpatient consulting service in the south wing, and minimize the distance these people will move. The lateral flows will be concentrated in the corridors linking the north and south wings.

Ambulances will arrive at the front of the ramp so that patients can be taken to the second floor operation room quickly.



ii) Second floor

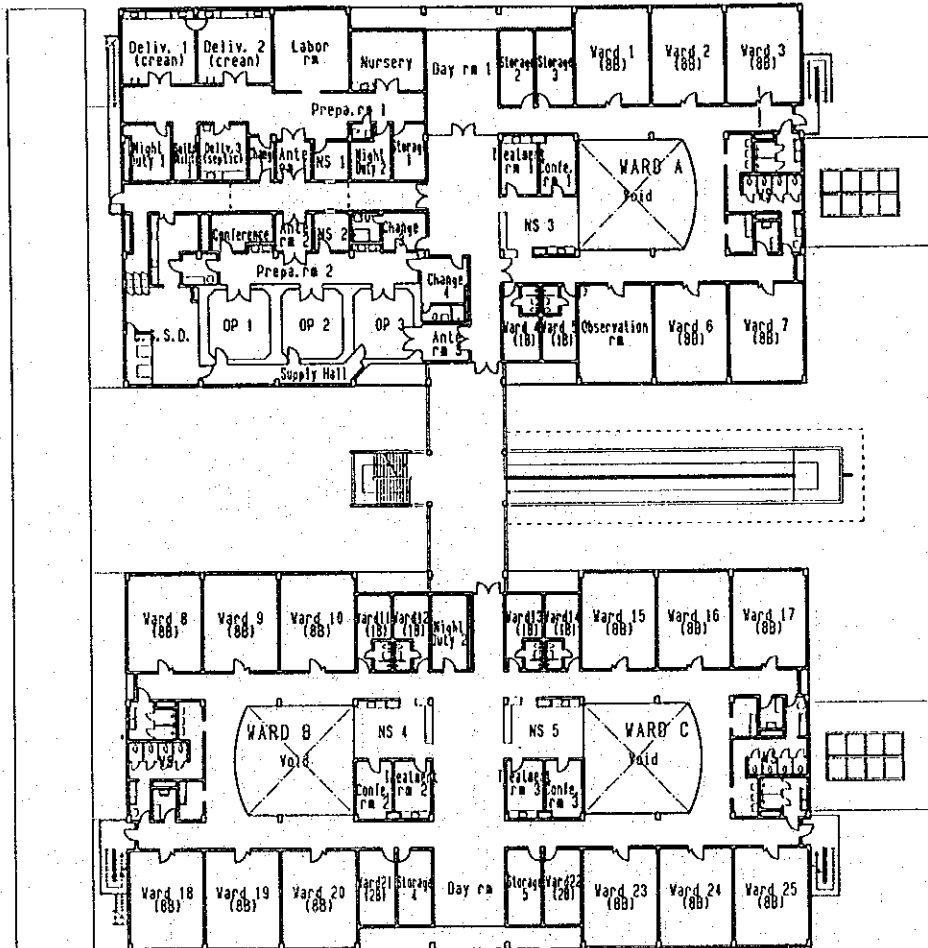


Figure 4-19. Second floor floor plan

The second floor of the north wing will house the medical functions performed in the operating and delivery rooms, concentrating them in one area to increase the efficiency of their diagnosis and treatment activities.

The wards will be divided up into three nursing units. Wards including those for seriously ill patients will be located in the east side of the north wing. The entire second floor of the south wing will be wards. The wards in both wings will be served by the nurses station in the center of the site between the two wings.

iii) Third floor

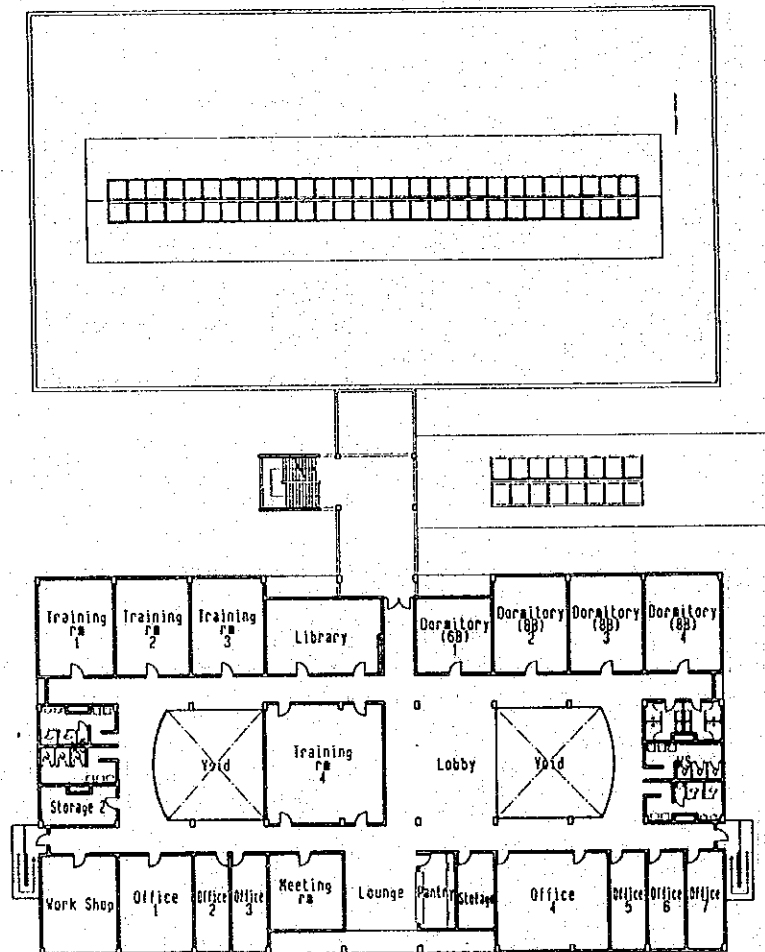


Figure 4-20. Floor plan of the third floor

Only the south wing will have a third floor. Its west side will be occupied by classrooms, training rooms, a library, work shop the director and assistant etc. used by the Training Department. The east side will be the location of the trainee residence (30 persons), the office of director, an office for 6 programming officers and the offices of advisory groups.

2) Section Design

Each story will be high enough to maintain the air volume of the rooms and to keep comfortness in the tropical climate. The story height of the building will be 3.75 meters. The floor of the first story will be 1.0 meters above the ground, which will be high enough to prevent flood damage to the building during the rainy season.

The internal transportation plans for the building do not include elevators to avoid the expensive running cost. A ramp that can be used to bring in stretchers will be constructed in the middle of the route connecting the north and south wings, so that the stretchers can be manually moved to the operating and delivery rooms on the second floor. Other patients and employees will use stairs built beside the ramp. In an emergency, patients and staff can escape to the first floor level on external stairways built on the east and west sides of both wings.

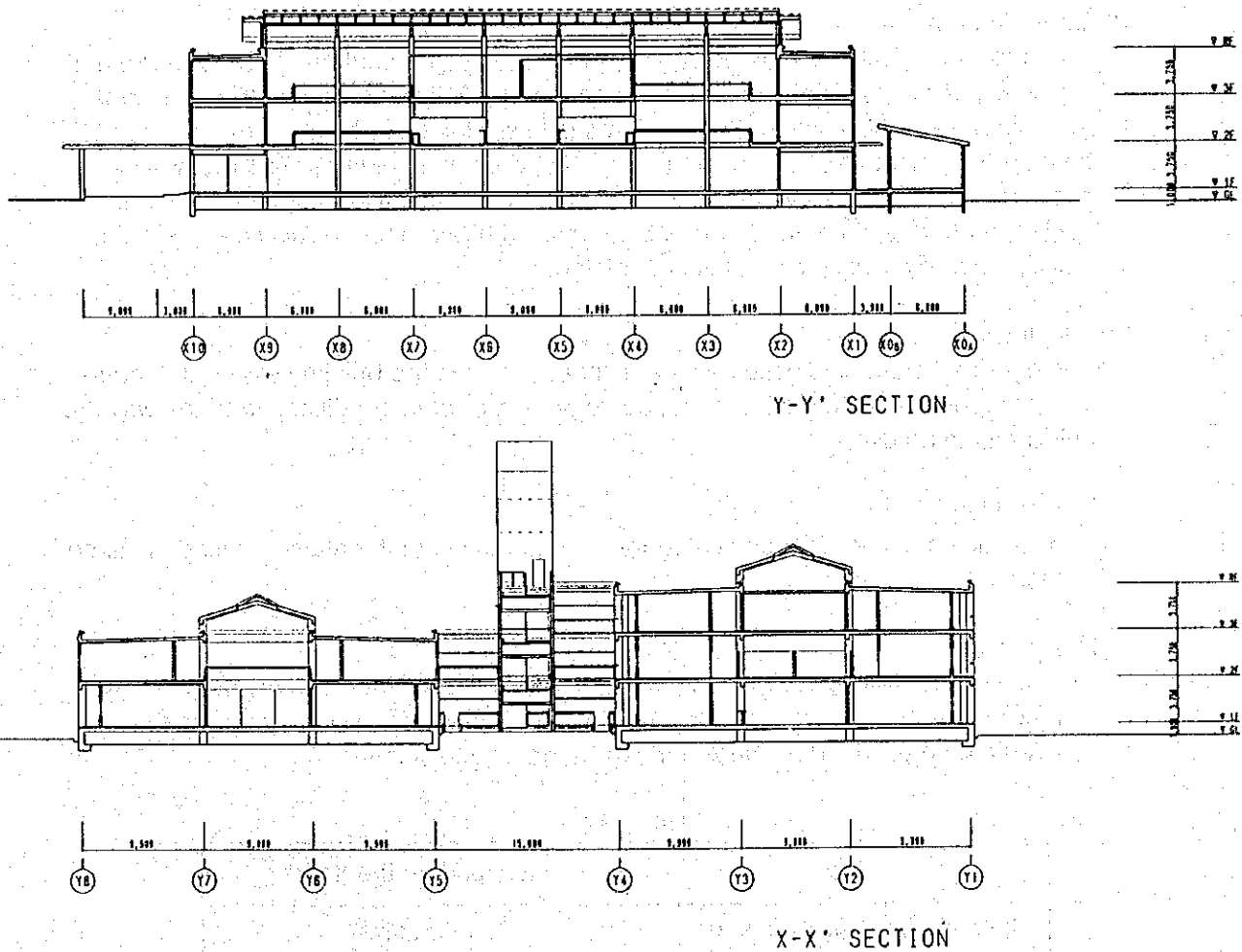


Figure 4-21. Section