Table 2-33 Annual Budget for Medical Drugs and Supplies, PMGH

(Unit: Kina)

	1984	1985	1986	1987
Appropriation	-	336,000	435,000	470,000

(Source: PMGH)

2-3-3 Present Situation of PMGH's Services

Port Moresby General Hospital has the following four functions and is positioned at the top of Papua New Guinea's medical system.

- Secondary health services functions for the national central district (NCD) and Central Province.
- Primary health services functions for NCD.
- Referral hospital functions for the entire nation.
- Functions as the teaching hospital for the Faculty of Medicine in the University of Papua New Guinea and College of Health Allied Sciences.

In Central Province, which includes NCD, Port Moresby General Hospital is the only general hospital the general public can utilize. Therefore, the hospital serves as a secondary health services institution, in addition to functioning as a referral and teaching hospital. In NCD there are no health centres or health subcentres responsible for primary health services. A total of nine urban clinics are functioning as primary health services institutions. Port Moresby General Hospital is providing primary health services in the NCD through its nutritional treatment facilities and the above mentioned urban clinics.

(2) Population and Area Covered by PMGH

It is generally understood that the entire Central Province is the only area where PMGH's secondary health services are provided. This is because there is no reliable means of transportation to connect the province and the neighboring four provinces due to the delay in establishing a comprehensive transport network.

Table 2-34 Citizen Population Projections, 1980-2000

	1980	1985	1990	1995	2000
Central	116,400	129,900	144,600	161,800	179,500
N.C.D.	112,400	136,800	158,700	178,200	215,700
All Provinces	228,800	266,700	303,300	340,000	395,200

(Source: National Health Plan 1886/90)

Population index on a 1988=100 base is projected to be 104.8 in 1990, 117.5 in 1995 and 136.6 in 2000. In the case of the population of the NCD, where there will be social as well as natural increase in population, the index on a base of 1988=100 (150,600) will be 105.3 in 1990, 118.3 in 1995 and 143.2 in 2000.

Accordingly, a population of 340,000 in 1995, five years after the completion of this project, is to be covered by this project.

On the other hand, NCD is where primary health services are provided by PMGH. It is expected that there will be a remarkable social increase in the population of NCD, and it is very likely that the actual population of this area in 1995 will be far larger than estimated. There will also be a marked expansion in the need for primary health services in keeping with the increase in population.

It is more desirable to limit PMGH's functions to technical guidance to the health centres and health subcentres in Central Province and urban

clinics in NCD and staff training, and staff training in these areas by improving the urban clinics' functions.

Since the central government is giving top priority to the expansion of primary health services facilities, it may be possible to gradually reduce the primary health services functions of PMGH. As regards PMGH's referral services, which are currently aimed at the total national population of 3.6 million, eventually this service should be provided on a nation-wide basis by PMGH and the four base hospitals.

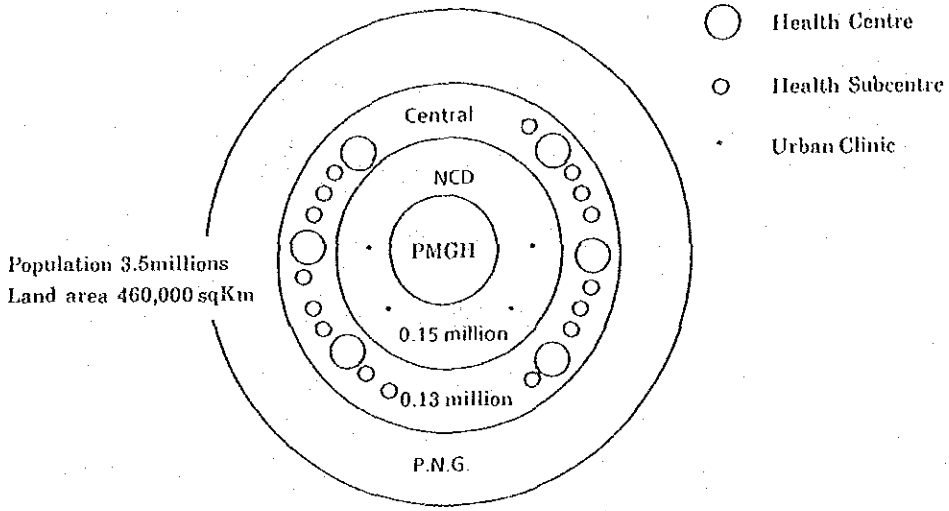


Fig. 2-13 Concept of Medical Services Catchment Area

PMGH's major services are diagnosis (outpatient casualty, specialist clinics, pharmacy), nursing, pathology and training.

Other services include operation and management of a blood bank, transfer of referral patients and support for primary health services institutions.

(1) Clinical Service

PMGH's clinical service is divided into outpatients, casualty and specialist clinics.

- Outpatient

  Outpatients are accepted for first and additional medical examinations. Patients first undergo screening by nursing officers. Through this screening patients are classified as, for example, prescription only, general diagnosis, and diagnosis by registrar or specialist.

- Casualty

  During consultation hours of outpatient department mainly patients injured in accidents are treated. Before or after consultation hours and on holidays, however, such patients and the general outpatients are accepted. In view of the fact that night and holiday medical health services are not provided by urban clinics or health centres, the national government is in the process of improving medical health services outside consultation hours provided by hospitals.

- Specialist Clinics

  Patient who requires examination and treatment by specialist has diagnosis in this department.

The annual cumulative total number of outpatients visiting PMGH was 454,306 in 1986, of which general outpatients, tuberculosis outpatients, and sexually transmitted diseases outpatients are to be treated at the new facilities for treatment of outpatients to be constructed under this project. In 1986 the total number of general outpatients was 237,020, which was a 68 percent increase from the 141,191 outpatients recorded in 1984. The daily number of outpatients was 658 (237,020 outpatients - 360 days).

Table 2-35 Number of Outpatients

		1984	1986	increase
Outpatient	General	112,419	198,540	+76%
	TB	16,2523	13,520	-20%
	STD	12,520	24,960	+100%
Total		141,191	237,020	+68%
Leprosy Clinic		3,156	4,500	+43%
O & G Outpatient		26,635	28,590	+8%
Paediatric Outpatient		129,848	184,196	+42%

(Source: PMGH)

Table 2-36 Number of Dispensed Prescription for Outpatients

	1984	1985	1986	1987
Prescription	63,913	82,591	107,017	116,250
increase	–	29%	30%	8.6%

(Source: PMGH)

(2) Nursing Services

PMGH's nursing service is divided into three groups to facilitate its management (see Table 2-37). Nursing service is provided in three shifts - 7:00 a.m. to 3:00 p.m., 2:00 p.m. to 10:00 p.m. and 10:00 p.m. to 7:00 a.m.

Table 2-37 Nursing Unit Allocation

Unit 1		Unit 2		Unit 3	
Ward	No. of Beds	Ward	No. of Beds	Ward	No. of Beds
ICU	6	Paediatric (Wd.2)	112	Obs. Gynaecology(Wd.9)	36
Full Nursing(Wd.7)	23	Surgical (Wd.3)	105	Ante. Natal (Wd.10)	35
Intermediate(Wd.8)	44	Apese (Leprosy)	32	Post Natal (Wd.11)	94
Medical (Wd4)	105	Nutrition Unit	12	Special Care Nursery	23
Tuberculosis(Wd.6)	35	Casualty / OPD	-	O & G Theatre	-
TB Clinic	-	Consultant Clinic	-	Ante Natal Clinic	-
Psychiotric (Wd.6)	30	Paediatric OPD	-	Blood Bank	-
Operating Theatre		S.T.D.	-	Labour Ward	26
C.S.D.				Overflow bed	80
Total Beds	243	Total Beds	261	Total Beds	294

(Source: PMGH)

In 1986 the total number of inpatients was 21,762, which was a 1 percent increase from the 21,010 recorded in 1984. There was a 51 percent increase in the total number of outpatients, so it is necessary to take special measures, including a significant increase in the number of beds.

Table 2-38 Number of Inpatients and Outpatients

	1984	1986	increase
Inpatients	21,010	21,762	+1
Outpatients	300,830	454,306	+51

(Source: PMGH)

(3) Pathology Services

The pathology services provided by PMGH include, in addition to general in-house pathological examinations, re-examination of the results of the pathological examinations conducted by local examination institutions, public health examinations and emergency examinations conducted outside consultation hours. Shown below are the 1987 statistics on pathological examinations.

1.	Histopathology		19,675
2.	Cytology		1,090
3.	Postmortem		164
4.	Haematology		86,362
5.	Microbiology		19,908
6.	Biochemistry		58,923
7.	Public health		38,589
Breakdown	a.	Sera	24,356
	b.	Tuberculosis	120,088
	c.	Leprosy	346
	d.	Water quality	1,597
	e.	Foods	21

f.	Blood(alcohol)	106
g.	BOD	75

8.	Emergency examinations	19,200
9.	Malaria	34,321

(4) Teaching Services

Shown below are the major teaching programmes implemented by PMGH in 1987.

a. Teaching/training

- Exchange training programme
  A programme for training medical specialists was implemented under an agreement on exchange training with Flinders University and Royal Prince Alfred Hospital of Australia.

- Training of three medical doctors at PMGH for medical specialist services.

- Clinical training of students from UPNG.

- Training of nurses and medical technicians.

b. Teaching programmes for students and graduates of UPNG

- Internal medicine educational courses for freshmen, sophomores, juniors, seniors, and 5th year students.

- Training of 12 doctors (residents) a year and 7 doctors (registrars) a year.

c. Training courses

- Treatment course (for sophomores of UPNG)

- On-the-job treatment training course.
- Training course on infectious diseases.
- Regular lectures
- Lectures on clerical work in medical institutions

d. Lectures on clinical research

- Lectures on general internal diagnosis treatment
  3 hours/week
- Special lectures
  - diabetes 2 hours/week
  - heat diseases 2 hours/week
  - asthma 2 hours/week

2-3-4 Present Situation of the Facilities and Equipment

Since its establishment in 1957, PMGH's facilities have been improved and extended under haphazard stop-gap measures. As a result, its facilities are now divided into various units, large and small, and scattered on its premises. Most of them are inefficient and some of them are superannuated. A brief history of PMGH facilities' improvement and extensions is given below.

1955 Construction of the PMGH building started.

1957 Walter Strong Wing completed, with 350 beds, 4 wards (obstetrics and gynaecology, paediatrics, surgery and internal medicine), an operating room (no physiotherapy room), a room for treatment of outpatients, the McGregor Wing, and two other wards.

1960 A plan to construct an eight-storied educational hospital with 1,000 beds proposed.

1961 Blood transfusion service initiated by the Red Cross of Society of Australia.

1969 The number of beds increase to 500.

1968 ICU (now the accommodation for doctors on night duty) constructed.

1971 The nutrition unit and rehabilitation facilities constructed.

1974 The Main hospital building (PNG) constructed. As a result, the McGregor Wing began to be used exclusively as an obstetric and gynaecological department.

1975 The facilities for guidance on child and maternal health care (UNFPA) constructed.

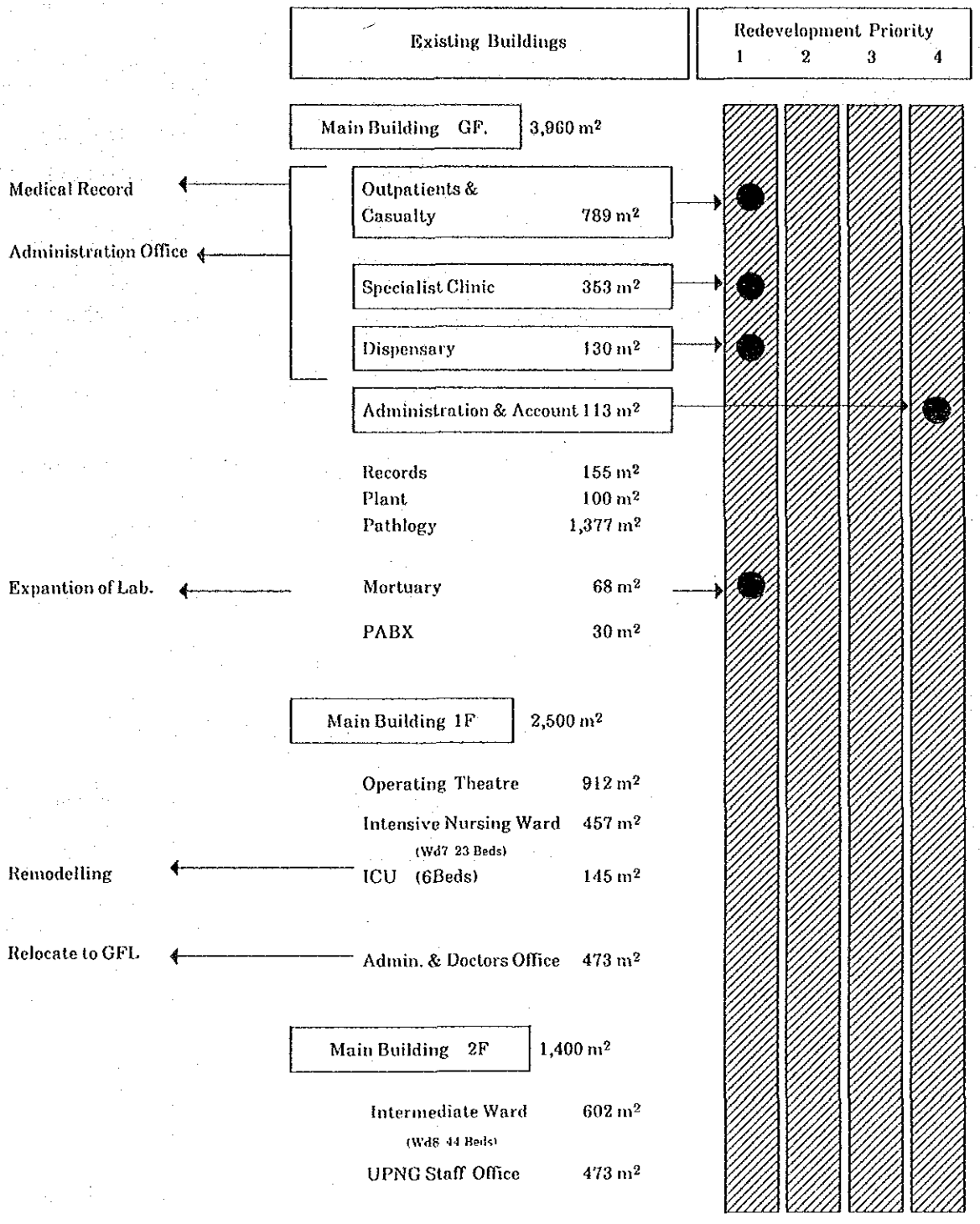
1977 The leprosy wing constructed.

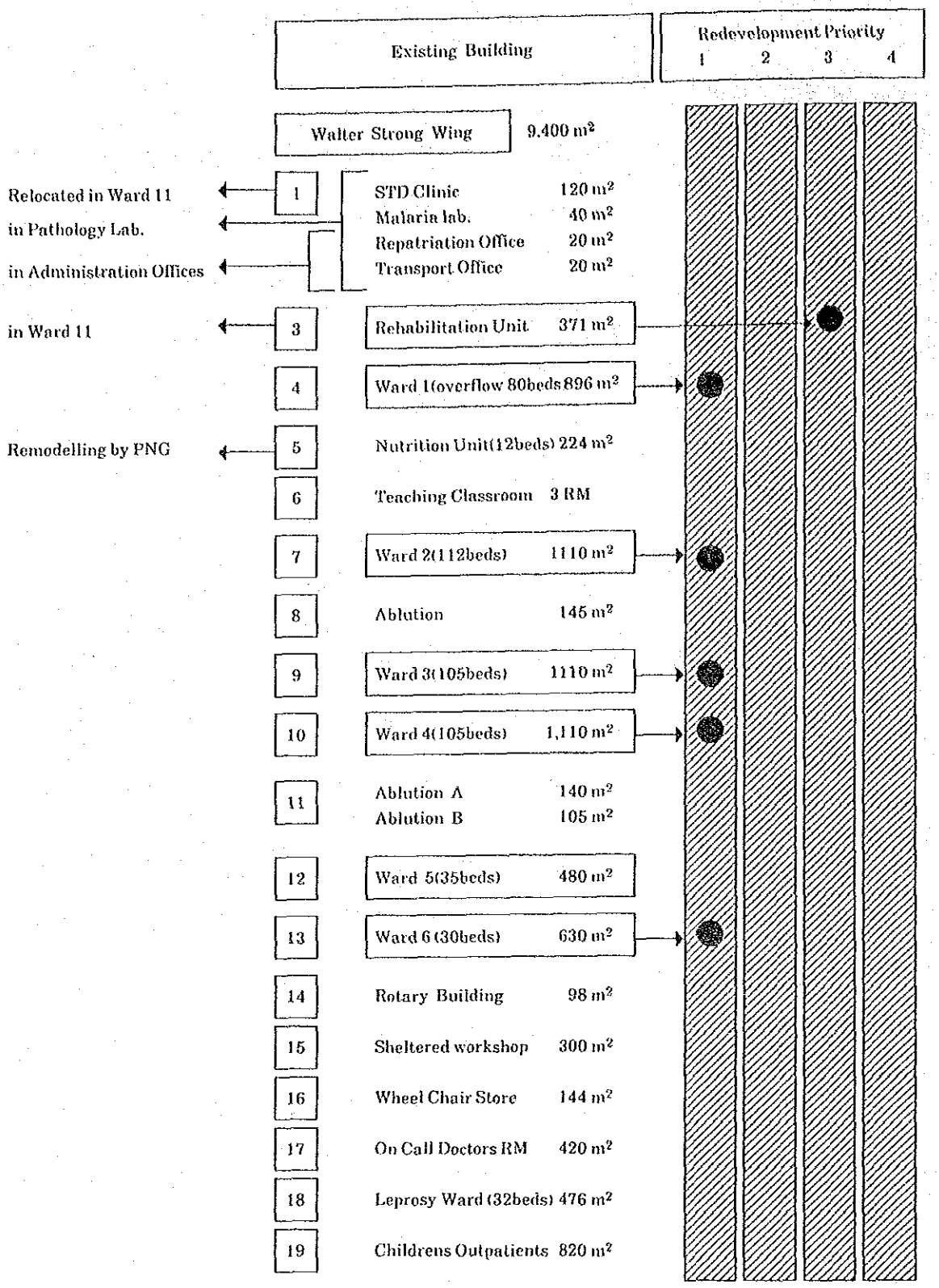
1982 The workshop constructed.

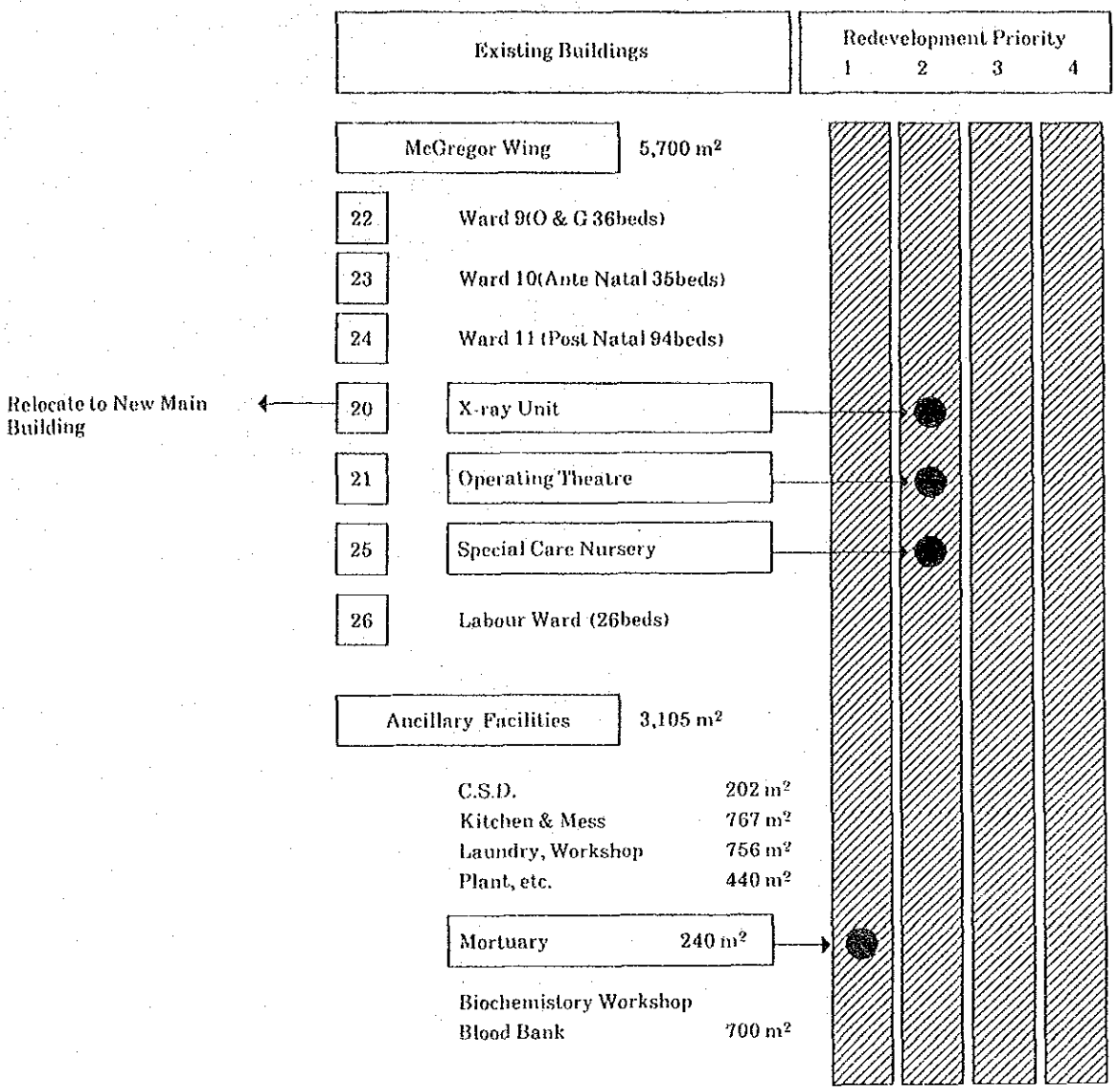
1984 McGregor Wing partially

1986 Children's outpatients clinic constructed.

(1) Present Situation of Facilities




Existing Building
Redevelopment Priority
1 2 3 4
Walter Strong Wing 9,400 m²
Relocated in Ward 11
in Pathology Lab.
in Administration Offices
1
STD Clinic 120 m²
Malaria lab. 40 m²
Repatriation Office 20 m²
Transport Office 20 m²
in Ward 11
3
Rehabilitation Unit 371 m²
4
Ward 1(overflow 80beds 896 m²
Remodelling by PNG
5
Nutrition Unit(12beds) 224 m²
6
Teaching Classroom 3 RM
7
Ward 2(112beds) 1110 m²
8
Ablution 145 m²
9
Ward 3(105beds) 1110 m²
10
Ward 4(105beds) 1,110 m²
11
Ablution A 140 m²
Ablution B 105 m²
12
Ward 5(35beds) 480 m²
13
Ward 6 (30beds) 630 m²
14
Rotary Building 98 m²
15
Sheltered workshop 300 m²
16
Wheel Chair Store 144 m²
17
On Call Doctors RM 420 m²
18
Leprosy Ward (32beds) 476 m²
19
Childrens Outpatients 820 m²


Existing Buildings
Redevelopment Priority
1 2 3 4
McGregor Wing 5,700 m²
22 Ward 9(O & G 36beds)
23 Ward 10(Ante Natal 35beds)
24 Ward 11 (Post Natal 94beds)
Relocate to New Main Building
20 X-ray Unit
21 Operating Theatre
25 Special Care Nursery
26 Labour Ward (26beds)
Ancillary Facilities 3,105 m²
C.S.D. 202 m²
Kitchen & Mess 767 m²
Laundry, Workshop 756 m²
Plant, etc. 440 m²
Mortuary 240 m²
Biochemistory Workshop
Blood Bank 700 m²

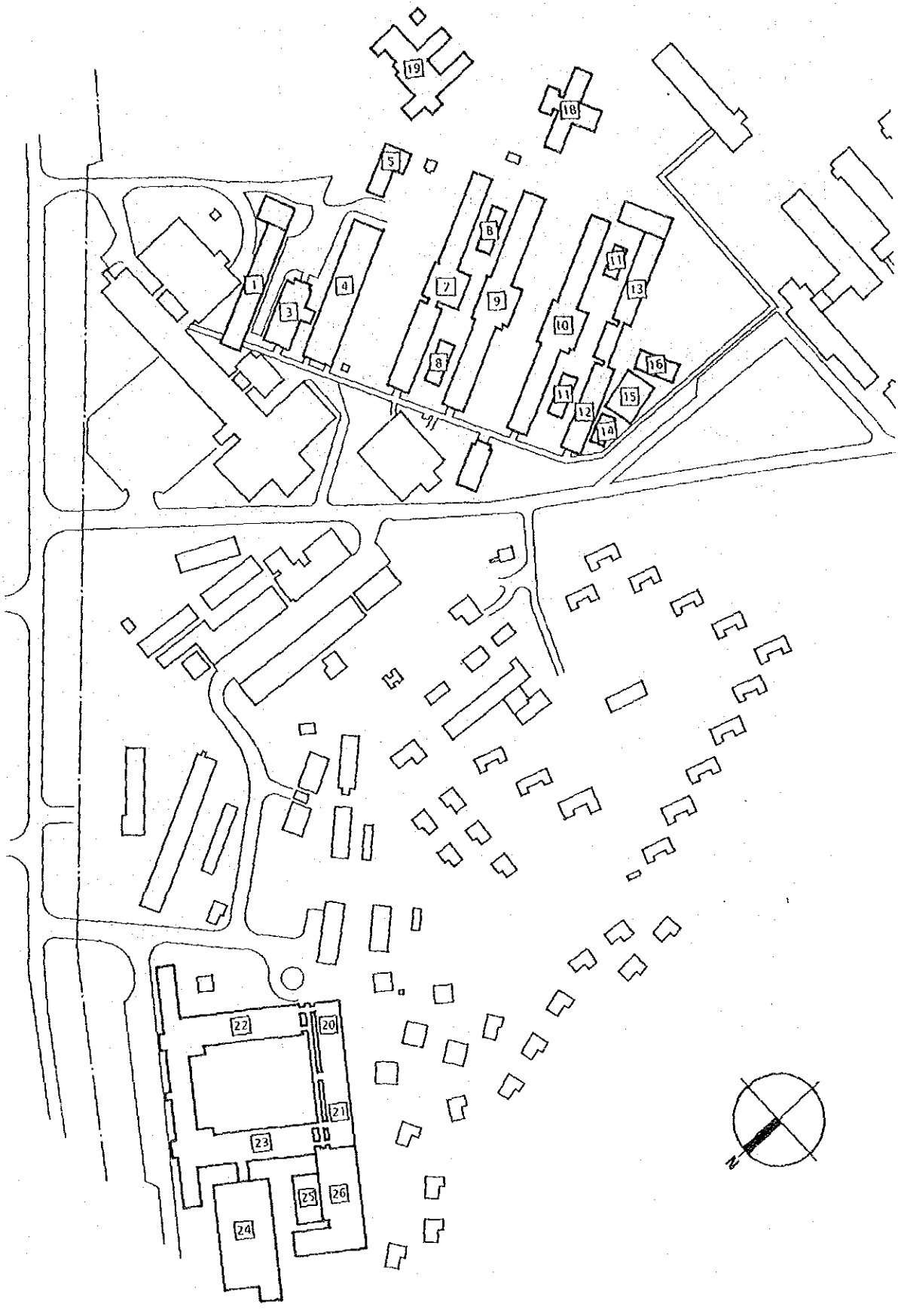


Fig. 2-14 *Present Situation of Port Moresby General Hospital*

(2) Present Situation of the Equipment

The present equipment line-up at PMGH meets the necessary conditions for the current level of health services provided by PMGH. However, only about half of them are being utilised effectively, with the rest being left unused because of mechanical failure, superannuation or shortages of spare parts or related equipment. Although most of the medical equipment requires comprehensive and periodical maintenance and replacement, PMGH can do nothing more than partial repairs and replacements. As a result, the performance of many pieces of medical equipment is unstable and inefficient. Except for the specialist clinics and the intermediate wards which collect extra charges, the outpatient, casualty, paediatric, general and surgical wards facilities are all operating below the level.

With regard to the pathology department, the facilities are equipped with all necessary devices and instruments. However, the equipment for mass treatment of test substances is inefficient. No teaching aids are furnished for use in medical teaching programmes organised by PMGH.

The Table 2-39 shows the results of an evaluation on a 3-point scale of the present situation of PMGH's medical equipment.

As the years of equipment installation shown in Table 2-39 implies, various pieces of equipment installed at different dates, from the 1960s until recently, are currently used at PMGH. Most of the old installations now in use are of simple structure (beds, machine stands, scales, etc.) or easy to maintain (aspirators, lights, illuminators, etc.). However, some of the recent installations are not used or superannuated. This means that there is no close correlation between the period of use of equipment and its present condition. In Japan it is generally understood that the life of medical equipment is 7 to 10 years. But its actual durability depends on how efficiently it is maintained. It can be said that, generally, medical equipment wears faster in Papua New Guinea than in Japan.

Table 2-39 Condition of Existing Medical Equipment

	Department	Condition	Existing Medical Equipment
Outpatient	Outpatient	B	Examining Table(1985)、Suction Unit(1980)
	Casualty	B	Examining Table, Operating Table(1960)、Suction Unit(1973)
	Specialist Clinic	B	Audio meter(1980)、slit lamp(1960)、Automatic Weighting Scale(1975)、Biocular Microscope(1975)、Film Illuminator(1973)
	Children's outpatient	B	ECG(1984)、Portable Defibrillator(1987)
	STD	B	Instrument Table
	X-ray (casualty)	B	X-ray Machine 1(1983)
	Pharmacy	B	Medicine balance,(1985)、Medical refrigerator
Central Diagnosis	X-ray	B	X-ray Machine 3
	Pathology	A	A.A. Spertrophotometer, Flame photometer
	Rehabilitation	B	Traction machine(1978)、High Frequency Faradic Stimulation(1979)
	Operating Theatre	B	Operating Table 4(1975)、Anesthesia Apparatus(1967)
	ICU	B	ICU Bed 6、Cardiac Monitor (1982)
	Louber	A	Delivery Bed (1980), Infant incubator(1980)
	O & G Oprating	B	Operating Table 2(1981/86)、Laparoscope(1983)
	Special Care Nursery	B	Infant incubator(1970)、Phototherapy unit(1970)
	Blood Bank	A	Blood Bank refrigerator, Regrigerated Centrifuge
	CSD	B	Steam Steriliser(1983)
	Mortuary		Freezer(50 corpses)、Autopsy Table
Ward	Paediatric Ward	B	Beds 110 (1960)
	Surgical Ward	B	Beds 110 (1957-75)
	General Medicine Ward	B	Beds 100 (1960)
	TB Ward	B	Beds 47 (1960)
	Psychiatric Ward	B	Beds 23 (1987)
	Intermediate Ward (Surgical)	B	Beds 23 (1985)
	Intermediate Ward (General)	B	Beds 42 (1985)
	Intermediate Ward (O & G)	B	Beds 44
	O & G Ward	B	Beds 42 (1985)
	Leprosy Ward	B	Beds 23 (1973)

( )show the year when installed. A: no problem B: serviceable C: needs replacement

2-4 General Condition of Medical Care-Related Programmes

2-4-1 National Health Plan

(1) The First National Health Plan 1974-78

The Government of Papua New Guinea formulated the first National Health Plan 1974-78 on the basis of the "Eight-point Improvement Plan" which were announced in 1974. The most important change since its independence in 1975 was that some of the functions of the Department of Health were transferred to provincial governments in accordance with their new definition: the Department of Health was to establish standards on health and give technical assistance to the health authorities of the provinces for the purpose of implementing the national government's health and medical care policies and helping provincial governments implement their respective health and medical care measures.

The top-priority goal of the 1974-78 programme was to increase the number of primary health services facilities. As a result, the ratio of the number of persons able to reach health services facilities within 2 hours increased from 86 percent in 1973 to 96 percent in 1985. Also, it was confirmed through the census conducted in 1980 that there had been significant improvements in the neo-natal mortality, the infant mortality, and life expectancy.

(2) The Second National Health Plan 1986-90

Based on the result of the examination of the First National Health Plan 1974-78, the Second National Health Plan 1986-90 was formulated. The following objectives of the programme were worked in accordance with the national goals and guideline set when the country achieved independence.

The 5 objectives of the Second National Health Plan 1986-90

- Participative ..... health services are best received when people and communities are involved in decision-making about their own health;
- Equitable ..... appropriate care should be available to all as close to their home as possible;
- Appropriate ..... standards should reflect the level of community and national development;
- Collaborative ..... the health services must work with other government departments and the community to achieve improvements in health; and
- Efficient ..... maximum benefit should be achieved from the expenditure of scarce resources.

(3) Medium-term Goals for 1988-92

Shown below are the medium-term goals for 1988-92.

- To realise improvements in the quality and efficiency of the existing primary health services and facilities through residents' efforts for self-reliance and active participation.
- To carry out effective activities for spreading the concept of health and prevent diseases by training health workers involved in preventive medicine.
- To improve the functions of primary health services through improvement of the quality of secondary health services.
- To establish national population policies.

To attain the above goals, the national government intends to step up efforts to make improvements in the local health and medical care programmes, and the malaria control programme with assistance from the Asian Development Bank.

As regards secondary health services, it is the intention of the national government to develop secondary health services by concentrating development effort on those which are conducive to the improvement of primary health services. Programmes for developing secondary health services are to be provided at PMGH, Mount Hagen Base Hospital, Lae Base Hospital and Enga Provincial Hospital.

2-4-2 Related Programmes

In 1986, the Government of Papua New Guinea conducted a survey of the actual situation of medical health services with the assistance of the Government of Australia for the purpose of improving the quality and efficiency of primary health services. The survey revealed that a project for improving the facilities of PMGH, as well as for improving the facilities of Mount Hagen Base Hospital (West High Land) and Kundiawa Provincial Hospital (Shimbu), was urgently necessary.

Furthermore, a survey of the actual situation of hospital health services was conducted in 1987 with the assistance of the Asian Development Bank. This survey was conducted on the basis of the results of the 1986 survey and the Second National Health Plan 1986-90, and a master plan for Lae, Mt. Hagen, Arawa, Kundiawa, Madang, Wewak, Kerema, Lorengau, Vanimo, was proposed based on the results of this survey. On the other hand, two projects, including one for training dentists at PMGH (1982-89) were launched by the World Health Organisation.

In 1987, the project for both quantitative and qualitative improvement in the medical equipment was implemented through a grant aid from Japan. In this project, technical cooperation was extended to 20 hospitals, including PMGH, and 468 health centres across the country. After reviewing the contents of the above surveys, it was confirmed that the scope of the proposed project does not overlap other projects.

2-5 Present Situation of International Cooperation in the Field of Medical Health Services

In 1986, foreign countries offered a total amount of 4,386,400 Kina in grant aid to Papua New Guinea. The major assistance-providing nations and organisations were the Asian Development Bank (1,782,000 Kina), the World Health Organisation (1,079,000 Kina), the United States (351,000 Kina) and Australia (341,000 Kina).

The projects implemented recently as international cooperation projects for the Department of Health of Papua New Guinea are shown in the Table 2-40.

Table 2-40 Medical Health Services International Cooperation

Assisting Country or Agency	Project	Implementation Period	Project Cost (Unit: US$)
Australia	Nursing Education Volunteer Activities	1983~1985	1,800/year
	Disabled Child Volunteer Activities	1984~	7,000/year
	Medical Specialist Technical Cooperation	1985~1988	809,300
	Rae Hospital Radiographer Technical Cooperation	1985	7,200
	Hospital Planning Study	1985	129,500
	Medical Registrar	N.A.	
	Solar Energy Refrigerator Project	N.A.	
	CAHS Project	N.A.	
Canada	Mt. Hagen Hospital Rehabilitation Programme	1985~1986	2,508
	Mont Float Catholic Hospital	1985~1986	11,146
	Medical Transportation Supply Project		
	Disabled Child Rehabilitation Programme	1985~1986	23,078
Korea	Medical Equipment Supply Project	N.A.	
U.S.A.	Pure Water Supply Project	N.A.	
	Child Life-support Training	N.A.	
China	Acupuncture Technical Cooperation		
Japan	Medical Equipment Supply Project	1987	4,030,000
WHO	Maralia Control Programme	1985 (1977~1985)	238,759
	Medical Care System Development	1985 (1974~1989)	331,787
	Medical Education Strengthen Programme	1985 (1982~1989)	133,214
	PMGH Dental Therapist Training Programme	1985 (1982~1989)	30,000
	PMGH Medical Research Strengthen Programme	1985 (1985~1987)	49,660
UNICEF	Primary Health Care Activities Programme	1985~1987	120,00
	Rural Health Service Study	1983~1987	177,000
UNFPA	Family Plan	N.A.	
ADB	Rural Health Impruvement Programme	1982~1988	12,00,000
	Hospital Services Project	1986	240,000

N.A.: not available

2-6 Background and Contents of the Proposed Project

2-6-1 Background of the Proposed Project

With completion of the construction of the Walter Strong Wing in October 1957, Port Moresby General Hospital (PMGH) started its operations as a hospital with obstetric and gynaecological, paediatric, surgical and internal medicine departments, with 350 beds. Between 1961 and 1982 the McGregor Wing, the Red Cross Blood Transfusion Services, ICU, the nutrition guidance wing, the rehabilitation wing, the guidance on family health wing, the leprosy wing, the observation of infant diseases wing, the workshop and so on were constructed with the assistance of international organisations. In 1974, the new central building with 4 operating theatres, ICU and testing room was constructed. As a result, PMGH began to function as a general hospital with 700 beds. Since improvements and extensions of its facilities were not conducted under a comprehensive long-term policy, however, their arrangement was extremely inefficient. Furthermore, in the architectural design for the Walter Strong Wing, which was constructed in 1957, its life was estimated at 25 years. Now the building is 30 years old and is therefore extremely superannuated. As a result, there have been substantial increases in the cost of operating and maintaining the buildings.

On the other hand, in the government's policies, top priority is given to "economic development", and "reinforcing the social infrastructure". As grant aid from Australia which once accounted for 40 percent of the national government's total budget have been on the decline, it is presently difficult to construct additional secondary health services facilities. Therefore, the Department of Health came up with plans to improve the present functions of hospitals mainly through training of human resources in health care without having to expand the existing facilities and increase costs for their operation and maintenance. On the basis of the recommendations presented in the reports on the surveys of

the actual situation of health care in Papua New Guinea, conducted in 1986 and 1987 respectively with the assistance of the Government of Australia, the Government of Papua New Guinea drew up the project for improvement of the facilities of PMGH, and in September 1987 requested the Government of Japan to provide a grant aid for the project.

In response thereto, the Government of Japan decided to carry out a basic design study concerning the requested grant aid cooperation, and the Japan International Cooperation Agency (JICA) dispatched the Preliminary Survey Team in February 1988 and the Basic Design Study Team in May 1988, respectively.

2-6-2 Contents of the Request

The contents of the request of the Government of Papua New Guinea for a grant aid, confirmed after consultations between the Japanese preliminary survey team, the subsequent Japanese basic design study team, and representatives of the Government of Papua New Guinea, are summarised herewith.

(1) First Priority Items

(a) Outpatient
(b) Casualty
(c) Specialist clinic
(d) Pharmacy
(e) X-ray
(f) Mortuary
(g) Medical ward (240 beds)
(h) Surgical ward (160 beds)
(i) Paediatric ward (150 beds)
(J) Psychiatric ward (50 beds)
(k) Other
(l) Emergency power plant unit
(m) Exterior utilities
(parking lot, access road within the site)

(2) Second Priority Items

Obstetric and gynaecological operating theatre, special care nursery, X-ray

(3) Third Priority Item

Rehabilitation

(4) Fourth Priority Item

Remodeling and renovation of existing buildings and facilities.

Existing main hospital block

(a) Administration offices in place of outpatient and clinic area

(b) Pathology in place of mortuary area

(5) Fifth Priority Item

Medical equipment (movable)

CHAPTER 3 CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3-1 Objective of the Project

This project is aimed at alleviating the shortage of beds in medical facilities, securing an adequate number of beds for referral patients and thereby reinforcing the country's support system for provincial hospitals and government medical care institutions in order to improve the quality of medical health services in the country. To this end, the national government will improve, through a grant aid from the Government of Japan, the facilities of the outpatient department, which are now small, the scattered facilities of the X-ray Department and the superannuated facilities of Wards of Port Moresby General Hospital in order to increase efficiency in operation and management of the entire hospital, and improve the hospital's functions.

3-2 Examination of the Contents of the Request

3-2-1 Examination of the Contents of the Project

The following four functions are required of the hospital so that it may fulfill its roles as the nation's only general hospital.

1) Base hospital in Central Province

2) Primary health services hospital in the National Central District

3) Referral centre

4) Teaching institution for doctors and other medical staffs

As stated in Chapter 2, however, the present situation of PMGH is characterised by the superannuation and scattering of the facilities. Thus it is urgently necessary to improve the contents and arrangement of the facilities.

Furthermore, it is expected that there will be sizable increases in the number of patients in keeping with increases to normalise the reduced functions of the hospital and improve the medical health services provided by the hospital.

For this reason, it is necessary basically to:

1) Reconstruct the superannuated facilities,

2) Rearrange the scattered facilities, and

3) Expand those facilities which are too small

The hospital after completion of the proposed project will be operated and managed by the existing personnel of the hospital. If the hospital's functions are improved as a result of implementation of this project, it will be possible to improve the efficiency of its medical health services without drastically changing the present system of operating and managing its facilities and equipment.

The projected construction site includes a land lot between the existing main hospital building and children's outpatient clinic and the northwestern parking lot near the delivery ward of the McGregor Wing. Accordingly, it is agreed between the basic design study team and the Papua New Guinean side that the existing nutrition unit, the STD Ward the Rehabilitation Ward and the Ward 2 will have to be removed before the construction work gets started. There will be no serious problem with supply of water, electricity, telephone services, and so on, to the construction site. Moreover, in selecting the construction site, due

consideration was given to the functional/geographical relationships among the departments of the hospital and to ways of securing the smooth operation of the hospital during the construction period.

3-2-2 Examination of the Facilities and Equipment Requested

The contents of the facilities and equipment requested were presented to the Japanese side at the stage of basic design study, with the order of priority shown for each item. The Japanese side examined the contents of the facilities and equipment requested after completion of the surveys in Papua New Guinea, relating them to the scope of the project.

(1) New Main Building

- Outpatient, Casualty, Specialist Clinic and Pharmacy

  The trend in the number of patents is as shown in Table 3-1. According to the table, the daily average number of general outpatients is 510 (168,540 outpatients/330 days; the average number of outpatients for Sundays is less than half that for weekdays) in 1985. According to the results of the on-site investigations conducted in PMGH, there is no wide variance in the number of outpatients from one weekday to another. That daily average number of outpatients undergo medical examination by one or two nurses and treatment by doctors in three treatment booths. But these facilities are always crowded with patients because of the shortage of both treatment booths and waiting spaces and the inconsistency in path of flow between the medical health services system and the building. Even the medical Specialist Clinic Department is suffering a decline in efficiency due to the insufficient space in the treatment room for the number of doctors.

The Casualty Department is located adjacent to the Outpatient Department. It is necessary to make the two departments adjoined because doctors of the Outpatient Department are also responsible for services by the Casualty Department.

The Pharmacy Department has a small waiting space with only 14 seats. Patients wait for their turn crowding near the counter. Moreover, this waiting space is located in the path of flow of patients moving to the clinical departments and causes confusion.

The above 4 departments are in the one-story building located to the west of the existing main hospital building which was constructed in 1974. The waiting space which is relatively new is surrounded on all sides by the clinical facilities. It is ventilated mechanically. But the air conditioner is out of order and it is not known when it will be repaired. There are no ceiling fans in these areas either.

The present condition and scale of the facilities shows clearly that these facilities will not be able to cope with future increases in the nation's population and the number of outpatients. Since it is impossible to partially extend the outpatient facilities, it is imperative to construct new facilities for these departments in the new main building.

Table 3-1 Number of Outpatient in PMGH and Population

	1985	1986	1987	1995	Reamrks
Outpatient (exclude: Obstetric & Gynaecology, Paediatric, Specialist Clinic)	168,540 (100%)	198,540	176,253	214,000~251,000 (127%~149%)	PMGH Statistics
Outpatient	374,526 (100%)	450,306	462,000	557,000 (149%)	DOH Statistics
Population of NCD + Population of Central	266,700 (100%)	274,300	281,900	340,000 (127%)	〃
Population of PNG	3,343,000 (100%)	3,419,000	3,498,800	4,4,183,100 (125%)	〃

- The X-ray Department

  X-ray diagnosis is conducted at the X-ray Department in the McGregor Wing which is located about 350 meters away from the existing main hospital building. Patients who have to receive X-ray diagnosis walk to the McGregor Wing with their record card and a written request for X-ray diagnosis prepared by their doctors. Sometimes patients are transported to the wing by an ambulance car. This situation is apparently imposing extra labour on both patients and staffs. It is unreasonable that the X-ray Department which is part of the main clinical division is separated from other main functions of the hospital. The Department should move to the new main building.

- The Mortuary

  There are two mortuaries in the hospital - one mortuary is on the ground floor of the existing main hospital building and the other in a place opposite to the existing main hospital building, with an access road between them. The mortuaries are too small for the number of the remains laid out in them. In addition, they are very inefficient because they are not located near each other. It is considered necessary, therefore, to construct an integrated Mortuary in the new main building. It should be noted, however, that nearly 50 persons, including the family of the deceased and relatives, mourn for the deceased in the mortuary before the body in passed over to the family. It is therefore advisable to construct a new Mortuary separate from to the new main building.

- The Paediatric, Surgical, General and Psychiatric Ward

  The trend in the number of inpatients is as shown in Table 3-2. It should be noted, however, that the number of inpatients is determined simply by the hospital's present ability to accept inpatients. It does not reflect accurately the actual number of persons who need to be hospitalised. The number of beds at the time of basic design study was 798. But the actual number of inpatients exceeds the number of

beds. Some inpatients are using beds placed in the passageways or collapsible beds. Also, the hospital is often forced to discharge some inpatients earlier than scheduled, and have them visit the hospital as outpatients. The average number of days of hospitalization was 13.0 (798×365/22,336) in 1987. This was about one-third of the average period of hospitalization in Japan. It is clear that the frequency of bed use is very high in Papua New Guinea even though it is admitted that the pattern of main diseases in Papua New Guinea is different from those in other countries.

The above 4 wards are in the Walter Strong Wing which was constructed in 1957. These wards were designed on the assumption that their life would be 25 years. They are now 30 years old and therefore are extremely superannuated. Furthermore, they are all wooden buildings with corrugated galvanised iron roofs. No heat insulators are used in them and their windows are relatively small. Therefore, none of these wards is well ventilated.

Judging from these factors, it is imperative to construct new wards in the new main building.

Table 3-2 Number of Inpatients in PMGH and Population

	1985	1986	1987	1995	Remarks
Inpatient	21,198 (100%)	21,762	22,336	27,000 (127%)	DOH Statistics
Population of NCD + Population of Central	266,700 (100%)	274,300	281,900	340,000 (127%)	〃
Population of PNG	3,343,000 (100%)	3,419,000	3,498,800	4,183,100 (127%)	〃

(2) The Obstetric and Gynaecological Wing

- The Operating Department

The facilities of the department are in the wing located to the west

of the McGregor Wing. The operating facilities, which were remodeled in 1984, are equipped with air conditioners. However, the building itself is a wooden building constructed in 1957 and most of its structural materials have been eaten by termites. It is urgently necessary to reconstruct the building. Furthermore, it is required that the number of the operating theatre should be expanded in accordance with the increase of operation in future.

- Special Care Nursery and X-ray Department

  The Special Care Nursery in the McGregor Wing presently has 23 beds for newborn babies. The room is operated and maintained well. The equipment is in good condition. In addition, it is unlikely that future increases in the number of beds will necessitate complicated construction works.

  While, no X-ray facilities will remain in McGregor Wing when the entire X-ray Department moves to the new main building. However, at present, cases of X-ray diagnosis for Obstetric and Gynaecology are a few and the portable X-ray machine which is installed in the existing building can be used. Accordingly, the construction work related to this facility is not included in the works by the Japanese side.

(3) Rehabilitation

The Rehabilitation Department is located in one of the Walter Strong Wing. Like many other wards, its facilities are superannuated and need to be reconstructed. However, as these facilities are not so large in scale, the equipment is not so complicated and the work to improve them can be implemented separately from this project, all the construction work related to these facilities can be implemented by the Papua New Guinean side. Accordingly, it is not included in the works by the Japanese side.

(4) The Existing Main Hospital Building

- Remodelling and renovation of existing buildings and facilities such as administration offices, in place of outpatient and clinic area, and pathology in place of mortuary area.

  As stated earlier, the existing main hospital building is relative new and therefore there is no structural problem with it. The facilities of the administration and testing departments are easy to improve, and accordingly could be improved by the Papua New Guinean side. Thus, this improvement work is not included in the scope of works by the Japanese side.

(5) Medical Equipment

Based on the results of the surveys on the present conditions of the existing equipment, those pieces of equipment which are indispensable in carrying out medical health services and which cannot be moved to the new facilities should be procured. In working out the equipment plan, basic diagnosis equipment, spare parts and medical supplies and so on should be included in the list of the new equipment and related products, and at the same time minute care should be taken so that the new equipment may harmonise with the existing one.

3-3 Contents of the Project

3-3-1 Implementation of the Project

The operation and management of the facilities of PMGH after completion of the project will be done through an operation and management system comprising the existing personnel of 776 staff members in a manner as shown in Table 3-3~6.

The number of staff members in each department is as shown in the table below.

Table 3-3 Allocation of Doctors (172 persons)

	Superintendent	Specialist	Registrar	Resident	Pharmacist	Dispenser	Staff/Worker	Total
Administration	1						2 1	4
Medicine		7	5	4			4	20
Surgery		4	4	4			1 3	16
Paediatrics		4	5	4			2 6	21
ENT		1	1	2				4
Ophthalmology		1	2	0				3
O & G		5	6	5			3 15	34
Dermatology		1	1					2
Tuberculosis		1	1	1			1	4
Pain		1	2	1			1	5
STD		0	1	0				1
Outpatinet/ Casualty			8 (4)	3			2	13 (4)
Dentist		2	11 (Therapist)	8 (Orderly)			2	23
Pharmacy					1	4	3	8
Full Nursing Ward							5	5
Intermediate Ward							5	5
Total	1	25 2	36 11 (Therapist) 4(Part time)	24 8 (Orderly)	1	4	30 26	172

Table 3-4 Allocation of Nurses (341 persons)

	Matron	Unit Supervisor No.4	Senior Nurse No.3	Senior Nurse No.2	Junior Nurse No.1	Nurse Aide NA. 3.2.1	Total
Administraton	1 1 (Deputy Matron)	1 (Coordinator)	1 (Coordinator)				4
Unit 1		1					1
ICU			1	3	6	9	19
Full Nursing Ward			1	1	7	10	19
Intermediate Ward			1	1	6	7	15
Medical Ward			1	2	7	10	20
Psychiatric Ward			0	1	0	1	2
Operating theatre			1	2	7	10	20
CSD			1	0	1	3	5
Unit 2		1					1
Paediatric Ward			1	5	5	9	20
Surgical Ward			1	1	8	15	25
Leprosy Ward			0	2	0	5	7
Nutrition Unit			0	1	2	1	4
Outpatient/Casualty			1	2	10	14	27
Specialist Clinic			1	5	3	3	12
Children's Outpatient			1	2	7	8	18
Unit 3		1					1
O & G Ward			1	2	4	6	13
Ante Natal Ward			1	3	4	4	12
Post Natal Ward			1	5	4	9	19
Special Care Nursery			1	2	5	6	14
O & G Theatre			1	2	0	4	7
Ante Natal Clinic			1	3	2	2	8
Blood Bank			1	2	0	2	5
Labour Ward			1	6	8	6	21
Night Supervisor			2				2
on leave				3	12	5	20
Total	2	4	22	56	108	149	341

Table 3-5 Allocation of Administration and Service Staff (142 persons)

	Officer Rank 1	Officer Rank 2	Officer Rank 3	Officer Rank 4	Technician Rank 1	Technician Rank 2	Worker	Total
Hospital Secretary	1		1	2			13	17
Administration Section Service Section		1	1	4 (General) 2 (Work-shop)	1 (Seam-tress)		13 (Driver), 2 (General), 8 (Security), 13 (Cleaner), 12 (Laundry), 5 (Workshop), 3 (Seamtress), 2 (Porter)	67
Personnel Section		1	1	1				3
Meal Section			2		17(Cook)	5	6	30
Medical Record Section		1	1	3			7	12
Account		1		6			6	13
Total	1	4	6	18	18	5	90	142

Table 3-6 Allocation of Central Diagnosis & Treatment Staff (121 persons)

	Doctor	Technician Rank 1	Technician Rank 2	Officer	Worker	Total
Pathology		20	5	6	12	43
X-ray	1 (Chief) 2 (Supt)	7	7	4	1	22
Operating	1	2		1	7	11
Blood Bank	1 (Doctor)	3 3 (Nursing Officer)	3 (Nurse Aide)	1	4	15
Physiotherapy Social Worker		2 2	2			6
Autopsy & Mortuary		1		1	4	6
CSD					18	18
Total	5	40	17	13	46	121

The hospital's personnel includes many part-timers in addition to full-time doctors, nurses, technicians and clerks, and the number of such part-timers varies from month to month. However, there will be no significant change in the hospital's personnel expenses, although there have been slight increases in expenses in recent years. Accordingly, it is

necessary to design the additional facilities on the assumption that they will be operated and managed by the hospital's existing personnel.

3-3-2 The Hospital's Services

The present medical health services by PMGH will continue to be provided by the departments described in Fig.2-9 after completion of this project.

It was agreed between the Papua New Guinean and Japanese sides at the time of basic design study that, in principle, the present operating and managing system will continue to be used for operation and management of the hospital after completion of this project.

(1) New Main Building

1) The Outpatient Department

About 650~760 patients a day (Outpatient Expectancy 1995 214,000 ~ 251,000/330 days) undergo screening by nurses and they may receive diagnosis by doctors. The specialists diagnose and treat such patients, or decide that they be hospitalised. After that, such patients go to the pharmacy to receive their medicine. The consulting hours of the Outpatient Department are from 8:00 a.m. to 4:00 p.m. The typical daily schedule for doctors who diagnose general outpatients is as shown below. Eight full-time registrars, four part-time registrars and three residents are working in three shifts, also providing services in the Casualty Department.

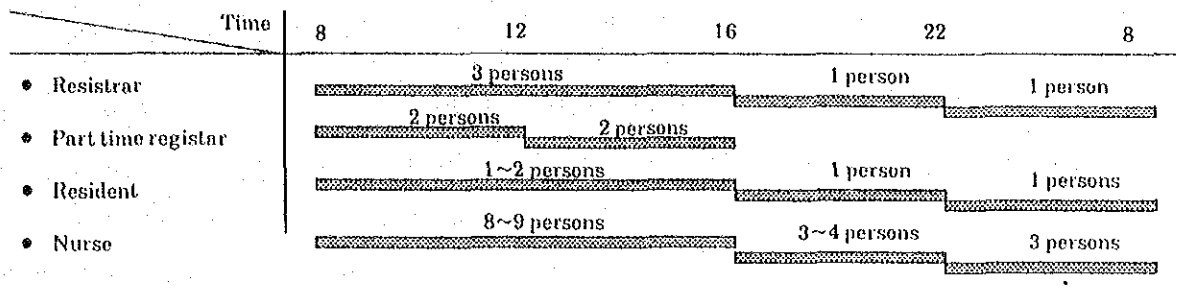


Fig. 3-1 Working Schedule of Outpatient

2) Casualty Department

This department conducts outside-examination-hours and emergency treatment. The outside-examination-hours service is offered at the facilities of the outpatient department after examination hours. The emergency treatment of a patient transported to the hospital by an ambulance car is done at the room for special emergency. In recent years, there have been increases in the number of persons killed or injured in traffic accidents.

In this department, teams consisting two of full-time registrars, part-time registrars, residents, are working in three shifts night and day. Registrars and residents working from 8:00 a.m. to 4:00 p.m. every weekday may help the Outpatient Department occasionally.

3) Specialist Clinic Department

Those patients who are found to require diagnosis and treatment by medical specialists visit the Specialist Clinic on a reservation basis.

This department is divided into Psychiatrical, Surgical, Internal, Paediatric, Tuberculosis, STD, ENT, Ophthalmological, Pain and Dermatological sections. At this department, teams of specialists, registrars and residents are working in relays, each team engaging in diagnosis and treatment of outpatients and inpatients and also on-call

services. At the Surgical section, for example, there are four teams, each consisting of a medical specialist, a registrar and a resident. And the four teams are further divided into an outpatient team, two ward teams and an on-call team. At the tuberculosis section, however, there is only one team consisting of a specialist, a registrar and a resident. The three doctors are working in three shifts, each of them providing different services at a time. Shown below are the typical daily work schedules for the sections of this department.

Table 3-7 Specialist Clinic Work Schedule

	Opening Day	Opening hour	Doctors in Charge
Psychiatric	Mon~Fri	8~12、13~1	1 (Specialist)
Surgical	Mon~Fri	8~12、13~16	3 (Specialist1,Registrar1,Resident1)
Internal Medicine	Mon~Fri	8~12、13~16	3 (Specialist1,Registrar1,Resident1)
Paediatric	Mon~Fri	8~12、13~16	3 (Specialist1,Registrar1,Resident1)
Tuberculosis	Mon~Sun	8~12、13~16	1~2 (Specialist,Registrar or Resident)
STD	Mon~Thu	8~11, 13~15	1 (Registrar)
ENT	Mon · Wed · Fri	8~12、13~16	1 (Specialist or Registrar1)
Ophthalmology	Mon~Fri	8~12、13~16	1~2 (Specialist1、Registrar1)
Pain	Mon~Fri	8~12、13~1	2 (Specialist, Registrar or Resident1)
Dermatorogy	Mon~Fri	8~12、13~16	1 (Specialist or Registrar1)
O & G	Mon~Fri	8~12、13~16	3 (Specialist1, Registrar1, Resident1)

Specialists periodically make trips to local base hospitals for treatment. While one of them is away from the hospital on a trip to a local base hospital, one of the other specialists takes his place.

4) The Pharmacy Department

This department is operated by a pharmacist and four dispensers. It procures medicines from the medicine warehouse in Port Moresby once a month and supplies medicines to the Outpatient and Ward Departments. Medicines are supplied to the Outpatient Department from 8:00 a.m. to 4:00 p.m. every weekday, and to the ward once a week. The department

can procure gas for medical use from private manufacturers in Port Moresby.

The trend in the number of medicine administrations is shown in the table below.

5) The X-Ray Department

This department makes X-ray examinations of patients who were directed to undergo an X-ray examination or who are required to do so after undergoing an operation. This department takes general X-ray photographs.

6) The Paediatric, Surgical, General Medical and Psychiatric Wards

As stated earlier, specialists, registrars and residents are diagnosing and treating patients as teams. After consulting hours, they provide on-call services to inpatients. Nurses are working in three shifts - from 7:00 a.m. to 3:00 p.m., from 2:00 p.m. to 10:00 p.m.and 10:00 p.m. to 7:00 a.m. (on the next day).

(2) The Mortuary

The monthly number of cases of dead-on-arrival (DOA) is about 80, of which about 20 percent are passed over to the families of the deceased and the rest are stored in the refrigerator of the Mortuary. In most cases, the family of the deceased find it difficult to arrange for a funeral service promptly. In the case of a person who died in a traffic accident, it takes some time to identify them. Under the law and regulations of NCD, the dead bodies of adults aged 16 or older can be laid out in the Mortuary for up to one month, and those of children under 16 for up to two weeks. Usually, 60 to 70 percent of the dead bodies are laid out in the Mortuary for the maximum permissible period.

(3) The Obstetric and Gynaecological Operating Theatre Building

1) Operating Room

Caesarean section, tubal ligation, evacuation of uterus, and myoma of the uterus will be performed mainly in this room. Medical examinations by the use of laparoscope which require anaesthesisation, will also be conducted in this room.

2) X-ray Room

X-ray photographs for use in diagnosis of pregnant women's complications and infertility testing will be taken in this room.

3-3-3 Outline of the Facilities and Equipment

To improve the superannuated and scattered facilities and increase the efficiency in operation and management of the hospital, it is necessary to construct a new main building which comprises Outpatient, Casualty, Specialist Clinic X-ray and Wards, a Mortuary Building, and an Obstetric and Gynaecological Operating Theatre Building which includes X-ray room. It is also necessary to work out an optimal arrangement of these new facilities because these new facilities are considered an extension of the existing facilities, with both closely related to each other. The medical equipment which is currently in use at facilities which will be directly involved in the project and which can be used in the future should be moved to the new facilities.

(1) Facilities

The new facilities to be constructed in this project are as shown below.

1) New Main Building

- Outpatient Department

  Waiting area, diagnosis examination room, treatment room, equipment store, etc.

- Casualty Department

  Waiting area, examination/treatment room, observation room, emergency operating room, nurse station, etc.

- Specialist Clinic Department

  Psychiatric examination/treatment room, surgical examination/treatment room, internal examination/treatment room, tuberculosis examination/treatment room, STD examination/ treatment room, ENT examination/treatment room, ophthalmological examination/treatment room, pain examination/treatment room, office, etc.

- Pharmacy Department

  Waiting area, dispensing room, general medicine store room, pharmacist room, etc.

- X-ray Department

  X-ray room, control corridor, reading room, dark room, etc.

- Paediatric Ward (150 Beds)

  Bed room, nurse station, treatment room, doctor's room, etc.

- Surgical Ward (160 Beds)

  Bed room, nurse station, treatment room, doctor's room, etc.

- General Medical Ward (230 Beds)

  Bed room, nurse station, treatment room, doctor's room, etc.

- Psychiatric Ward (40 Beds)

  Bed room, nurse station, treatment room, doctor's room, etc.

- Mechanical Room

2) Mortuary Building

- Mortuary, preparation room, body storage, etc.

3) Obstetric and Gynaecological Operating Theatre Building

- Operating Department

  Operating room, washing room, doctor's room, etc.

(2) Equipment

Shown below is the outline of the new equipment required by the above departments.

1) New Main Building

- Casualty Department

  This department requires equipment for use in the minor operating theatre and observation rooms.

  Operating table Nebuliser

  Electrocardiograph

- Specialist Clinic Department

  This department, which includes Psychiatric, Surgical, Internal, Paediatric, Tuberculosis, STD, ENT, Ophthalmological, Pain, Dermatological sections, provides specialised examination and treatment services to patients whom it is very difficult to treat at the General Outpatient Department. Especially the following sections require the mentioned equipment.

- ENT Section

  ENT unit — ENT treatment chair

- Ophthalmological Section

  Slit lamp — Synoptophore

- Dermatological Section

  Binocular microscope

- Pharmacy Department

  This department services the Outpatient, X-ray, Operating Theatre and all Wards and even to the delivery room. Therefore, special emphasis should be placed on ways to eliminate complicated procedures in keeping and managing medicines in selecting the equipment required by this department.

  Dispensing table — Distilled water apparatus

- X-ray Department

  As regards the X-ray Department, installation of the following equipment should be examined taking into consideration the past records of examinations and the possibility of reusing the existing equipment.

  X-ray TV machine

  X-ray machine (shifting from McGregor wing)

  X-ray machine (shifting from casualty dept. of the existing main hospital building)

- Paediatric Ward

  The Paediatric Ward will have 150 beds and will be operated by 2-nursing units. In the Ward existing equipment will be used except following. This fact should be taken into account in selecting the equipment required by this ward.

  Bed pan steriliser — Ice making machine

- Surgical Ward

  The Surgical Ward will have 160 beds and will be operated by 2 nursing units. Of the 160 beds, 10 will be orthopaedic and fracture beds, and 20 will be one-crank gatch bed.

Bed pan steriliser	Beds
One-crank gatch bed	Orthopaedic and fracture bed
Ice making machine	

- General Medical Ward

  The General Medical Ward will have 230 beds and will be operated by 2 nursing units. Of the 230 beds, 40 will be one-crank gatch beds.

Bed pan steriliser	Beds
Ice making machine	

- Psychiatric Ward

  The Psychiatric Ward will have 40 beds.

  Beds

In wards, total new 250 beds (including 60 one-clank gatch beds, 10 orthopaedic and fracture beds) will be required, and rest of 580 beds will be used existing beds.

2) Obstetric and Gynaecological Operating Theatre Building

- Operating Department

The oxygen inhalation equipment should be connected to the central air pipe. Also the ward should include a sterilising room. Since it is expected that there will be increases in the number of patients, the following equipment should be added to the existing one.

Operating table	Operating light	Diathermy machine
Ultrasonic cleaner	Water steriliser	Operating glove dryer
Autoclave		

3-3-4 Outline of the Project Site

(1) Projected Construction Site

Port Moresby General Hospital is located about 6 km east of the centre of the city. It is adjacent to the buildings of the faculty of Medicine of UPNG, the College of Allied Health Sciences. The projected construction site is a land lot of irregular form, gently sloping to northeast. On the northeastern side it borders on the Taurama Road, one of the city's trunk roads. The facilities of the Walter Strong Ward, the McGregor Ward, the existing main hospital building constructed in 1974 and the Children's Outpatient Clinic which opened last year are scattered on the site.

According to the geographical survey data on the projected construction site obtained from the Department of Works of Papua New Guinea, the layer immediately below the ground surface (up to 2m deep) is a grayish brown clay layer, which is followed by a whitish yellow sandy clay layer. These clay layers are characterised by a high degree of swelling. The ground water level is very low. (The actual ground water level has not been confirmed in the past surveys.)

On the Taurama Road, there is a bus stop by the side of the entrance of the hospital. Buses stop frequently at this bus stop. Many patients visiting this hospital utilise buses running on this route.

(2) Infrastructure

1) Electricity

11 kV overhead electric power transmission line has already been laid along the Taurama Road running on the northeastern side of the projected construction site. Currently, electricity is supplied from this power line.

Since this line is connected to the facilities of UPNG, the power distribution system is very complicated. Accordingly, electric power should be supplied to the new wards via new utility poles. (The power distribution system for the new facilities should be separated from that for UPNG.)

In Port Moresby there are about 5 power failures and power cuts a year. So the new facilities of the hospital should be equipped with devices to cope with power failures or cuts. Also, measures are necessary to cope with the wide fluctuations in voltage, which exceed the target range of ±5% set by the Public Electric Power Corporation.

2) Telephone

A telephone cable with 200 circuits has already been connected to the telephone exchange room of the existing main hospital building. About 30 of the 200 circuits will be allocated to the new facilities.

It is also possible to take the necessary number of circuits from the telephone drop in the existing manhole in the Taurama Road.

3) Water Supply

The City of Port Moresby has a water supply system, which uses the waters of the Laloki River. The National Capital District Interim Commission is responsible for operation and management of this system. The water taken from the Laloki River is purified through sedimentation, filtration and sterilisation, and therefore the quality of tap water is quite good. On the other hand, the Waterboard is responsible for operation and management of the water supply systems in all other areas. Generally, two branches come from the water main one for tap water which comes via water meter, and one which connects to a fire hydrant in every land lot.

Water is supplied to the existing hospital facilities from the water main with a 150mm diameter which is laid along the Taurama Road running on the northeastern side of the promises of the hospital. At present 7 branches of the water main are connected to the existing facilities. Water will be supplied to the new facilities from the water tap with a 150mm dia. via a new water meter.

4) Sewerage

The National Capital District Interim Commission is responsible for operation and management of sewerage. Soil and waste and other waste water are discharged directly into the sea. Waste water from the existing hospital facilities is discharged into a sewer pipe laid along Noko place, across the Taurama Road. Rain water is discharged into an open channel-type ditch laid along the Taurama Road.

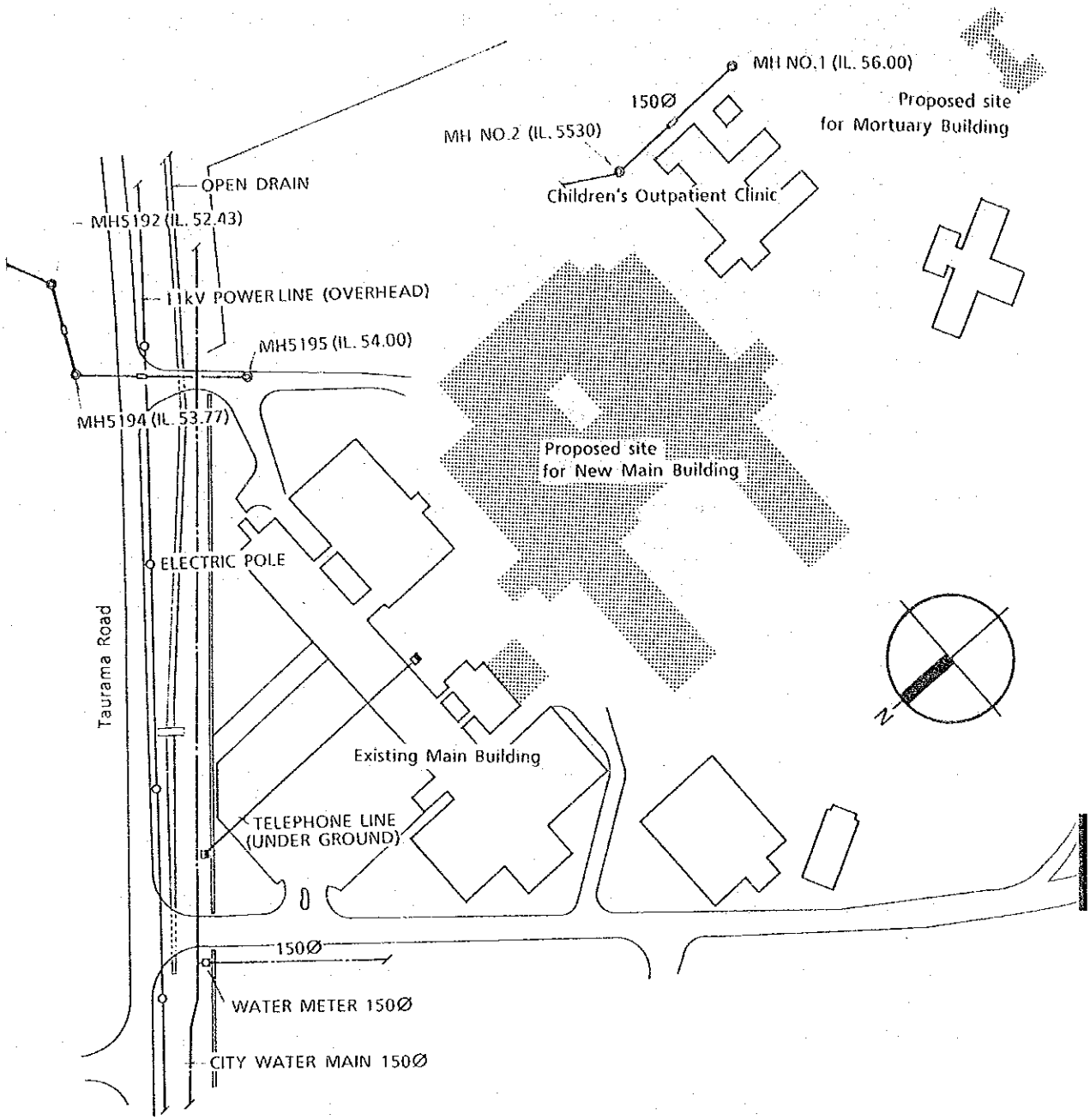


Fig. 3-2 Infrastructure near the New Main Building

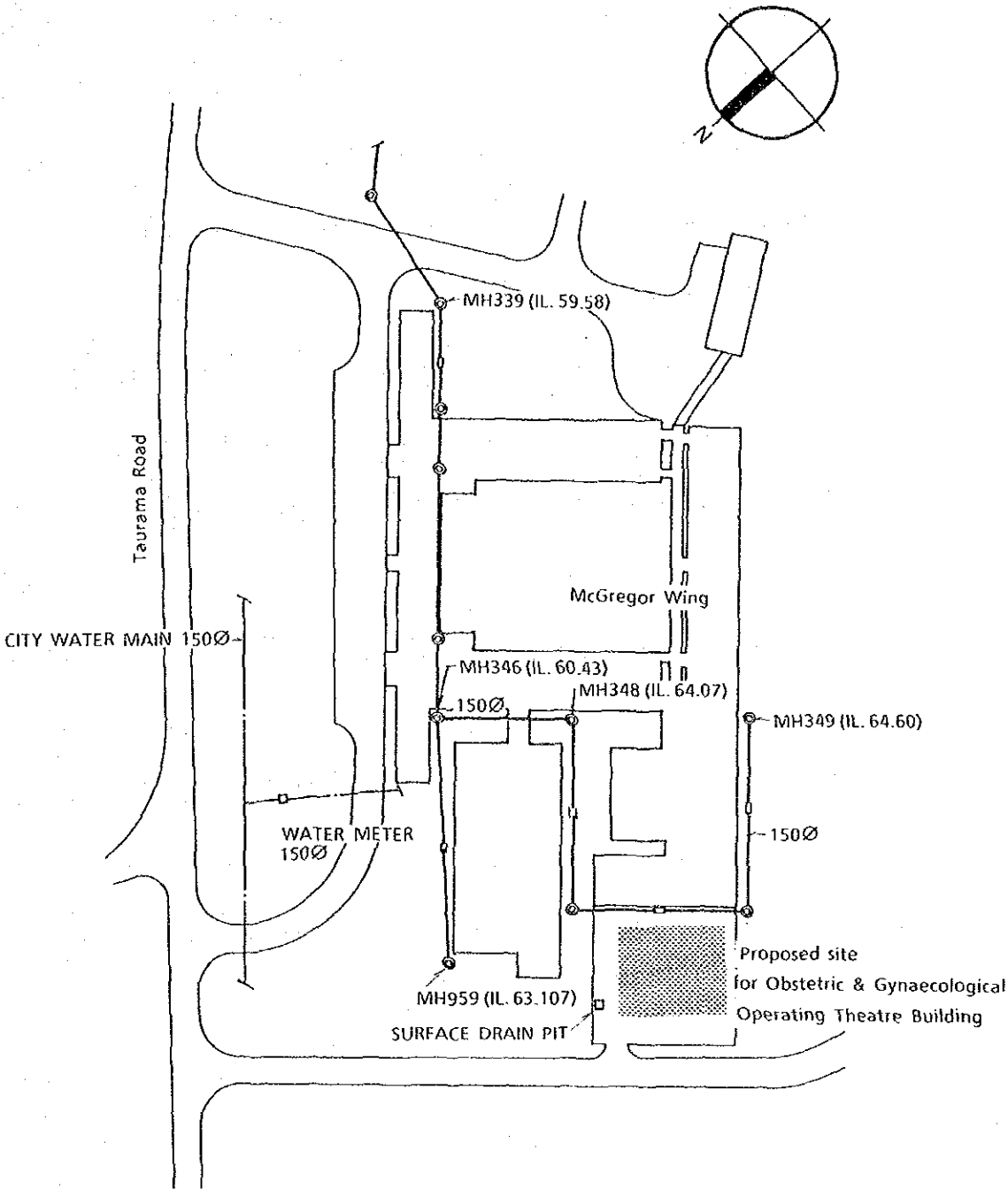


Fig. 3-3 Infrastructure near the Obstetric & Gynaecological Operating Theatre Building

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Basic Design Policies

The following are the basic design policies worked out based on examination of what was described in Chapter 3.

(1) To draw up a facility arrangement plan that will maximise efficiency in the mutual functional relationships between the divisions, paying close attention to the position of each of the existing facilities.

The facilities of each division should be arranged in a manner that will secure smooth mutual relationships between the facilities of the new main building, as well as the Operating Department, Central Sterilising Supply Department, Kitchen and Administration Divisions of the existing main hospital building and the new main building and the Children's Outpatient Clinic - in other words, there should be smooth paths of flow for patients, staff, equipment, and so on.

(2) To draw up an arrangement plan that will not disturb routine services being provided at the existing hospital facilities during the construction period.

Although this is a facility improvement project, routine services are to be continued during the period of construction work. Accordingly, due consideration should be paid to the arrangement of the new facilities. Particularly, smooth paths of flow must be secured for patients and staff at the children's outpatient clinic. Also, care should be taken in selecting the positions of access roads for transporting machines and materials to the construction site.

(3) To give due consideration to local customs in working out procedures for operating the new facilities.

There is a custom called "wantok' which is peculiar to Papua New Guinea. According to this custom, a patient lives together with 3 to 4 attendants in his or her ward. The attendants' presence is useful because it helps reduce nurses' work load. Furthermore, since many outpatients come to this hospital accompanied by their family or relatives, it will be impossible to completely disregard their presence during implementation of the project.

(4) To endeavour to reduce the cost of maintenance of the facilities and equipment.

The fee for medical services paid by outpatients and inpatients is the hospital's only source of income, but it accounts for less than 5 percent of the hospital's total operational and management expenses.

On the other hand, there is little likelihood that the hospital's budget for operation and management of its facilities and equipment, which is allocated to the hospital jointly by the Department of Health and the Department of Works, will be raised substantially. Meanwhile, the number of cases of medical examination and treatment is on the rise. Thus it is clear that an increase in the maintenance costs at a hospital with a limited budget will undoubtedly result in a decline in the quality of its medical health services. It is imperative to reduce energy costs by selecting materials which are highly durable and to work out a basic design that will maximise utilisation of natural ventilation and lighting.

(5) To design facilities capable of coping with future changes in the medical health services.

The Department of Health has no plans to construct additional primary health facilities in the NCD or new base hospitals in Central Province

over the next decade. Even after completion of this project, PMGH will remain the only general hospital in this area. It is expected that there will be significant increases in the number of patients in keeping with increases in the population of this hospital's catchment area. Viewed from a medium- to long-term perspective, however, it is desirable that this hospital function not as a general hospital, but as a referral and teaching hospital. It is necessary, therefore, to design partition walls while giving due consideration to possible changes in the role of the hospital.

(6) To make the new facilities fit the local climate.

In Port Moresby the wind blows from the southeast during the dry season and from the northwest during the rainy season. So it is advisable to make the buildings lie from east to west, with windows on the southern and northern sides, so that they are well ventilated. Also close attention should be paid to the height of each story, the shapes and positions of window fittings, and ceiling fans so that the new facilities provide inexpensive, yet very comfortable spaces for both patients and staff.

(7) To make the equipment of the new facilities compatible with that of the existing facilities.

The specifications for the equipment of the new facilities should be the same as those for the equipment currently in use at the existing main hospital buildings, in order to facilitate operational and maintenance work after completion of this project.

(8) To utilise the existing equipment wherever possible.

In working out the basic design, an equipment-use plan should be formulated to maximise the continued use of existing equipment based on the actual situation of equipment utilisation and management. This will help avoid an excessive supply of equipment.

4-2 Examination of the Basic Design Conditions

In working out the basic design, the following design conditions should be examined carefully.

4-2-1 Conditions for Design of the Facilities

(1) Required Functions

The new facilities should function in a manner that will normalise the medical health services provided at PMGH and enhance their efficiency by complementing the functions of the present facilities and the existing buildings.

Accordingly, the new facilities will perform the following basic functions.

- Outpatient Department
  General Outpatient, Casualty, Specialist Clinic
- Central Diagnosis Department
  X-ray examination
- Ward
  Paediatric ward, Surgical ward, General ward and Psychiatric ward
- Mortuary Department
- Obstetric and Gynaecological Department
  Operating theatre

(2) Examination of Natural Conditions

The new facilities must fit in well with the local natural conditions,

particularly the climate. If the new facilities accomodate these conditions, they will function smoothly and will also be highly durable. As a result, the cost for operating and maintaining them will be reduced substantially. In that case, it is necessary to work out the basic design giving due consideration to the following natural conditions.

- Sunlight

  Port Moresby is located in lat. 9°30' S. The maximum temperature is about 32°C. There is no significant change in temperature during the year. However, it is necessary to take measures to block sunlight from the north and south.

- Rain

  Port Moresby is in a tropical rain forest zone, but the annual rainfall is only about 1,200 mm due to the influence of the central mountainous area. As there are torrential rains during the rainy season, however, it is necessary to take preventive measures against heavy rain. As the projected construction site is located at the foot of a gentle slope, it is very likely that large quantities of rainwater will flow into the site. Thus, the site should be a well drained one.

- Ventilation

  In and around the projected construction site the wind blows from the northwest during the rainy season (December to April) and from the south during the dry season (May to November). Accordingly, satisfactory natural ventilation will help minimise the number of air conditioners needed, thereby reducing the overall maintenance costs.

- Earthquakes

  Papua New Guinea belongs to the Pacific Rim Earthquake Zone. Although earthquakes are not so frequent in and around Port Moresby, they greatly affect buildings. Since the facilities to be constructed in

this project are for a hospital, close attention should be paid to their resistance to earthquakes.

(3) Construction Situation

Papua New Guinea is strongly influenced by Australia both economically and socially. Under such circumstances, close attention should be paid to the following factors in working out the basic design.

- Construction Materials and Machinery

  Building materials are locally manufactured in small quantities. Most of them are imported from Australia and are marketed as locally made ones. Accordingly, there is no problem with the quality of locally available building materials. As even these Australian-made building materials are not in ample supply it is necessary to import them from Australia by order.

- Laws and Regulations

  Laws and regulations related to architecture and construction are generally based on the architectural standards of the Standard Association of Australia (SAA). It is necessary to design the new facilities in accordance with these laws and regulations. Papua New Guinea also has well-established procedures for application for certification. It is therefore necessary to obtain the approval of a registered structural engineer and a registered electric engineer prior to filing an application for certification. The screening for permission is conducted by the Town Planning Board and the Building Board of the Department of Works and usually takes 2 months.

  In working out the basic design, it is necessary to comply with the above-mentioned procedures and at the same time draw up an overall project schedule which takes into consideration the time required for following the procedures.

4-2-2 Conditions for Selection of the Equipment

In selecting the equipment, it is necessary to meet the following conditions.

(1) Selection of equipment conducive to improvements in the current situation of the hospital

Although this is a project for improving the facilities of the hospital, it is necessary to select equipment which is also conducive to an improvement in the scale and level of its medical health services, to increased precision in diagnosis and treatment, as well as to a reduction of doctors' and nurses' work load.

(2) Equipment which fits in well with the local medical conditions

The type and level of equipment is determined by the scope of the services provided by each department. And the scope of the services offered by each department is closely related to the present level of the nation's medical care and to the number and competence of the medical professionals concerned. For this reason, top priority should be given to selection of strongly-built, high-quality and easy-to-maintain equipment so that it may remain serviceable for a long time.

4-3 Basic Design for the Facilities

4-3-1 Layout Plan

(1) New Main Building

The necessary conditions for the layout of the new main building are easy access to it from the existing main hospital building and the children's outpatient clinic, and establishment of a parking lot for use by outpatients which can accommodate up to 150 cars. To meet these conditions, the space enclosed by the existing main hospital building and the Children's Outpatient Clinic must be chosen as part of the projected construction site. In order to secure this space, a mutual agreement must be reached by the Japanese and Papua New Guinean sides on removal of the superannuated Rehabilitation Ward, the STD Ward, the extra Ward and the Ward 2 before the start of the construction work.

The main road leading to the premises of PMGH is the road running in front of the hospital. The space currently used as an access road to the children's outpatient clinic would also be used as an approach to the new main building. As a result of this arrangement, it will be possible to gain direct access to the new main building from the Taurama Road. And the present access road for outpatients can be used exclusively for the hospital's staff (separation of the two paths of flow).

(2) Mortuary Building

The Mortuary Department need not be closely linked to the new main building. As it is desirable that the mortuary should be isolated from other hospital facilities, it should be located to the south of the new main building and Children's Outpatient Clinic.

(3) Obstetric and Gynaecological Operating Theatre Building

It was decided that the new Obstetric and Gynaecological Operating Theatre could not be located in space currently occupied by an operating room since it would be difficult either to continue operating services during the construction period or to set up a temporary operating theatre. Instead, the space on the northwestern side of the McGregor Wing (currently a staff parking lot) should be used as the site for the new Obstetric and Gynaecological Operating Theatre building.

This space is conveniently placed for acceptance of emergency patients. Furthermore, part of the existing delivery ward can be remodeled into an approach from the McGregor Wing to the new building.

4-3-2 Architectural Plan

(1) Floor Planning

1) Layout of each department

In the following basic policies on the layout of each department close attention is given to their functional relationships with existing facilities.

- New Main Building

- To reduce patients' vertical movement as well as maintenance costs, the new main building should be a 3-story one just like the existing main hospital building, and its first and second floors should be connected to the existing building to secure sufficient paths of flow.

- Facilities of the Outpatient Department should be constructed on the space on the eastern side of the site which is near the main entrance of the hospital. In designing the layout of the passageway and the facilities of the Administration Department, care should be taken to simplify the clerical work for patients visiting the Children's Outpatient Clinic.

- The General Outpatient and Casualty departments, at which the same doctors and nurses will conduct examinations and treatment, should be located adjacent to each other.

- The wards should lie east to west, with windows on their northern and southern sides, so that they will be well ventilated and lighted throughout the year. All other facilities, except for those which functionally prohibit natural ventilation, should also be designed in this way.

- In principle, the Paediatric Ward should be located on the ground floor so that space can be provided for infants and children to play. As the site itself is very small, it will be possible to provide part of the ward with an approach to the play space utilising the inclination of the site.

- As the existing main hospital building has an operating theatre on its first floor, the new Surgical Ward should be located on the same level for maximum efficiency.

- To generate smooth traffic between divisions, passageways leading to the existing main hospital building should be located in the centre of the new main building. They may be extended in the future to provide easy access to the new facilities of the Rehabilitation Department and the Leprosy Ward.

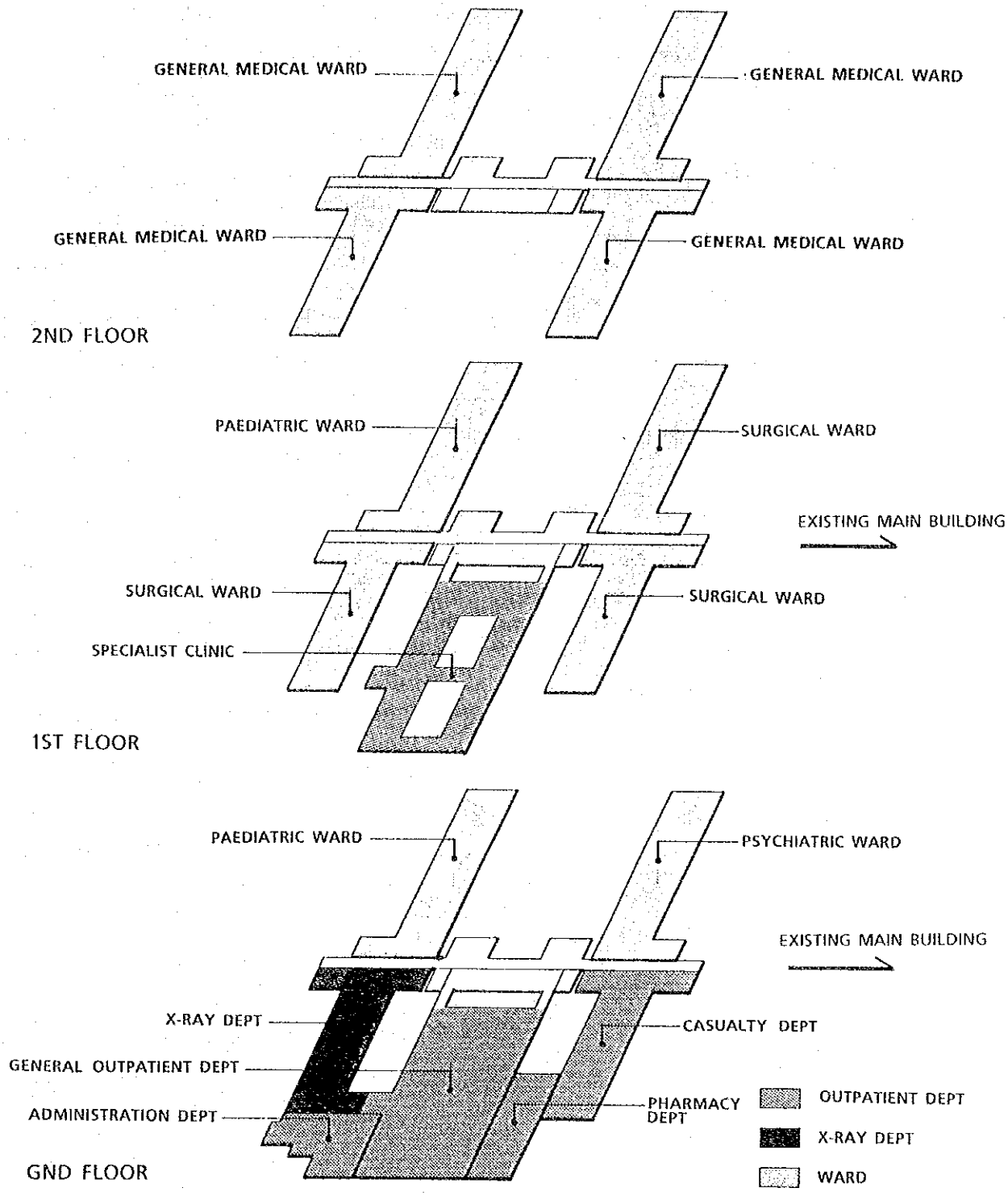


Fig. 4-1 Zoning of New Main Hospital

- Mortuary Building

- The funeral service spaces and the postmortem examination space should have separate entrances.

- The funeral service space should be located on the eastern side of the site so that it has direct access to the main entrance. On the other hand, the postmortem examination space should be located on the western side so that it may be connected to any future passageway extended from the new main building.

- Obstetric and Gynaecological Operating Theatre Building

- Both the operating theatres and the X-ray room should be located in a space which can be easily connected to the existing Obstetric and Gynaecological Wing via passageways.

(2) Internal Path of Flow Plan

- Path of Flow for Outpatients

The Outpatient Department should be designed as an almost independent block. Patients should be directed to the General Outpatient Department and Specialist Clinic from the entrance hall for outpatients. The X-ray Department should be located adjacent to the Outpatient Department, with a courtyard in between, so that outpatients may be able to undergo diagnosis and treatment within a limited space without having to move deep into the building. Diagnosis and treatment of outpatients outside consultation hours will continue to be done at the General Outpatient Department. In the case of an emergency patient, he or she will be treated at the Casualty Department. If an operation is necessary, the emergency patient will be moved to the minor operating theatre in the department.

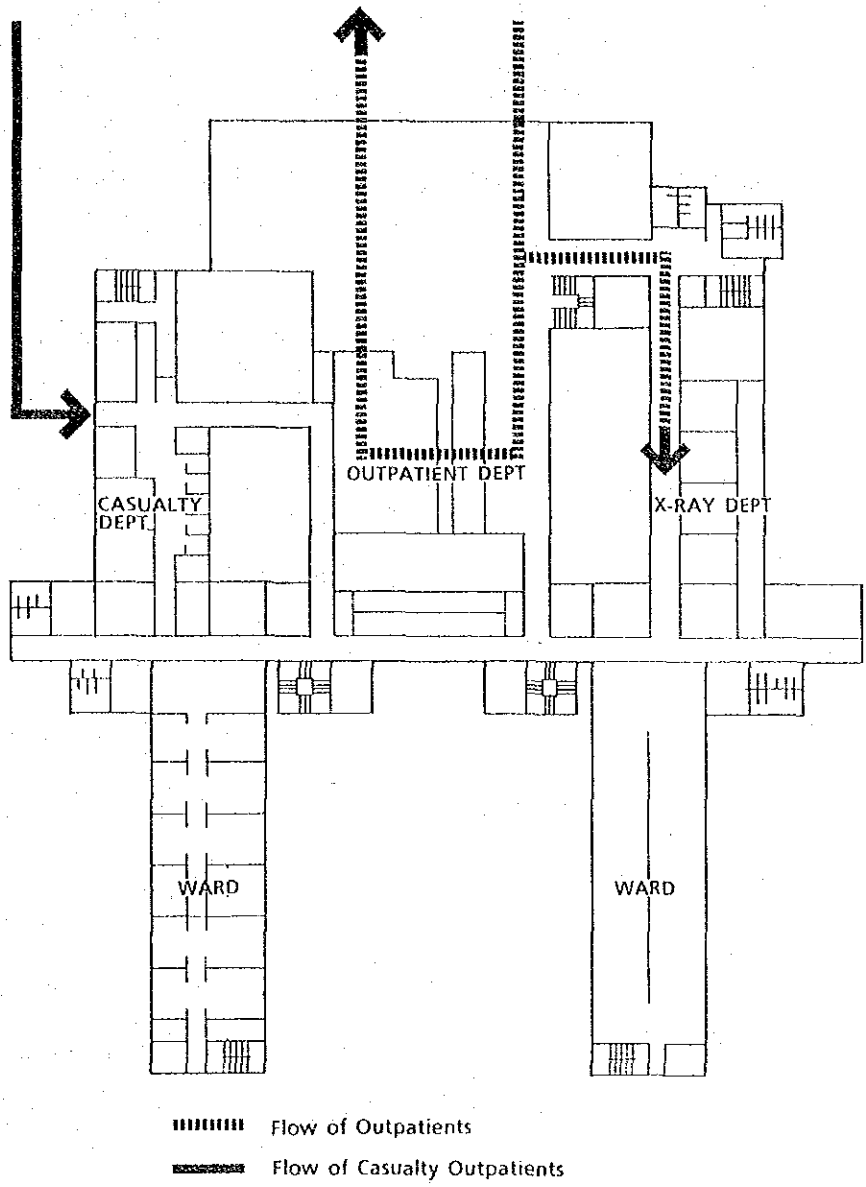


Fig. 4-2 Flow of Outpatients

- Paths of Flow for Inpatients, Patient Attendants, Doctors, and Other Hospital Staff

  Inpatients, doctors and other hospital staff basically move inside the hospital using elevators, ramps or staircases located in the centre of the new main building. Their movement from the wards to the operating and X-ray rooms should not cross the facilities of other departments.

  The new main building should be connected to the existing main hospital building at its ground and first floors via passageways running from south to north. Branches from these passageways should

run from east to west to provide easy access to the wards in the existing main hospital building. In this way the paths of flow of patients, doctors and other hospital staff will be streamlined and shortened.

Entrance for the exclusive use of patient attendants should be attached to the ends of the passageways, and use of these entrances should be controlled during certain hours.

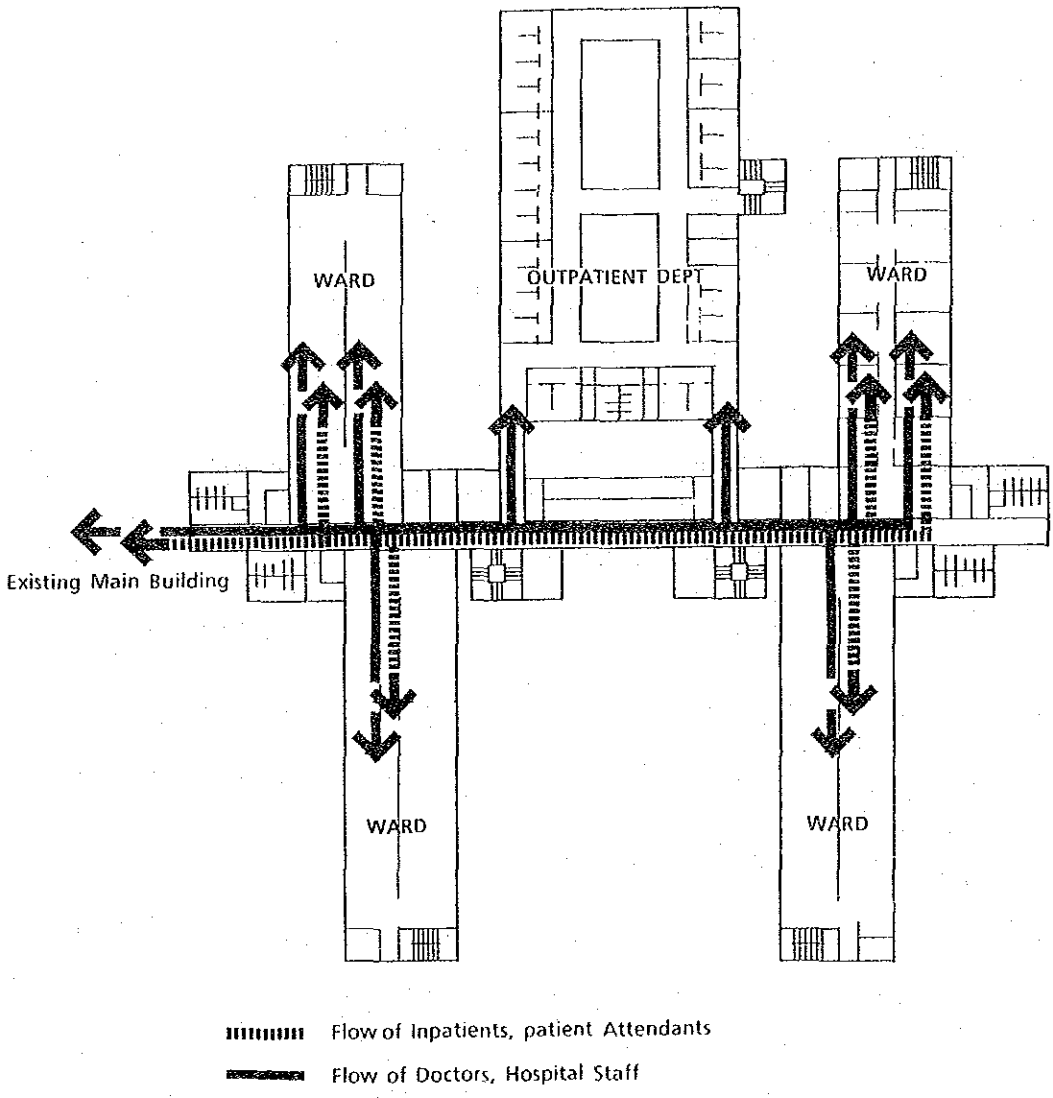


Fig. 4-3 Flow of Inpatients, Patient Attendants, Doctors, Hospital Staff

- Paths of Flow for Service (transportation of equipment and materials)
  Meals, linen and equipment and materials from the central sterilising supply department should be transported to the departments in the building via passageways.

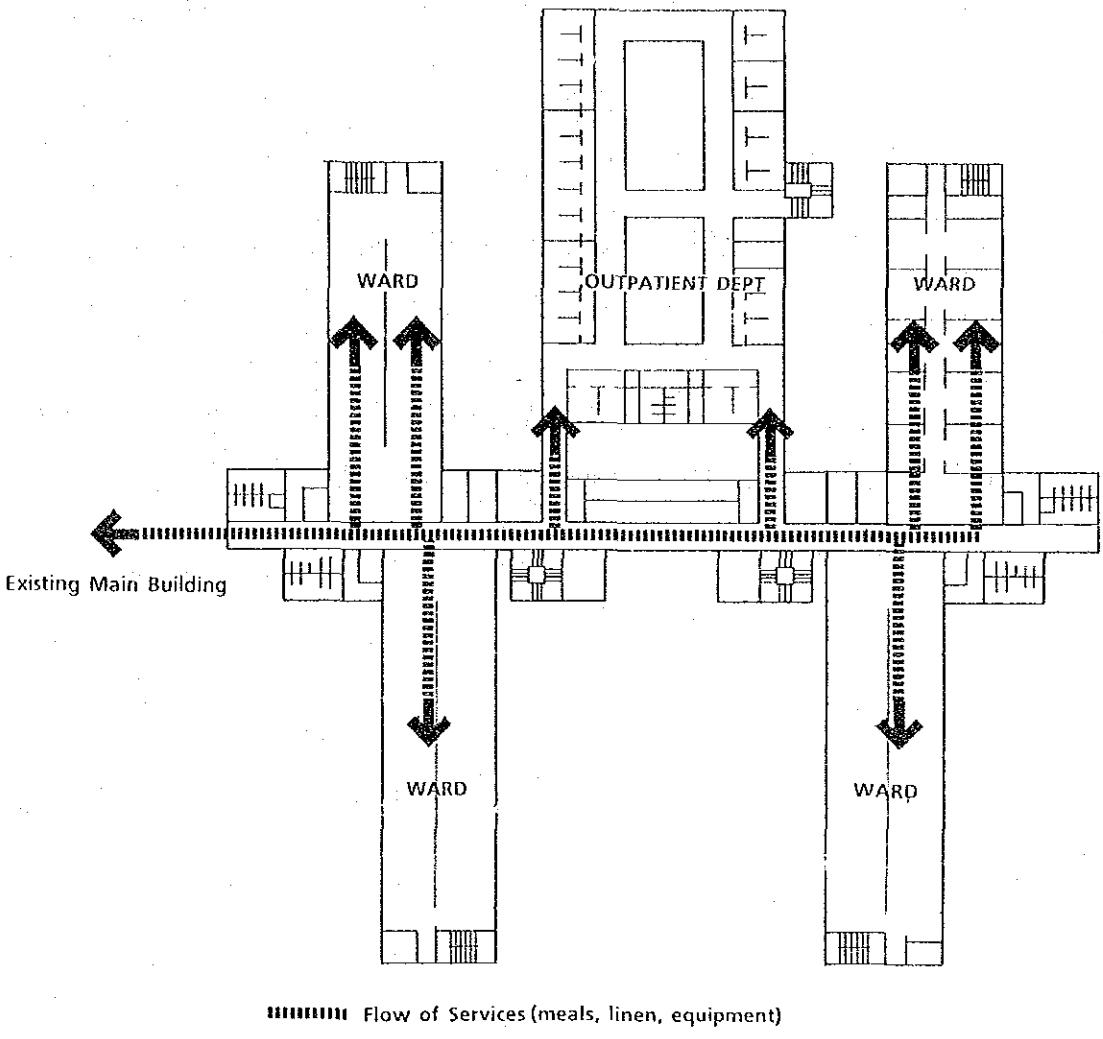


Fig. 4-4 Flow of Services

(3) Scales and Functions of the Major Facilities

It is necessary to determine the scale and functions of each facility, as well as the type of the equipment required to maximise its functions by the nature of the examinations and treatment provided there. Furthermore, each facility should be closely functionally related to other facilities under the entire plan. Shown below are the scales of the major facilities and the reasons for them.

- Outpatient Department (General Outpatient, Casualty, Specialist clinic, Administration)

  This department should have 7 medical examination rooms (3m×3.7m) and a treatment room (18m×11.5m) for dressing, medication and injection treatment. The expected daily average number of patients is estimated at 650~760, but the number of patients and attendants waiting for screening by nurses reaches 150 to 230 at peak hours. Accordingly, a waiting hall with 200 seats should be constructed in front of the nurse control desk. (see Layout Drawing 1, 2.)

  The Casualty should have an observation room (9.5m×6.5m) to be used for monitoring of patients' conditions after receiving treatment and an emergency treatment booth (2.4m×3.5m) to treat patients injured in traffic and other accidents. This booth will also be used to treat emergency patients transported to the hospital at night. (see Layout Drawing 3, 4.)

  The Specialist Clinic, which has Psychatric, Surgical, Internal (including Paediatric), Tuberculosis, STD, ENT, Ophthalmological, Pain and Dermatological sections, requires at least a medical examination and a treatment room, both with a floor space of 3m×5.5m. In addition, to secure smooth functioning of each section, the department will require equipment storage, an office, and a nurse's room station. (see Layout Drawing 5~13.)

The scope of services by the Pharmacy is very broad, covering all departments of the hospital. But its major functions are limited to dispensing medicine to patients, keeping and managing the stock of medicines and related functions. Accordingly, it only requires a dispensing room (10m×9m) and medicine stock rooms. Since medicines are often brought into the pharmacy, its facilities should be located in a space which faces the road and which is convenient for dispensing medicines to patients and transporting them to the wards and the Central Sterilising Supply Department. (see Layout Drawing 14.)

The Administration is responsible for receiving patients, accounting, and the procedures for hospitalization. Accordingly, it should have an office, a reception room (6m×8m) and an accounting room (4m×6m).

The existing medical records room has a floor space large enough to cope with future increases in the number of patients. Accordingly, the new main building has no medical record room. However, it will have a storage room (6m×4m) which can keep patient registration certificates, record cards and X-ray films for one year to facilitate procedures for patients who continue receiving medical care.

- X-ray Department

Judging from the objectives and contents of the medical testing done at this hospital, the number of X-ray photographs taken during a year is estimated at 45,600. Accordingly, the following pieces of X-ray equipment should be installed in the X-ray Department.

Table 4-1 Calculation of X-ray Diagnosis

X-ray Machine	Unit	Expected number of diagnoses	Average time	Total/time
X-ray machine	2	60pers×2 unit = 120	5 min.	300min./day · unit
X-ray TV machine	1	18pers×1 unit = 18	10 min.	180min./day · unit
Total	3	138 pers/day×330days = 45,600 pers/year		

According to Table 4-1, three X-ray rooms should be arranged in a row, facing a passageway (3m×24m) with a waiting room on one side and an X-ray equipment operating table on the other, the latter being equipped with an observation window. This arrangement will result in a functional floor plan. Besides these, a darkroom (3m×3m), a film studying room (3m×3m), an office, a radiologist room (8.5m×9.5m) and a seminar room will be necessary. (see Layout Drawing 15)

- Wards (Paediatric, Surgical, General Medical and Psychiatric wards)

At present the number of beds in each of the wards to be involved in this project is as follows: 112 for the Pediatric ward, 105 for the Surgical Ward, 180 for the General Medical Ward (35 for the Tuberculosis Ward and 40 out of the 80 beds for the Reserve Ward are added to 105 for the General Medical Ward) and 30 for the Psychiatric Ward.

In 1985, the hospital's bed utilisation rate was 106 percent, compared with 90 percent for the general hospitals in Japan. If the bed utilisation rate is set at 100 percent, with no change in the present average length of hospitalization, in light of the current situation of medical care in Papua New Guinea, then even at present the Paediatric Ward requires 119 beds, the Surgical Ward 112, the General Medical Ward 191, and the Psychiatric Ward 32. For the number of inpatients in 1995 estimated by the Department of Health (see "Table 3-2, Number of Inpatients in PMGH and Population of PNG"), there should be a 27 percent increase in the number of beds for each of the

wards, namely 152 for the Paediatric Ward, 142 for the Surgical Ward, 243 for the General Medical Ward, and 41 for the Psychiatric Ward.

However, it is desirable that the bed utilisation rate for the Surgical Ward should be kept at 90 percent so that some beds may always be set aside for emergency patients. On the other hand, it is expected that the number of tuberculosis patients will decrease in the future. Taking into account the above factors, the number of beds for each ward should be as follows.

Table 4-2 Projected Number of Beds

Ward	Number of Beds
Paediatric Ward	150 beds
Surgical Ward	160 beds
General Medical Ward	230 beds
Psychiatric Ward	40 beds
Total	580 beds

Each ward should be of the Nightingale type in principle. However, 4-bed or 6-bed rooms can be incorporated in it as the situation demands. The partitions in these 4-bed or 6-bed rooms should be just as high as the beds so as to facilitate nursing. Generally, each ward requires a nurse station, a treatment room, a pantry, a doctors' room, a nurses' room, toilet and shower rooms for patients, etc.

In the case of the Paediatric Ward, 140 of the 150 beds should be installed in the Nightingale type rooms with two nursing units and the other 10 should be installed in 4-bed or 6-bed rooms for children psychiatric patients. The standard size of the paediatric bed should be 800(w)×1,820(L)×300(H) and beds should be at least 900 mm apart. The spaces between beds are for patients' mothers to sleep with patients at night. (see Layout Drawing 17)

Of the 160 beds for the Surgical Ward, 116 should be installed in Nightingale type rooms. The other 44 beds should be set aside for patients suffering from serious diseases and should be installed in 4-bed or 6-bed rooms to facilitate nursing. (see Layout Drawing 18, 20)

Of the 230 beds for the General Medical Ward, 44 should be set aside for patients suffering from serious diseases. The other 186 beds should be installed in Nightingale type rooms. (see Layout Drawing 19, 20)

In the Psychiatric Ward, the total 40 beds should be regarded as one unit. (see Layout Drawing 21)

- Mortuary Building

The mortuary should be divided into 5 parts, each part (3m×3m) accommodating 10 corpses. An autopsy theatre (6m×5m), a preparation room (3m×3.5m), and office room (2m×6m) should be attached to it. Two laying out spaces (5m×6m each) should be located outside the mortuary wing because each funeral service will be attended by many people.

- Obstetric and Gynaecological Operating Theatre Building

At present, obstetric and gynaecological operations are performed at the operating room in the McGregor Wing and those in the existing main hospital building. In 1985, a total of 2,311 obstetric and gynaecological operations were performed at the hospital, of which 1,826 (79 percent) were relatively simple operations for tubal ligation, evacuation of the uterus and so on, and 485 (21 percent) were ordinary surgical operations such as Caesarean section.

After completion of this project, all obstetric and gynaecological operations will be performed at the operating rooms in the new Obstetric and Gynecological Operating Theatre Building. It is estimated that in 1995 a total of 2,935 obstetric and gynaecological

operations (2,311×127%), 2,319 simple operations and 616 ordinary surgical operations, will be performed at these operating rooms. Since operations are usually performed 5 days a week (260 days a year), 11.3 (2,935/260 days) operations, i.e., 8.9 simple operations and 2.4 ordinary surgical operations, will be performed every weekday. It takes 10 to 30 minutes to complete a simple operation, and 2 to 3 hours to complete an ordinary surgical operation. Since the time for making preparations is added to the length of each operation, the wing should have at least one room for simple operations and 2 rooms for ordinary surgical operations.

Each operating room's standard floor space is 6m×6m (see Layout Drawing 23). In addition to the operating rooms, this wing should include a washing and sterilising room (see Layout Drawing 23), a doctors' room, a nurses' room/dressing room and a recovery area.

(2) Elevations and Sections

1) Elevations

Since the new main building will be constructed on a space between the existing main hospital building and the existing Children's Outpatient Clinic, the finishing materials and colors of the new main building should match those for the two existing buildings. The same should apply to the finishing materials and colors of the mortuary building and the Obstetric and Gynaecological Operating Theatre Building so that all facilities of the hospital look coordinated.

2) Sections

When drawing up the sections, due consideration should be given to natural ventilation and preventive measures should be taken against rainwater, direct sunlight and water flow.

The height of each story should be 4.5 m for the ground floor and 4.0 m for the first and second floors so that enough natural ventilation can be secured. In principle, 1.8m-wide balconies should be attached to both sides of each building to prevent direct sunlight and rainwater from coming into the rooms and to allow windows to be kept open even when it rains (to secure enough natural ventilation). There should be openings for ventilation in the external walls below windows so that the space just above the floor will be well ventilated.

Since the area around the site for the new main building slopes gently, it is necessary to equip the site with drains to prevent rainwater rushing onto the site. The ground floor should be 850mm above the present ground level as a preventive measure against torrential rainfalls.

The roofs should be waterproofed with asphalt membrane and laid with gravel having heat insulators so that the uppermost floor may be highly resistant to heat.

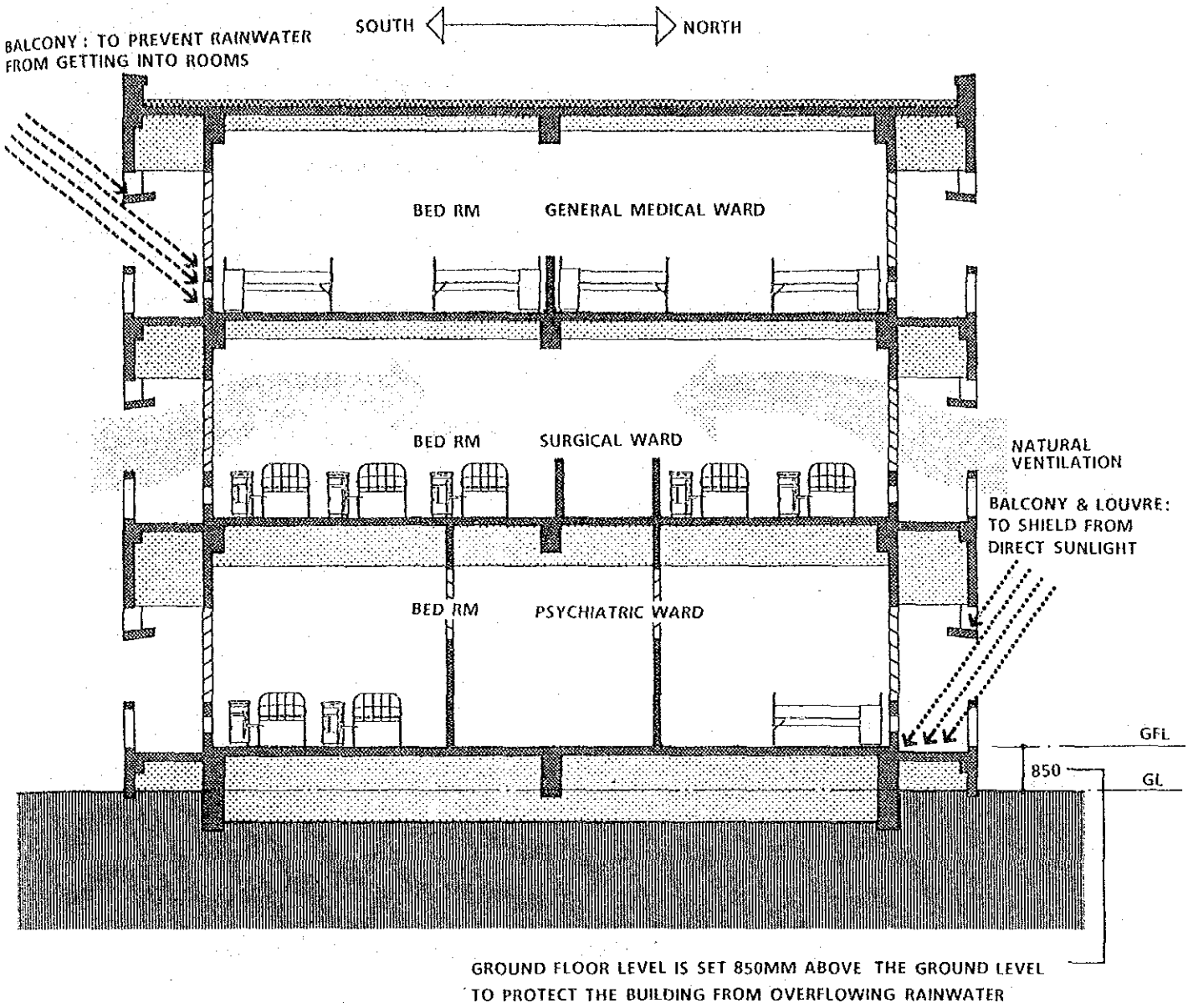


Fig. 4-5 Sectional Planning

4-3-3 Structural Plan

(1) Outline of the Structures

The buildings will be built on the premises of PMGH after demolishing part of the existing facility. It will have four wards -- Paediatric, Surgical, General and Psychiatric wards - with a total of 580 beds, and clinical departments such as outpatient, casualty and specialist clinics. Its scale is as summarised below.

No. of stories	:	3 above ground (with a one-story penthouse)
Floor height	:	ground floor 4.5m 1st floor 4.0m
		2nd floor 4.0m
Total floor area	:	15,124 m^2

(2) Form of the Structure

1) Foundation

According to the geographical data on the construction site obtained from the Department of Works of Papua New Guinea, the ground layer just below the surface soil which is about 0.2 m thick is grayish brown clay followed by whitish yellow clay. Since these clay layers are highly plastic with a high degree of swelling, they are not suitable support ground for a foundation. As this is a 3-story building, it is advisable to employ a foundation in direct contact with the clay layer just below 2.0 m from the surface as the supporting layer. Also, its ground floor slab should be a suspended floor instead of a slab-on-grade in light of the existence of the clay layer with a high degree of swelling. In this case, the slab should not be concreted to the ground.

2) Superstructure

This is a hospital building with basic spans of 6m×6.5m and 6m×9m, and of 3 stories. Considering the local construction conditions and the standpoint of economy, reinforced concrete block walls shall be used and minimize the reinforced concrete wall as much as possible. All the horizontal force in the direction of both X and Y shall be taken by the reinforced concrete frame. Also, proper expansion joints shall be planned as a measure against differential settlement of the ground and so on.

(3) Structural Materials

• Concrete	ordinary concrete	Fc 210kg/cm^2 (28-day compression strength)	
• Reinforcing bars	16mm or less	SD30	Fy=3,000kg/cm^2
	19mm or more	SD35	Fy=3,500kg/cm^2
• Steel		SS41	Fy=2,400kg/cm^2

(4) Codes and Standards

The structural design shall be done in accordance with the following codes and standards of Papua New Guinea.

- Papua New Guinea Standards

1001-1982 :	Parts 1 and 2	(General Design Requirements, Dead and Live Loads)
1001-1982 :	Part 3	(Wind Loads)
1001-1982 :	Part 4	(Earthquake Loadings)
1002-1982		(Reinforced Concrete Structures)
1003-1982		(Steel Structures)
1004-1982		(Reinforced Masonry Structures)

(5) Design Load and External Force

1) Dead Load

The dead load value shall be calculated in accordance with the actual weights of the structural and finishing materials.

2) Live Load

The live load value shall conform to the Papua New Guinean Standards (1001-1982: Part 2 Section 3; Table-8).

- Typical Values of Live Load

Bed room	2.0kPa	205 kg/m^2
Classroom	3.0	305
Office	3.0	305
Laboratory	3.0	305
Library	2.5	255
Dining hall	3.0	305

- Reduction of the Live Load Value

In designing the foundations, columns and girders, the live load value can be reduced according to the equation below provided the values are less than 510kg/m^2.

$R=0.86\times A$

R: Reduction rate (%)

A: Area to be supported by element (m^2)

$R \leqq (50\%$ and $0.231\ (1+D/L) \times 100$

(6) Seismic Force

Papua New Guinea lies in the Pacific Rim Earthquake Belt. Port Moresby, where the project site is located, belongs to Zone 4 of the country. The

seismic force value will be calculated in accordance with the Papua New Guinean Standards (1001-1982: Part 4).

- Base Shear (V)

  The base shear value shall be calculated on the basis of the following equation.

$$V=CIKW_t$$

C : Basic seismic coefficient

I : Importance factor

K : Structural type factor

W_t : Combination of the total vertical dead load and a reduction in the design live load

when;

$0<L<1.5kPa$

$W_t=D$

$1.5kPa \leqq L<5kPa$

$W_t=D+L/3$

$L \leqq 5kPa$

$W_t=D+2L/3$

base shear is,

$$V=CIKW_t$$
$$=0.05\times 15\times 1.0\times Wt$$
$$=0.075Wt$$

4-3-4 Utility Plan

(1) Electrical Facilities Plan

1) Power Supply System

Electric power is to be received from the overhead 11kV, 3-phase, 3-line, 50Hz power line at a utility pole on the site and then led to the new indoor transformer (capacity: 750kVA) via an underground cable.

Electricity is also to be supplied to the existing main hospital building and Children's Outpatient Clinic from the new ward. As a measure against voltage fluctuations, an inductive type automatic voltage regulator (500 kVA) will be attached to the indoor transformer.

2) Generator System

There are about 5 power failures and power cuts a year in Papua New Guinea, each lasting for 30 to 60 minutes. So a power generator capable of supplying electric power to a minimum number of pieces of vital equipment should be installed as a measure to prevent stoppage of the hospital's services. Electricity generated by it will be supplied mainly to the sprinkler pumps, the water pumps, the Casualty Department, the operating theatre, and the nurse stations.

3) Lighting System

In principle, fluorescent lamps should be used for general lighting. Incandescent and mercury lamps may be used where they are necessary. The lighting fixtures and their average illuminance are as shown in the table below.

The lighting fixtures should be embedded in the ceilings or mounted directly on the surfaces of the ceiling.

Table 4-3 Standard Illumination Level

Room Name	Equipment	Average
Examination Room	fluorescent lamp (recessed type with acrylic panel)	300 lx
Operating Theatre	fluorescent lamp (recessed type with acrylic panel)	500 lx
Office	fluorescent lamp (recessed type)	300 lx
Bed Room	fluorescent lamp (recessed type with acrylic panel/louver)	100 lx
Nurse Station	fluorescent lamp (recessed type)	300 lx
Store, etc.	fluorescent lamp (surface mounted)	100 lx

4) Socket Outlets

The necessary number of socket outlets should be installed to supply electricity to the medical equipment and small-size electric appliances. To those pieces of equipment which are likely to malfunction or be damaged by a momentary voltage fluctuation, electricity should be supplied via the automatic voltage regulator.

5) Telephone System

Telephone exchange equipment will be installed at the Administration, to which a telephone drop will be connected. Also, a reception-only telephone should be installed so that it may be connected to the telephone exchange equipment of the existing main hospital building. The telephones exchange equipment should connect to telephone exchange circuits and provide extension circuits. Telephones should be installed in the administration office, the pharmacy, the doctor's rooms and the nurse station.

6) A public address system should be installed at the Administration to provide a broadcast service within the hospital. The system's output should be 250 W and the switchboard should provide 10 circuits.

Speakers should be installed in the passageways, the diagnosis and treatment rooms, the pharmacy, the doctor's rooms, the nurse station, etc.

7) Nurse Call Intercommunication System

A nurse call intercommunication system to connect all beds and toilets in each of the wards (except Nightingale type wards) to the nursing station should be installed. The intercommunication phone should be of a simultaneous two-way communication type, one channel for each bed.

8) Paging System

A paging system to call hospital staff via pocket beepers should be installed. The pocket beeper should be of a ship antenna type and be linked to a telephone via the switchboard.

9) Community Antenna

A community antenna should be installed on the roof of the building. The antenna terminals should be installed in the waiting room, the doctor's rooms and so on.

10) Fire Alarm System

A fire alarm signal receiving device should be installed at a facility of the Administration and the necessary number of fire alarms should be installed in the building.

11) Lightning Arresting System

A lightning arrester should be installed in each of the wings.

(2) Air Conditioning Facilities Plan

1) Design Air Conditions

- Outside design air conditions

Temperature	33.5°C (D.B.)
Humidity	28.0°C (W.B.)

- Inside design air temperature (aimed value)

Temperature	25°C (D.B.)

2) Rooms to be Air-conditioned

Natural ventilation should be utilised in as many rooms as possible and only a very limited number of rooms should be air-conditioned so that the running cost of the air conditioning system will be minimised. Areas to be air-conditioned are Outpatient (examination, treatment room), Casualty, Specialist Clinic (examination, treatment, office room), Pharmacy, Ward (Nurse's, Doctor's room), Laying out room, and Obstetric and Gynaecological Operating Theatre Building.

3) Air Conditioning Equipment

Air-cooled package-type air conditioners and split type air conditioners should be used because both types are easy to operate and maintain.

4) Air Duct System

Single type ducts should be installed to Outpatient, Casualty, Specialist Clinic, X-ray Department, and the Obstetric and Gynaecological Operation Theatre Building.

5) Pipe System

Refrigerant pipes to connect the indoor and outdoor units and draining pipes should be installed.

6) Ventilation System

Facilities of the wards should be ventilated by ceiling fans. Also, the lavatories, the shower rooms and the pantries should be equipped with exhaust fans to prevent the lingering of odors, vapor and heat.

7) Automatic Control System

Automatic controls for remote control of the air-cooled duct connecting package-type air conditioners and the room temperature control should be installed.

(3) Sanitary and Plumbing Facilities Plan

1) Water Supply System

- New Main Building

  City water will be supplied from the 150 mm diameter water main to a FRP water tank (capacity: about 170m3)installed on the ground through a 100 mm diameter pipe, and then sent to an elevated water tank (capacity: about 35m3) by a water lift pump installed in the outdoor pump room. The water stored in the elevated tank will be supplied by gravity to each place necessary including the Mortuary Building. The outdoor pipes should be steel pipes, and the indoor pipes should be copper pipes. Water should be supplied to the steam boiler via a water softener unit.

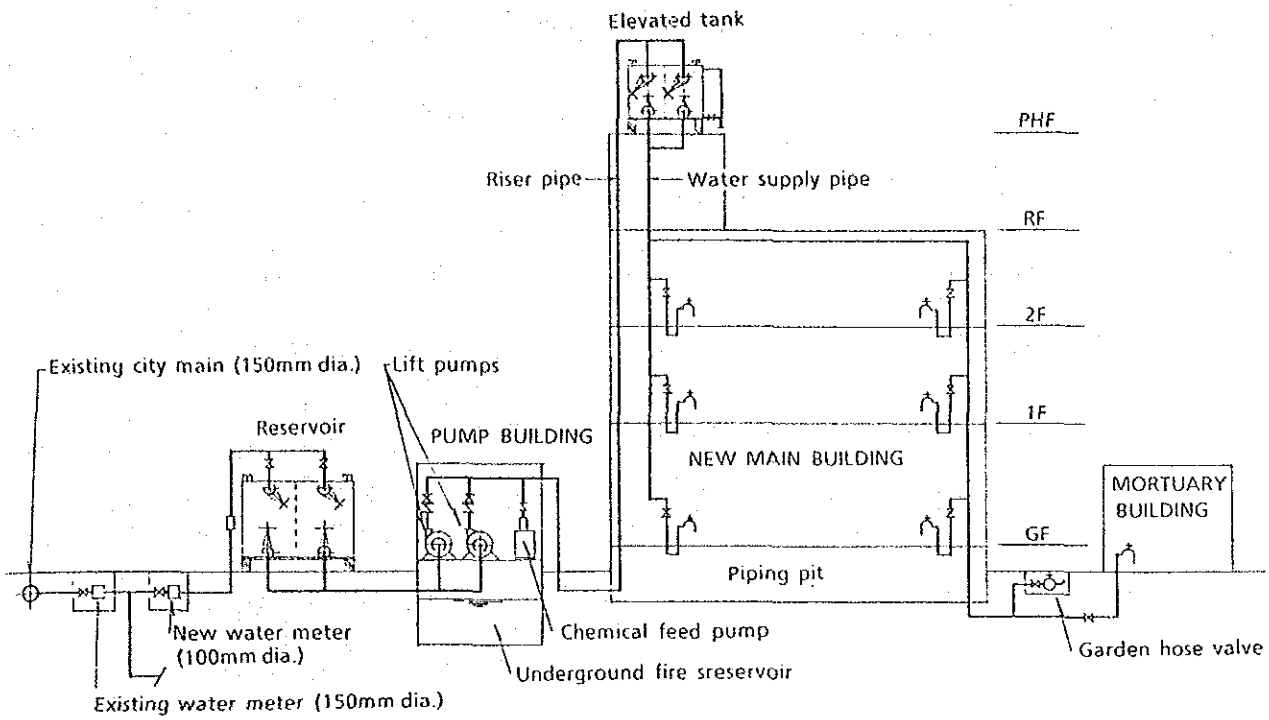


Fig. 4-6 Schematic Piping Diagram

- Obstetric and Gynaecological Operating Theatre Building

  Water will be supplied directly to this building from the 150 mm diameter water main via a 100 mm diameter pipe. The outdoor pipes should be steel pipes, and the indoor pipes should be copper pipes.

2) Hot Water Supply System

- New Main Building

  Solar-heated hot water supply equipment should be installed to minimise the running cost. Steam should be used as the auxiliary source of heat.

- Obstetric and Gynaecological Operating Theatre Building

  Just like the New Main Building, this building should also be

equipped with a solar-heated hot water supply system.
Electric power should be used as the auxiliary source of heat.

3) Drainage and Vent Piping System

- New Main Building

  A separate system for soil and waste drainage should be employed in the buildings, and a combined system of soil and waste drainage should be adopted for outdoors.
  Soil and waste drainage should be discharged into the existing catch basin (MH5195).
  Rainwater should be discharged into the existing open gully laying along the road on the northeastern side of the construction site by means of an open gully drainage system.
  A vent piping system shall be employed with the stack vent system.
  PVC pipes should be used for both drainage and vent systems and steel pipes for hot water drainage.

- Obstetric and Gynaecological Operating Theatre Building

  The same arrangement will be used as in the case of the new main building, but soil and waste water will be discharged into the existing catch basin (MH346) and rainwater should be discharged into the existing grating catch basin in the parking area.

4) Fire Extinguishing System

- New Main Building and Obstetric and Gynaecological Operating Theatre Building

  Under Papua New Guinean law, wet pipe sprinklers, fire hydrants and fire extinguishers should be equipped according to Australian codes. Pipes should be steel pipes.

5) Steam Supply System

- New Main Building

  High pressure steam is supplied to the high pressure sterilisers installed in the existing CSD and the high pressure steriliser, bed pan washers, and storage tank for hot water in the new main building. Oil should be used as the fuel for the steam boiler. Pipes should be steel pipes.

- Obstetric and Gynaecological Operating Theatre Building

  Steam should be supplied to the high pressure steriliser. Fuel for the steam boiler should be oil.

6) Sanitary Fixtures

- New Main Building and Obstetric and Gynaecological Operating Theatre Building

  Both buildings should be equipped with sitting and squatting type water closets, urinals, laboratories and so on.

7) Medical Gas System

- New Main Building

  Centralised oxygen gas and suction equipment should be installed. Since nitrous oxide gas is used in small quantities in the emergency operating theatre, it can be supplied from a manifold installed in the existing main hospital building.

- Obstetric and Gynaecological Operating Theatre Building

  Centralised oxygen gas, nitrous oxide gas and suction equipment should be installed.

Table 4-4 Rooms to be Supplied with Medical Gas

BUILDING	DEPARTMENT	ROOM NAME	OXYGEN	NITROUS OXIDE	VACUUM
NEW MAIN BUILDING	CASUALTY	EXAMINATION BOOTH	O		O
		MINOR OPERATION THEATRE	O	O	O
		OBSERVATION ROOM	O		O
	WARD	PAEDIATRIC WARD	O		
		SURGICAL WARD	O		
		GENERAL MEDICINE WARD	O		
OBSTETRIC & GYNAECOLOGICAL OPERATING BUILDING	OPERATION	OPERATING THEATRE	O	O	O
		RECOVERY ROOM	O		O

4-3-5 Materials Plan

The building materials should be selected after fully examining such important factors as the local climate, functions required of the new facilities, and the local construction situation (construction period, construction costs and building maintenance costs). Locally available materials should be used as much as possible since these materials will facilitate the operation and maintenance of the facilities constructed. Also, in working out specifications for each type of material, the utmost emphasis should be placed on the material's ability to harmonise with those used in the existing main hospital building and the Children's Outpatient Clinic.

(1) Structural Materials

The superstructure should be reinforced concrete, which is used widely in Papua New Guinea. There is no significant difference in quality between locally made cement, aggregate and concrete blocks and foreign-made products.

(2) Exterior Finishing Materials

1) Roofs

Reinforced concrete roof slabs should be made for a built-up roof (by the use of asphalt and gravel) and equipped with heat insulators. This is a tested and true way of making roofs waterproof. It also helps increase the durability of roofs.

2) Exterior Walls

Reinforced concrete should be used as the wall material in places which are very likely to be exposed often to rainwater. But concrete blocks should be used inside balconies which are unlikely to be exposed directly to rainwater. This will help shorten the construction period and reduce the construction cost. Spray-type synthetic resin should be used as the wall finishing material. There is a clear difference in durability between the spray type resin and paints. In the case of the latter, it will be necessary to repaint more often, which means higher costs in the long run. Thus, the spray type resin is preferable although the initial cost may be relatively high.

3) Fittings

The exterior fittings should be aluminum sash window frames, which require no repainting and are easy to maintain, compared with steel window frames. Unlike wooden window frames, they are never eaten by termites. The jalousie window which is used widely in Papua New Guinea should be used to provide adequate ventilation. As a measure against theft, lattices should be attached to the windows of the rooms located on the ground floor. Also, exterior windows should be equipped with insect screens to prevent flies and mosquitoes from entering them. The doors should be mostly wooden flash doors, but

aluminum or iron doors may be installed where the doors are often opened and closed.

(3) Internal Finishing Materials

1) Floors

Terrazzo tiles and PVC sheets should be used as floor finishing materials. Terrazzo tiles should be used for the floors of the waiting hall, where many people move about. These tiles are smooth and easy to clean. In addition, their useful life is about three times as long as PVC sheets whose useful life is 10 years. Thus terrazzo tiles are more durable and easier to maintain.

PVC sheets should be used for the floors of ordinary rooms and wards. Compared with terrazzo tiles, these tiles are easier to walk on and less expensive. The floors of the warehouse and the machine room should be covered with concrete.

2) Internal Walls

The reinforced concrete columns, beams and concrete block walls should be painted. Paints which are easy to clean should be used. The internal walls of the toilets and the shower rooms should be covered with ceramic tiles.

3) Ceilings

Ceilings should be hung so as to secure spaces for heat insulation, sound absorption, and concealing wiring or piping. The ceilings of the main rooms should be finished with plaster boards having a painted finish and with a light-gauge steel bed. Painted calcium silicate boards should be used for the ceilings of the toilets and the shower rooms where measures against humidity are necessary.

4-3-6 Exterior Site Plan

The exterior plan includes the following.

- An approach from the Taurama Road for outpatients and ambulance cars and an access road to the Mortuary Building within the site.
- A parking lot to accommodate 150 cars.
- Courtyard structures to protect against rainwater, and sand from the slope on the western side of the site.

4-3-7 Area of Facilities

Areas of each department are shown in the table below.

Table 4-5 Area Schedule

(Unit: m^2)

Building	Outpatient Dept.	Central Diagnosis Dept.	Ward	Administration and Service Dept.	Total
New Facilities					
New Main Building	Outpatient (1445) Casualty (521) Specialist Clinic (1088) Pharmacy (474)	X-ray (624)	Paediatric (1541) Surgical (2058) General (2828) Psychiatric (770)	Administration (168) Corridor, etc.(2606)	14,123 m^2
Mortuary Building		Mortuary (240)			240 m^2
O & G Operating Theatre		Operating (321) X-ray (246)			567 m^2
Mechanical Building				(172)	172 m^2
Pump Building				(22)	22 m^2
Sub Total	3,528	1,431	7,197	2,968	15,124 m^2
Existing Facilities					
Existing Main Hospital Building		Operating (912) ICU (145) Pathology (1377)	Intermediate (602) Full nursing (457)	Doctor's Rm (473) " (473) Administration, Other (3166) Medical Record(155) Mechanical (100)	7,860 m^2
Walter Strong Wing			Leprosy Ward(476) Nutrition Unit(224)	Rotary(98) Workshop (300) Store (144) Doctor's on call RM (420)	1,662 m^2
Children's Outpatient Clinic	Children's Outpatient (820)				820 m^2
McGregor Wing		Labour (975) Public Health(1060) Special Care Nursery (252)	O & G Ward (742) Ante natal Ward (689) Post natal Ward (1200)		4,918 m^2
Ancillary		CSD (202) Blood Bank (700)		Canteen (767) Laundry (756) Plant and Others (440)	2,865 m^2
Sub Total	820	5,623	4,390	7,292	18,125 m^2
Total	4,348	7,054	11,587	10,260	33,249 m^2

☐ New Main Building

	Room name	Q'ty	Area (m²)
1)	General Outpatient		
	Waiting Hall	1	346.5
	Nurse Control	1	11.1
	Waiting Corridor	1	100.8
	Examination rm	7	77.7
	Treatment rm	1	207
	Equipment Store	1	9
	Medicine Store	1	9
	Store	1	7.5
	Toilet (for Outpatients)	1	45
	Toilet (for Staff)	1	20
	Entrance Hall	1	132
	Corridor, Others	–	479.4
	Sub Total		1,445
2)	Casualty		
	Entrance	1	19.5
	Waiting Hall	1	27
	Office	1	27
	Examination Booth	5	42
	Preparation rm	1	12
	Nurse Station	1	16
	Observation rm	1	62
	Minor Operating Theatre	1	27
	Preparation rm	1	12
	Plaster rm	1	12
	Dirty Utility	1	12
	Resuscitation rm	1	27
	Laying Out rm	1	39
	Doctor's rm	1	18
	Nurse's rm	1	21
	Anaesthesiologist rm	1	18
	Mechanical rm	1	21
	Toilet (for Outpatients)	1	27
	Stretcher Pool	1	5

	Room name		Q'ty	Area (m²)
	Corridor, Others		–	76.5
	Sub Total			521
3)	Specialist Clinic			
	Psychiatric	Examination rm	2	33
	Surgical	Examination rm	3	49.5
		Treatment rm	1	16.5
		Plaster rm	1	16.5
	Internal Medicine (including Paediatric)	Examination rm	3	49.5
		Treatment rm	1	16.5
	TB	Examination rm (w/toilet)	2	33
		Treatment rm	2	33
	STD	Examination rm	2	30
		Toilet	1	3
		Waiting rm	1	16.5
	ENT	Examination rm	1	33
	Ophthalmology	Examination rm	1	22
		Treatment rm	1	11
		Dark rm	1	9
	Pain	Examination rm	1	16.5
		Treatment rm	1	16.5
	Dermatology	Examination rm	1	16.5
		Treatment rm	1	16.5
	Nurse's rm		1	16.5
	Office rm		1	16.5
	Waiting rm		2	336
	Equipment Store		1	9
	Store		1	16.5
	Toilet (for Outpatients)		1	36
	Toilet (for Staff)		1	21
	Corridor, Others		–	198.5
	Sub Total			1,088
4)	Pharmacy			
	Waiting Hall		1	144
	Dispensary rm		1	90

	Room name	Q'ty	Area (m²)
	Pharmacist rm	1	21
	Staff rm	1	15
	Alcohol rm	1	7.5
	Drug Store	1	36
		2	43
	Cool rm	1	7.5
	Disposal Store	1	12
	Corridor, Others	—	98
	Sub Total		474
5)	Administration Dept.		
	Reception	1	48
	Account Office	1	24
	Medical Record Store	1	24
	Tel Exchange rm	1	16
	Store	1	36
	Corridor, Others	—	20
	Sub Total		168
6)	X-ray Dept.		
	Office rm (Radiologist rm)	1	81
	X-ray rm	3	117
	Seminar rm	1	39
	Control Corridor	1	72
	Chief Radiologist rm	1	19.5
	Dark rm	1	9
	Reading rm	1	9
	Film Store	1	10.5
	Mechanical rm	1	19.5
	Waiting Area	1	72
	Corridor, Others		175.5
	Sub Total		624
7)	Paediatric Ward		
	General Ward	2	896
	Nurse Station	2	27
	Treatment rm	2	54

	Room name	Q'ty	Area (m²)
	Examination rm	1	27
	Dirty Utility	2	9
	Linen Store	2	13.5
	Equipment Store	2	9
	Office rm	2	13.5
	Toilet · Shower rm	4	133.5
	Milk Kitchen	2	13.5
	Seminar rm	1	27
	Doctor's rm	2	36
	Nurse's rm	2	42
	Corridor, Others	—	240
	Sub Total		1,541
8)	Surgical Ward		
	General Ward	2	845
	6-Bed rm	5	195
	4-Bed rm	3	72
	1-Bed rm	2	24
	Nurse Station	3	39
	Treatment rm	3	39
	Examination rm	3	38
	Dirty Utility	3	13.5
	Linen Store	3	17
	Pantry	3	26
	Toilet · Shower rm	3	139.5
	Store	3	42
	Seminar rm	1	27
	Doctor's rm	1	18
	Nurse's rm	1	21
	Corridor, Others	—	502
	Sub Total		2,058
9)	General Medical Ward		
	General Ward	2	1001
		1	422.5
	6-Bed rm	5	195
	4-Bed rm	3	72

	Room name	Q'ty	Area (m²)
	1-Bed rm	2	24
	Nurse Station	4	52.5
	Examination rm	4	48.5
	Treatment rm	4	52.5
	Dirty Utility	4	18
	Linen Store	4	21.5
	Pantry	4	35
	Toilet · Shower rm	4	168
	Store	4	56
	Seminar rm	1	27
	Doctor's rm	2	36
	Nurse's rm	2	42
	Corridor, Others	—	556.5
	Sub Total		2,828
10)	Psychiatric Ward		
	6-Bed rm	4	156
	4-Bed rm	4	96
	Nurse Station	2	22
	Treatment rm	1	12
	Dirty Utility	1	4.5
	Linen Store	1	4.5
	Pantry	1	9
	Consulting rm	1	8
	Toilet · Shower rm	1	68
	Doctor's rm	1	14
	Store	2	20
	Bed rm	2	63
	Group Therapy rm	1	39
	Corridor, Others	—	254
	Sub Total		770
11)	Conecting Corridor, ELV Hall, ELV Mechanical rm, Others		2,606
	Total		14,123

☐ Mortuary Building

Room name	Q'ty	Area (m²)
Ante rm	1	18
Preparation rm	1	10.5
Store	1	7.5
Office rm	1	12
Autopsy	1	30
Body Storage	6	54
Corridor, Hall	–	39
Laying Out Area		69
Total		240

☐ Obstetric & Gynaecological Operating Theatre Building

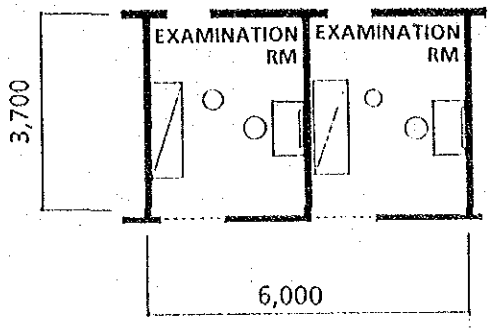
	Room name	Q'ty	Area (m²)
1)	Operating Dept.		
	Operating Theatre	2	72
		1	25
	Hall	1	54
	Preparation rm	1	16
	Sterilising rm	1	32
	Changing rm (for Doctor)	1	14
	Changing rm (for Nurses)	1	16
	Rest rm	1	12
	Recovery rm	1	35
	Waiting Area	1	27
	Mechanical rm	1	30
	Compressed Gas Cylinder Storage	1	10
	Corridor, Others	–	166
	Remodelling Area in Existing Building	–	58
	Total		567

☐ Ancillary

Room name	Q'ty	Area (m²)
Mechanical Building	1	172
Pump Building	1	22
Total		194

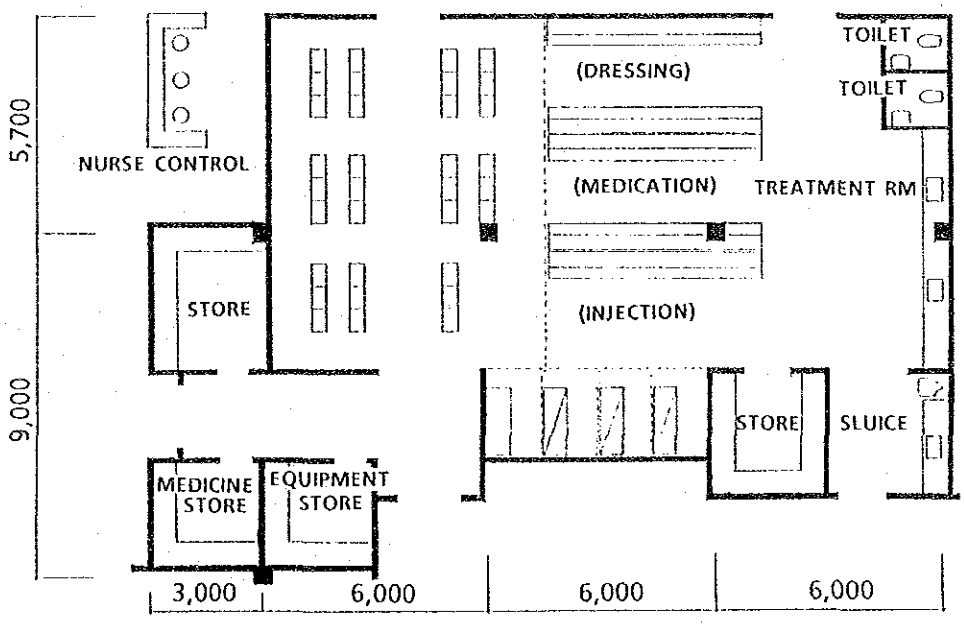
GENERAL OUTPATIENT DEPARTMENT LAYOUT-1

General Outpatient Dept. Examination RM (11.1m²)



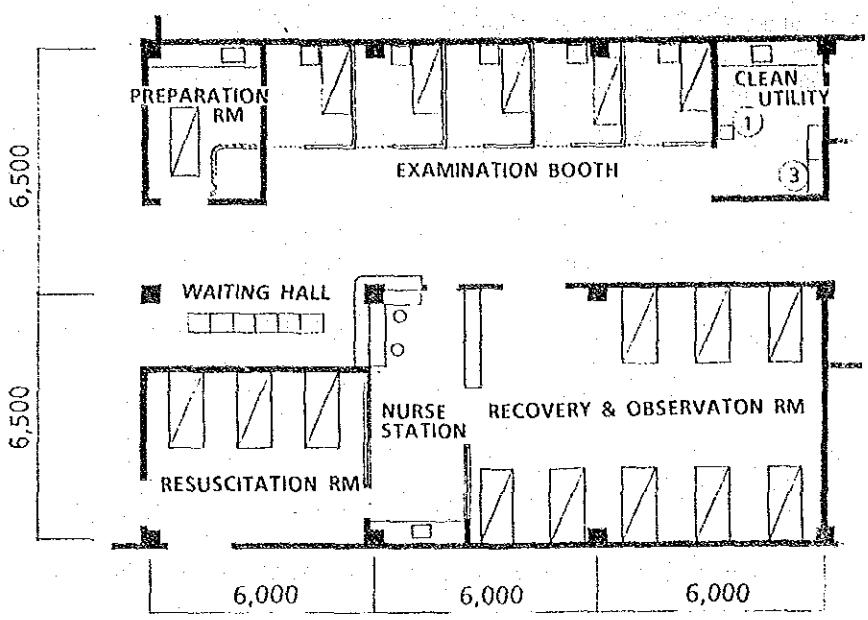
GENERAL OUTPATIENT DEPARTMENT LAYOUT-2

General Outpatient Dept. Treatment RM (207m²) / Equipment Store (9m²) / Medicine Store (9m²) / Store(7.5m²)



CASUALTY DEPARTMENT LAYOUT-3

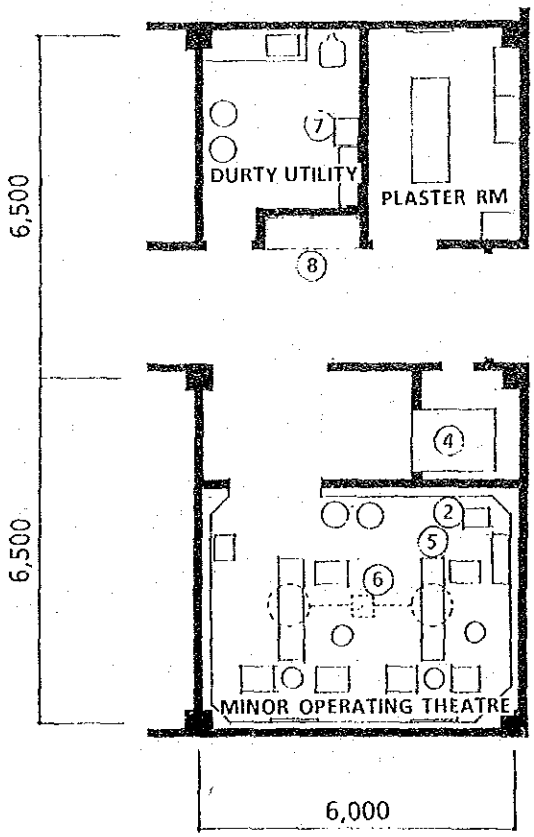
Casualty — Waiting Hall (27m²) / Preparation RM (12m²) / Observation RM(62m²) / Nurse Station (16m²) / Examination Booth (42m²) / Resuscitation RM (27m²)



No	Equipment
A01	Electrocardiograph
A02	Suction Unit
A03	Nebuliser
A04	Autoclave
A05	Operating table
A06	Operating light
A07	Bed pan steriliser
A08	Water striliser

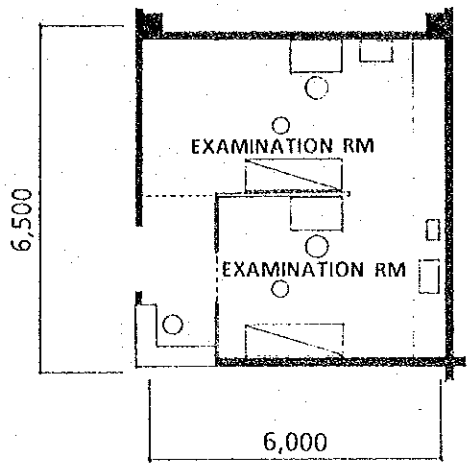
CASUALTY DEPARTMENT LAYOUT-4

Casualty — Minor Operating Theatre (27m²) / Dirty Utility RM (12m²) / Plaster RM (12m²)



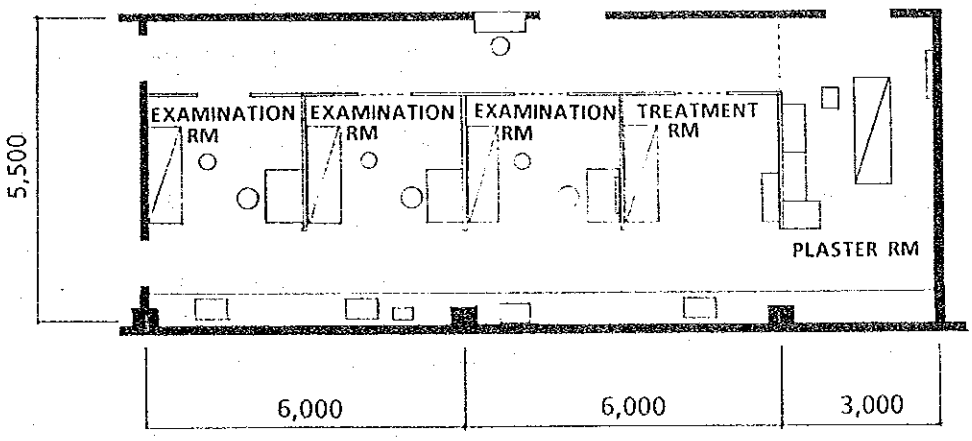
No.	Equipment
A01	Electrocardiograph
A02	Suction Unit
A03	Nebuliser
A04	Autoclave
A05	Operating table
A06	Operating light
A07	Bed pan steriliser
A08	Water striliser

Psychiatric Examination RM (33m²)

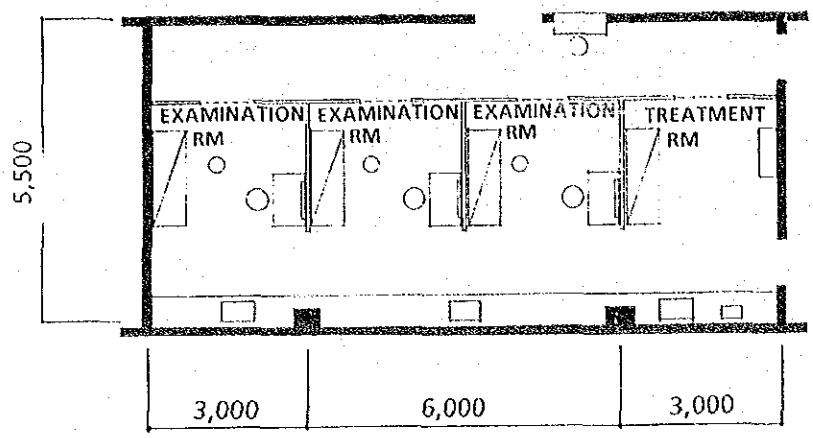


SPECIALIST CLINIC LAYOUT-6

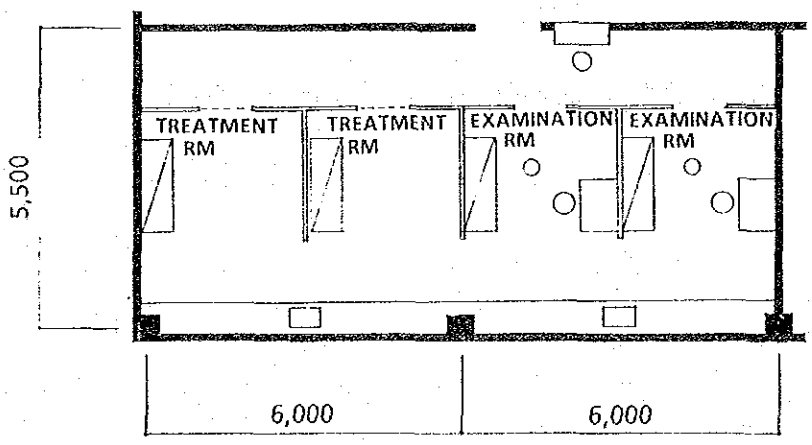
Surgical Examination RM (49.5m²) / Treatment RM (16.5m²) / Plaster RM (16.5m²)



Internal Medicine Examination RM (49.5m²) / Treatment RM (16.5m²)

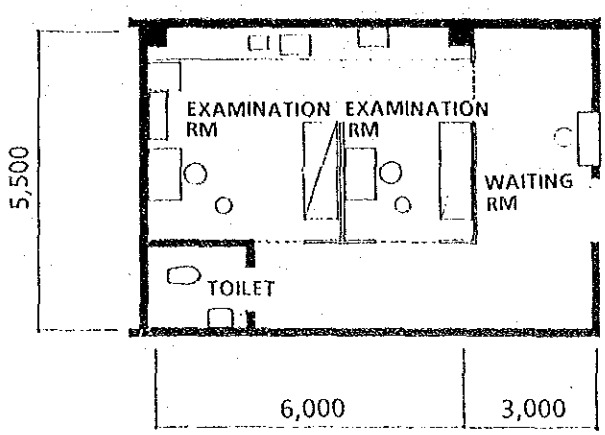


TB Examination RM (33m²) / Treatment RM (33m²)



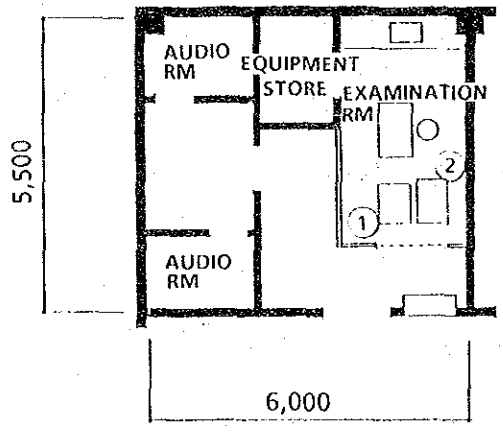
SPECIALIST CLINIC DEPARTMENT LAYOUT-9

STD Examination RM (30m²) / Waiting RM (16.5m²) / Toilet (3m²)



SPECIALIST CLINIC DEPARTMENT LAYOUT-10

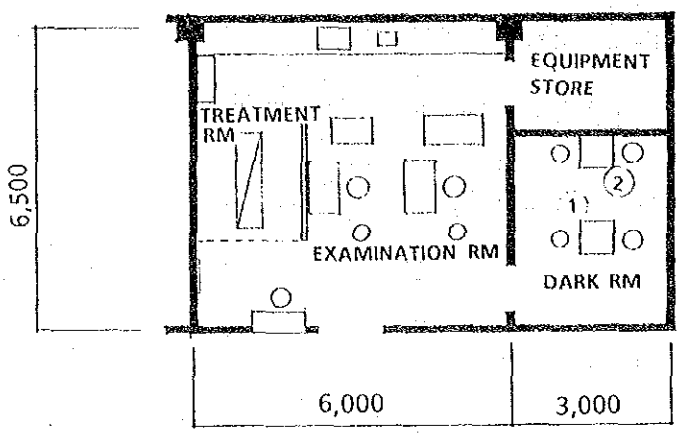
ENT Examination RM (33m²)



No	Equipment
B01	ENT treatment unit
B02	ENT treatment chair

SPECIALIST CLINIC DEPARTMENT LAYOUT-11

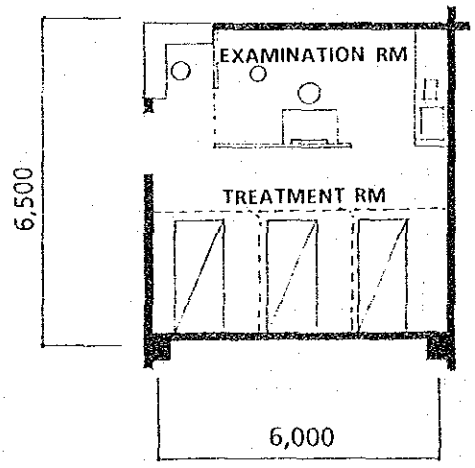
Ophthalmology Examination RM (22m²) / Treatment RM (11m²) / Dark RM (9m²)



No.	Equipment
C01	Slit lamp
C02	Synoptophore

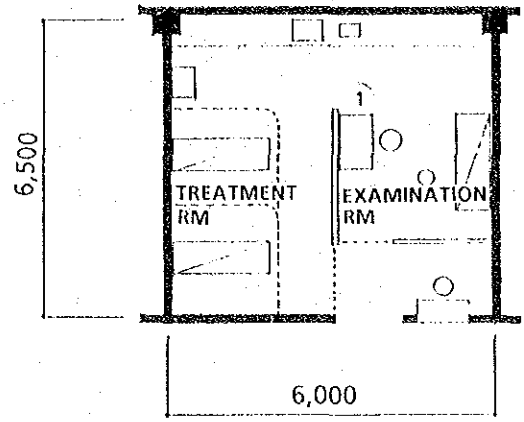
SPECIALIST CLINIC DEPARTMENT LAYOUT-12

Pain Examination RM (16.5m²) / Treatment RM (16.5m²)



SPECIALIST CLINIC DEPARTMENT LAYOUT-13

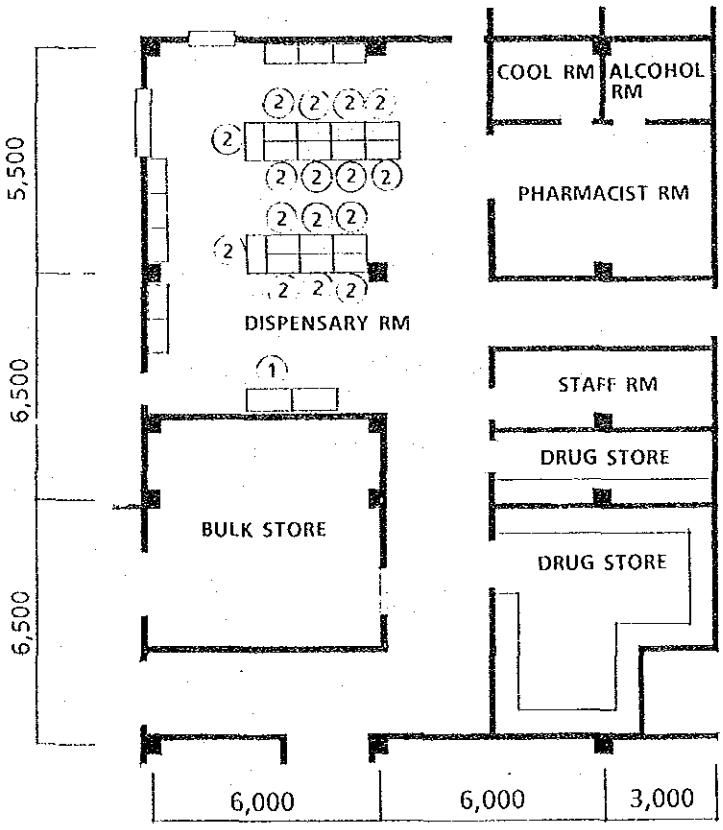
Dermatology Examination RM (16.5m²) / Treatment RM (16.5m²)



No.	Equipment
D01	Binocular microscope

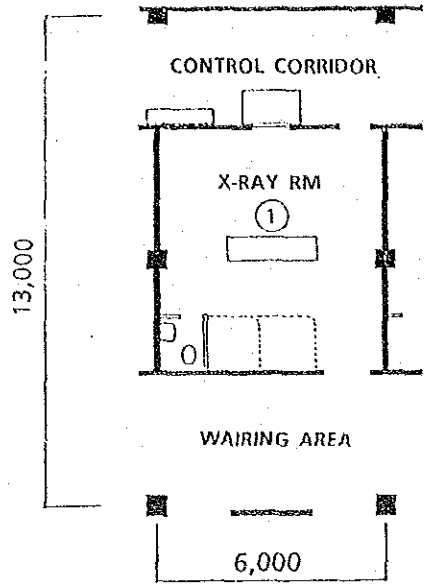
PHARMACY DEPARTMENT LAYOUT-14

Pharmacy Dispensary RM (90m²) / Drug Store (36m²) (12m²) (31m²) / Cool RM (7.5m²) / Alcohol RM (7.5m²) / Pharmacist RM (21m²)



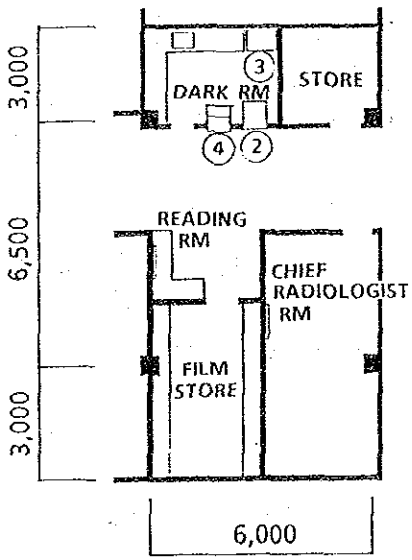
No.	Equipment
E01	Distilled water apparatus
E02	Dispensing table

X-RAY X-ray RM (39m²)



No.	Equipment
F01	X-ray machine
F02	Automatic processor
F03	Developing tank
F04	Casette pass box

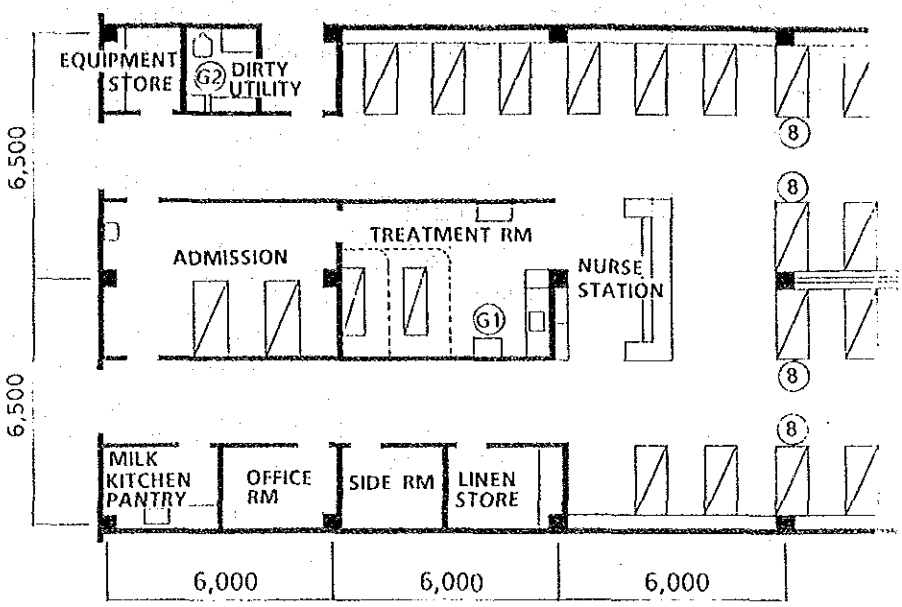
X-RAY Dark RM (9m²) / Reading RM (9m²) / Film Store (10.5m²) / Chief Radiologist RM (19.5m²)



No.	Equipment
F01	X-ray machine
F02	Automatic processor
F03	Developing tank
F04	Casette pass box

WARD DEPARTMENT LAYOUT-17

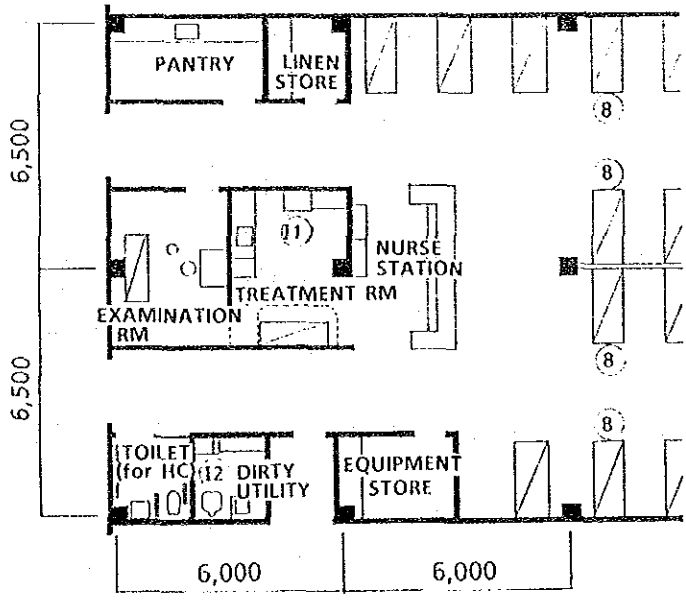
Paediatric Ward — Nurse Station (13.5m²) / Treatment RM (27m²) / Examination RM (27m²) / Linen Store (7.75m²) / Equipment Store (4.5m²) / Office RM (6.75m²) / Dirty Utility (4.5m²) / Bed RM (6.09m²/Bed) [including Corridor]



No.	Equipment
G01	Ice making machine
G02	Bed pan steriliser
L01	Stainless steel instrument set
L02	Spare parts
L03	Consumable
L04	Oxygen flow meter
L05	Vacuum trap bottle (wall hang type)
L06	Clank gatch bed
L07	Orthopaediac and fracture bed
L08	Bed

WARD DEPARTMENT LAYOUT-18

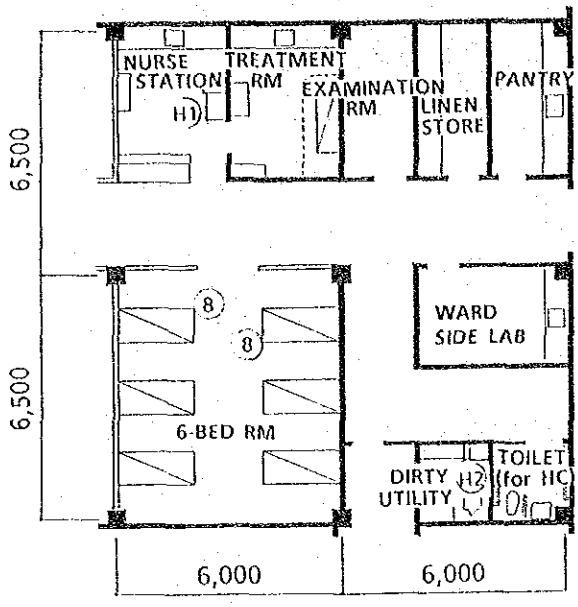
Surgical Ward · General Medical Ward — Nurse Station (12m²) / Treatment RM (12m²) / Linen Store (4.5m²) / Store (4.5m²) / Pantry (9m²) / Dirty Utility (4.5m²) / Bed RM (6.5m²/Bed)



No.	Equipment
I01	Ice making machine
I02	Bed pan steriliser
L01	Stainless steel instrument set
L02	Spare parts
L03	Consumable
L04	Oxygen flow meter
L05	Vacuum trap bottle (wall hang type)
L06	Clank gatch bed
L07	Orthopaediac and fracture bed
L08	Bed

Surgical Ward
General Medical Ward

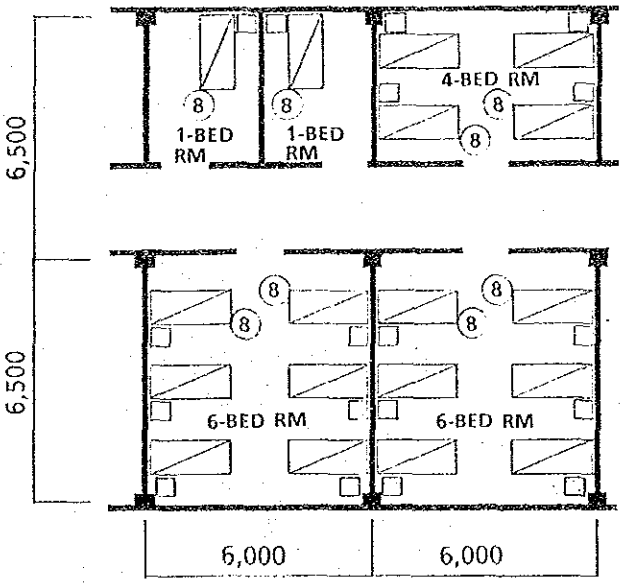
Nurse Station (12m²) / Treatment RM (12m²) / Linen Store (8m²) / Pantry (8 m²) / Dirty Utility (4.5 m²) / 6-Bed RM (39 m²)



No.	Equipment
H01	Ice making machine
H02	Bed pan steriliser
L01	Stainless steel instrument set
L02	Spare parts
L03	Consumable
L04	Oxygen flow meter
L05	Vacuum trap bottle (wall hang type)
L06	Clank gatch bed
L07	Orthopaediac and fracture bed
L08	Bed

Surgical Ward
General Medical Ward

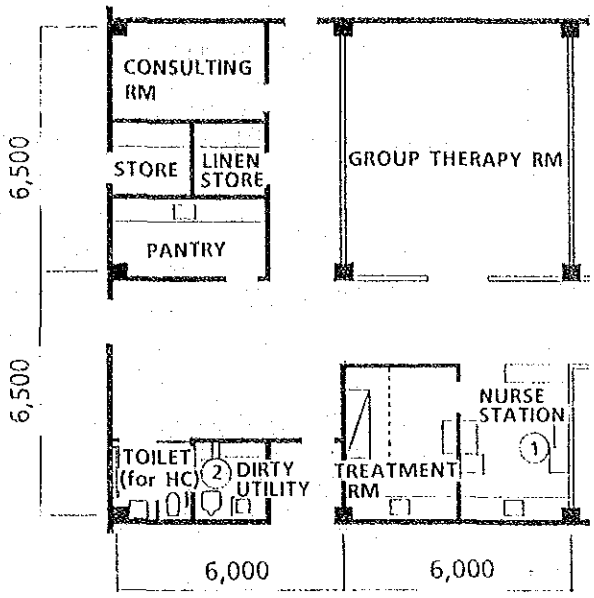
6-Bed RM (39m²) / 4-Bed RM (24m²) / 1-Bed RM (12m²)



No.	Equipment
L01	Stainless steel instrument set
L02	Spare parts
L03	Consumable
L04	Oxygen flow meter
L05	Vacuum trap bottle (wall hang type)
L06	Clank gatch bed
L07	Orthopaediac and fracture bed
L08	Bed

WARD DEPARTMENT LAYOUT-21

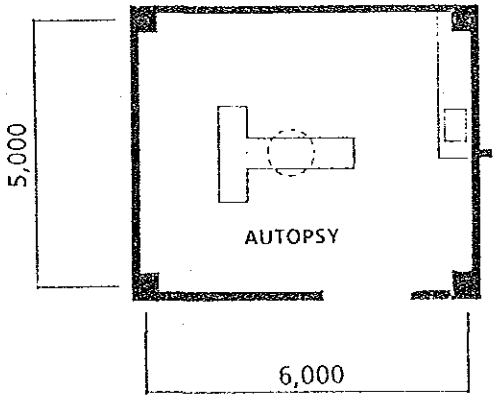
Psychiatric Ward	Nurse Station (12m²) / Treatment RM (12m²) / Group Therapy RM (39 m²) / Consulting RM (8 m²) / Linen Store (4.5 m²) / Pantry (9 m²) / Dirty Utility (4.5 m²)



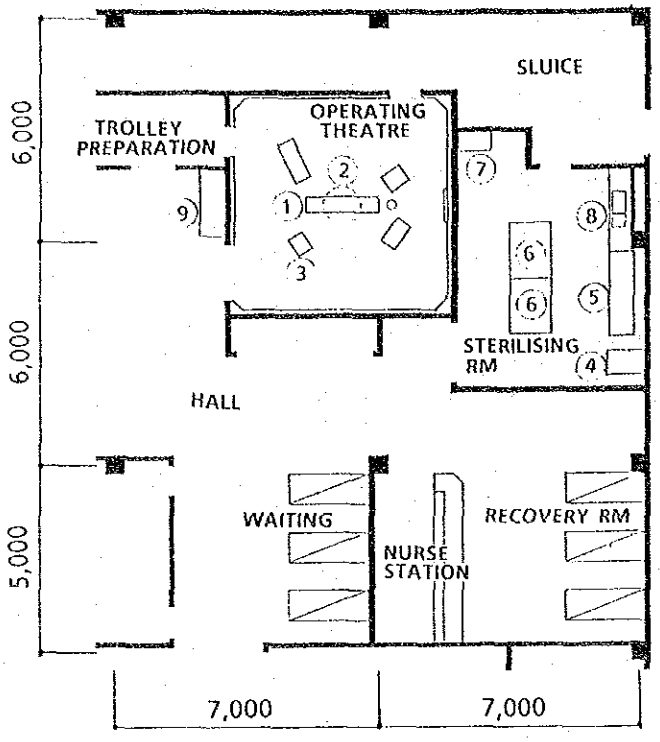
No.	Equipment
J01	Ice making machine
J02	Bed pan steriliser

MORTUARY DEPARTMENT LAYOUT-22

Mortuary	Autopsy RM (30m²)



Operating Operating Theatre (36m²) / Sterilising RM (32m²)



No.	Equipment
K01	Operating table
K02	Operating light
K03	Diathermy machine
K04	Autoclave floor type
K05	Ultrasonic cleaner
K06	Working table
K07	Operating glove dryer
K08	System sink
K09	Water steriliser