

Table 3-5-2 Content of Equipment and Material Plan

CWM Hospital (continued)

	Department	Main-tenance	Ex-cluded	Newly installed	Parallelly installed	Plan
Ward	Acute care ward	-			*	Besides internal medicine and surgery, ICU, burns and dialyzer are requested. Excluding dialyzer, the other units are practiced, so they will be planned to satisfy present level. Dialyzer is excluded since sufficient maintenance cannot be expected from past practice. Vehicles shall be provided for transport of inpatients between hospitals.
	Paediatrics	C	*			
	Medicine ward (male)	C	*			
	Medicine ward (female)	C	*			
	Surgery ward (male)	C	*			
	Surgery ward (female)	C	*			
	New surgery ward	B	*			
	Non fee charge ward	B	*			
	Goynaecology ward	A	*			
Service	Kitchen	B	*			
	Laundry	B	*			

Table 3-5-3 Content of Equipment and Material Plan

FSM

	Department	Main-tenance	Ex-cluded	Newly installed	Parallelly installed	Plan
Hoodless House	Pathological laboratory	B	*			
	Otorhino-laryngology room	B	*			
Tamavua campus	Biochemistry laboratory	C	*			
	Physiological laboratory	B	*			
	Anatomical laboratory	C	*			
	Environmental health laboratory	C	*			

As can be seen from the above table, the request for equipment and material in this project consists mostly of renewal for old worn ones or additional equipment and material required for increased units such as operating unit and new equipment and material for upgrading services such as for central supply and sterilizing department.

Since operational and management difficulties can be foreseen, the contents of equipment and material, especially for sophisticated equipment, were studied to satisfy the following criteria.

- Difficulty in operation and maintenance
- Personnels necessary for operation and management
- Expense necessary for its application
- Benefit expected for Fiji and neighboring countries.

The sophisticated equipment being studied include automatic analysis equipment for clinical inspection, angiography equipment and CT scanner for organ imaging and dialyzer for ICU. The results of study based on past practice and the above mentioned criteria are as shown in the following table.

Table 3-6 Result of Study for Requested Equipment

Equipment	Experience	Maintenance personnels	Difficulty	Operating expense	Benefit
Automatic analysis equipment	No	Necessary (clinical technician examination)		Expensive	
Angiography	Yes	Necessary (internal medicine doctor, surgeon, organ imaging technician)	Difficult	Expensive	
CT scanner	No	Unnecessary (doctor from each clinic organ imaging technician)			Large
Dialyzer	Yes	Necessary (Nurse)		Expensive	

Note: Maintenance personnel listed in the table are specialists from Australia.

The existing equipment for automatic analyzer can be substituted, so it is considered that this should be used instead of purchasing a new equipment.

Although dialyzer application is practiced, the life of the equipment is rather short also regular procurement of consumable materials and dialyzate is foreseen to be difficult, therefore it is considered that it should be excluded from the plan.

The utilization of angeography has dropped drastically from the 219 cases in 1985 to 56 cases in 1989. This was due to the decrease of equipment performance owing to its age as well as the loss of professional personnels. However the reduced utilization does not mean that its necessity has diminished, therefore this equipment should not be excluded just because its utilization has diminished. Such action would only be contrary towards the upgrading of medical health level in Fiji and should be avoided.

Table 3-7 Number of Angeography Inspection Cases

Year	1985	1986	1987	1988	1989
Number of cases	219	213	106	85	56

Today, such equipment has developed to a high degree with many additional functions and even the most simple equipment is far advanced from the existing equipment procured from UK in 1963. Therefore, the introduction of a special equipment which is for sophisticated compared to existing equipment does not seem appropriate from the viewpoint of technical operation and maintenance as well as from the achieved benefit. A universal equipment which can also be used for angeography would be much more effective even though its performance may be inferior.

The CT scanner is a sophisticated equipment which has never been used in the CWM Hospital nor in other places in Fiji. Therefore, the

introduction of this equipment must be carefully studied, and for this purpose, the pros and cons regarding its introduction are given below:

- o Since the population of Fiji is about 700,000, there is sufficient population for the use of a CT scanner for examination. For example, in Japan, there is 1 CT scanner for every 65,000 population.
- o It will also benefit neighboring countries too, since it would not be necessary to transport patients to New Zealand or Australia for examination, which results in a large reduction in expense.
- o The present organ image examination cases exceeds 40,000 cases a year (Table 4-9) and since 3,500 cases are brain examination, the utilization frequency will be quite high even when used for brain examination only.
- o Since it can be utilized in a wide range of examination, including internal medicine and surgery, it provides a rapid progress in examination range as well as examination accuracy.
- o Since Fiji is now quite advanced as can be seen from disease structure (Table 2-9) and population (Table 2-3) and also with the CWM Hospital feature and function as a clinical training hospital, a higher medical examination should be pursued.
- o The largest causes of equipment trouble are due to environmental condition such as dust, high temperature and high humidity, but the trouble can be resolved by the installation of the CT scanner in a new building which will be taken necessary measures for the environmental condition.
- o Maintenance which is of greatest concern is presently being conducted through agents in Australia and New Zealand of X ray equipment manufacturers throughout the south pacific region, and this maintenance service system can be extended by concluding a contract for regular maintenance. Therefore it is to be considered by the Government of Fiji to conclude the contact for maintenance or repair of CT scanner with an appropriate agent.

The plan for organ imaging unit is summarized for existing equipment and requested equipment as listed in the following table. Since the existing organ imaging equipment in the gynaecology department is equipped with black room and necessary accessories for independent function, it is planned to be used in the present gynaecology department. Therefore, 4 new pieces of equipment and one existing equipment shall be provided in this project. As to the request for breast cancer photograph equipment, it was judged as not necessary to install a special equipment from the frequency of utilization.

Table 3-8 Plan for Organ Imaging

Existing equipment	New equipment	Plan
Angeography	Angeography X ray television	X ray television
Fluoroscope (efflourescent plate type)	_____	Discontinue
General fluoroscope (Buckey photo stand) General fluoroscope (Buckey stand)	General fluoroscope (2)	General fluoroscope (2)
	X ray CT scanner	X ray CT scanner
	Breast flouroscope	Exclude
X ray television (gynaecology ward)	_____	Continue

### 3.2.6 Necessity of Technical Assistance

When this project is completed, technical assistance from international agencies such as WHO and aid agencies of foreign countries will be necessary on the following points especially for CWM Hospital.

#### (1) Endoscopy and CT scanner examination technologies

The usage of endoscope is being practiced but much improvement is desired, while CT scanner technique is not introduced. However, with the increase of deaths from cancer and increase of brain injury cases owing to the increase of traffic accidents, examinations by these new technologies will increase without doubt.

#### (2) Maintenance, management and repair of medical equipment and material

Today, there are 2 technicians sent from Australia as its technical cooperation and it is to be desired that this cooperation will be continued. But, in any case, it is the most important for the Fiji side to train its own technician.

At present, technical assistance is provided by doctors and technicians mainly for FSM. In the medical education field, Australia, New Zealand and UK have been fully involved. Therefore, when Japan wishes to provide technical assistance in this field, it is necessary to discuss with international agencies such as WHO to coordinate assistance with these countries, but when difference of educational system and language problems are considered, it may be difficult to send teachers from Japan to FSM as technical assistance. Therefore it is desirable to have technical assistance continued from the present countries in this field under coordination of WHO.

### 3.2.7 Basic Policy for Implementing Technical Assistance

In this chapter, the direct benefit and the far reaching benefit together with the execution capability of the Government of Fiji has been confirmed. Also it was confirmed that the objective of this project satisfies the grant aid system. Therefore, basic design shall be performed by studying the contents of the project in detail on the premises that grant aid from Japan will be provided.

### 3.3 Outline of the Project

#### 3.3.1 Operating Organization and Managing Organization

##### (1) Managing organization of the project

After the project is completed, the CWM Hospital under the administration of the Ministry of Health will be responsible for the management. The hospital functions can be managed without any basic changes in the present organization, while in terms of medical training functions, a Council Board will be held together with FSM for coordinating clinical training, curriculum and educational program. (Refer to "2.5.1 (1) The relation between CWM Hospital and FSM".) The maintenance of the facility shall be carried out by PWD, which is responsible for maintenance of all government facilities, while maintenance of medical equipment shall be carried out by Equipment & Material Section of the CWM Hospital (refer to "2.5.1 (7) Organization Chart of CWM Hospital").

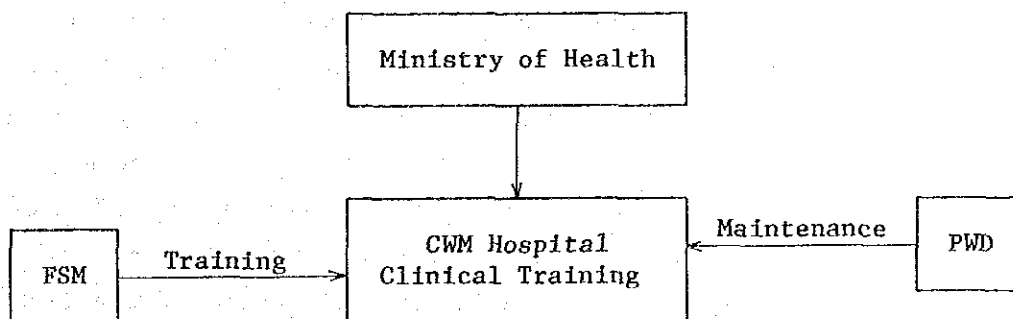


Fig. 3-1 Managing Organization

(2) Operating organization of CWM Hospital

The operating committee is comprised of the Permanent Secretary, Director of CWM, Senior Matron, and Doctors of each department which determines policy of operation. Furthermore, Matrons' Meeting and Department Doctors' Meeting are held regularly, and these meetings are attended by the Medical Superintendent and the Hospital Secretary. In the CWM Hospital, the operating organization is well established. As to the relation with FSM and FSN as their clinical training hospital, the Medical Superintendent of CWM Hospital participates on the respective Council Board for adjusting curriculum schedule, and content of training in accordance with the actual examination and treatment at the CWM Hospital.

(3) Manning program

The manning program is basically the same as at present, but the vacant orthopaedic clinic doctor must be filled and nurses as well as assistants must be supplemented. The vacancy of the CWM Hospital staff are be as follows:

Doctor:	Orthopaedic (register)	1
Nurses:	Sisters	3
	Staff nurses	24
Assistants:	Central supply and sterilizing unit	8
	Housekeepers	several

Aside from the housekeepers which is subcontracted to a private company, all persons are under the management of the Ministry of Health. The doctor for orthopaedic clinic is presently vacant and examination is performed by the surgeon, but with the expected increase of patients, a special doctor is necessary. At the Lautoka Hospital there is an orthopaedic doctor and for the CWM Hospital to provide service as a top referral hospital, an orthopaedic doctor should be recruited. The staff nurses could be filled by arranging graduates from FSN to serve with experienced nurses. In any case, necessary personnels should be prepared before completion of the construction.



### 3.3.2 Project Plan

The objective of this project is to restore and complete the original function of the CWM Hospital for providing medical service and clinical training service under the present system and administration. The basic operation and activity of each department will be described in the following paragraphs.

#### (1) General clinic

The general clinic is open for examination from 8:00 AM to 1:00 PM and from 1:30 PM to 4:30 PM, Monday through Friday, and an average 550 patients come daily (1989). 12 doctors conduct the examination while casualty clinic is manned on an 8 hour shift rotation of the doctors. The patients are screened by consultation at the general clinic, and comparatively minor internal medicine and surgery cases are examined and treated here while other patients are referred to special clinics. The consultation, examination and treatment here is the most frequently used place for clinical training since it is the first step in clinical training. Here, 6 booths are divided into 3 units of 2 booths each and 3 doctors are each responsible for 1 unit. In 1 booth a student or a nurse conducts consultation and in the other booth the doctor conducts examination.

#### (2) Special clinic

In the commonly shared examination room of the special clinic, examination is conducted according to the schedule in Table 3-9.

Orthopaedics, paediatrics and gynaecology are also examined Monday through Friday and the hours is 8:30 AM to 1:00 PM.

Table 3-9 Examination Schedule

Days	8:30 AM - 10:30 AM	10:30 AM - 1:00 PM	1:30 PM - 4:30 PM
Monday	Government employee health examination	High blood pressure examination	Internal medicine examination
Tuesday	Government employee health examination Dermatology examination Psychiatry examination	Otorhinolaryngology examination	Surgery examination
Wednesday	Government employee health examination	Rheumatism examination	Urology examination Respiratory examination
Thursday	Government employee health examination	Diabete examination	Surgery examination
Friday	Government employee health examination	Dermatology examination	Internal medicine examination

(3) Casualty clinic

Casualty clinic handles emergency cases as well as late hour general outpatients. The 12 doctors are divided into 3 groups for conducting a 3 shift operation similar to nurses as shown in the following figure.

	8:00	16:00	24:00	8:00
1st day	(A)	(B)	(A)	
2nd day	(B)	(C)	(B)	
3rd day	(C)	(A)	(C)	
4th day	(A)	(B)	(A)	

Fig. 3-2 3 Shift Operation

(4) Pharmacy

In the pharmacy, there is a dispensary and a production division, and the pharmacy supplies medical drug to outpatients, clinics within the hospital and wards.

Outpatients receive drugs, as prescribed by the doctors, which amount to 800-1,000 prescription medical drugs daily, and nurses or staff nurses from respective clinic and wards collect necessary medical drugs from the pharmacy daily. The necessary drugs amount to about 200 kinds daily.

Medical drugs and materials for drug production here at the hospital is supplied regularly from the storage of the Ministry of Health at the rate of once every month.

The pharmacy is operated with 6 pharmacists and 4 assistants, also the drug information service of the pharmacy provides prescriptions for participants who purchase medicine in town.

(5) Organ imaging

X ray photographs are taken mainly for outpatients specified by doctors and inpatients for examination and treatment. This service is also provided for institutes such as private clinics with no X ray equipment. Radiology treatment is not performed here, but this clinic is becoming more and more busy for achieving early detection of sickness in line with the development of preventive medicine. The kinds of examination are becoming diversified with the introduction of X ray TV, X ray general examination angiography, ultrasonic examination and tomography. The types of organ imaging examination is shown in Table 3-10, and the staff performing examination is shown in Table 3-11.

Table 3-10 Number of Organ Imaging Examination

	1987	1988	1989
X ray general examination	40,834	39,734	41,276
X ray TV	712	691	859
Angiography	106	85	56
Ultra-sonic examination	7,456	9,631	12,450
Tomography	149	77	119
<b>Sub-total</b>	<b>49,257</b>	<b>50,218</b>	<b>54,760</b>
Portable X ray photograph in operation theatre	188	135	106
Portable X ray photograph in ward	1,480	1,650	1,996
<b>Sub-total</b>	<b>1,668</b>	<b>1,795</b>	<b>2,102</b>
<b>Total</b>	<b>50,925</b>	<b>52,013</b>	<b>56,862</b>

Table 3-11 Staff for Organ Imaging (April 1990)

Position and qualification	Number
Director, organ imaging clinic	1
Doctor, organ imaging clinic	4
Chief organ imaging technician	1
Organ imaging technician 1st grade	2
Organ imaging technician 2nd grade	18
Organ imaging assistant	2
Nurses (attendant)	2
Clerk	1
Typist	1
Assistant	1
(FSM students)	33)
<b>Total</b>	<b>33</b>
	<b>(including students 66)</b>

(6) Clinical laboratories

Medical specimens are taken from outpatients specified by doctors and inpatients for examination of condition. Specimens will be taken according to the type of examination required which may consist of blood examination, bacteria examination, biochemical examination and pathological examination. The types of clinical examination and the number of staff performing this examination is shown in Table 3-12, and Table 3-13 respectively.

Table 3-12 Monthly Clinical Examination (January 1990)

Examination	Number
Biochemical examination	7,116
Cell examination	605
Pathological examination	174
Blood examination	13,483
Immunity examination	4,628
Bacteria examination	4,938
Parasite examination	719
Food examination, water examination	205
Blood serum examination	1,808
Total	33,676

Table 3-13 Staff of Clinical Laboratories

Position	Number
Director, clinical examination	1
Doctor, clinical examination	2
Technician, clinical examination	26
Assistant, clinical examination	4
Total	33

(7) Physiological examination

Cardiography and electromyography which is a must in modern medical examination are performed. The equipment is located next to the special outpatient clinic since it is convenient for outpatient. However, electromyography is not performed since 1989, because the electromyogram is out of order. There is no special staff for this purpose, and nurses in the internal medicine clinic performs these examination and doctors in the internal medicine clinic judge the results. The number of examination is shown in Table 3-14.

Table 3-14 Number of Physiological Examination

Year	Cardiography	Electromyography
1987	2,544 cases	244 cases
1988	2,332	205
1989	2,857	36

(8) Endoscope examination

Endoscope examination is presently conducted in the operation theatre. Records of endoscope examination for the past three years are shown in Table 3-15, and it shows a decrease of examination in 1989 which is caused by the drainage of internal medicine doctors to overseas countries.

Table 3-15 Endoscope Examination Records

Year	Alimentary tract examination	Colon examination	Total
1987	357	36	393
1988	316	12	328
1989	41	15	56

(9) Blood bank

Blood necessary for emergency operation is collected and stored. Two technicians for blood examination in the clinical examination department perform this work.

(10) Operation theatre

A number of operation theatre is prepared for different purposes to be able to address all kinds of operation. Operation is conducted under the presence of anaesthetic doctor, surgeon and all other doctors concerned with the operation.

Operation schedule is set up by 2 surgeons 2 sisters and the doctor in charge. Up to now, 1 operation theatre had to be reserved for emergency, but since 1 emergency operation theatre is provided in the casualty clinic, the congested schedule will be eased. The number of operations are shown in Table 3-16. It shows that over 7 operations were performed 1 theatre in 1 day even when the 3 operation theatres were fully utilized.

Table 3-16 Number of Operation

Year	Operation
1987	6,147
1988	5,648
1989	5,657

Table 3-17 Contents of Main Operation (1989)

Main operation	cases
Orthopaedic operation	326
Plastic surgery and otorhinolaryngology operation	186
Gynaecology operation	1,402
Others	3,743

(11) Central supply and sterilizing unit

The main duty of this unit is to prepare equipment for the operation theatre, but this unit washes, sterilizes and supplies all equipment and material necessary for the entire hospital.

(12) Acute care ward

This newly established department shall provide intensive care and treatment for patients in grave condition. Burn patient ward and ICU are provided to prevent infectious disease. In this ward, a 24 hour care system is performed by a nurse team consisting of 1 sister and 8 staff nurses working in 3 shifts.

(13) Central library

A central library open 24 hours, with collection of both basic and current medical information, is provided with books and journals stored in open racks for easy access. Since medical personnels must always refer to basic principle as well as soak up up-to-date medical information, it is an indispensable function of a clinical training hospital and a referral hospital in Fiji. The library is designed for a collection of 30,000 books, also copy services are provided, but as information service, establishment of a video library and computer information service through international communication service should also be considered for future installation.

### 3.3.3 Outline of Planned Site

(1) Planned construction site

The planned construction site is located on the northeast side of the CWM Hospital complex in Suva city. The land is level, but the shape is uneven and it was once used as a heliport for transporting emergency patient from islands, however, now it is an open space with no plan for utilization. The flat part of the site is shaped like a bow and is



about 60 m wide at the centre, about 150 m long and the area is about 8,500 m<sup>2</sup>. The chord side of this site lying on the north northeast side of the site lies along the Extension St. which extends out from the Waimanu St. The Extension St. terminates at the land owned by the Ministry of Health lying on the far end of the planned site. However, according to the Suva city plan, the Extension St. is to be extended by a 12 m width road to connect with the Vunivalu St. The south-southwest side of the site is a deep valley with steep slope.

The present land level of the site is a bit lower than the road level but poses no problem, because the overburden is not deep and hard rock which is difficult to excavate lies immediately under it. Therefore, the ground floor height had to be designed at a high level, which made the ground floor level of the planned building higher than the road level.

According to the data of the Ministry of Land and Resources, the above mentioned rock is over 60 m deep and provides a very strong load bearing base. However, since it is expected to be very hard to excavate, the foundation and water discharge piping must be carefully designed.

(2) Infrastructure surrounding the planned construction site

(a) Power

An 11 kV power line lies along the Waimanu St. and it is possible to take in power to the site along the Extension Street.

(b) Telephone

The telephone exchange within the present facility has an extra 50 circuits available, therefore it is possible to utilize these circuits.

(c) Water supply

A 200 mm diameter water main lies under the Waimanu St., therefore it is possible to lay a pipeline along the Extension Street.

(d) Water discharge

A public sewer line lies under the Waimanu St., so sewage and waste water can be discharged through a discharge pipe laid along the Extension Street into the main sewer line. Since the site is about 3 m lower than the Waimanu St., sewage and waste water must be pumped up with a pump. Storm water is discharged into the creek in the valley at the south southwest side of the site.

(e) Steam

The present steam plant of the existing facility can be enlarged and utilized.

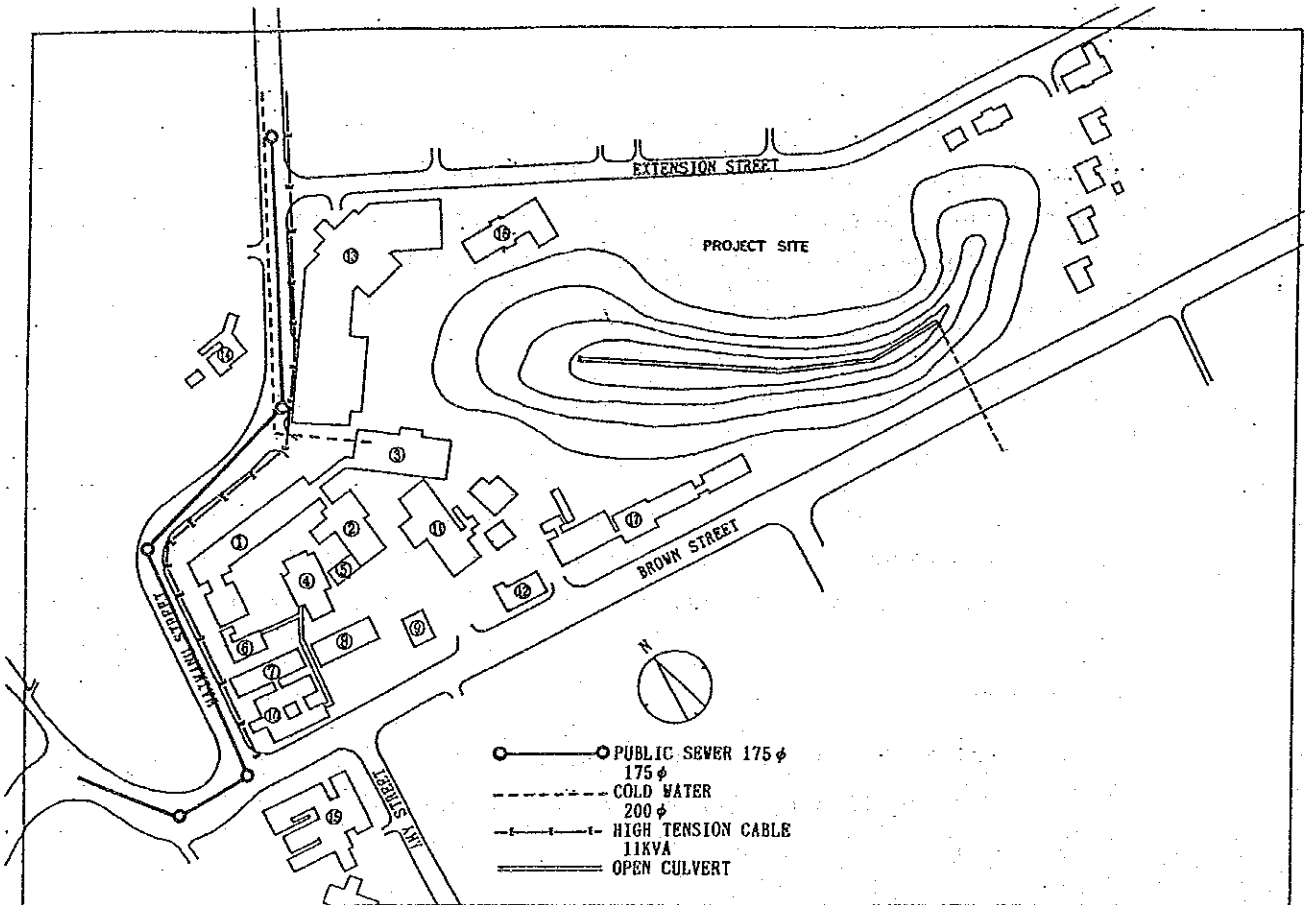


Fig. 3-3 Infrastructure Surrounding the Project Site

### 3.3.4 Outline of Facility, Equipment and Material

#### (1) Outline of facility

As described in "3.2 Study of the Requested Content", the plan is in principle to improve existing facility although acute care ward is newly constructed and central library is remodelled. The contents of the facility is as given below.

Table 3-18-1 Contents of the Facility

Department	Main Room	Main Function
Administration	Reception, accounting Medical record management  Document, waiting room	. Reception of outpatient . Calculation of examination expense and accounting of outpatient . Management of medical records
General clinic	Examination, treatment  Doctor's rest room Waiting room Seminar room	. Examination and consultation of outpatient
Special clinic	Paediatric examination treatment Gynaecology examination treatment Orthopaedic examination treatment Shared examination treatment Endoscope examination Waiting room Seminar room	. Special clinic and examination of outpatient
Casualty	Minor operator Examination and treatment Observation room Seminar room	. Emergency examination and treatment of outpatient
Pharmacy	Pharmacy, drug production Medical drug information Pharmacy office, manager Staff room Waiting room	. Production and packaging of medical drug . Medical drug dispensing and selling
Organ imaging	Photograph, direct reading  Dark room, reading Record management, manager Staff room Waiting room, seminar room Film storage	. X ray photograph, TV, ultrasonic examination, examination, CT examination . Film developing, reading storing
Physiology examination	Physiology examination	ECC, EEGs examination

Table 3-18-2 Contents of the Facility

Department	Main Room	Main Function
Clinical laboratories	Blood examination Bacteria examination Biochemical examination Photology examination Urine collection, blood collection Record management, manager Staff room Waiting room, seminar room	All kinds of examination
Blood bank	Examination, blood collection, storage	Collect, examine and store blood
Operation theatre	General operation Orthopaedic operation Infectious patient operation Operation preparation Equipment, material store Linen store Anesthetic preparation Washing, recovery, care Doctor, nurse dressing room Conference room Seminar room	Anesthetic, operation, operation recovery, care Linen, equipment material store
Central store and sterilizing unit	Washing, sterilizing Storage Record management, manager	. Washing and sterilizing medical equipment, material . Storage of medical equipment, material
Acute care ward	ICU, burns and General disease room Individual room, nurse station Treatment, dirty material processing, Catering, linen store Seminar room	. Hospitalizing and treating acute care patients
Service	Morgue Transformer, generator Water tank, pump	. Temporary storage of corpse . Power transform, generator during blackout . Public water tank and supplying to elevated water tank
Central library	Reading room, copy Management, repair	. Store and provide medical journal . Copy service . Repair and arranging stored publication
Clinical lecture room	Auditorium, storage	. Lecture, present paper, meeting
Covered way	Covered way	. Connection with existing facility

(2) Outline of equipment and material plan

Table 3-19-1 Equipment and Material Plan

1) Outpatient

Department	Section	Equipment and material plan
General outpatient	Examination clinic Treatment clinic	<ul style="list-style-type: none"> <li>. Equipment and material for general examination and treatment</li> <li>. Equipment and material for training and education of students</li> </ul>
		Examination table, treatment table, scale, sterilizer, film illuminator
Special outpatient	Medicine Surgery Paediatrics Gynaecology Orthopaedics Otorhinolaryngology Urology Dermatology Others	<ul style="list-style-type: none"> <li>. Equipment and material for general examination and treatment</li> <li>. Special inspection equipment and material for gynaecology, otorhinolaryngology, etc.</li> <li>. Equipment and material for training and educating students</li> </ul>
		Examination table, child examination table, examination table, plaster cast table
Casualty	Examination clinic Treatment clinic Minor operation Supervision room	<ul style="list-style-type: none"> <li>. Equipment and material for accident and emerging</li> <li>. Equipment and material for operation and sterilization</li> <li>. Equipment and material for reviving and supervising patient in supervision room</li> </ul>
		Operation table, shadowless lamp, anesthetic equipment, autoclave, emergency cart, reviving equipment, aspirator
Pharmacy	Pharmacy Medicine preparation	<ul style="list-style-type: none"> <li>. General pharmacy equipment and material for both outpatient and inpatient</li> <li>. Equipment and material to improve medicine preparation function and environment</li> <li>. Equipment and material for on-the-job training for students</li> </ul>
		Medicine cabinet, medicine preparation table, medicine refrigerator, distiller, dry heat sterilizer, electronic balance, clean bench, typewriter

Table 3-19-2 Equipment and Material Plan

2) Central clinic

Department	Section	Equipment and material plan
Organ imaging	X ray room Black room Film examination room	. 4 equipment including CT scanner . Equipment and material for training students
		CT scanner, X ray television, general image projection (2), supersonic diagnosis equipment
Physiology	ECG/EEG	. Equipment and material for the 2 sections
		Electrocardiograph, electroencephalograph
Endoscope examination	Endoscope examination	Endoscope, endoscope storage
Clinical laboratories	Blood examination Bacteria examination Biochemical examination Pathological examination	. Equipment and material for the 4 daily examinations and on-the-job training for students
		Automatic blood counter, microscope, stainer, CO <sub>2</sub> incubator freezer, autoclave
Blood bank	Blood collection Inspection Storage	. Equipment and material for blood collection, inspection and storage
		Blood collection table, centrifuge
Operation theatre	General (2) Orthopaedic Dirty operation Anaesthetic preparation Recovery	. Equipment and material for the 4 left clinic as well as anesthetic preparation clinic and recovery ward. . Equipment and material for storing operation equipment
		Operation table, anaesthetic equipment (4), shadowless lamp (4), microscope for operation, cabinet for equipment and material
Central supply and sterilizing unit	Washing Sterilizing Storage	. Equipment and material for preparation and storage of operation equipment . Main sterilizer and EO gas sterilizer similar to existing ones
		Autoclave (3), operating glove dryer, cabinet for storage bins
Morgue	Morgue	. Equipment and material for mortuary
		Corpse storage (6 bodies), corpse transportation cart

Table 3-19-3 Equipment and Material Plan

3) Ward

Department	Section	Equipment and material plan
Ward	Paediatrics ward Male ward Female ward Burn ward ICU	<ul style="list-style-type: none"> <li>. Equipment and material for acute care patients</li> <li>. Equipment and material for ICU</li> <li>. Vehicle for transporting inpatient to old wards</li> <li>. Vehicle for transporting linen</li> </ul>
		Beds for patient, reviving equipment, patient monitor, toilet washing and sterilizing equipment, mobile X ray equipment

3.3.5 Maintenance and Management Plan

In order to assure the benefit of this project, good maintenance and management of facility, equipment and material are necessary. A good continuous maintenance and management will assure a long smooth operation of the project.

After construction is completed and equipment is installed under grant aid, the maintenance and management must be provided by the recipient country, therefore the human and economical background of the country must be fully considered when planning the project. However, in many cases, high level technology and expensive equipment must be provided to achieve the objective of the project. Especially, in this project many modern medical equipment with a large number of electronic parts are installed, and when there is a breakdown, parts must be replaced which will be a higher burden than now for Fiji.

The budget of the Ministry of Health which was about 8% of the national budget has dropped to 5-6% and although there are indication that this percentage is increasing, it is desired that the Ministry of Health shall endeavor to restore the budget to the previous level.

Furthermore, more effort should be made to secure maintenance and management budget for CWM Hospital within the framework of the Ministry of Health budget. The following table shows the main expenditure of the CWM

Hospital. As can be seen, clinical examination expense increased abnormally in 1989, also it can be seen that maintenance expense of medical equipment has increased since technical assistance of Australia started.

Table 3-20 CWM Hospital Main Maintenance Expense (F\$)

Item	1986	1987	1988	1989	1990
Fuel and oil for vehicles	11,406.24	17,786.58	23,507.24	22,091.38	16,000
Vehicle maintenance	9,355.52	12,013.99	18,893.85	25,399.45	18,000
Medical equipment maintenance	18.25	—	518.25	11,493.84	12,000
Facility maintenance	8,087.50	—	66.00	2,469.90	2,000
Energy and water expense	293,916.50	313,213.22	329,283.38	332,078.07	359,240
Oxygen gas expense	67,563.95	74,133.25	109,111.95	133,398.54	100,000
Clinical examination medicine	212,039.32	245,870.82	252,383.56	465,814.00	280,000
Food expense	215,867.31	225,459.81	222,282.49	221,282.75	240,300
Laundry	22,937.68	34,324.56	35,053.51	31,587.57	18,428

(1) Maintenance of facility

The daily maintenance excluding daily housekeeping is performed by the Public Works Department (PWD). The technicians of PWD will regularly inspect facilities and when defects are found, he will report it together with recommendation to CWM Hospital and PWD will take actions as instructed by CWM Hospital. The public facilities of Fiji are comparatively well maintained. In this survey, it was observed that although old defects on CWM Hospital have propagated, it did not seem to be in a neglected condition, also the Fiji School of Nursing completed by grant aid in 1987 was very clean and well maintained.

The PWD which will be responsible for maintenance will be providing advice to the Fiji side during planning stage and will also provide advice to the consultant as the technician of Fiji side during implementation.

When the facility is constructed, energy and water supply expense is expected to increase by about F\$200,000 as shown in the following calculation:



Energy and water expense:

Unit price of 1989 obtained by dividing total expense by floor space is applied to the increased floor space with a 30% increase estimated for the increased density of facility and equipment

$$\frac{\text{F\$}332,078.07}{18,772 \text{ m}^2} = 17.737 \text{ F\$/m}^2$$

$$17.737 \text{ F\$/m}^2 \times 8,320 \text{ m}^2 \times 1.30 = \text{F\$}191,843.39$$

Since the 1989 CWM Hospital budget was F\$7,065,065, it will be roughly a 2.7% increase of budget.

$$\frac{\text{F\$}191,843.39}{\text{F\$}7,065,065} \times 100 = 2.71\%$$

However, since the department using the most energy and water will move to the new facility, it can be said that the above figure will not be exceeded in real terms.

(2) Maintenance and management of equipment and material

Generally, when equipment and material are provided under grant aid, the following problems are often experienced.

- ① The frequency of troubles are much higher than Japan, owing to environmental problem caused by poor, unstable supply of water and power, manual problem caused by insufficient skill, local problem caused by insufficient maintenance service and other such adverse condition.
- ② Frequency of parts replacement and overhaul increases, also the wear of parts are excessive owing to reasons similar as in 1 above.

- ③ Breakdown inside modern medical equipment which uses many electronic parts can only be repaired by replacing parts which expense will become quite a burden for the recipient country.
- ④ Complicated procurement route and delivery will also become a problem.
- ⑤ Even when repair is locally performed, technicians with high electronic skill is limited and in many cases, the repair is beyond their skill.

The maintenance and management of equipment and material involve such problems which pose a limit on the degree that can be resolved by the recipient country. Therefore, in this plan the following points were considered to permit quick response and action when troubles occur. Needless to say, the Fiji side must provide organization and effort to maintain and manage equipment and material.

- ① Measures for high frequency of troubles
  - o Study installing voltage regulator equipment in area with many high precision equipment (Japan)
  - o When installing equipment, provide good training on both operation and maintenance (Japan, Fiji)
  - o When studying selection of equipment, try to select equipment of supplier with local agent who can provide services when trouble arises (Japan)
  - o When providing training, both staff for operation and staff for maintenance must be trained for their respective services based on manuals. An operation manual and a maintenance manual must be prepared and training should be provided to a number of staff.

② Procurement of parts

- o Consumables should be procured for 1 or 2 year supply, if their each effective period permits, and for parts which wear excessively, they should also be procured for supply of similar period (Japan)
- o Standardization will be pursued by selecting equipment of manufacturer of present equipment wherever possible (Japan)
- o Local agents will be utilized as much as possible and maintenance contract or repair contract will be concluded with manufacturers or their local agents (Fiji)

The utilization of contractor and local agent should be conducted by the Fiji side under the cooperation of the Ministry of Health after the project is handed over. For this purpose a staff responsible for maintenance and management should be designated, as well as maintenance staff, to check entry and issue of all equipment and material excluding medical drugs. He should also control inventory and be aware of products stored in Government Pharmacy.

③ Procurement expense of parts, etc.

- o To procure all necessary parts once or twice a year through contractor (Fiji)
- o To endeavor to secure necessary expense funds (Fiji)

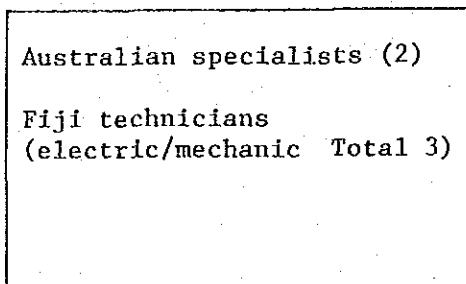
④ Procurement route and delivery

- o To give preference to manufacturer in Japan or in the world with a high reputation and with good service organization when selecting equipment (Japan)
- o To obligate contractor to establish local office or its agent as well as be responsible for all after service (Japan)

⑤ Maintenance staff

- o To establish maintenance organization as shown in the following figure under the guidance of the 2 mechanical specialists provided under a 2 year contract with Australia (Fiji)
- o To speed up training to secure local electronic technicians (Fiji)
- o To continue present contract for specialists with Australia (Fiji)

Present CWM Hospital Equipment and Material Department



Desired New Organization

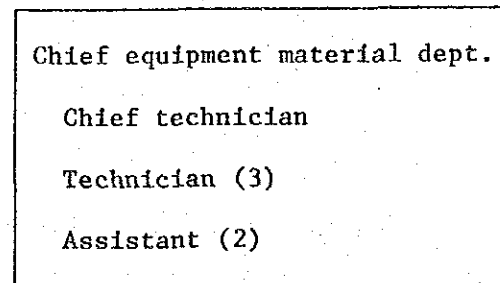


Fig. 3-4 Maintenance and Management Organization

In order to secure good maintenance and management, the following 3 points must be secured and for this purpose, the Government of Fiji should set up an effective plan. In Table 3-21, equipment which require maintenance are listed showing the source of parts and maintenance.

- ① Since the usage of electronic parts will increase in medical equipment, the training of local electronic technicians must be speeded up.
- ② The specialists from Australia must be continued until the above new organization functions smoothly.
- ③ For smooth operation of equipment and material, about 5% of procurement cost should be earmarked for yearly maintenance and management, therefore necessary budget must be secured.

Table 3-21 Equipment Requiring Maintenance

Equipment	New/Renewal	Consum-ables	Parts	Procurement/maintenance
Electrocardiograph	Renew	x		Local agent
Electroencephalogram	Renew	x		Local agent
X ray equipment	Renew/new		x	Local/Australia
Automatic blood counter	Renew	x		Local/Australia
Anesthetic equipment	Addition		x	Local agent
Autoclave	Renew		x	Japanese manufacturer
EO gas sterilizer	New	x		Local dealer
Electrocardiogram monitor	Addition	x		Local agent
Vehicle	Addition		x	Local firm

The expected annual expense increase due to new or additional equipment, which is estimated from the present utilization, is as shown in the following table.

Table 3-22 Expected Annual Expense

Equipment	No.	Consumables	Annual utilization	Unit price	Annual operation expense
CO <sub>2</sub> incubator	1	CO <sub>2</sub>	100 days	F\$3/day	F\$300
EO gas sterilizer	1	EO gas	100 times (twice weekly)	F\$13/day	F\$1,300
Electrocardiograph	6	Paper	600 patients x 6	F\$0.5/patient	F\$1,800
Electroencephalogram	1	Paper	500 patients	F\$3/patient	F\$1,500
Electrocardiogram monitor	12	Electrode	60 patients x 12	F\$3/patient	F\$2,100
CT scanner	1	Film	1,300 patients	F\$7/film	F\$9,100

Since breakdown after the 1 year guarantee period must be borne by Fiji side, some expense may be necessary for maintenance. The parts for repair may be procured from manufacturer, local agent or contractor, but in either case, delivery after order will normally take 2-3 months.

The procurement cost of spare parts differ greatly and cannot be estimated, but for electronic parts, on breakdown of internal parts, an additional transportation cost is generally necessary, making it quite expensive. The breakdown parts must therefore be accurately identified by Fiji side.

When breakdown involves the necessity of technicians to be sent from Japan, Australia or New Zealand the following extra expense will be necessary on top of the parts cost.

Technician expense (incl. lodging)	F\$500 - F\$750/day
Air tickets (Tokyo round trip)	F\$3,600 per person
Air tickets (Sydney or Auckland round trip)	F\$1,640 per person

## CHAPTER 4 BASIC DESIGN





## CHAPTER 4 BASIC DESIGN

### 4.1 Basic Policy

The basic design of this clinical training hospital was planned to incorporate the facility, equipment and material described in the following paragraphs after considering the contents described in Chapter 3, including the role of the hospital for south pacific countries, the medical administration of Fiji and the climate.

#### 4.1.1 Facility Plan

- (1) Clarify the role of referral hospital and clinical training hospital

A structure which clarifies the function of referral hospital for the South Pacific Region including Fiji and of clinical training hospital is provided.

- (2) Plan layout to maintain operational coordination with existing facilities

A layout which provides maximum coordination between existing facilities and replaced facilities is planned. The flow of patients, doctors, nurses and staff as well as equipment and material are laid out to provide a clear, efficient circulation.

- (3) Provide a plan to reflect activities of existing hospital

A plan which reflects the characteristics and activities of a central and eastern divisional hospital as well as the top referral hospital for Fiji is provided.

(4) Secure space for conducting clinical training

A plan which secures sufficient space for providing clinical training of doctor course and paramedical course of FSM is provided.

(5) Provide a facility plan which can correspond to changes in medical condition

In view of the increase of population in the division covered by CWM Hospital owing to the concentration of population in Suva and also the hospital's role as a referral hospital, future changes in medical condition is foreseen. Therefore in order to correspond to these changes, outpatient clinic and wards are provided with simple partition walls.

(6) Provide reduction of operation, maintenance and administration expense

The size and grade of the facility are determined to provide a facility which after completion, will not place an unduly heavy burden both technically and financially on the Government of Fiji. With due consideration to the annual budget of the Ministry of Health, the facilities are planned to be of a technical level which can be maintained and administered by the PWD. Construction materials of high durability and readily available local materials are selected wherever possible, also in order to reduce energy expense, natural ventilation and natural lighting are adopted. Furthermore, the system as well as equipment, electrical equipment and material which are easily operated and maintained are selected.

(7) Plan a facility satisfying local climatic condition

It is necessary to design this project to meet the natural condition such as climate and earthquake without affecting the function of the hospital. The basic design should be prepared to be suitable for tropical high temperature, humid and rainy weather condition.

(a) Climate

- o Since Suva is located at 18°09' south latitude, sunlight protection such as eaves and louvres are provided on both north and south sides.
- o Fiji is located in the tropical rain climate region and the rainfall in Suva reaches 3,000 mm a year. Therefore, special care is taken for drainage within the site, waterproof quality of buildings, water leakage and storm winds.
- o The prevalent southeast wind is utilized to secure natural draft, also the building is built along a north-south axis to protect from afternoon sunlight while ventilation opening is provided on the east and the west side. Air conditioning is provided only to a minimum number of rooms, and ceiling is raised as high as possible for rooms without air conditioning.

(b) Earthquake condition

Fiji is located within the Pacific rim seismic zone and has recorded about 60 earthquakes during the past 40 years, but the only earthquake which caused damage to Suva city is the earthquake in 1953. However, since a hospital is a highly public facility, earthquake condition shall be carefully considered.

(8) Building condition

Local materials are selected wherever possible and when local materials are not available, they are procured from Australia, New Zealand or Japan. The most suitable materials will be selected after considering all factors including cost, quality, quantity and maintenance.

The following points should be considered when preparing a building plan.

(a) Building material

Most materials, which are mainly imported or produced locally under financial or technical assistance from foreign countries (mainly Australia, New Zealand), are available locally. Therefore quality is not a problem, but survey must be made beforehand to see whether large quantity is readily available.

(b) Construction method

The ordinary construction applies reinforced concrete with concrete block or wooden partition covered with finishing material. Since steel frame structure must use all imported materials, it is expensive and is not normally practical.

In this project, the structure is a reinforced concrete rigid frame structure and finishing material applies locally practiced finishing method for easy maintenance.

(c) Regulations

The Pacific Building Standards Project is preparing the National Building Code of Fiji under assistance of the Australian International Development Assistance Bureau and is expected to be submitted to the Fiji Government in August, 1990. The code uses the Australian and New Zealand codes as reference and is modified to satisfy the condition in Fiji, therefore it is necessary to prepare the basic design according to this code.

The construction application for building relating to government agencies must be submitted to the PWD, while that for private buildings must be submitted to the City Council of each city which in case of Suva is the Suva City Council. In case of grant aid project, approval of application will be given priority by the PWD, but with the enactment of the above mentioned code, application formality is being reconsidered. Therefore, the entire project construction schedule must provide necessary period for construction license application.

#### 4.1.2 Medical Equipment and Educational Equipment

When planning the equipment for this project, many factors must be considered including the medical level of the country, the role of the hospital, needs and daily activities, condition of present equipment, and technical skill of doctors and medical staff.

In the course of this study, the points which should be especially considered or be basic consideration for the equipment and material plan are summarized in the following paragraphs.

- (1) Equipment shall not deviate greatly from present CWM Hospital standards

Since this hospital is staffed to a high degree by doctors and technicians from foreign countries, the quality is estimated to be quite high from the type of operation conducted here. In most cases, equipment involving transfer of technology is frequently desired, but in this case, transfer of technology is not so desired by both sides, therefore sophisticated equipment which later reduces efficiency is avoided and equipment which provides treatment of present standard is selected mainly from the viewpoint of maintenance.

- (2) Educational equipment which is simple and orthodox is selected.

The training of students in the hospital should be conducted without obstructing daily medical activities of the hospital. Therefore a complicated system requiring much time and manpower should be avoided in favor of simple equipment which can be easily moved and suited for a small number of staff.

- (3) Present equipment shall be utilized also equipment shall be standardized.

Equipment which has been recently installed for operation and clinical inspection is utilized and planned equipment is selected from manufacturer of present equipment wherever possible, and standardization of equipment is pursued.

- (4) Equipment which is easily maintained and administered after introduction is selected.

There are several small local agents (Japanese manufacturer, European manufacturer) of operation, X ray and ME equipment, so equipment supplied by these agents shall be selected from the viewpoint of after-service. Therefore, procurement from third countries will be considered when it is deemed advantageous based on the following conditions and will not be limited to Japanese products.

- (a) Supply of consumables, spare parts and necessary expense
- (b) Skill of workers to operate the equipment
- (c) Equipment procurement expense

Sturdy equipment of good quality will be given preference from viewpoint of medical condition and for long period usage.

## 4.2 Study of Basic Design Criteria

The following conditions were studied when preparing the Basic Design.

### 4.2.1 Design Conditions of the Facility

- (1) Content of facility

The content of facility was determined as follows:

- (a) In view of the old and worn facilities, the small space owing to increasing number of patients and the dispersed functions of CWM Hospital, the following departments will be moved to achieve consolidation and coordination among departments, and to upgrade hospital function.

- o General clinic
  - o Special clinic: internal medicine, surgery, orthopaedic, paediatric, gynaecology, otorhinolaryngology, dermatology, urology
  - o Casualty
  - o Examination clinic: organ imaging, clinical laboratories, physiological examination, endoscope examination
  - o Operation theatre
  - o Pharmacy
  - o Blood bank
  - o Central supply and sterilizing department
- (b) In order to provide intensified care, the presently dispersed services are moved into a special acute care ward including ICU.
- (c) A seminar room is provided at all departments for clinical training and a lecture theatre for diagnosis and treatment lecture is constructed where patients can be transported.
- (d) The libraries which are located at the Tamavua campus and Hoodless House will be consolidated into a central library which will be provided at the remodelled existing X ray building for students of FSM and medical staff of CWM Hospital.

(2) Size of facility

The area of the present facility at CWM Hospital excluding FSM, nurses and paramedical accommodations is 16,958 m<sup>2</sup>. When divided by the nominal number of beds which is 402, the area for each bed is 42.2 m<sup>2</sup>. The size of the hospital will be determined by using this figure as reference, with provisions for increased number of beds for increased population, also estimating the necessary area and Fijian physique for the afore-mentioned departments.

#### 4.2.2 Design Condition of Medical and Educational Equipment and Material

The conditions described in the following table must be followed when specifying specifications and selecting equipment and material.

Table 4-1 Equipment and Material

Electric	<ul style="list-style-type: none"> <li>. Electric equipment shall be designed for 240 V/50 Hz, single phase or 415 V/50 Hz 3 phase, and down transformer shall be specified only when the above specification is difficult to satisfy.</li> <li>. Plug shall be of local specification, and grounding shall be provided when necessary.</li> <li>. Fluorescent lamp and electric bulk shall be of local specification.</li> </ul>
Central piping	<ul style="list-style-type: none"> <li>. Outlets for oxygen, anaesthetics and aspiration shall be of local specification and connection of equipment shall fit such outlets</li> </ul>
Steam	<ul style="list-style-type: none"> <li>. For large size sterilizer, steam type similar to present type shall be supplied from viewpoint of running cost.</li> </ul>
Gas	<ul style="list-style-type: none"> <li>. Gas equipment shall use propane gas which is available locally.</li> </ul>
Rust prevention	<ul style="list-style-type: none"> <li>. Since rust is easily generated owing to high humidity in wet season, equipment and material subjected to sensitive health condition must be provided for rust prevention.</li> </ul>
Fungus prevention	<ul style="list-style-type: none"> <li>. Owing to the aforementioned reasons, necessary equipment and material such as mat must be provided for fungus and mold protection.</li> </ul>
Equipment & material sign	<ul style="list-style-type: none"> <li>. All signs, instructions, and manuals for equipment and material must be in English</li> </ul>



## 4.3 Basic Plan

### 4.3.1 Facility Plan

#### (1) Layout plan

This project plan is phase 1 of the 3 phase master plan of the CWM Hospital prepared under the assistance of WHO. After studying the master plan, the construction site was selected at the open space of about 8,500 m<sup>2</sup> along Extension Street instead of the originally proposed site, in view of reducing the heavy cost burden on the Fiji side resulting from the demolishing of existing building and construction of temporary building also the adverse effect on existing facility during construction.

The layout was planned to locate departments, closely related to the existing hospital, near the CWM Hospital and to concentrate clinics in the newly constructed hospital also to simplify the flow of persons and materials. The buildings were divided into 3 buildings after studying the independence and interdependence of respective departments. The 3 buildings are staggered side by side along a East-West axis considering the configuration of the site and the buildings are interconnected both horizontally and vertically.

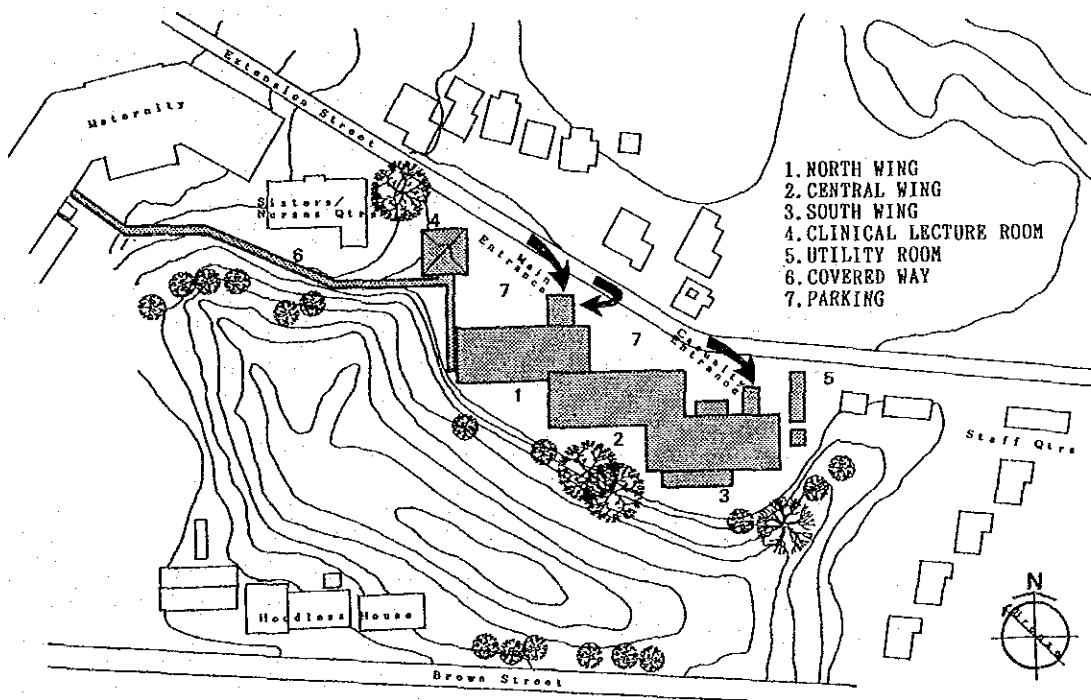


Fig. 4-1 Layout Plan

(2) Building plan

① Floor plan

The location of each department was arranged as described below giving due consideration to each clinic's relation with the existing CWM Hospital, operational function within the new buildings and Fijian physique.

a. Office and administration department - North wing, ground floor

This department facing the entrance hall includes reception for outpatients, management of accounting, and management of medical records.

b. Pharmacy - North wing, ground floor

This department is located along the flow line of outpatients with easy access for drug supply to the existing CWM Hospital.

c. General, special clinic - Central wing, ground floor

This clinic is located at a location easily identified by outpatient coming for the first time and where nurses can easily classify the outpatients. The special outpatient clinic for orthopaedic which is closely related to organ imaging is located in the ground floor.

d. Organ imaging - South wing, ground floor

This clinic is located along the flow line of closely related outpatients, operation theatre, casualty and staff.

e. Casualty - South wing, ground floor

This clinic is located at a location with good relation to organ imaging, operation theatre and central supply and sterilizing department.

f. Clinical examination, blood bank - North wing, first floor

Since this department is closely related to the existing hospital, it is located on the first floor of the north wing with easy access to the existing hospital through a covered way.

g. Special clinic - Central wing, first floor

This clinic is located on the first floor of the central wing in view of its relation with blood examination and biochemical examination as well as general clinic. A physiology examination which is closely related special clinic is also planned.

h. Operation theatre/CSSD - South wing, first floor

These departments are closed from outpatients and outside persons and are located to secure high independence. Operation theatre and CSSD are placed together for easy supply.

i. Wards - Central wing, second floor

These wards hospitalize patients of comparatively minor injury or sickness.

j. Wards - South wing, second floor

These wards hospitalize serious condition patients including ICU and burn treatment.

Since patients who utilize organ imaging clinic or operation theatre must move a long distance, patient transporting equipment will be employed.

The floor arrangement is shown in the following diagram.

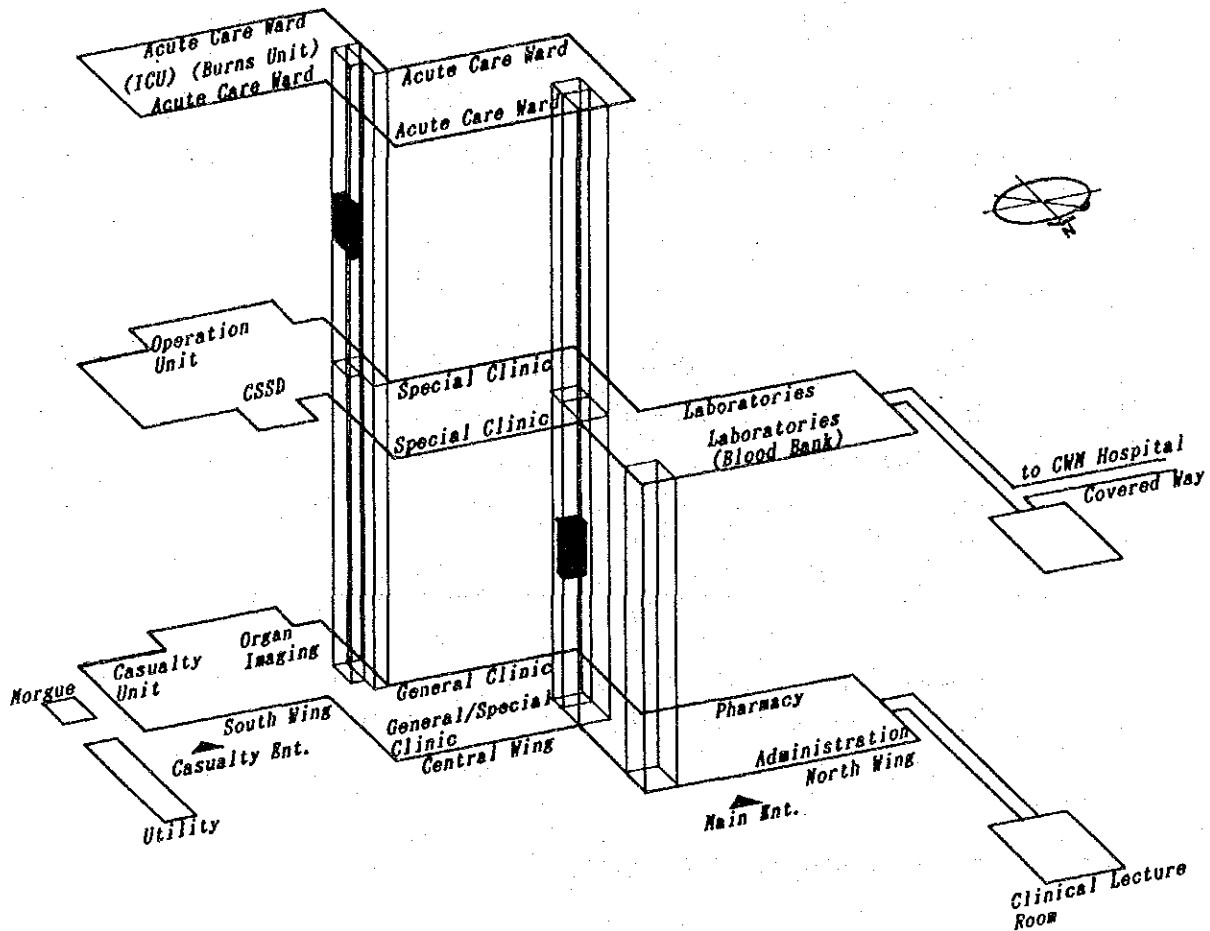


Fig. 4-2 Floor Arrangement

② Flow plan within hospital

a. Patient flow line

The flow of outpatients is simple and clear, and the only important consideration is to prevent them from entering special departments such as organ imaging clinic and operation theatre. In this plan, the outpatient clinic is located on the ground and first floors of the central wing to provide a short, simple flow. Furthermore, clinics are arranged to provide minimum distance to organ imaging and clinical laboratories.

Casualty outpatients are examined and treated at the casualty and transported to the operating theater and organ imaging when necessary.

Since inpatients are mostly patients in serious condition, the wards are located near the operation theatre with a high degree of independence. Since patients in serious condition are provided with full care, provisions for personal attendant are not included.

Patients who die in hospital or during operation shall be transported to the morgue located at the east side of the south wing utilizing the elevator in the south wing to lower them to the ground floor.

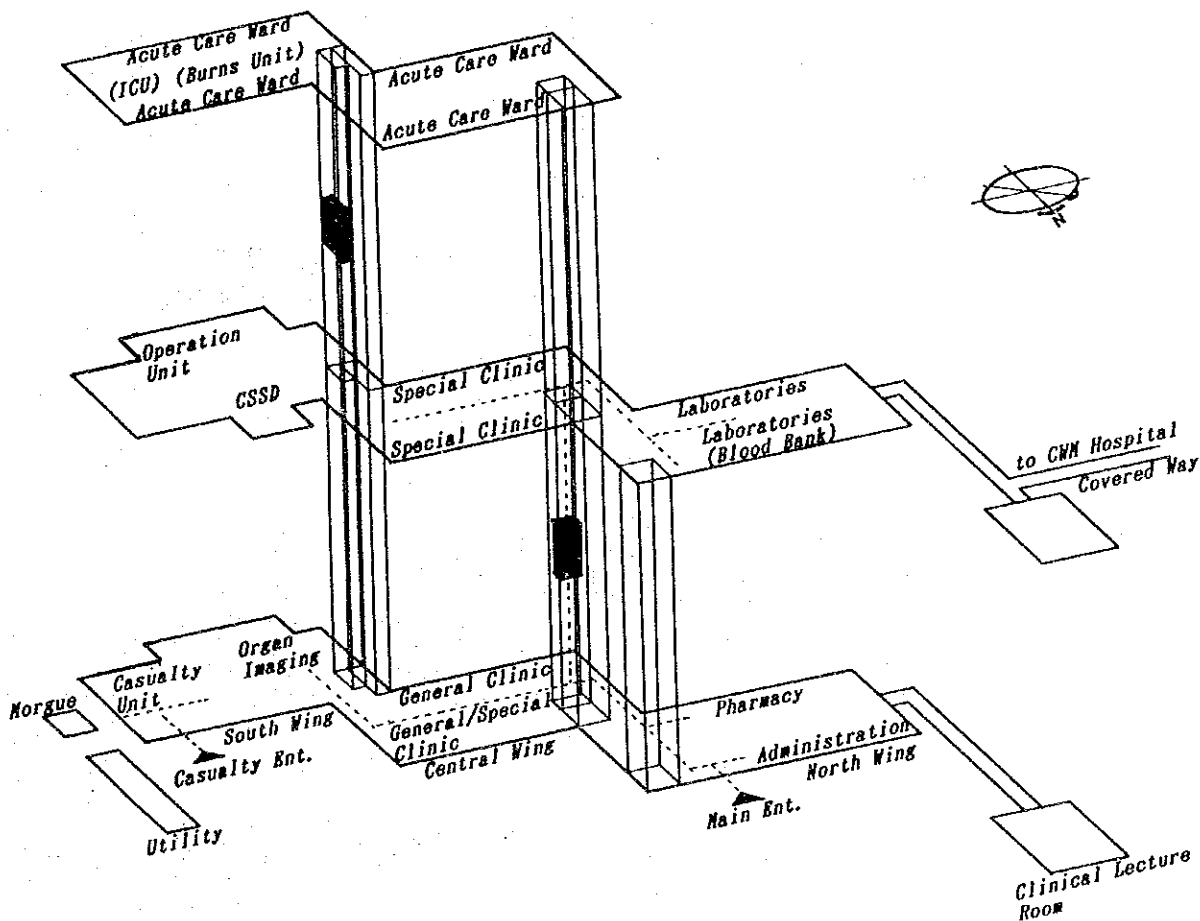


Fig. 4-3 Patient Flow

b. Medical staff and student flow line

The flow line of medical staff including doctors, nurses and FSM students shall be the main flow among department. The vertical movement is provided by the one stairway located in each wing and the elevators located in the central wing and the south wing. The access to the existing hospital is provided by the covered way from the third floor of the north wing. The students will also use the covered way for movement to the lecture theatre.

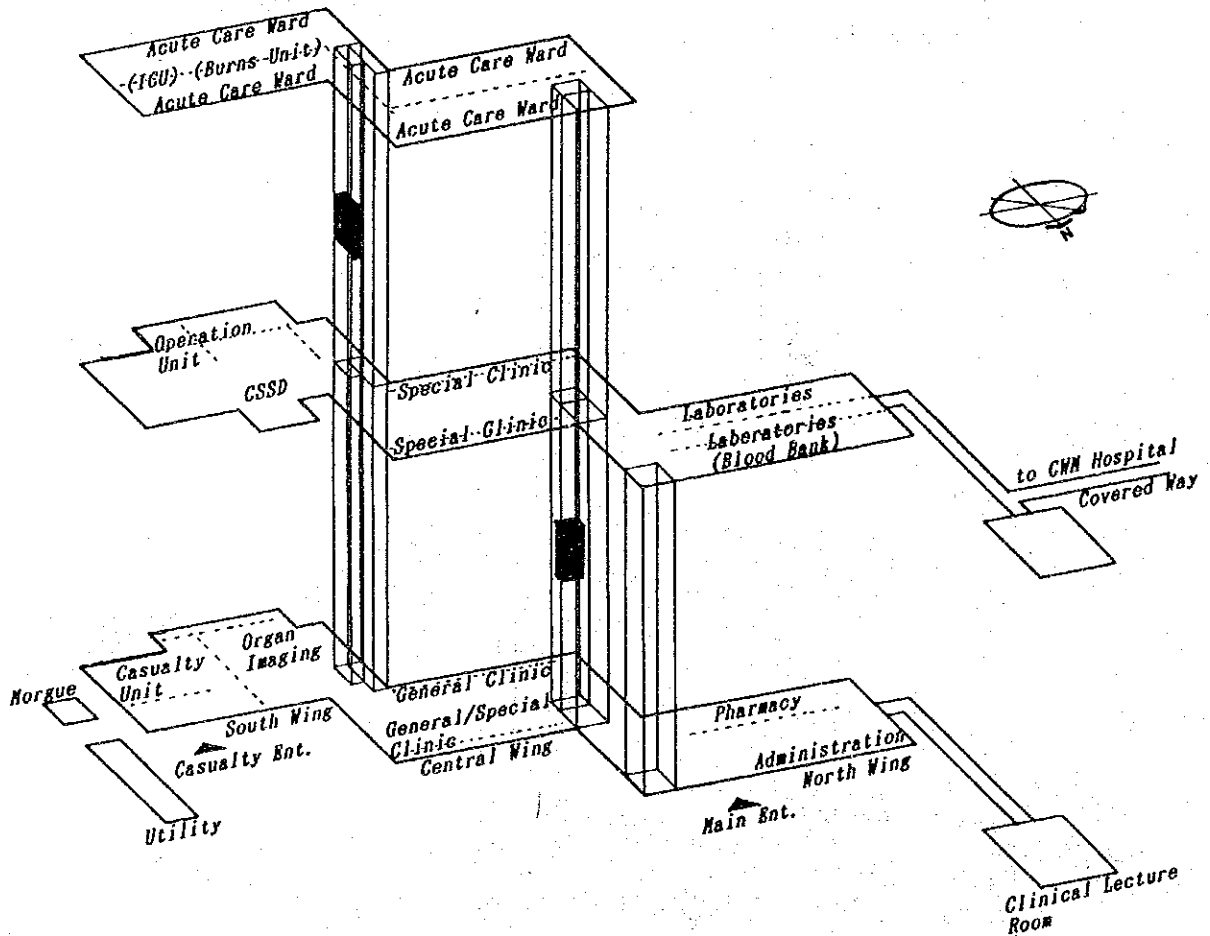


Fig. 4-4 Medical Staff and Student Flow Line

c. Service and energy flow line

A machine building is located at the east end of the site, where all mechanical equipment such as transformer, energy, water tank, and pump are located. Also manifold is located adjacent to this building to supply oxygen and medical gas for aspirator. Steam is supplied to necessary places from boiler through pipeline laid along the covered way. Services such as food, records and drugs from the existing hospital are transported through the covered way to the third floor of the North wing and than to the ground or first floor through the elevator in the Central wing.

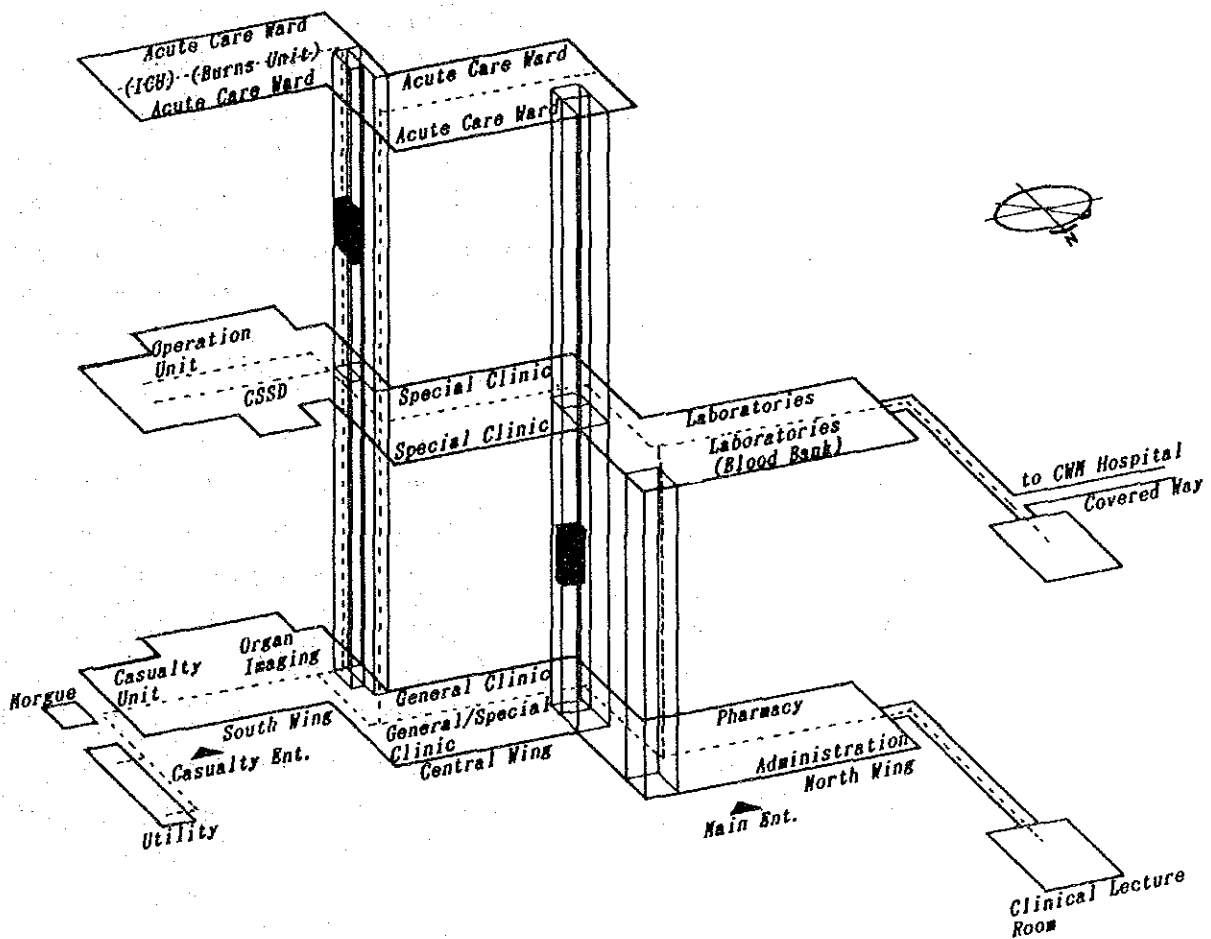


Fig. 4-5 Service and Energy Flow Line

③ Size of the main clinics

The size of different clinics was calculated from the statistics of patients, and statistics of examination and treatment based on the present examination and treatment system.

a. General clinic

This clinic, including the special clinic, receives 65-70% of the total number of outpatients, and the daily number of outpatients including repeated outpatients received in the general clinic is about 550 persons (excludes Saturday and Sunday).

The present flow of outpatients is from consulting → examination → treatment. The doctor conducts consulting in the consulting room, then the nurse takes necessary measurement such as temperature and blood pressure in the examination room and reports to the doctor who determines the necessary treatment. In the treatment room, treatment such as giving medicine and injection or changing bandages is performed by the nurse and the patient spends the longest time in this room. This outpatient flow was reduced into a pattern which showed that a treatment room with a consulting and examination room on both sides provided the shortest patient and nurse flow line avoiding crossovers. In accordance with the present number of outpatients, 3 blocks of an examination room/treatment room/examination room (12 m x 5.0 m) are provided. These consulting/examination rooms are provided to permit 2-3 students to attend the consulting/examination. The space in front of the nurse station is provided as a waiting space with seating for an average of 100 persons each hour. One seminar room (6 m x 7.5 m) is provided for student's clinical training.

b. Special clinic

The special clinic is similar to the basic flow of the general clinic. An independent examination/treatment clinic will be



provided for gynaecology, paediatric, and orthopaedic which require special equipment. The pattern of a treatment room with a consulting/examination room on both sides are provided for paediatric clinic while an examination room, treatment room and preparation room are provided for orthopaedic clinic and a consultation room and 2 common examination rooms are provided for gynaecology clinic. Examination room and treatment room are provided as special outpatient room for internal medicine, surgery, dermatology, urology, otorhinolaryngology and psychiatry/neuralgy. The special clinic is divided into 2 blocks; a block which does not require a treatment room such as psychiatry/neurology, dermatology, otorhinolaryngology and a block which require a treatment room such as internal medicine and surgery. These rooms will be used differentiating days and time of examination hours. The block with no treatment room shall be provided with examination room, while the other block will be provided with 4 consulting/examination rooms and 2 treatment rooms. A separate independent endoscope examination room (3 m x 7.5 m) is provided for endoscope examination, which is now being conducted in the operation room, in order to reduce the usage of operation room. One seminar room is provided for student's clinical training.

c. Casualty

In view of the recent increase of traffic accidents, 4 examination rooms (1 room, 2.5 m x 4.5 m), 2 treatment rooms (1 room, 3.5 m x 4.5 m) are provided. For emergency cases at night, 1 minor operation room (6 m x 6 m) is provided and when this is not sufficient, patient is transported to the operation theatre in the third floor. For treatment and recovery after operation, 1 observation room (6 m x 6 m) is provided, also 1 nurse station room is provided to monitor and control patients. A storage room, preparation room as well as reception, room for night shift nurse and a seminar room for student's clinical training are also provided.

d. Administration department

This department conducts reception of outpatients, accounting and medical record management. The reception space is 15 m<sup>2</sup>, office space is 30 m<sup>2</sup>, based on 10 m<sup>2</sup> for office manager and 5 m<sup>2</sup> per person for office clerks. One seminar room of 18 m<sup>2</sup> and 1 medical record storage of 12 m x 7.5 m are provided. The medical records of patients who are cured should be stored in the medical storage in the existing hospital.

e. Pharmacy

With the present number of pharmacy staff, it is not possible to establish 2 pharmacies; 1 pharmacy at the existing hospital and a new pharmacy for this project. Since it is desirable to establish a pharmacy next to the outpatient clinic, a pharmacy is included in this project, and drugs to the existing hospital and wards are planned to be supplied from this pharmacy. The necessary space is 9 m<sup>2</sup> for reception, 10 m x 7.5 m for pharmacy, 6 m x 7.5 m for drug production, 3 m x 4 m for aseptic room, 3 m x 4 m for cytotoxic room, 6 m x 4 m for washing and sterilizing room and 6 m x 7.5 m for pharmacy storage.

f. Organ imaging

The yearly organ imaging examination recently numbers about 43,300 cases in the CWM Hospital. Based on the estimate of daily inspection of present equipment, the annual inspection cases are expected to be about 47,850 cases.

Necessary number of organ imaging rooms are 2 ordinary imaging room of 6 m x 4.5 m, 1 X ray TV room of 6 m x 7 m, 1 CT scanner room of 7.5 m x 6 m and operation corridor of 2 m width which separates the patient waiting space. A reception of 2 m<sup>2</sup>, 1 office of 9 m x 4 m, 1 dark room of 3 m x 3.8 m, 1 image reading room of 3 m x 3.8 m, 1 seminar room of 6 m x 4 m, a film storage of 10 m x 3.8 m and 1 staff room of 6 m x 5 m are provided.

Table 4-2 Annual Number of Organ Imaging Cases

	Number	Daily number of examination	Estimated number of examination
General X ray equipment	2	65/equip.	65 x 2 = 130
X ray TV equipment	1	20/equip.	20 x 1 = 20
CT scanner	1	15/equip.	15 x 1 = 15
Total	4		(130 + 20 + 15) x 290 days = 47,850 cases

g. Clinical laboratories

The main units included in the clinical laboratories are blood examination room including blood collection unit and blood bank, biochemical examination room, bacteria examination room, and pathology examination room including cell examination. The size of these rooms are determined based on the present examination activity and the balance among different units. Furthermore, in order to satisfy the examination function, a common weight measurement room of 3 m x 3.5 m, washing and sterilizing room of 3 m x 7.5 m, a storage of 3 m x 7.5 m, and a student seminar room of 4 m x 6 m are provided.

h. Operation theatre

The number of operation theatre is determined from the number of operation performed in one theatre in a day. The yearly number of operations during the past 3 years averaged 5,800 operations. They include about 2,850 large operations consisting of general surgery, orthopaedics, and gynaecology, also small operations such as ophthalmology and otorhinolaryngology as well as emergency operations. Today, there are 3 operation units, so the average daily number of operation for a theatre is 7.7 operations. But in order to keep the operation unit clean, the normal number of operation is said

to be 2.5-3 cases. When the number of large operations is divided by the number of days, the number of operation unit will be 4.56-3.8 theatres. From these figures, the number of theatres was set at 4 theatres. 2 theatres of 6 m x 5 m and 2 theatres of 6 m x 7.5 m were designed with 1 theatre to be a dirty operation unit.

i. Central supply and sterilizing department

This unit consists of a prefabricated working room, a sterilizing room containing 3 autoclaves, and a storage room for sterilized supplies. The size of each room will be determined from the location of autoclaves.

j. Wards

The number of beds is determined from the annual number of beds used in a year. From the yearly number of operations during the past 3 years of 2,850 cases, the annual number of beds became 24,368 beds based on the present number of hospitalized days after operation which is estimated to be about 8.55 days. Dividing the 24,368 beds by 365 days, the necessary number of beds became 66 beds. At present, the beds at ICU are 6 beds, but from the increase of traffic accidents, the number of ICU beds was increased to 8 beds, and the total number of beds is 74 beds including 2 incubators for newly born babies. The size of bed is considered according to Fijian physique.

k. Clinical lecture room

The auditorium is designed as a lecture theatre with a seating capacity for the entire medical students (30 students/grade x 6 grades = 180 students) also a projecting room and a toilet is provided.

1. Central library

The 2 libraries included at the Hoodless House campus and Tamavua campus are consolidated to create a library of 12,000 books. The present 360 m<sup>2</sup> organ imaging ward is remodelled into a central library. The type of library is designed to be an open rack type, also reading room, book storage, and an office are provided.

Table 4-3 Floor Area

	Division	Floor Area (sqm)
New Building	a. General clinic	270.0
	b. Special clinic	697.5
	c. Casualty	636.5
	d. Administration	225.0
	e. Pharmacy	270.0
	f. Organ imaging	486.0
	g. Clinical laboratories	618.5
	h. Operation unit	747.0
	i. CSSD	238.5
	j. Wards	1,638.0
	k. Clinical lecture room	282.0
	Covered way, Toilet, Stair, etc.	1,611.0
		<b>Total</b>
	Covered way	600.0
Remodelling	i. Central library	360.0

Fig. 4 - 6 - 1 GENERAL OUT PATIENT

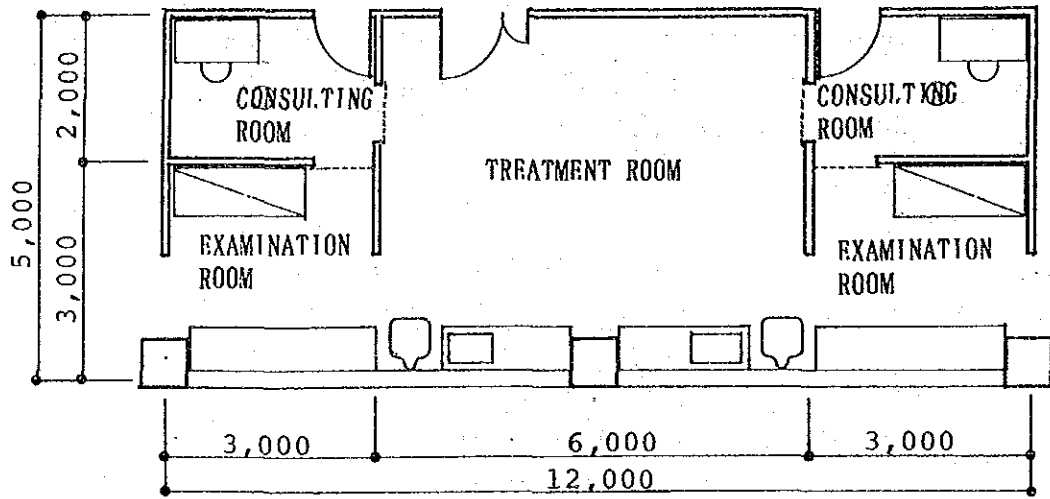


Fig. 4 - 6 - 2 LABORATORIES

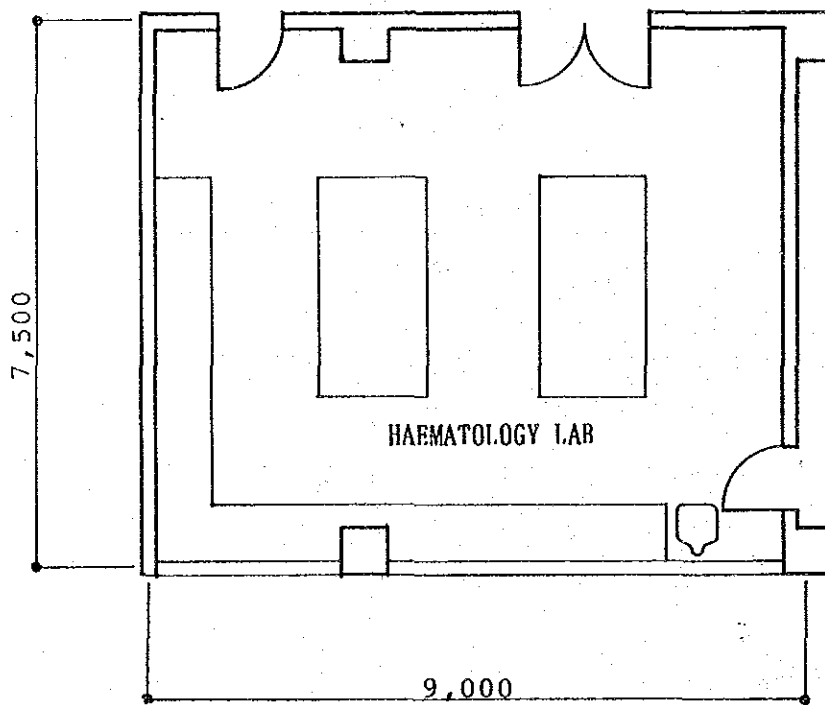


FIG. 4 6 3 ORGAN IMAGING

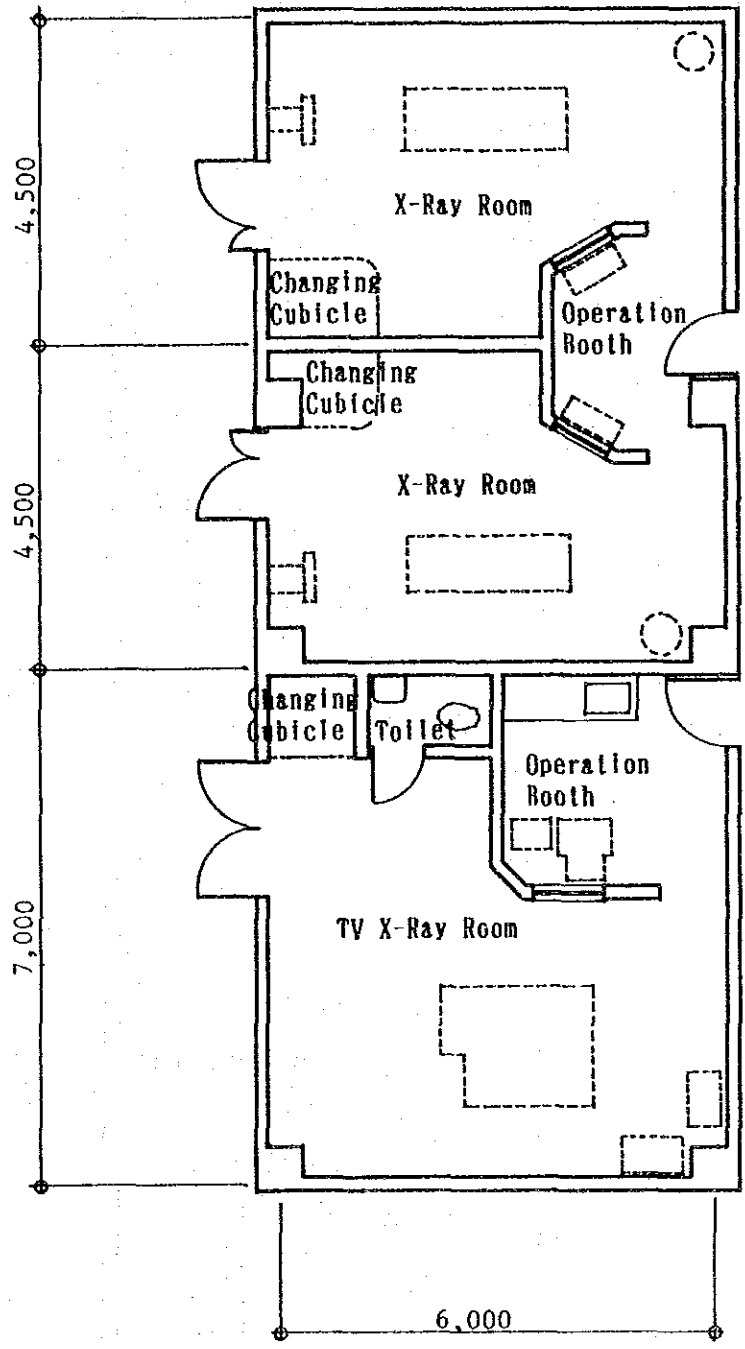


Fig. 4 - 6 - 4 OPERATION THEATRE

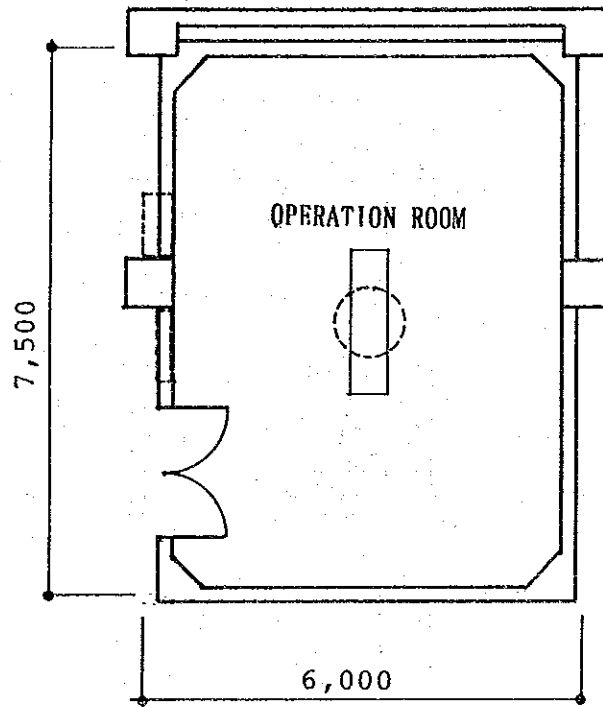
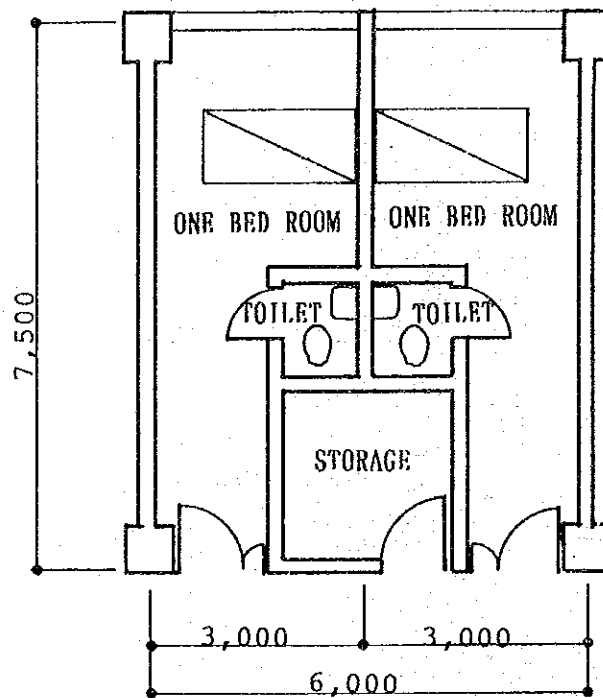


Fig. 4 - 6 - 5 WARDS





④ Profile plan

In the profile plan, the following matters were carefully considered.

- a) Securing natural ventilation and draft
- b) Sheltering from direct sunlight
- c) Preventing water infiltration.

As a measure for a), the building is laid out along a East-West axis also the floor height is set at 3.75 m to increase inside air volume and to secure natural ventilation and draft.

As a measure for b), a 2 m roof eave and a 1.5 m wide balcony are provided, also a louvre is provided at the edge of the eave to prevent direct sunlight from shining into the room.

As a measure for c), protection is provided on the louvre to prevent rain from infiltrating, also the ground floor is raised by 90 cm to prevent storm water from flooding into the building and to secure draft under the floor.

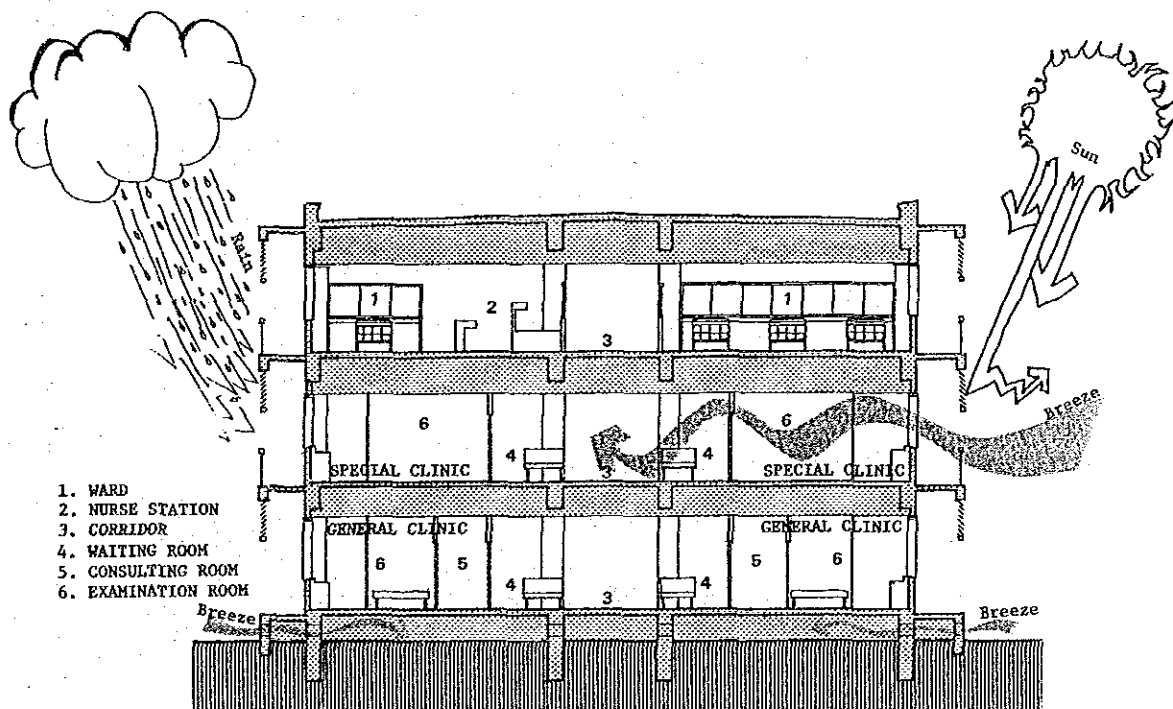


Fig. 4-7 Profile Plan

⑤ Elevation plan

Since the CWM Hospital was expanded time and time again ever since its establishment in 1923, there is no feature in its outside appearance. This project building is planned to be installed in the back of the CWM Hospital and is located about 70 m apart from the existing hospital. Therefore, the building can be planned to provide an independent appearance, but it must be planned as a consolidated hospital complex within the Ministry of Health site.

⑥ Material plan

Local material or locally available imported material was selected for exterior finishing material and interior finishing material, since maintenance would be easier. The main building materials are listed below.

a. Exterior finishing material

Roof: Bituminous membrane water proofing, concrete topping.

Exterior wall: Concrete block ( 200) and mortar base finished with sprayed EP.

Window: Aluminum sash (mainly jalousie) glass thickness 6 mm or more

Door: Steel flush door and stainless steel door at the main entrance

b. Interior finish

Outpatient hall and waiting room:

Floor: Hard long vinyl sheet (embossed finish)

Skirting: Same as above

Wall: Mortar base coating, AEP

Ceiling: Wooden finish

Common area such as corridor:

Floor: Hard long vinyl sheet (embossed finish)  
Skirting: Same as above  
Wall: Mortar base coating AEP  
Ceiling: Rock wool sound absorption tile placed on wooden base

Examination room, treatment room, inspection room, pharmacy and ward:

Floor: Long vinyl sheet  
Skirting: Soft skirting  
Wall: Mortar base coating AEP  
Ceiling: Rock wool sound absorption tile placed on wooden base

Operation unit:

Floor: Long vinyl sheet  
Skirting: Soft skirting  
Wall: Ceramic tile (150 x 150)  
Ceiling: Gypsum board on wooden base, finished with rock wool sound absorption tile

Toilet, washing room, bath room

Floor: Ceramic tile  
Wall: Ceramic tile (50 x 150)  
Ceiling: Asbestos cement board ( 6.0) EP

Others:

- o Curtain rail and curtain for each bed
- o Hand rail is provided along corridor and other necessary places

### (3) Structure plan

Locally available material and widely applied local construction method are adopted. Fiji Building Code is presently being prepared, but for structural standard, the New Zealand Building Code (NZS) is being applied. The New Zealand code includes seismic regulation which is not included in the British Standard (BS).

In this structure plan, load condition is based on the Fiji Building Code which is presently being prepared, while other conditions are based on Australia and New Zealand codes. The design method for section is based on the standard of the Architectural Institute of Japan.

#### ① Structure

The structure design is based on the reinforced concrete rigid frame structure widely practiced in Fiji and reinforced concrete seismic resistant walls are arranged wherever necessary. The floor slab is reinforced concrete while partition walls are concrete block. The roofs are wooden purlin frame roof.

#### ② Foundation

A spread foundation of either independent or continuous footing is placed on the Suva marl distributed within the site.

#### ③ Structural design standard

##### a. Stress calculation

Calculated in accordance with elastic analysis method.

##### b. Section design

Designed in accordance with the "Reinforced Concrete Structure Calculation Standard" of the Architectural Institute of Japan.

④ Load condition

a. Dead load

Table 4-4 Dead Load

Department	Room	Dead load (MPa)
Administration Department	Office, conference room, etc.	2.5
Outpatient clinic	Outpatient, examination, treatment, etc.	3.0
Organ imaging	Organ imaging	3.0
Operation theatre	Operation room	3.0
Ward	Ward	3.0

b. Seismic force

The standard shearing force modulus is calculated from "New Zealand Standard NZS 4203, Part 3 Earthquake Provisions" and the seismic force was calculated for this modulus according to the standard method of the Architectural Standard of Japan.

The standard shearing force modulus is calculated from the following formula

$$C_d = C \cdot I \cdot S \cdot M \cdot R = 0.2$$

where C: seismic zone factor = 0.125

I: important factor = 1.6

S: structural type factor = 1.0

M: structural material factor = 1.0

R: risk factor = 1.0

Suva seismic zone is zone 4.

c. Wind load

Wind load was determined in accordance with "Australian Standard AS 1170, Part 12 Wind Force".

⑤ Materials and strength

a. Concrete

Ordinary concrete is used. The standard design strength is  $F_c = 210 \text{ kg/cm}^2$  (28 days, compressive strength).

b. Steel reinforcement

Table 4-5 Steel Reinforcement

Reinforcement	Specification	Yield strength (MPa)
Deformed bar	Grade 275	275
	Grade 380	380

c. Load bearing power

Load bearing power of Suva marl for long period is estimated as  $15-20 \text{ t/m}^2$ .

(4) Electrical installation

① Power take-in installation

Power take-in installation up to the site is to be provided by the Government of Fiji at its account. The power is taken in from the 11 kV overhead power line, of the Fiji Electric Authority (FEA), running alongside the road in front of the site to the substation within the site through an underground cable. The power is one circuit of 3 phase, 3 line, 50 Hz.

② Sub-station

The power is transformed in the sub-station within the site. A door with lock facing the public road is provided since the sub-station will be supervised by the FEA. An open standing type switchboard is installed in the sub-station.

Power within the site supplied through the low voltage switchboard.

Rated power capacity	500 kVA
Rated voltage	11 kV/415 V - 240 V
Wiring system	3 phase 4 line 50 Hz
Voltage drop	Less than 4%

③ Power generator

As a backup power source for blackout during operation or treatment, a power generator is provided.

Capacity	150 kVA
Voltage	3 phase, 4 line, 415/240 V, 50 Hz

④ Main line and motors

The main line supplies power through a cable to each building. Vinyl pipe are used for outer conduit to protect from seawater damage and corrosion, while cable racks are used within the building. The motors for pumps are automatic start/stop type while motors for air conditioners are independent start/stop type. Overhead fan and ventilation fan are started and stopped manually.

⑤ Lights and electric sockets

a. Wiring is laid according to the standard for electric installation and the Australian Wiring Standard. The voltage is 240 V single line, and all fixtures and equipment are provided with an earth terminal. The lines are vinyl insulated wires or cables.

- b. Vinyl conduits normally used in Fiji are used.
- c. The lighting fixtures are mainly fluorescent lights which consume little energy, but depending on the purpose of the building, incandescent lamps and high brilliant lamps are used.
- d. Operating theatre, treatment room, and emergency room are provided with full generator circuit to provide for power blackout and other departments are provided with 20% generator circuit.
- e. Sockets are provided with switches.
- f. The illumination standards for main rooms are as shown in Table 4-6 illumination standard.
- g. An isolation transformer for electric current for operation theatre is a non-grounded type.

Table 4-6 Illumination Standard

Place	Illumination Standard
Office, treatment room, examination room	400 lux
Operation theatre	500 lux
Waiting room	100 - 200 lux
Examination room	300 - 400 lux
Ward	50 - 100 lux
Seminar room, classroom	20 - 50 lux
Corridor, storage	300 lux

⑥ Telephone installation

Telephone switchboard, telephone and wiring are to be leased from the Post and Telecommunication Department (P&T). The conduits are branched off from the distribution board at the gynaecology



building and provided to the outlet box at examination room, nurse station, office and central supply and sterilizing unit. The size of conduit shall be more than 22 mm.

⑦ Interphone installation

Interphones are provided between operation theatre and central supply and sterilizing unit and also nurse station.

⑧ Public addressing installation

An amplifier is provided within the existing telephone switchboard room for calling persons within the hospital. Speakers are installed in the corridor. Independent amplifiers are installed in clinical lecture room for lectures.

⑨ Clocks

Clocks for operation (measure anesthetic and operating time) are installed in operation theatre. Examination room and nurse stations are provided with its own battery operated clocks.

⑩ Lightening rod

A lightening rod is installed on top of the elevated water tank.

⑪ Medical equipment grounding installation

Grounding installation is provided in the operating theatre, examination room and ICU where medical electronic equipment is used.

⑫ Automatic fire alarm

Automatic fire alarms according to the standards of Fiji are provided for early fire warning to protect human life. Receiver will be installed on the outside surface of the entrance.

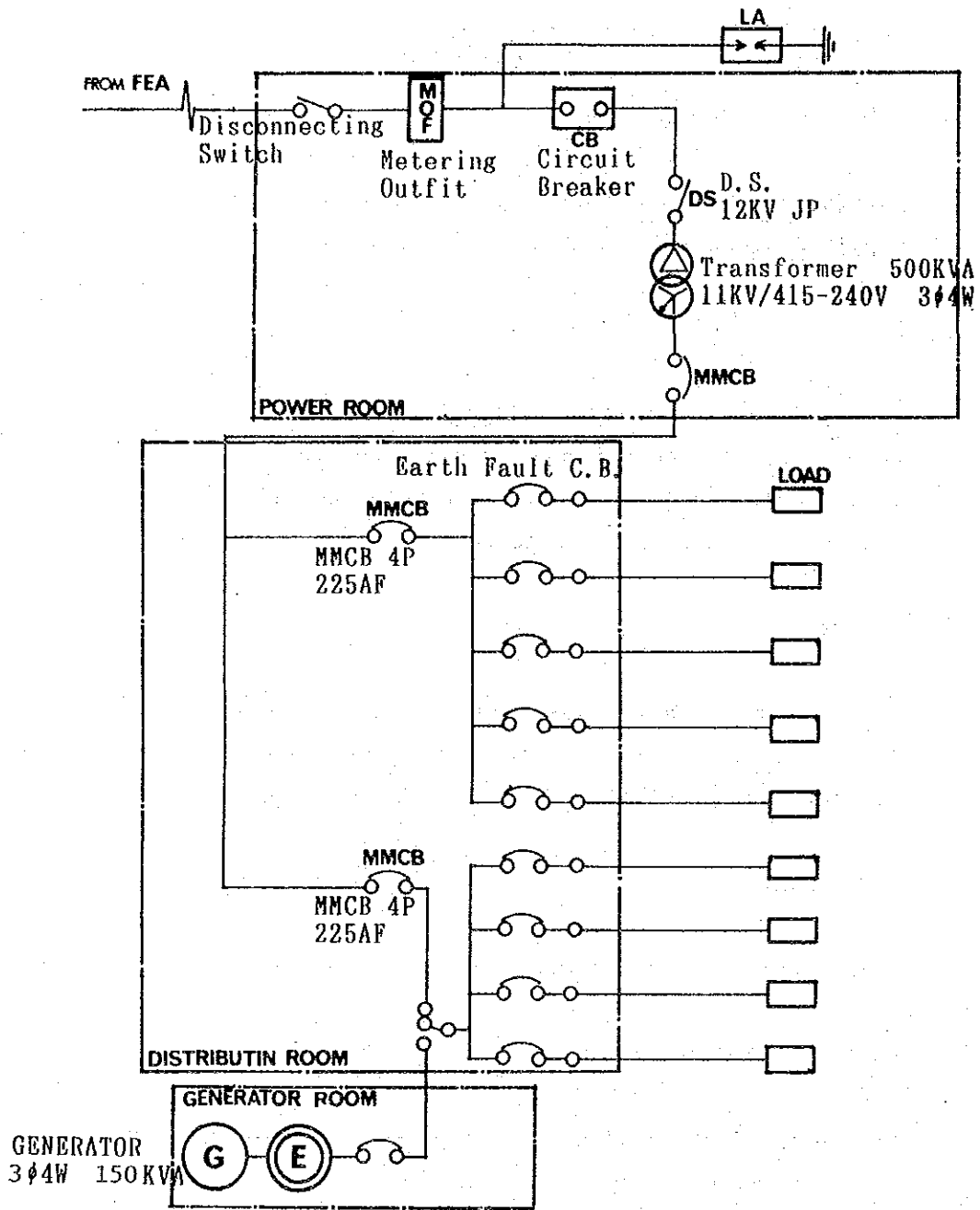


Fig. 4-8 Power Wiring Diagram

(5) Water supply, sewage, drainage and sanitary installation

① Water supply installation

Water is received into the water tank from the main water line laid along the Waimanu Street. Water from the tank is pumped up to the elevated tank from where it is distributed to the installation in each building by gravity. Water supply up to the site is to be installed by the Government of Fiji at its own account.

Water supply

1) Hospitalized patient	80 beds x 500 ℓ/day	= 40,000 ℓ/day
2) Hospital staff	200 persons x 120 ℓ/day	= 24,000 ℓ/day
3) Outpatients	1,000 persons x 8 ℓ/day	= 8,000 ℓ/day
4) Students	30 persons x 120 ℓ/day	= 3,600 ℓ/day

= 75,600 ℓ/day

= 75 m<sup>3</sup>/day

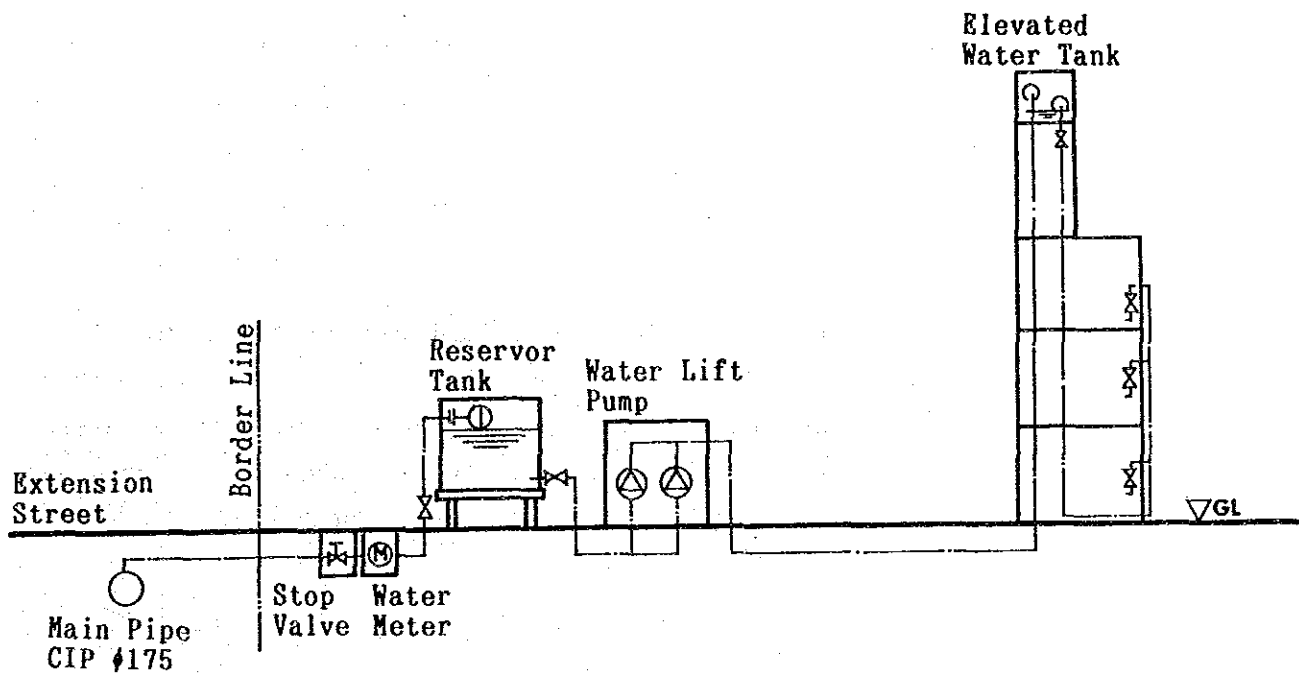


Fig. 4-9 Water Supply Diagram

② Hot water installation

Hot water for shower, bath and washing is supplied from the hot water tank, heated by steam, in the machine building to necessary places by pipeline.

③ Drainage installation

Drainage is separated into storm water line, sewage and waste water line, and medical waste water line.

- Storm water is collected in storm water drainage and discharged into the open ditch running within the site.
- Sewage and waste water is collected in the drainage tank located inside the site and then pumped into the public sewage line laid along the Waimanu Street alongside the site.
- Medical waste water is first collected in a collection tank when necessary and then discharged into the drainage tank.

④ Gas installation

- Gas installation is installed in rooms where gas is necessary.
- Gas is LPG gas and gas cylinders are located at necessary location.

⑤ Sanitary equipment

Western style urinal, toilet stool, and washing basin with lever type flushing are provided in the toilet. Medical hand washing basin, medical drainage, water drainage, chamber pot sterilizer are provided in rooms such as examination room, operation theatre, and sewage room. The equipment shall be large, sturdy type.

⑥ Fire fighting installation

Fire fighting installation shall be installed in accordance with the fire prevention code of Fiji.

⑦ Medical gas installation

Table 4-7 Medical Gas Supply

Department	Room	Oxygen	N <sub>2</sub>	Aspiration	Remarks
Casualty	Examination booth	o		o	
	Emergency operation theater	o	o	o	
	Observation room	o		o	
Wards	ICU	o		o	
	Burn unit	o		o	
	Ward	o		o	a part of wards
Operation theatre	Operation theatre	o	o	o	
	Recovery room	o		o	
	Anesthetic room	o	o	o	
Special clinic	Endoscopic room	o		o	

(6) Air conditioning and ventilation installation

Since humidity of Suva area becomes very high in rainy season, medical equipment may become rusted or corroded unless the room is air conditioned. In such rooms air conditioning is provided, but in other rooms ceiling fan is provided for cooling.

① Air conditioning equipment

Air conditioning equipment which is locally available is selected. The type is air cooled separate type. Independent type equipment is selected for energy saving purpose.

The rooms to be air conditioned are as follows:

- Casualty

Observation room, minor operation theatre

- Organ imaging

X ray room, CT scanner room, TV room

- Pharmacy

Dispensary, drug producing room, clean room, washing and sterilizing room

- Operation

Operation theaters-1, 2, 3, 4, nurse room, doctor room, anaesthetic room, conference room, records room, recovery room

- Otorhinolaryngology clinic

Treatment room, dark room

- Clinical laboratories

Blood bank, blood collection room, balance equipment room, bacterial room, pathology room, cool room, biochemical room, storage

- ICU

ICU room, NS room, 2 wards, burn unit

② Ventilation installation

Places where heat or bad air is generated such as toilet, sterilizing room, dark room and electrical room are provided with ventilation installation.

(7) Outdoor installation plan

The outdoor installation plan for this project is as described in the following paragraphs.

① Roads inside the site

A separated road for people and vehicle is provided from the Extension Street for general outpatients, ambulance and staff. A separate service road for person and road is provided on the east side of the site for service to the machine building and for sending out corpse. The width of the approach road is 6 m and the width of the service road is 4 m. Both roads are asphalt surface paved road and a slope is provided on the approach to the building.

② Covered way

The new building and the existing CWM Hospital is connected by a covered way. This covered way is an enclosed corridor for staff and patient movement, also for transporting food, drugs, and medical record. The length is 200 m and the width is 3 m.

③ Morgue

A morgue of 3 m x 6 m, with refrigerator for 6 corpse and a visiting room, is provided for patients who died in the hospital.

④ Electrical installation

Sub-station, distribution room and generator room of a total 6 m x 11 m is provided for power supply. Street lamps are provided where necessary.

⑤ Water supply and drainage installation

Water receiving tank, and pump room totalling 6 m x 11 m and an elevated tank of 21 m high are provided for water supply. This installation is planned to be built together with the electrical installation. A drainage tank is provided for discharging water by pump to the Wainuma Street.

⑥ Manifold, gas cylinder storage

A manifold of 3 m x 6 m for medical gas cylinder and a butane gas cylinder storage of 3 m x 3 m is provided within the electrical and water supply installation building.

⑦ Incinerator and garbage storage

A storage separated for flameable material, non-flameable material and raw garbage is provided together with incinerator.

⑧ Parking lot/garage

Parking lot is located in the space between Extension Street and building, and this parking lot is separated for outpatients and staff. The surface is paved with blocks. A garage for ambulance is located on the ground floor of the south building under the extending first floor.



#### 4.3.2 Equipment and Material Plan

##### (1) Equipment and material plan

Since this project is a redevelopment project, the equipment and material must contribute toward improving medical clinic size and quality, upgrading medical service and examination quality to patients, as well as improving the working environment of medical staff. Furthermore, extending medical training functions which are overlooked because of daily clinical activities is also an important objective. In other words, the main objective is to raise the function of a training laboratory by providing necessary facility, equipment and material. For this purpose, this matter was approached from the following two directions.

- o Raise the general standard of medical service by improving medical environment.
- o Invigorate medical training function by improving medical educational environment.

The equipment and material described in the following paragraphs for each department are planned for achieving the aforementioned purposes either directly or indirectly.

##### ① Outpatient department

###### a. General clinic

Basically, examination, treatment and utility rooms shall be provided in line with the present outpatient examination system. Therefore equipment and material shall mainly be for examination and treatment.

###### b. Casualty

The casualty differs from that of Japan and handles minor wound patients too. Therefore, together with surgery treatment booth

and plastic cast room, an internal medicine examination and treatment room is provided. Here, equipment and material must be able to provide a wide range of equipment and material to cover emergency first aid, standard recovery treatment and night-time patients. Also since a small operating theater shall be provided, necessary operation, and sterilizing equipment must be installed.

c. Special clinic

These clinics are for those who were found to require special professional treatment. Therefore some special equipment will be necessary, but it shall be within the present medical examination range.

Since clinics such as internal medicine, surgery and dermatology which share examination rooms by differing dates and hours, generally require only equipment and material similar to general clinic examination room, special professional equipment and material shall not be installed.

At other clinics, equipment and material which can provide a wider range of examination as described in the following table shall be provided to improve the present insufficient condition.

Table 4-8 Equipment and Material Plan

Clinic	Equipment and material plan
Paediatric	Equipment and material providing better health control of infants shall be added.
Orthopaedics	Plastic cast equipment and material shall be increased for the many patients with fracture
Gynaecology	Equipment for examination shall be provided.

d. Pharmacy

Since medical drugs for more than 1,000 patients are handled daily, the types and volume are quite large. Therefore, the present biggest problem is to reduce the amount of work from storing to dispensing. Emphasis is placed on this point in the present plan and the initial target is to raise the efficiency of the involved work. Since training of students will arise in production of medicine, basic inspection tools are provided.

② Diagnosis and therapy

a. Organ imaging

In order to improve the present capacity of 150 patients a day and to enlarge the examination range, X ray TV, 2 general X ray and a CT scanner are provided in place of angiocardiology, fluoroscopy, and 2 general X ray which are now old and worn.

The X ray TV is a multi-function type which can be used for fluoroscopy, tomography, and angiocardiology, therefore a special angiocardiology is not provided. Since the X ray TV is a multi-function type, it is expected to provide examination for over 4,000 cases daily.

The examination record shows that examination is mainly for chest and fracture X ray photographs which numbers over 80% or 120 cases a day. This number clearly exceeds the capacity of 1 X ray so the general X ray equipment was decided for 2 X ray as at present and each X ray is provided with buckey and buckey stand. Excessive accessories were avoided for CT scanner and one with simple performance was selected. The number of patients is expected as 10 patients a day for brain tumor and brain injury, but the usage frequency is expected to increase as the range of application increases.

Table 4-9 Annual Number of X Rays (1989)

X ray examination	Number	%
Chest	19,907	44.8
Arms and legs	14,262	32.1
Head	3,500	7.9
Abdomen	3,113	7.0
Barium examination	560	1.3
Pelvis	480	1.0
	248	0.6
Others	2,342	5.3
Total	44,412	100.0

Note: Others (2,342 cases) are inspection carried out with portable equipment in operating room and ward.

The present 2 general X ray equipment was installed in 1985, and although it is being overworked, it is still quite new, so the possibility of using it at other places were considered.

However, it was determined that moving this equipment to other places would not be advantageous owing to the reasons given below, so it was decided to leave the equipment as it is in this plan and to use it at hospitals in other regions.

- i. Although there are 2 equipment they only have 1 generator, so in order to fully operate as 2 equipment, another set of generator, and buckey and buckey stand must be procured.
- ii. Since the construction of buildings is still some years later, an overhaul including X ray conduit replacement is necessary.

The present ultrasonic equipment is in poor condition, only part of the function can be used. The examination record indicates that several pieces of equipment are necessary, but would naturally raise the problem of operator, so in this plan,

1 ultrasonic examination equipment is provided for general multiple purposes excluding maternity.

Table 4-10 Ultrasonic Examination Record

Examination	1988	1989
General purposes	2,459	2,733
Maternity and gynaecology	7,172	9,527
Total	9,631	12,250

b. Physiology examination

Only the old and worn cardiograph and the unusable EEG are replaced and the equipment shall be of present size.

c. Endoscope examination

The present endoscope equipment will be used and only related equipment such as examination table and endoscope storage will be added.

d. Clinical laboratories

The equipment necessary for this examination is mainly blood, biochemistry, bacteria and pathology with equipment and material for supporting balance scale room and washing room. However, since the most up-to-date examination equipment for blood and biochemistry have only recently been introduced, they are still usable when this building is completed, the improvement of educational equipment and examination tools together with equipment and facility which must be considered together with the building is emphasized in this plan, for example, experiment table, drug storage cabinet, clean bench, sterilizers and distillers are considered. The equipment which can be moved and used are shown in the following table.

Table 4-11 Clinical Laboratories Equipment

Equipment	Number	Equipment	Number
Blood gas analyzer	2	Deep freezer	1
Na/K analyzer	1	Glucose analyzer	1
Spectrophotometer	1	Flame photometer	1
Constant temperature bath	2	Microscope	6
Centrifuge	2	Blood storage cabinet	1

e. Blood bank

Examination consists mainly of blood type determination and crossmatching test associated with blood collection and blood transfusion. Improvement of facility and equipment for blood collection room and small examination room will be considered mainly and the content and grade of equipment shall be similar to present ones. The following present equipment shall be used.

Table 4-12 Blood Bank Equipment

Equipment	Number	Equipment	Number
Deep freezer	1	Blood storage cabinet	1
Cool centrifuge	1		

f. Operation theatre

Since equipment and material are generally in good condition, they are included in this plan for reuse. In principle, the content and grade of the 4 operation theatre shall be similar to present size and level while equipment for sterilizing and storing operation set shall be supplemented.

Recovery room shall contain 7 beds with cardiogram monitor, emergency cart, aspirator and sophisticated monitoring system is not provided. The equipment which are reused are shown in the following table. The anaesthetizer in the table shall be used in the small operating theater in the casualty clinic.

Table 4-13 Equipment for Operation Unit

Equipment	Number	Equipment	Number
Operation table	3	Anesthetizer	3
Ventricular fibrillation	3	Electric scapel	3
Blood analyzer	1	Recovery bed	3

f. Central supply and sterilizing department

Upgrading efficiency of operation including replacement of the old and worn autoclave and procurement of an EO gas analyzer is planned here. For treating the present daily 50-60 casts, 3-4 autoclaves of 6 cast capacity at 3 cycles a day are necessary. Also it is expected that 1 small EO gas sterilizer for catheter application is sufficient. Steam from the present boiler shall be used for the autoclave while EO gas shall be procured from local medical gas supplier. In this unit, cabinets for storing sterilized materials shall be supplemented for good sanitary and simple management.

g. Morgue

An additional 6 corpse storage installation is necessary in view of longer corpse storage, and the characteristic of acute care ward including emergency and operation cases. The present morgue will be left for existing ward and anatomy purposes.

③ Wards

Equipment and material are selected to provide quick, easy and labor saving activity for nurses, since this ward is for acute care patients including ICU and burns.

The beds for the wards are all crank beds for acute care patients with necessary arrangement of paediatric beds and orthopaedic beds.

Sophisticated systems with many functions are not provided for ICU and only comparatively simple system mainly based on moved equipment are provided for reducing technical burden on medical staff as well as management and economic burden on the administration.

Equipment and material for nurse stations and utilities are provided to maintain a pleasant and sanitary working environment, also with preparation to sterilize and process dirty waste.

Vehicles for transporting inpatients between present wards are necessary for this department, organ imaging and operation theater also vehicles for transporting linens from laundry are necessary.

Equipment and material which can be reused in ICU are shown in the following table.

Table 4-14 Equipment and Material for Wards

Equipment	Number	Equipment	Number
Artificial respirator for adults	2	Artificial respiratory for children	1
Heart monitor	1	Incubator	1
Ventricular fibrillation	1	Aspirator	1



Table 4-15-1 List of Medical Equipment for Colonial War Memorial Hospital

Item No.	Item	Q'ty
A	GENERAL CLINIC	
A01	Consulting Desk & Chair	6 sets
A02	Examining Couch	9
A03	Film Viewer, wall type	6
A04	Examining Light	6
A05	Instrument & Dressings Cabinet	3
A06	Instrument Sterilizer, stand type	1
A07	OPD Equipment	1 lot
B	SPECIAL CLINIC	
B01	Consulting Desk & Chair	11 sets
B02	Examining Couch	10
B03	Plaster Table	2
B04	Gynaecological Examining Table	1
B05	Colposcope	1
B06	Electric cautery	1
B07	Film Viewer, wall type	10
B08	Examining Light	16
B09	Instrument & Dressings Cabinet	5
B10	Autoclave, table top type	1
B11	Instrument & Sterilizer	1
B12	SCD Equipment	1 lot
C	CASUALTY	
C01	Consulting Desk & Chair	4 sets
C02	Examining Couch	4
C03	Film Viewer, wall type	5
C04	Film Viewer, recessed type	1
C05	Examining Light	6
C06	Instrument & Dressings Cabinet	4
C07	Operating Table	1
C08	Operating Light	1
C09	Suction Unit	2

Table 4-15-2 List of Medical Equipment for Colonial War Memorial Hospital

Item No.	Item	Q'ty
C10	Patient Bed	6
C11	Overbed Table	3
C12	Stretcher Trolley	2
C13	ECG Monitor	2
C14	Compact Autoclave	1
C15	Instrument Sterilizer, stand type	1
C16	Bedpan Sterilizer	1
C17	Emergency Equipment	1 lot
<hr/>		
D	PHARMACY	
D01	Unit Pharmacy Table	1 set
D02	Medicine Refrigerator, 700L	1
D03	Water Still	1
D04	High Pressure Steam Sterilizer	1
D05	Safety Cabinet	2
D06	Typewriter	2
D07	Medicine Balance	1 lot
D08	Pharmacy Equipment	1 lot
<hr/>		
E	ORGAN IMAGING	
E01	General X-Ray Unit	2 sets
E02	Multipurpose X-Ray Unit	1 set
E03	C.T. Scanner	1 set
E04	Automatic Film Processor	2
E05	Ultrasound Scanner	1
E06	System Film Viewer	2 sets
E07	X-Ray Accessories	1 lot
<hr/>		
F	PHYSIOLOGY	
F01	Consulting Desk & Chair	2 sets
F02	1-Channel Electrocardiograph	1
F03	EEG Machine	1
F04	Examining Couch	2

Table 4-15-3 List of Medical Equipment for Colonial War Memorial Hospital

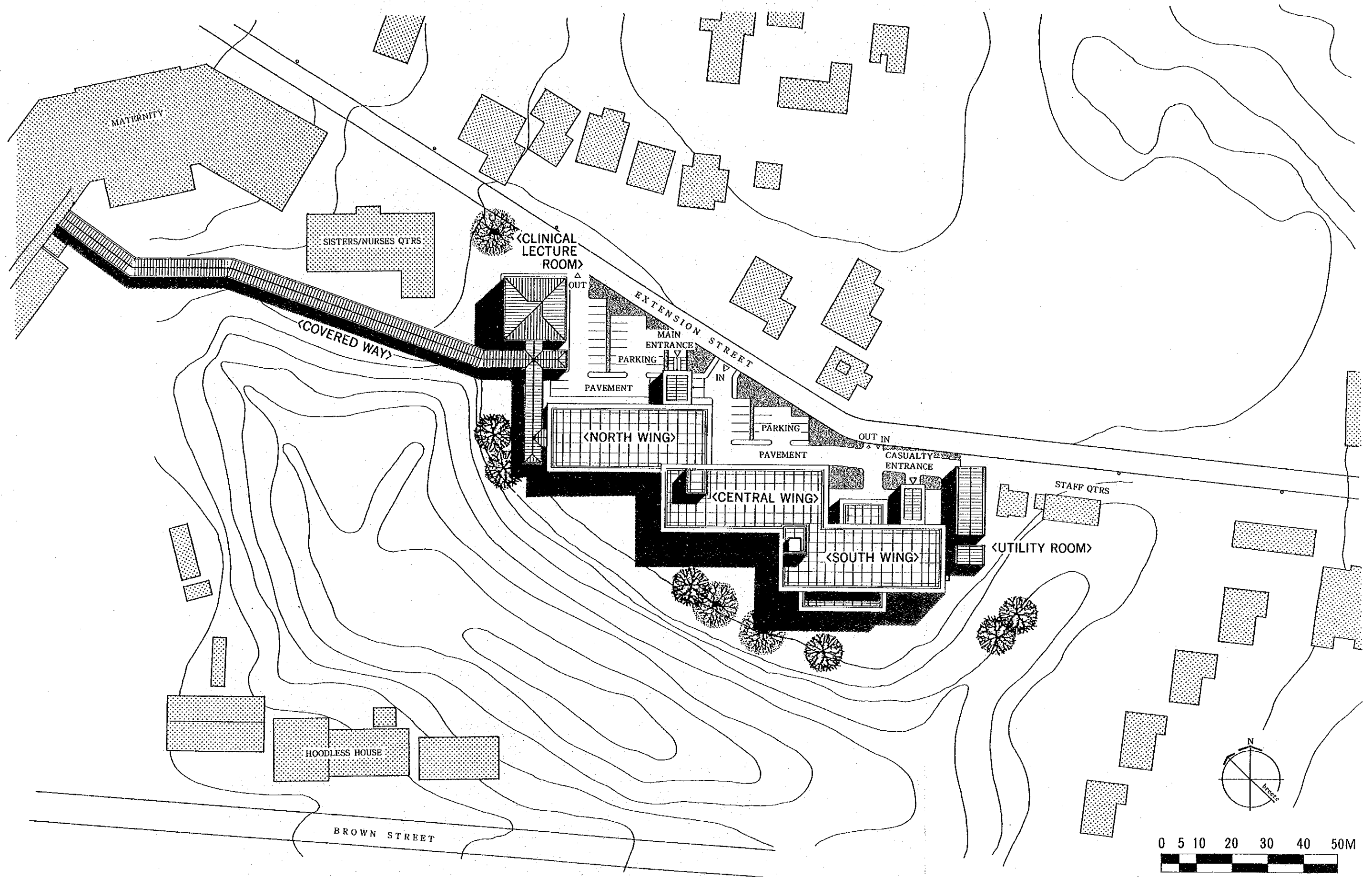
Item No.	Item	Q'ty
G	ENDOSCOPIC ROOM	
G01	Endoscopic Table	1
G02	Endoscopy Cabinet	1
G03	Endoscope Cart	1
H	CLINICAL LABORATORIES	
H01	Unit Laboratory Table	1 set
H02	Autoclave, vertical type	2
H03	Hot Air Sterilizer	2
H04	Medicine Refrigerator, 700L	1
H05	Hemato Slide Stainer	1
H06	Microtome	2
H07	Tissue Processor	1
H08	Tissue Embedding Machine	1
H09	Microscope	1 lot
H10	Coaguro Meter	1
H11	Boild Cell Counter	1
H12	Precision Balance	1 lot
H13	Water Still	1
H14	Safety Cabinet	1
H15	Incubator	2
H16	Centrifuge	1 lot
H17	Cytosedimentation Machine	1
H18	Refrigerator, 260L	4
H19	Electrophoresis Equipment	1 set
H20	Carbondioxide Incubator	1
H21	pH Meter	2
H22	Automatic Dispenser	2
H23	Deep Freezer	1
H24	Freeze Dryer	1
H25	Laboratory Instrument Set	1 lot

Table 4-15-4 List of Medical Equipment for Colonial War Memorial Hospital

Item No.	Item	Q'ty
I	BLOOD BANK	
I01	Blood Collecting Table	3
I02	Unit Laboratory Table	1 set
I03	Refrigerator, 260L	1
I04	Blood Collecting Instrument Set	1 lot
J	OPERATING UNIT	
J01	Operating Table	1
J02	Anesthesia Apparatus	4
J03	Operating Light	4
J04	Film Viewer, recessed type	6
J05	Operating Microscope	1
J06	Autoclave	1
J07	Autoclave, table top type	1
J08	Suction Unit	5
J09	Electro Surgical Unit	2
J10	Recovery Bed	4
J11	ECG Monitor	4
J12	Instrument Cabinet	1 lot
J13	OP Theater Equipment	1 lot
J14	Recovery Room Equipment	1 lot
K	CSSD	
K01	High Pressure Steam Sterilizer, large	1
K02	High Pressure Steam Sterilizer, small	2
K03	EO Gas Sterilizer	1
K04	Operating Glove Dryer	1
K05	Hot Air Sterilizer	1
K06	Instrument Cabinet	1 lot
K07	Working Table	1

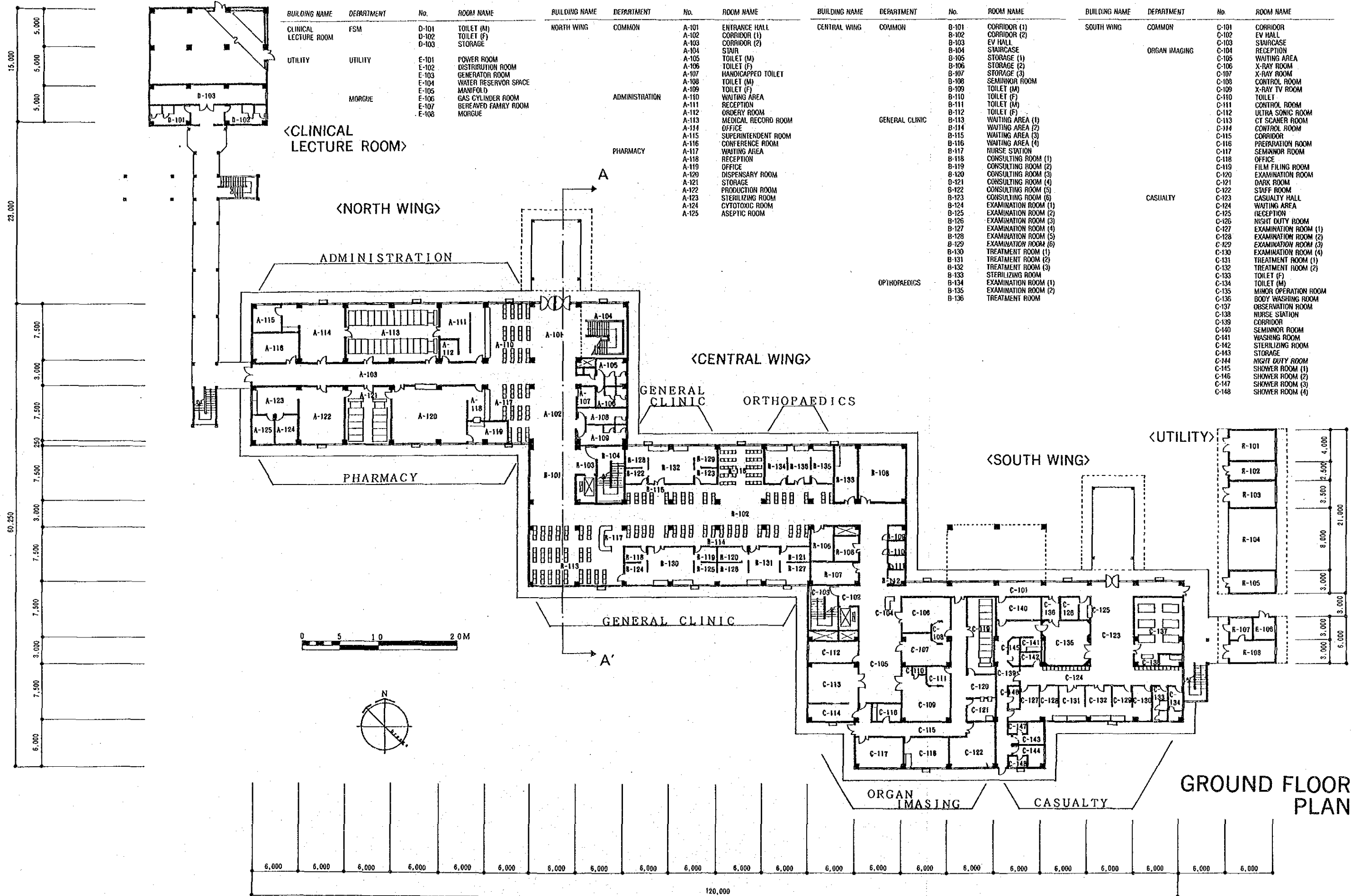
Table 4-15-5 List of Medical Equipment for Colonial War Memorial Hospital

Item No.	Item	Q'ty
L	MORTUARY	
L01	Morgue Refrigerator	1 set
L02	Morgue Trolley	1
M	WARDS	
M01	Patient Bed	64
M02	Paediatrics Bed	4
M03	Orthopaedic Bed	4
M04	Overbed Table	38
M05	Stretcher Trolley	4
M06	Instrument & Dressings Cabinet	4
M07	ECG Monitor	6
M08	Suction Unit	7
M09	1-Channel Electrocardiograph	5
M10	Low Pressure Suction Unit	5
M11	Portable X-Ray Unit	1
M12	Film Viewer, wall type	6
M13	Refrigerator, 260L	4
M14	Ice Making Machine	1
M15	Autoclave, table top type	3
M16	Instrument Sterilizer, stand type	2
M17	Bedpan Sterilizer	3
M18	Ward Equipment	1 lot
M19	Vehicle	2
N	OTHERS	
N01	Audiovisual Equipment	1 lot
N02	Hospital Sundries	1 lot
N03	Stainless Steel Instrument	1 lot
N04	Surgical Instrument	1 lot
N05	Diagnostic Instrument Set	1 lot
N06	Spare Parts & Consumables	1 lot
N07	Personal Computer	1 lot

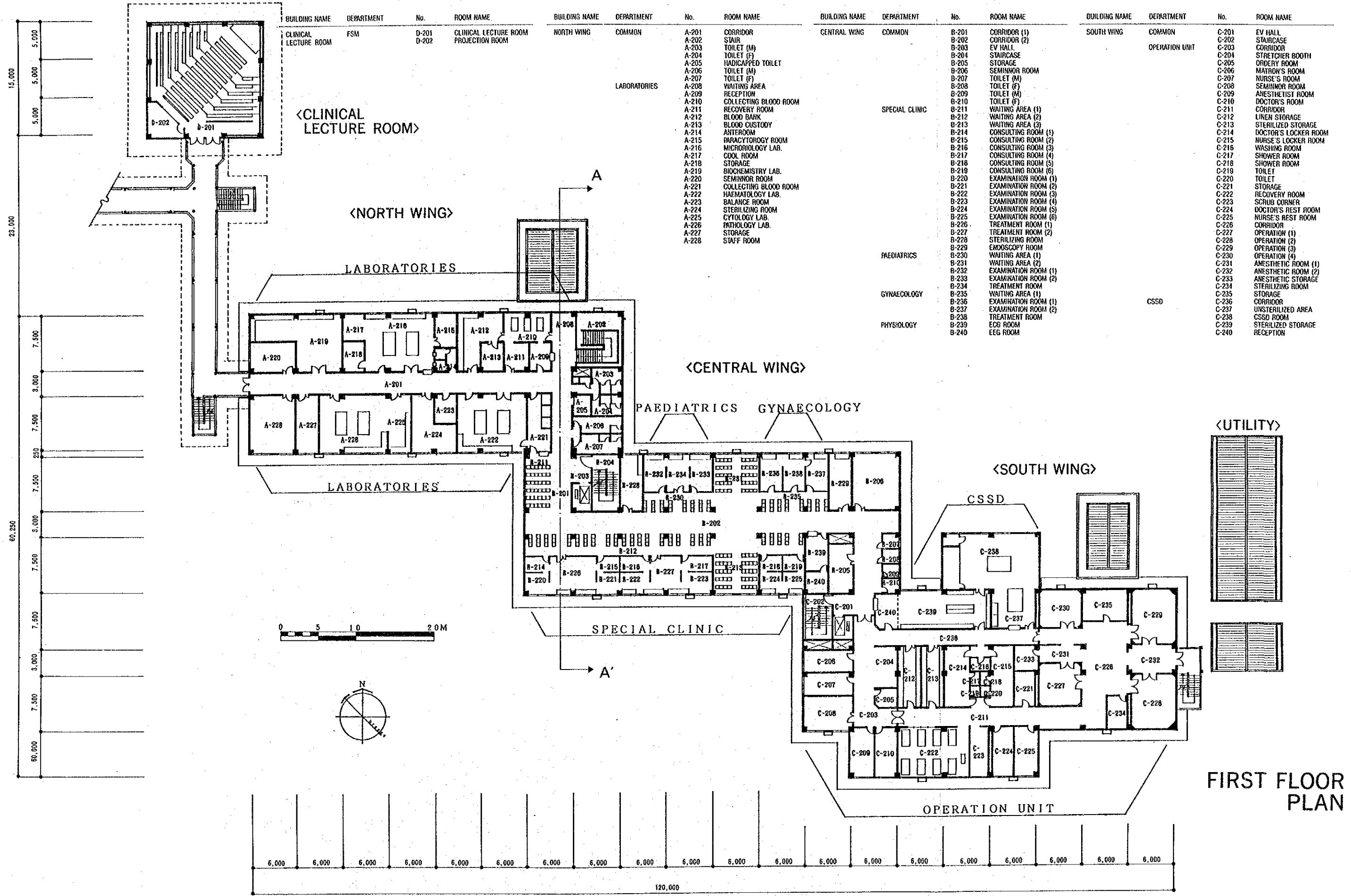


SITE PLAN

THE PROJECT FOR THE REDEVELOPMENT OF F.S.M. AND C.W.M. HOSPITAL 01

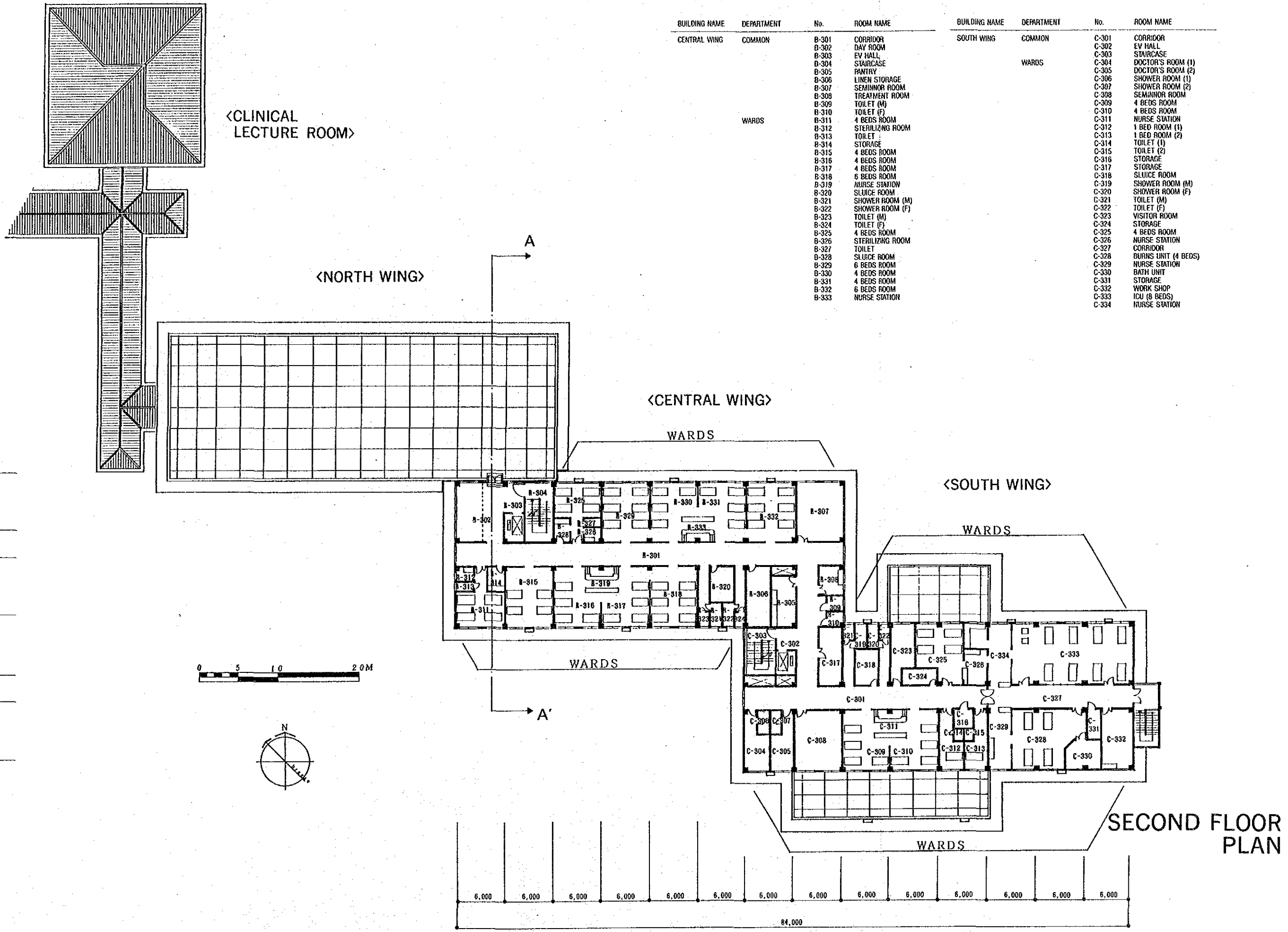


THE PROJECT FOR THE REDEVELOPMENT OF F.S.M. AND C.W.M. HOSPITAL 02



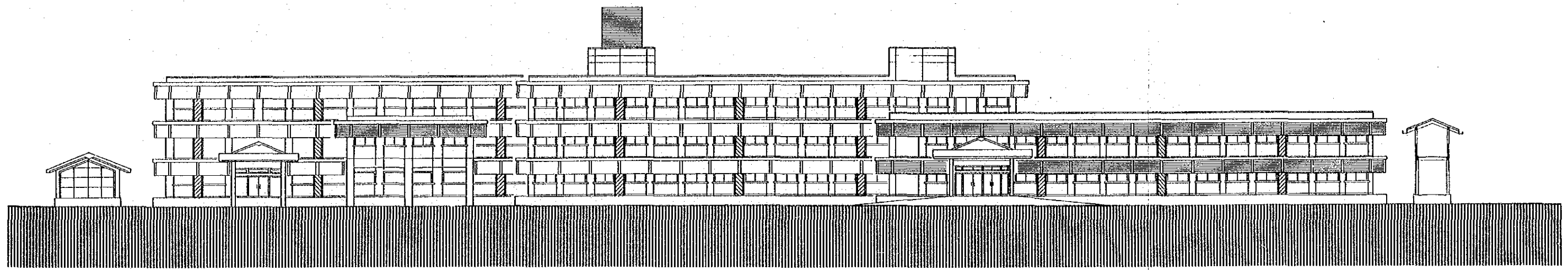
THE PROJECT FOR THE REDEVELOPMENT OF F.S.M. AND C.W.M. HOSPITAL 03



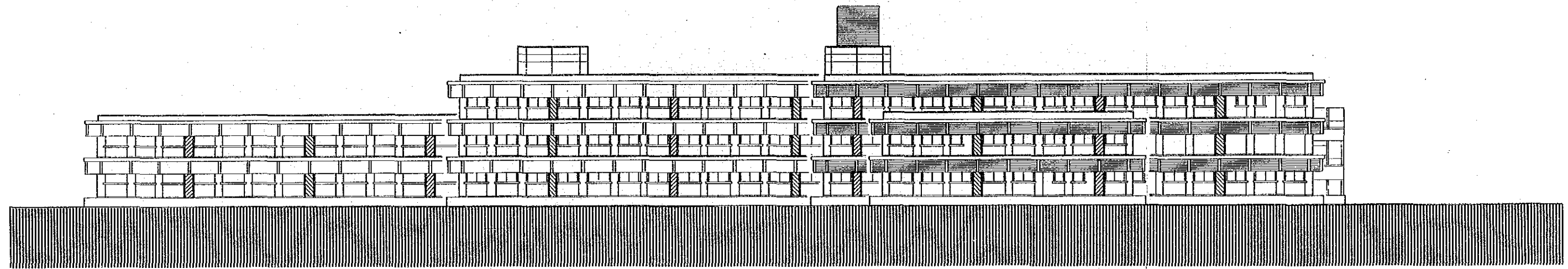


BUILDING NAME	DEPARTMENT	No.	ROOM NAME	BUILDING NAME	DEPARTMENT	No.	ROOM NAME
CENTRAL WING	COMMON	B-301	CORRIDOR	SOUTH WING	COMMON	C-301	CORRIDOR
		B-302	DAY ROOM			C-302	EV HALL
		B-303	EV HALL		C-303	STAIRCASE	
		B-304	STAIRCASE		WARDS	C-304	DOCTOR'S ROOM (1)
	B-305	PANTRY	C-305			DOCTOR'S ROOM (2)	
	B-306	LINEN STORAGE	C-306			SHOWER ROOM (1)	
	B-307	SEMINAR ROOM	C-307			SHOWER ROOM (2)	
	B-308	TREATMENT ROOM	C-308			SEMINAR ROOM	
	B-309	TOILET (M)	C-309			4 BEDS ROOM	
	B-310	TOILET (F)	C-310			4 BEDS ROOM	
	B-311	4 BEDS ROOM	C-311			NURSE STATION	
	B-312	STERILIZING ROOM	C-312			1 BED ROOM (1)	
	B-313	TOILET	C-313			1 BED ROOM (2)	
	B-314	STORAGE	C-314			TOILET (1)	
	B-315	4 BEDS ROOM	C-315			TOILET (2)	
	B-316	4 BEDS ROOM	C-316			STORAGE	
	B-317	4 BEDS ROOM	C-317			STORAGE	
	B-318	6 BEDS ROOM	C-318			SLUICE ROOM	
	B-319	NURSE STATION	C-319			SHOWER ROOM (M)	
	B-320	SLUICE ROOM	C-320			SHOWER ROOM (F)	
	B-321	SHOWER ROOM (M)	C-321			TOILET (M)	
	B-322	SHOWER ROOM (F)	C-322			TOILET (F)	
	B-323	TOILET (M)	C-323			VISITOR ROOM	
	B-324	TOILET (F)	C-324			STORAGE	
	B-325	4 BEDS ROOM	C-325			4 BEDS ROOM	
	B-326	STERILIZING ROOM	C-326			NURSE STATION	
	B-327	TOILET	C-327			CORRIDOR	
	B-328	SLUICE ROOM	C-328			BURNS UNIT (4 BEDS)	
	B-329	6 BEDS ROOM	C-329			NURSE STATION	
	B-330	4 BEDS ROOM	C-330			BATH UNIT	
	B-331	4 BEDS ROOM	C-331			STORAGE	
	B-332	6 BEDS ROOM	C-332			WORK SHOP	
	B-333	NURSE STATION	C-333		ICU (6 BEDS)		
		C-334	NURSE STATION				

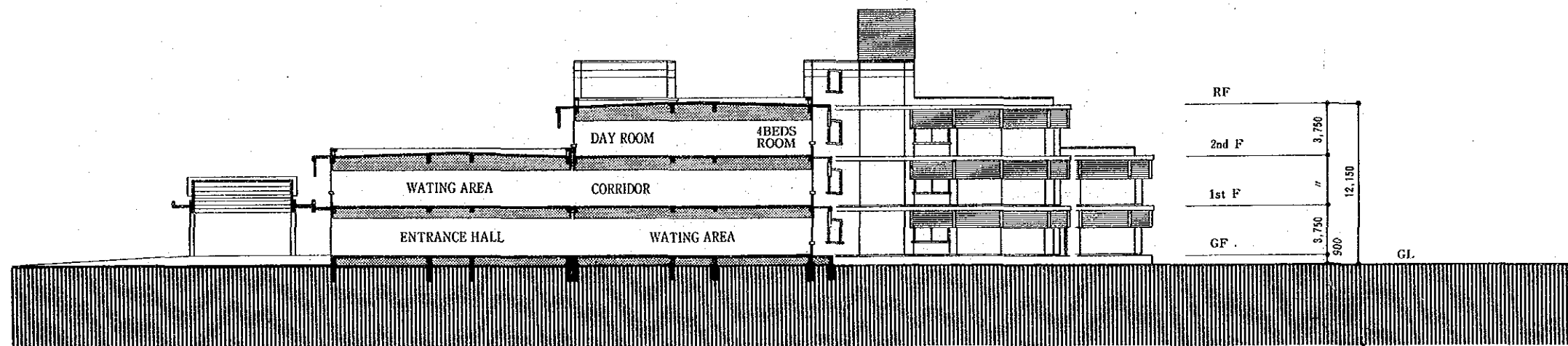
THE PROJECT FOR THE REDEVELOPMENT OF F.S.M. AND C.W.M. HOSPITAL 04



NORTH ELEVATION

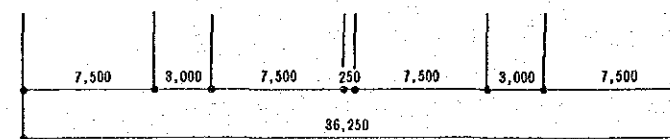


SOUTH ELEVATION



SECTION

ELEVATION SECTION





#### 4.4 Construction Plan

##### 4.4.1 Construction Policy

This project shall be executed as a general grant aid under the grant aid program of the Government of Japan, and after the Government of Fiji and the Government of Japan approve this project, an Exchange of Notes shall be executed between the two governments. The project will then enter the execution stage.

The Government of Fiji shall first select a Japanese consultant and conclude a consultant contract with the selected consultant. This consultant shall prepare a detailed design of facilities, equipment and materials. Next, Japanese corporations shall be invited to submit tenders for executing this project including execution of construction and provision of equipment and materials. The Government of Fiji shall then conclude a construction contract with the successful tenderer. When executing this project, the following points should be considered.

##### (1) Executing agency of the project

The government agency of Fiji responsible for the execution of this project is the Ministry of Health, therefore the Ministry of Health shall execute the consultant contract and the construction contract. Dr. Sakio I. Varea, Permanent Secretary, Ministry of Health, will be the Fiji side counterpart and will seek coordination with Dr. Josaia Taka, Medical Superintendent of CWM Hospital and Professor Ian C. Lewis, Head of FSM. Mr. Tony Sansom, Government Architect, Director of Buildings, PWD will provide necessary advice on design and construction.

##### (2) Consultant

Since this project shall be executed under the grant aid program of the Government of Japan, a Japanese corporation shall be selected to provide consultant services. A consultant contract covering detailed

design of facilities, equipment and material, preparation of tender documents, execution of tender on behalf of the Government of Fiji and supervision during construction period shall be concluded between the Government of Fiji and the consultant.

(3) Construction company/equipment and material supplying company

Owing to the reasons described in the preceding paragraph (2) a Japanese corporation shall be selected to execute construction and supply equipment and material. The corporation shall be selected on basis of an open tender, subject to the approval of the Government of Fiji and the Government of Japan, and the Government of Fiji shall execute a contract with the successful tenderer for the construction of facilities and supply of equipment and material.

(4) Construction plan

The Consultant and the Fiji side counterpart shall fully discuss and agree on the following points during the detailed design stage.

- ① The undertaking of the Fiji side including site preparation, securing temporary power, telephone and water supply as well as all necessary licenses, permissions and other formalities with PWD must be completed before construction is started.
- ② Construction schedule must be set up to avoid foundation and earthwork from being performed during the wet season in Suva; namely, November to April of the following year.
- ③ Although there is some distance between the construction site and the existing hospital, special care must be taken to prevent obstructing hospital function, especially when performing modification or installing covered way between the new and the existing hospitals.

- ④ Products available in Fiji shall be used wherever possible, but in cases where equipment and material must be procured from overseas countries such as Japan, Australia and New Zealand, the Fiji side must provide custom clearance and bear all expenses.
- ⑤ The budget and implementation period for provision of furniture, fixture, utensils, supplies, beddings, etc. and its transportation together with outside construction work included in the undertaking of the Fiji side must be confirmed.

(5) Necessity of supervisors

It will be necessary to send the manufacturer, supplier or agent's supervisor, for supervising installation of supplied equipment and for explaining the operation manual.

#### 4.4.2 Important Considerations for Construction

(1) Construction condition

The construction condition in Fiji is as described in the following paragraphs.

① Construction industry

After the coup d'etat in 1987, the economy of Fiji fell into a minus growth, and although the economic condition is improving together with political stabilization, the activity in the construction industry is still quite low and has not recovered to the construction level of pre-coup d'etat days. There is no doubt that the construction industry will become more active with the recovery of the nation's economy, but there are still only few visible construction sites in Fiji.

② Local construction company

In Fiji, there is the Fiji Master Builders' Association Inc. which members include major contractors, subcontractors as well as building material manufacturers. Among the major contractors, there are local corporations of construction contractors in U.S.A., Australia, New Zealand and other countries, and many of these companies are large size companies which are engaged in tourist development projects. On the whole, the technical level of construction is quite high compared to other developing countries.

③ Labour condition

Labourers are classified by their skills such as carpenters, masons, steel fitters, etc. and are organized into labour unions, however, there is no standard license or qualification to identify the skill of labourers. Common labourers are not classified into special fields and are employed when necessary. The skills of skilled labourers are much varied and truly skilled labourers are quite few. Today, the average performance of various skilled labourer in Japan is 1.3 times that of Fiji.

④ Quality and construction schedule

Since much of the construction materials are imported from Australia, New Zealand and other countries, the quality is quite good, but the question is whether they are available in sufficient quantities, which must be verified. Since Suva has a long wet season period, the construction period should be set up with full consideration of this condition.

⑤ Construction cost

Construction cost has gone up in line with the rise of consumer price index after the coup d'etat. Especially prices of imported materials such as steel frames, steel products and electrical

products rose more than 1.5 times during the 2 years from 1985 to 1987.

⑥ Application for project permit

In case of grant aid project, a permit for survey and design must be applied to the PWD through the Ministry of Health, also the design must be in agreement with the city plan on items such as road width.

(2) Special considerations for construction

This construction can be executed by local construction companies since this project is only for a 3 story building and no special construction method is employed, furthermore most of the construction materials are locally available materials, and the construction materials which would be sent from Japan will not require any special handling skill. Therefore, there is no need to send supervisors from Japan and the only necessary consideration is to be sure that necessary materials and skilled labourers are secured according to the construction schedule.

However, the installation of equipment and material require special, precise skill and must be installed under instruction and supervision of supervisors provided by the agent or the manufacturer, also the supervisor must explain the operation manual. After the equipment is installed, arrangements should be made with the agent regarding the maintenance of the equipment.

#### 4.4.3 Construction Supervision Plan

The consultant selected for the project shall organize a project team in accordance with the grant aid programme of the Government of Japan to prepare detailed design according to the basic design and to supervise the execution of the project. The consultant shall send 1 site representative to provide assistance and supervision as well as to maintain close contact with the Ministry of Health, Embassy of Japan in Fiji, JICA Fiji office and



other related parties. The consultant shall also send specialists on structure, equipment and other work whenever required to provide instruction, inspection and to attend tests.

(1) Purpose of supervision

- ① Maintain close contact with concerned parties to complete the project within the construction schedule.
- ② Provide prompt instruction and assistance to execute project in accordance with the design.
- ③ Assure that local materials and local practices are applied wherever possible.
- ④ Provide technical guidance to upraise construction and installation skills which permits the grant aid project to be more beneficial.
- ⑤ Provide the Ministry of Health with operation and maintenance manuals as well as necessary instruction and guidance for smooth operation of the project.

(2) Contents of supervision

① General supervision

The consultant on behalf of the Government of Fiji shall determine the type of construction contract, prepare construction contract document, select and recommend construction contractor to the Government of Fiji, check construction contractor's construction work details and attend the signing of contract.

- ② Inspection and approval of shop drawings, construction materials, etc.

The consultant shall inspect and approve the shop drawings, materials, finished samples, and equipment submitted by the contractor.

③ Construction supervision

The consultant shall review and monitor construction plan and schedule also supervise construction contractor and provide construction progress report to the Ministry of Health, Embassy of Japan in Fiji, JICA Fiji office and other related parties.

④ Certification for payment

The consultant shall inspect and certify the invoice submitted by the contractor for interim payment and final payment.

⑤ Attend inspection

The consultant shall attend inspection of work whenever necessary to verify quality and quantity of work performed by the contractor. At the completion of the project, the consultant shall verify that the project is completed in accordance with the contract and shall attend handover of the project to the Ministry of Health. Furthermore, the consultant shall report all pertinent matters such as progress of construction, payment and handover after completion to the concerned parties of the Government of Japan.

(3) Construction supervision

In order to execute the project within the construction schedule in accordance with the design documents, it is necessary for the contractor to implement the project under close cooperation with local construction subcontractors and to provide necessary technical instruction. Furthermore, in order to assure a high quality construction, it is desirable to have a construction supervisor, well experienced in hospital and training facility construction.

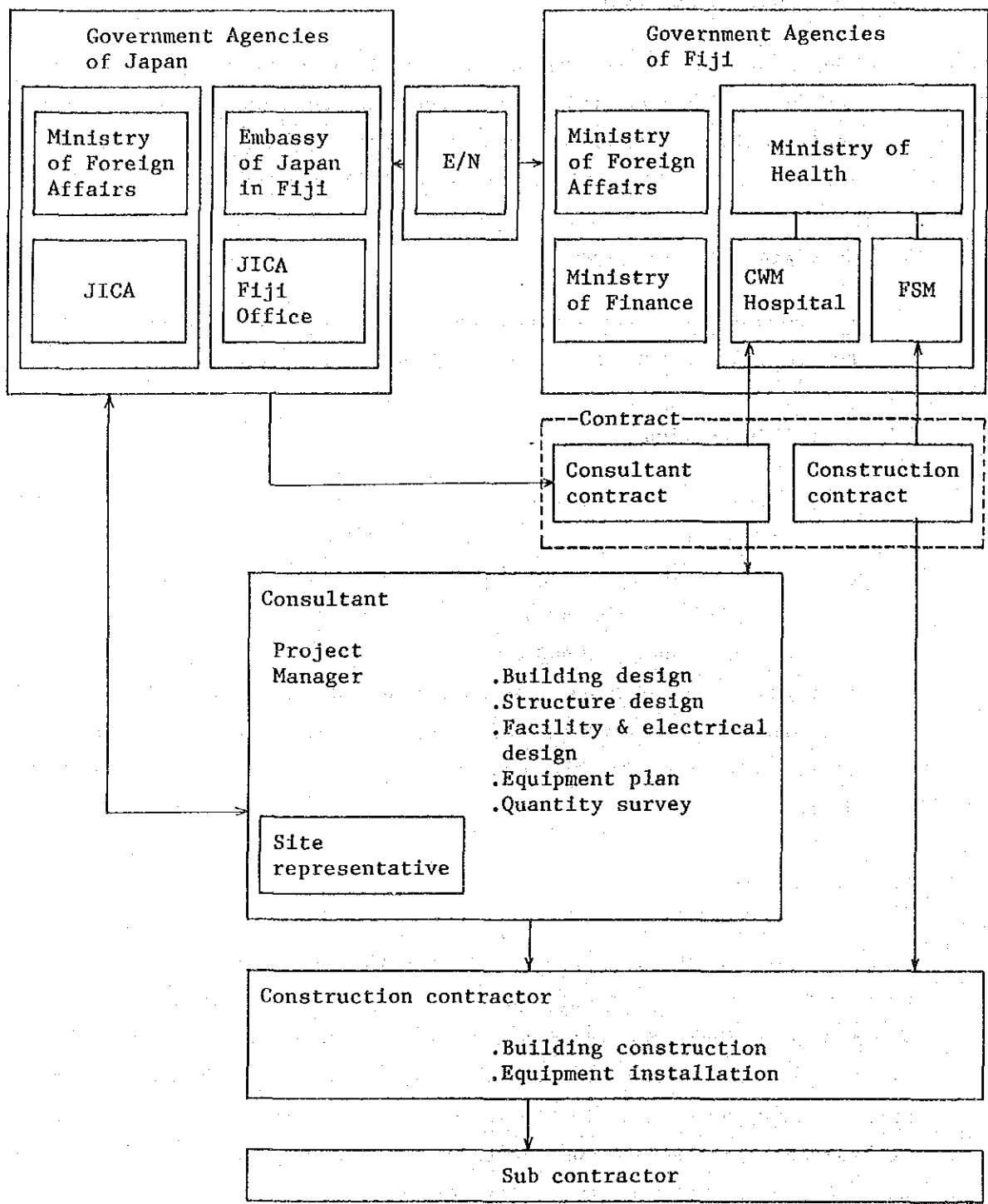


Fig. 4-10 Diagram of Consultant's Supervision

In view of the size and contents of this project, the project team of the consultant shall be organized as shown below.

① Facilities

Project Manager (1) : Manage the entire project  
Building and structural engineer (1) : Supervise construction and review shop drawings  
Equipment and electrical engineers (2) : Instruct and review the installation of facility and electrical equipment  
Administration (1) : Supervise procurement of equipment, material, and labour as well as perform administration work

② Equipment and material

The following specialists shall be sent to provide instruction on installation and operation of equipment.

Organ imaging equipment

. general X-ray unit, automatic film processor : 1 person  
. ultrasonic scanner : 1 person  
. Multipurpose X-ray unit, CT scanner : 1 person

Sterilizing equipment

. high pressure sterilizer : 1 person  
. EO gas sterilizer, operating glove dryer : 1 person

Laboratory equipment

. unit laboratory table setting : 1 person

Other equipment

. ECG monitor, colposcope, electrocardiograph, hemato slide stainer, coaguro meter, boild cell counter, electrophoresis equipment, carbon dioxide incubator, anesthesia equipment, electro surgical unit : 1 person

#### 4.4.4 Procurement Schedule of Equipment and Material

(1) Construction material

In principle, local construction material shall be procured. For materials which cannot be procured locally, materials necessary for maintaining the quality and grade level of the project shall be

procured from Japan. The source of procured material is shown in Table 4-16.

Table 4-16-1 Source of Construction Material and Equipment

Item	Japan	Local	Remarks
Construction Material		◎	
1. Aggregates (coarse and fine)		◎	
2. Cement		◎	
3. Steel bars		◎	
4. Concrete block		◎	
5. Waterproof agent		◎	
6. Plywood and lumber		◎	
7. Floor and wall tile		◎	
8. Wooden fixtures		◎	
9. Metal fixtures	○	●	Special fittings (lead containing) not available
10. Metal fittings (master key system)	○	●	Master key system is imported
11. Paints		◎	
12. Work table, sink	○	◎	Veneer table top is not available locally
13. Wooden shelf, counter		◎	
14. Fence, gate		◎	
15. Elevator		●	
16. Concrete pavement blocks		◎	
17. Form material		◎	
18. Construction equipment		◎	

Table 4-16-2 Source of Construction Material and Equipment

Item	Japan	Local	Remarks
Equipment and Material		◎	
1. PVC electric wire conduit		◎	
2. Wires, cables		◎	
3. Panels		◎	
4. Illumination fixtures		◎	
5. Transformers		◎	
6. Diesel generators	○		Japanese diesel generators are widely used
7. Wiring fixtures		◎	
8. Electronic equipment	○	◎	Japan products shall be used for some equipment for matching existing equipment
9. PVC conduit (sanitary application)		◎	
10. Copper pipes		◎	
11. Sanitary ceramic ware		◎	
12. Boiler		○	The present boiler is English boiler, but the price is high
13. Pumps		◎	
14. Incinerator		◎	Same as above 8.
15. Window cooler		◎	Same as above 8.
16. Fans		◎	Same as above 8.

◎ : Local products or locally available products

● : Imports from Australia or New Zealand

(2) Medical equipment and material

In principle, medical equipment and material shall be procured from Japan, but as described in "4.1 Basic Policy", when it is considered that procurement from foreign countries will be more advantageous, then procurement shall not be restricted from Japan, and foreign equipment and material shall be procured.

The most difficult problem which must be considered when procuring equipment is its maintenance and supply of consumable supplies and spare parts. If this problem is not properly resolved, it can even influence the success of the project.

Fortunately, there are a number of dealers acting as agents for foreign suppliers in Fiji, therefore by applying these products, a good maintenance and management system for supplies and spare parts can be readily set up.

Furthermore, in this project, equipment previously granted by the United States and Australia cannot be ignored from the viewpoint of standardizing equipment. Since there equipment and material were provided from 1989 and later, it is not clear whether they can be operated smoothly, but it is considered that standardization should be provided for a number of equipment.

The equipment which is considered to be advantageous when procured from foreign countries or through agents in Fiji is listed in the following table.

Table 4-17 Equipment for Procurement from Foreign Countries or through Agents

. Artificial respirator	. Anesthizer
. EEG	. Cardiograph

Equipment and material which are cheaper than Japan and performance and specification are better than Japan products may be procured locally.

Table 4-18 Equipment and Material for Local Procurement

. Doctor examination desk	. All kinds of work table
---------------------------	---------------------------

(3) Equipment and material delivery route

The main foreign trade ports in Fiji is the Suva port and the Lautoka port on the Nadi side. Materials shipped by sea from Japan are landed in Suva port and transported overland to the project site. Since the road from Suva port to project site is paved with asphalt, there should be no problem.

Medical equipment from Japan is mainly packed in container for ocean shipment, while equipment from foreign countries are packed in crates or container for ocean shipment or air shipment.

4.4.5 Implementation Schedule

Since this project involves 8,320 m<sup>2</sup> of new construction and 360 m<sup>2</sup> of remodelling construction, also construction industry in Fiji is not so active, the entire construction is expected to take 24 months. Therefore, this project schedule is divided into 2 stages.

The 1st stage consists of new construction work. The period required to complete the construction work is expected to be 12 months, after preparation of the detail design documents following the conclusion of the Exchange of Notes (E/N) by the two countries, tender, and construction and equipment supply contract.



Contents of construction:

New construction work of central wing, south wing and utility room.

Construction work in the 2nd stage, following such a pattern as in the 1st stage, is expected to be completed in 12 months.

Contents of construction:

New construction of north wing, clinical lecture room, covered way, outside work and remodelling of central library.

The installation of medical equipment and explanation of its operation and maintenance shall be conducted along with the above mentioned schedule, but shall be scheduled it will not interfere with daily examination activity.

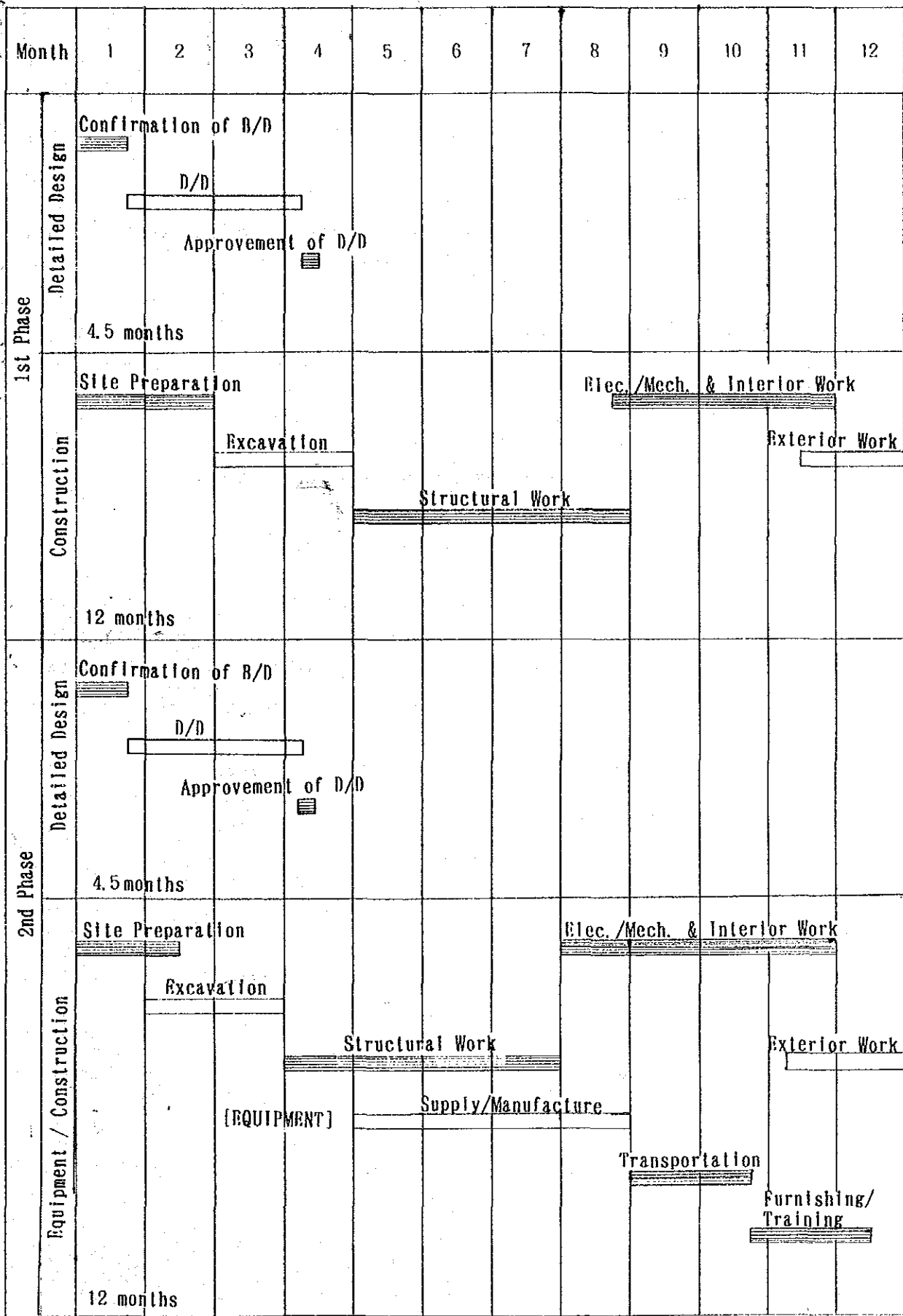


Fig. 4-11 Implementation Schedule

#### 4.4.6 Cost Estimate

##### (1) Scope of construction

Since this project is implemented under the grant aid of the Government of Japan, the undertakings of the Government of Japan and the Government of Fiji shall be as listed below.

##### ① Undertaking of the Japan side

###### a. Consultant work

Consultant work shall include detailed design, tendering, evaluation of tender and supervision of construction.

###### b. Medical equipment and material procurement

Clinical training hospital construction and partial modification of existing hospital construction and modification are described in Chapter 4, 4.3.1 and procurement of medical equipment and material is described in Chapter 4, 4.3.2.

###### c. Work related to the aforementioned undertakings

This work involves the transportation of equipment and material from Japan to Fiji, also the unloading at the port in Fiji and transportation to the construction site.

##### ② Undertaking of the Fiji side

###### a. Land preparation of construction site

This includes removal of vegetation and levelling of land at construction site.

###### b. Secure temporary power, phone and water

###### c. Provide all information for construction work

d. Outside construction

i. Landscaping

e. Utilities installation

i. Water supply (pipeline from city main)

ii. Water discharge (discharge water pipeline and public manhole for public sewer pipeline)

iii. Power (power cable from outside line to specified terminal)

iv. Telephone (circuit line to the MDF)

f. Furnitures and fixtures

Office furnitures, fixtures, beds, etc.

g. Connection work of utilities

Securing necessary space and preparation work for medical equipment procured from Japan shall be provided.

Connection work on water receiving tank and water discharge manhole constructed by the Japan side shall be provided.

Connection work in the distribution panel installed by the Japan side shall be provided.

h. Transportation and movement of beds, furnitures, fixtures, medical equipment and supply to the new buildings in association with the construction of new building, and modification of existing facility.

i. Bear banking charges associated with determining the bank.

j. Provide custom clearance, exempt duties and taxes also promptly arrange unloading and transportation from port for equipment and material purchased under grant aid.

- k. Exempt duties, taxes and all other levies of the Government of Fiji on Japanese personnels associated with providing services, equipment and material of this project.
- l. Provide all assistance and necessary formalities for the above mentioned Japanese personnels entering and staying in Fiji under the grant aid project contract.
- m. Secure necessary budget and personnel for the efficient operation of constructed facilities and material procured under grant aid.
- n. Bear all expenses necessary for executing this project although it may not be included in the scope of grant aid.

(2) Cost estimate of Fiji side

When this project is executed under grant aid from the Government of Japan, the estimated cost necessary for the main undertakings of the Government of Fiji will be as shown in the following table.

① Cost estimate of Fiji side                      F\$265,650

Table 4-20 Cost Estimate

Item	First stage	Second stage	Total
a. Land preparation cost	F\$8,500.00	-	F\$8,500.00
b. Outside construction cost	-	F\$13,800.00	F\$13,800.00
c. Utility intake cost	F\$40,000.00	-	F\$40,000.00
d. Furniture & fixture cost	F\$70,890.00	F\$128,460.00	F\$199,350.00
e. Transportation cost	F\$3,000.00	F\$1,000.00	F\$4,000.00
<b>Total</b>	<b>F\$122,390.00</b>	<b>F\$143,260.00</b>	<b>F\$265,650.00</b>

② Basis of cost estimate

a. Period of cost estimate

Estimate of Fiji side expense: In accordance with information and data collected in April 1990 during the basic design study survey.

Estimate of Japan side expense: In accordance with quantity survey data published in the May 1990 publication.

b. Foreign currency exchange rate (6 months average up to May 1990)

US\$1 = 150.91 yen

F\$1 = US\$0.667

F\$1 = 100.66 yen

c. Construction period

Construction period is conducted in 2 stages and the construction schedule including equipment and material procurement and installation is as shown in the implementation schedule.

d. Others

This project will be executed under the grant aid program of the Government of Japan.



## CHAPTER 5 PROJECT EVALUATION AND CONCLUSION





## CHAPTER 5 PROJECT EVALUATION AND CONCLUSION

The CWM Hospital serves as the divisional hospital of the central and eastern division of Fiji as well as the top referral hospital for Fiji, also it serves as the clinical training hospital of the FSM which is the medical personnel training school for the south pacific island countries. However, the medical equipment and material of the CWM Hospital are quite old and worn, so it cannot function as an educational hospital, nor even satisfy the medical needs of the division.

The purpose of this project is to restore its original function of a training and medical hospital in the south pacific island countries and to improve and upgrade the present condition of the CWM Hospital. By implementing this project the following benefits are expected.

- (1) Contribution to the medical health administration of Fiji and the south pacific island countries

The improved CWM Hospital will not only contribute toward maintaining the primary health care, improving the secondary and the thirdly medical services and improving divisional medical service, but it is also expected to contribute greatly toward improving Fiji national medical service and the training of medical personnels for the south pacific countries.

- (2) Fiji School of Medicine (FSM)

- ① Enlarge clinical training function

The present CWM Hospital lacks space for clinical training which can be secured by implementing this project. The clinical training function can be strengthened and enlarged which will also permit FSM to increase its number of students.

② Installation of a central library

The library which is presently located separately at the 2 locations of Tamavua campus and Hoodless House will be consolidated into a newly installed central library by remodelling the present organ imaging. This will serve not only students and medical staff of CWM Hospital, but all medical personnels of Fiji as well.

③ Increase number of students from neighboring island countries

By improving the old and worn facilities of CWM Hospital, the clinical training function can be extended making it easier to accept students from neighboring island countries.

(3) CWM Hospital

① External medical service for wider medical accessibility

The range of medical service is extended, increasing the medical accessibility of the population, by enlarging and strengthening the following medical functions.

- o ICU and treatment for acute care patients and 74 beds will be added for this purpose
- o General outpatient, special outpatient and emergency outpatient
- o Operation theater, organ imaging clinic and examination department (enlarging and strengthening central supply and sterilizing unit)
- o Consolidating administration department for rationalizing office work

② Upgrade divisional medical service

By restoring hospital function, it will become possible to provide medical services as a referral hospital of Fiji as well as upgrade divisional medical services. This will serve to improve the medical health environment of not only the 310,000 population in the central and eastern division, but the 710,000 population of Fiji as well.

③ Upraise medical quality

By providing sufficient medical facility, equipment and material, the medical quality can be improved so that it can fully function as the referral hospital in Fiji.

This will also enable the people of Fiji to receive proper examination and treatment which will contribute greatly to improving the medical health condition of the people in this region. Furthermore, patients who were transported to Australia and New Zealand for examination and treatment can now be examined and treated here which will greatly reduce the financial burden of the hospital as well as the patient.

④ Improve examination efficiency and reduce medical cost

Concentration and consolidation of the examination department together with sufficient equipment and material will rationalize examination system and improve examination efficiency. This is expected to increase the number of examination and reduce examination time as well as medical cost.

This project is the plan of the Government of Fiji to redevelop the CWM Hospital and the FSM which constitutes the first phase of the 3 phase redevelopment master plan assisted by WHO. The content and size of facility plan also equipment and material plan are planned according to the master plan after considering the present condition of CWM Hospital. When the

second and third phases of this master plan is implemented, it is expected to contribute greatly to upgrading the medical service level of Fiji and the south pacific island countries.

After completion of this project, the hospital can be operated with the present medical staff of 350 persons. Since the present technical assistance provided by Australia and New Zealand is expected to continue and also since the Ministry of Health which administers the CWM Hospital has assured its full back up, there is no problem in the operation of the hospital. Furthermore, the Ministry of Health has assured to increase the budget of CWM Hospital by 3% with the implementation of the project. Therefore the operation budget is foreseen to be secured under the highest priority.

This project as described in the preceding paragraphs is expected to provide many benefits and also contribute greatly to the wide improvement of medical health to the people of Fiji together with the training of medical personnels in the south pacific countries. Therefore this project is considered to be suitable and qualified as a grant aid project. Also no problem is foreseen in the Government of Fiji administration system, personnel and finance for the operation and management of this project.

But in order improve hospital function and activity, the organization of software such as management and administration is absolutely necessary. Therefore, the medical staff of the hospital must fully consider the following points to assure a smooth operation of the hospital.

- ① to become fully acquainted with procured equipment and material;
- ② to effectively utilize constructed facility, equipment and material;
- ③ to provide suitable maintenance, management and budget of constructed facility, equipment and material; and
- ④ to establish a maintenance and management system, also strengthen the cleaning department.

The Ministry of Health which is the administrating government agency of the CWM Hospital must provide full assistance for the smooth operation of this hospital. It is sincerely hoped that phases 2 and 3 of the CWM Hospital and FSM redevelopment master plan be modified and implemented to assure the full benefits of the master plan.

