No.

Ministry of Health
The Republic of The Marshall Islands

Basic Design Study Report
on
The Project for Improvement of
The Majuro Hospital
in
The Republic of The Marshall Islands

June, 2003

Japan International Cooperation Agency
Azusa Sekkei Co., Ltd.
System Science Consultants, Inc.

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PREFACE

In response to a request from the Government of the Republic of the Marshall Islands, the Government of Japan decided to conduct a basic design study on the Project for Improvement of the Majuro Hospital and entrusted the study to the Japan International Cooperation Agency (JICA).

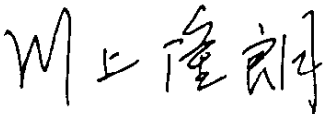
JICA sent to the Republic of the Marshall Islands a study team from 23rd October to 5th December, 2002.

The team held discussions with the officials concerned of the Government of Marshall Islands, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Marshall Islands in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly, relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Marshall Islands for their close cooperation extended to the teams.

June, 2003



Takao Kawakami
President
Japan International Cooperation Agency

June, 2003

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of the Majuro Hospital in the Republic of the Marshall Islands.

This study was conducted by Azusa Sekkei Co.,Ltd. and System Science Consultants, Inc., under a contract to JICA, during the period from 21st October, 2002 to 27th June, 2003. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Marshall Islands and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

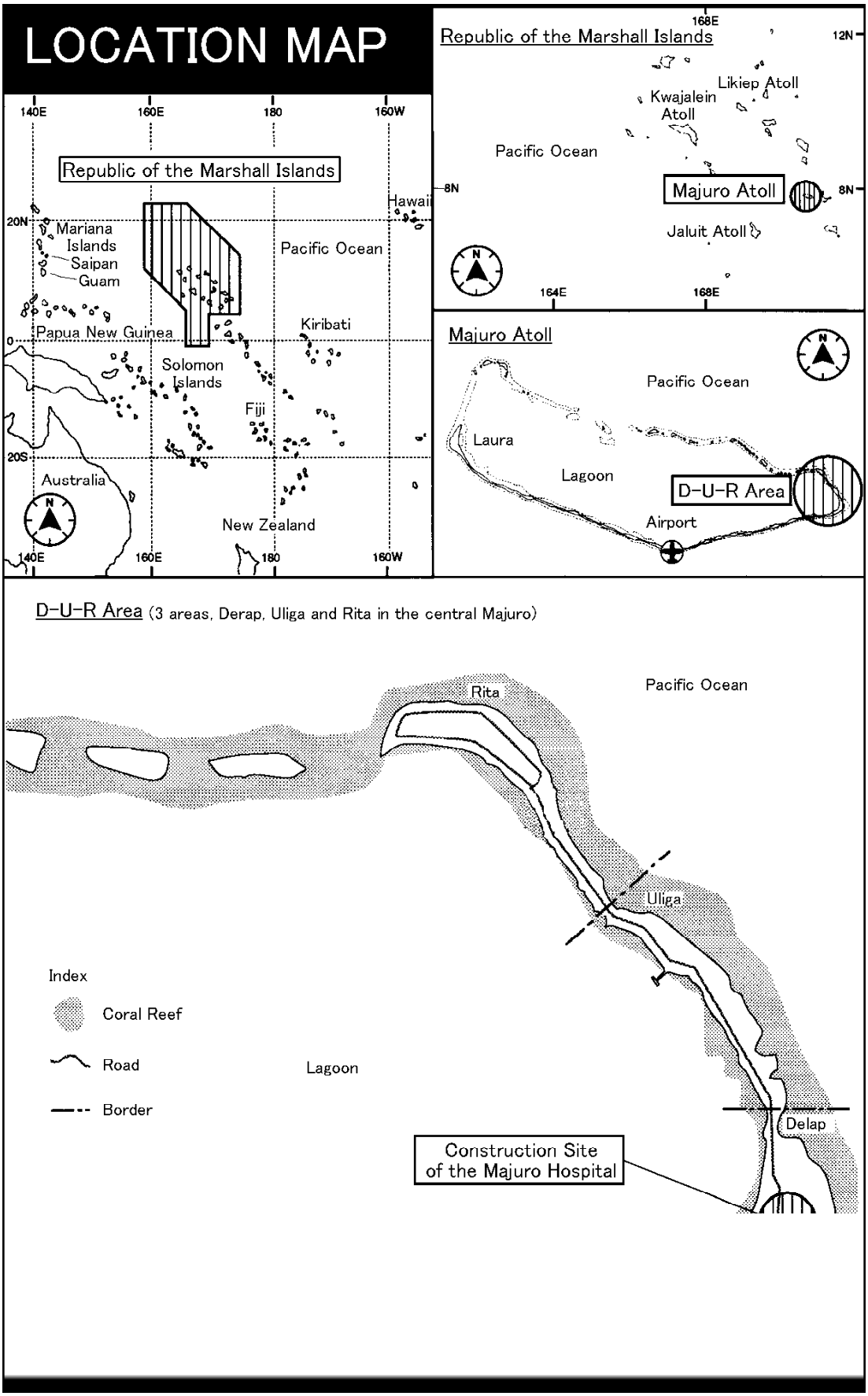
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Hozumi Ogawa
Project manager,
Basic design study team on
The Project for Improvement of the Majuro Hospital

Azusa Sekkei Co., Ltd. &
System Science Consultants, Inc.

Location Map



THE PROJECT FOR IMPROVEMENT OF THE MAJURO HOSPITAL

THE PROJECT FOR IMPROVEMENT OF THE MAJURO HOSPITAL

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ABBREVIATIONS

Abbreviation	Idiom	Original Name
ADB	English	Asian Development Bank
BHN	English	Basic Human Needs
B/M	English	B/M Mode
CIP	English	Capital Investiment Project (PWD)
CMV	English	Continuous Mandatory Ventilation
CPAP	English	Continuous Positive Aiaway Pressure
CT	English	Computed Tomography
DOE	English	Department of Energy
E/N	English	Exchange of Notes
EPA	English	Environment Protection Authority
IMV	English	Intermittent Mandatory Ventilation
JICA	English	Japan International Cooperation Agency
JIS	English	Japanese Industrial Standard
JOCV	English	Japan Overseas Cooperation Volunteers
MEC	English	Marshall Energy Co.
MISSA	English	Marshall Islands Social Securities Adminstration
MOH	English	Ministry of Health
MPW	English	Ministry of Public Works
MWS	English	Majuro Weather Station
MWSC	English	Majuro Water & Sewer
NTA	English	National Telephone Authority
PEEP	English	Positive End-Expiratory Pressure
PHC	English	Primary Health Care
RMI	English	Republic of the Marshall Islands
RC	English	Reinforced Concrete
SIMV	English	Synchronized Intermittent Mandatory Ventilation
SPONT	English	Spontaneous Breathing
UBC	English	Uniform Building Code
VP	English	Vinyl Paint

SUMMARY

SUMMARY

The Republic of the Marshall Islands (hereinafter referred to as “the RMI”) has a population of 53,000 (as of 2002), including about 30,000 people living in the Majuro Atoll and its vicinity. Regardless the fact that the growth rate of population fell from 2.0% in the 1980s to 1.5% in the 1990s, the concentration has been rapidly growing in the capital city, where more than half of the country’s population already lives.

The Majuro Hospital was founded in May 1986 with funding from U.S. aid. As one of the two national hospitals in the RMI providing secondary healthcare services, it is ranked as a core hospital offering hospital-based activities. According to the hospitalization records of the Majuro Hospital in 2001, child deliveries account for nearly half of the cases treated. Respiratory illnesses such as respiratory tract infections, pneumonia, and bronchitis make up the second highest portion of treated cases, accounting for about 27%. Lifestyle-related diseases such as diabetes and high-blood pressure (mainly nutritionally related) have also become a serious issue and now account for about 15% of all treated cases. Thus, the Majuro Hospital needs to improve in both quality and capacity.

However, the buildings have been degraded by seawater, leading to leakage and partial collapse of the structures. Further, the medical equipment has been utilized for longer than its intended lifetime. And in 2002, as many as 140 patients had to be transferred to the U.S., Philippines, etc., placing a burden on the health service budget.

In FY 2000, the Ministry of Health in the RMI established a “15-year Strategy 2001-2015” for improving, promoting, and expanding basic health services. The plan calls for the implementation of three 5-year plans that the Ministry hopes will lead to the accomplishment of an ambitious set of long-term goals targeted for 2015. The Majuro Hospital has set goals in facility construction, equipment installation, deployments of medical staff, etc. to be accomplished by fiscal 2005. The Government of the RMI has requested Grant Aid from the Government of Japan to fund facility construction and equipment supply.

In response to the request, the Government of Japan dispatched a Preparatory Study Team to verify that

suitability of the Majuro Hospital as a grant aid recipient in October 2001. The team confirmed that the deteriorated facilities and shortage of equipment have been detrimental to the healthcare services provided at the Majuro Hospital. To improve the healthcare services, the team has confirmed the following: (1) the degraded facilities severely hinder the hospital functions, but the existing hospital could be utilized by partial mending; (2) the hospital urgently needs to replace the aging, outmoded equipment still in use (well past the equipment's intended lifetime); (3) though the number of beds is insufficient, the items (1) and (2) should have urgent priority for improvement of healthcare services.

The Government of Japan decided to implement a Basic Design Study based on the foregoing conclusions, and JICA sent a study team to discuss the project with officials in the Government of the RMI, confirm relevant details, and collect necessary information and data during the period of dispatch from October 27, 2002 to December 5, 2002 (date of arrival in Japan). Next, the study team summarized the Basic Study Report through an analysis in Japan and presented a draft report covering a later site visit conducted from February 23, 2003 to March 9, 2003 (date of arrival in Japan).

This project is formulated in accordance with the following guideline.

Originally, the RMI side requested reconstruction of the whole hospital. However, a rapid expansion of the scale of the hospital could impose larger burden on running costs and interfere with the hospital administration. Such problems could potentially hinder a continuous project effect, as many of the medical staff from abroad are hired on 2-year contracts and the costs for facilities and equipment maintenance would be inordinately high for an island country with such a small population. Thus, the phased expansion of the hospital has been deemed a more appropriate option, and the project has been planned within a range that the RMI side can manage.

The target departments of the project have been selected in accordance with the following policies.

(1) The Outpatient Department, Emergency Department, Laboratory Department, and Radiology Department manage many of the patients, and additional hospital functions not directly related to patient management increase their workloads considerably. If the good functioning order of those departments declines, their diagnostic abilities would decline as well, leading to an increase in the

number of patients transferred abroad. Therefore, those departments will be prioritized in the project.

(2) The Primary Health Care (hereinafter referred to as “the PHC”) provides maternal and child healthcare, specific disease programs, immunization, dental services, measures against lifestyle-related diseases, a mobile clinic servicing the outer islands, etc. The PHC has been included as a target of the project since it provides measures against lifestyle-related diseases such as diabetes, hypertension, heart disease, etc., and contributes to the health of children and mothers.

(3) The wards mostly have patient rooms accommodating four people (8.7 ㎡ per patient), with a certain amount of space secured. The plan focuses exclusively on the Outpatient Department, as it has considerably less space.

(4) The Operating Theatre, Obstetrics, and ICU have been excluded from the project targets, as required by the RMI side. The nurses in these areas hold concurrent posts in the hospital wards, hence they cannot be deployed at too great a distance from the wards.

(5) All of the departments that provide care to patients are located on the first floor. The installation of elevators is undesirable in view of the maintenance costs and slower response to emergencies. Ramps are undesirable in view of the space and workloads.

(6) If the Administration Department is included in the project, all of the departments located in the existing Building A and B will be covered. As a result, those buildings could be utilized for other purposes or renovated as new buildings to facilitate future development. Thus, the Administration Department has been included as a project target. The administration departments that do not provide medical care to patients are located on the second floor due to limitations in the site area.

(7) Facilities are given an appropriate grade and scale for hospital administration and maintenance.

In addition, the target equipment in the project have been selected based on the following policies.

(1) The replacement of degraded equipment has been selected as an object of focus, in order to strengthen the medical care functions in the Bureau of the Majuro Hospital and the Bureau of the PHC. The main support targets are the X-ray Department, Emergency Department, and Dental Services.

(2) The grade of project equipment will be of a level sufficiently high to provide primary and secondary health services, and the equipment specifications will not be too sophisticated for the current medical staff to handle. Equipment requiring less expensive consumable supplies will be chosen to save maintenance costs.

Facility outline.

	Building	Contents	Structure, Scale		
1st stage	Building-2	Outpatient Department (including Ophthalmology & ENT) and Public Health	RC	One-story	697.96 ㎡
	Building-3	Emergency Department, Laboratory Department, X-ray Department and Reproductive Health	RC	One-story	1,006.01 ㎡
	Utility Buildings	Generator Room, Pumping Machine Room, etc.	RC	One-story	82.52 ㎡
	Subtotal				1,786.49 ㎡
2nd stage	Building-1	Reception/Cashier/Registration, Medical Records Room, Dentistry, Pharmacy, Health Promotion & Human Services, Hospital Admin. and PHC Admin.	RC	Two-story	1,205.74 ㎡
	Subtotal				1,205.74 ㎡
Total of 1st and 2nd stages					2,992.23 ㎡

Equipment outline.

	Description	Specifications	Q'ty	Purpose
1st stage	X-ray Apparatus (General)	Composition: X-ray generator, X-ray tube unit, tube support, bucky stand and bucky table. Max. tube current: 600mA. Max. tube voltage: 150kV.	1	Fracture and chest examinations.
	X-ray Apparatus (Fluoroscopy)	Composition: X-ray generator, X-ray tube unit, fluoroscopy table, TV camera and monitor with cart. Max. tube current: 600mA. Max. tube voltage: 150kV.	1	Fluoroscopy barium examination and IVP test.
	Ultrasound Diagnostic Apparatus	Scanning method: Electronic convex and linear. Display format: B Mode, M Mode, B/M Mode, Monitor: B/W Applicable probe: Linear and convex	1	General diagnosis of abdomen
	Ventilator	Applicable patient: child to adult. Mode: CMV, SIMV, SPONT Tidal volume: 50 – 1,300ml Breath rate: 6 – 40 bpm	1	Respiratory control for children and adults. Distribute in emergency section.
	Ventilator (Infant)	Applicable patients: newborn baby to infant Mode: CMV, IMV, PEEP/CPAP Inspiratory time: 0.1 – 3.0 sec. Breath rate: 5 – 120 bpm	1	Respiratory control for newborn baby to infant. Distribute in emergency section.

	Operating Table	Composition: arm rest, shoulder supports, knee crutches, X-ray cassette tray Hi-Lo adjustment: manual hydraulic type Table position adjustment: Trendelenburg, lateral tilting, back section, leg section	1	Minor surgery of all emergency patients.
	Patient Monitor	Composition: with cart, battery pack Parameter: ECG, RESP, TEMP, Non-Invasive and Saturation Monitor size: at least 6 inch Alarm setting: equipped	2	Patient observation for ECG, non-invasive blood pressure, temperature and respiration rate.
	Electrosurgical Unit	Composition: patient plate, 10 types of electrode tip, 2 types of bipolar forceps, with cart. Output mode: Cutting, coagulation and bipolar Max. output: 250W by monopolar cutting	1	Cutting, hemostatic cutting and coagulation in general surgery.
2nd stage	Dental Unit	Composition: Treatment chair, control unit, operation light, air compressor and vacuum pump, doctor's chair	4	All dental treatment. Composed of a treatment chair and instrument unit.
	Dental Panoramic X-ray Unit	<Panoramic X-ray unit> Max. tube voltage: 80kV Max. tube current: 10mA, Focal spot: 0.5-1.0mm	1	Panoramic dental arch examination.

This project will be funded by a grant aid from Japan. The project cost required by the RMI side is estimated to reach US$ 832,900. This project will be carried out in two phases; a 1st stage of 11 months and a 2nd stage of 10 months.

The cooperation target fields of the project are the facility construction of departments, centering on the Outpatient Department and the PHC, the unit that takes charge of preventive medical care. The expected achievements of this project can be outlined as follows.

- Conveniences for outpatients could be enhanced. In-hospital infection could be easily prevented by clearly separating the building for inpatients and the operation theater.
- As a core of preventive medicine, the PHC is included in the scope of the project. Measures for adult diseases could be enhanced and benefits for subjects of maternal and child health could be increased.
- The transfer of the two buildings located to the north of the existing buildings could facilitate future development for the hospital.

The suitability of this project for Grant Aid from Japan has been confirmed based on the following reasons (1) to (7):

(1) Since the Majuro Hospital is a core hospital providing the primary and secondary healthcare services in the RMI, the approximately 30,000 people living in the Majuro Atoll and its vicinity (more than 50% of the entire population in the RMI) could receive benefits.

(2) The Majuro hospital currently has facility limitations that affect the healthcare services. This project could enhance the functions of outpatient services, increasing reliability and satisfaction for residents.

(3) Special high technology will not be required in operating facilities and equipment after hand-over, and the current staff will be able to operate them. The management costs of the Majuro Hospital after the hand-over could probably be secured without difficulty, judging from the past records of budget distribution from the Ministry of Health to the Majuro Hospital.

(4) In a highly placed plan, the "15-year Strategy 2001-2015," a short term goal toward 2005 is set as facility construction, equipment installation, deployment of medical staff, etc. to improve the functions of the Majuro Hospital. From this point of view, the project could contribute to the realization of dominant assignments of the Ministry of Health in the RMI.

(5) The Ministry of Health in the RMI determines fees for examinations, hospitalizations, laboratory tests in hospitals and clinics. They are small amounts, but collected from patients. About 10% of the total annual revenue of the Majuro Hospital comes from its patients, and this project cannot be expected to yield great profits.

(6) Medical wastes in the Majuro Hospital are treated in an incinerator. Large wastes are treated as a type of general waste after sterilization. General wastewater is connected to a main underground drainage pipe located in the south side road of the site. Wastewater discharged from the laboratory tests in the Laboratory Department and the image developing process in the Radiology Department is collected. A plaster trap is set in Dental Services. These and other measures against negative effects on the environment are appropriately taken.

(7) Although the site has been leased on long-term contracts from landowners by the Government of the RMI, it has been confirmed that there would be no problem regarding the construction of this

project. Preparation of the site and removal of obstacles would not be an excessive burden for the RMI. The infrastructure is already in place, as the site is adjacent to the existing hospital. The RMI has also had experience in accepting grant aid from Japan, and no special difficulties in implementing this project as a grant aid from Japan are expected.

The Government of the RMI should work the following issues in order to make maximum use of, bring out, and maintain the effects of the facility construction and equipment procurement.

(1) Securement of Human Resources

Many of the staff are foreigners, and few Marshallese doctors and nurses are actually available. No CT operator is currently available, and one should be promptly secured (including foreign staff). The hiring of foreign staff is expected to continue. However, qualitative aspects such as technical skills and motivations should be improved, in addition to the quantitative securement of doctors and nurses.

(2) Facility and Equipment Maintenance

The Department of Building and Ground Maintenance takes the charge of facility maintenance of the Majuro Hospital. One Building and Ground Maintenance supervisor, 1 Carpenter, 1 Trade Specialist, 1 Plumber and 10 Special Workers, 14 in total, are deployed by the Department of Building and Ground Maintenance to carry out the facility inspection and daily maintenances. As for the medical equipment, 1 Filipino Biomedical Engineer and 1 local Biomedical Technician, 2 in total, are deployed by the Department of Biomedical Equipment Maintenance to carry out the equipment inspection and daily maintenances. Regular inspection notes and repair notes should be kept in order to provide effective maintenance of facilities, machines and medical equipment, and manuals should be kept to further strengthen the maintenance system. Although the ratios of facility and equipment maintenance costs differ greatly from year to year within the total hospital expenses, a certain amount should be allocated for maintenance costs each year as a fixed cost.

(3) Maternal and Child Health

Child delivery free from danger can be secured through women's health education, regular checkups for pregnant woman, and proper perinatal care. On the other hand, maternal and infant mortality can be decreased through overall maternity and child healthcare combined with infant checkups, immunization, nutrition education, family planning, etc. It will be desirable to secure privacy protection so that patients can receive medical care with ease, and to further enhance the Bureau of the Majuro Hospital and the Bureau of the PHC.

(4) Minimizing the cost of patient transfers abroad

The Majuro Hospital and Ebeye Hospital provide primary and secondary level healthcare services in the RMI. If advanced treatments reaching the third level of healthcare services are required, patients are transferred to hospitals in Hawaii, the Philippines, etc. based on the referral system. The Majuro Hospital and the Ebeye Hospital need to work together to strengthen laboratory and diagnosis functions in order to reduce the costs for patient transfers abroad. Hopefully the huge amount of money spent for patient transfers abroad could be utilized to improve inland medical care.

Contents

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1. Member List of the Study Team
2. Study Schedule
3. List of Parties Concerned in the Recipient Country
4. Minutes of Discussions

Chapter 1　BACKGROUND OF THE PROJECT

Chapter 1　BACKGROUND OF THE PROJECT

The Majuro Hospital, founded in May 1986, is one of the two national hospitals providing primary and secondary healthcare services in the Republic of the Marshall Islands (hereinafter referred to as “the RMI”). The facility is ranked as a core source of hospital-based services in the region. The growing population, increasing population density in urban areas, varied lifestyles, and various other factors in the RMI are generating a higher demand for medical services in the country. However, the facilities of the Majuro Hospital have been degraded by environmental conditions, and severe erosion of the walls and roofs caused by salt damage is now leading to extensive leakage and partial collapse. Moreover, much of the medical equipment has been utilized for longer than its intended lifetime, and this is leading to severe decreases in the quality and quantity of the health services provided. In 2002, as many as 143 patients treated at the hospital had to be transferred to Hawaii, the Philippines, etc., placing a considerable burden on the budget for health services (transport costs).

Under the “15-year Strategy 2001-2015” established by the Government of the RMI to improve the health service environment, a Project Committee for the New Majuro Hospital was organized to draw up a concrete improvement plan for the Majuro Hospital. As part of its strategy, the Government of Majura contacted the Government of Japan with a request for Grant Aid to fund facility construction and equipment supply. An outline of the requested facility construction and equipment supply is shown below.

Table 1-1 Proposed Facilities and Equipment by the Government of the RMI

Component		Facilities and equipment
Facility Construction	Construction of Building-1 (Total Floor Area 2,805 ㎡)	First Floor: Outpatient Clinics, Pharmacy, Surgical Unit, ICU, Emergency Room, Cashier Second Floor: 50 beds for Surgical Unit, etc.
	Construction of Building-2 (Total Floor Area 2,887 ㎡)	First Floor: 50 beds for maternity Second Floor: 50 beds for Physical Therapy and Pediatrics, etc.
	Construction of Utility Building	Power supply room, Generator room, Pump chamber, Laundry, Maintenance unit, etc.
	Demolition and Renovation of Existing Buildings	Renovation of Buildings A and B (Total Floor Area 1,546 ㎡) Demolition of Existing Buildings (Total Floor Area 3,800 ㎡)
Equipment Supply	Equipment	Blood Gas Analyzer, Incubator, C-arm X Ray Unit, Ambulance, Ambulance Boat, etc.

In response to the request, the Government of Japan dispatched a feasibility study team to verify the appropriateness of the Majura Hospital plan as a grant aid project in October 2001. As a result, the team confirmed: 1) that the deteriorated facilities and shortage of equipment are detrimental to the health services provided at the Majuro Hospital, and 2) that the highest priority should be placed on the recovery of the currently deteriorated facilities and replacement of deteriorated equipment, followed by an increase in the number of beds and facility expansion.

SUMMARY

Chapter 2 CONTENTS OF THE PROJECT

2 - 1 Basic Concept of the Project

2-1-1 Objectives of the Project

In FY 2000, the Ministry of Health in the RMI established a "15-year Strategy 2001-2015" for improving, promoting, and expanding basic health services. The plan sets out to achieve its long-term goals to be achieved in three separate 5-year phases. In the first 5-year plan terminating in 2005, the Majuro Hospital has set the goals of facility construction, equipment installation, deployment of medical staff, and so on.

The RMI has a population of 53,000 (in 2002); about 30,000 of the population lives in the Majuro Atoll and its vicinity. The growth rate of population in 1980s was 2.0%, and it decreased to 1.5% in 1990s. However, the population density continues to rapidly increase in the capital city, where more than half of the population already lives. According to the hospitalization records of the Majuro Hospital in 2001, child deliveries account for nearly half of the cases treated. Respiratory illnesses such as respiratory tract infections, pneumonia, and bronchitis make up the second highest portion of treated cases, accounting for about 27%. Lifestyle-related diseases such as diabetes and high-blood pressure (mainly nutritionally related) have also become a serious issue and now account for about 15% of all treated cases. Thus, the Majuro Hospital needs to improve in both quality and capacity.

The Majuro Hospital was founded in May 1986 with funding from U.S. aid. Since then, however, the buildings have been degraded by seawater, leading to leakage and partial collapse of the structures, and much of the medical equipment has been utilized for longer than its intended lifetime. This project seeks to solve those issues in order to improve the medical services now provided in Majuro Hospital, which are now degraded in both the quality and quantity. The Majuro Hospital has been working to make partial repairs, introduce new medical equipment, and employ new medical staff. However, the shortage of money at the hospital makes it difficult to deliver full-scale repairs,

maintenance, and procurement of the necessary medical equipment for the improvement of the healthcare services provided. Under the current project, the Majuro Hospital Bureau and Public Health and the Bureau of the Primary Health Care (hereinafter referred to as "the PHC") will seek to develop the various departments within the hospital, primarily those in the Outpatient Department, in order to improve the healthcare services provided.

2-1-2 Outline of the Project

The Majuro Hospital consists of nine buildings occupying a land area of about 15,000 ㎡ and comprising a floor area of about 5,700 ㎡. Crossing the Westside road, the hospital site adjoins a ground, the President's Office, and the Joint Government Buildings referred to as the "Capital and Houses of Parliament." The entire area comprising five blocks, including the site of the existing hospital and the ground, has been leased on long-term contracts from a total of fifteen landowners (three landowners for each block) since January 1982 for the construction and operation of the hospital. There will be no problem regarding the construction and renovation of buildings on the land leased (total of about 6.21 acres, 25,130 ㎡) under this project.

The hospital facilities opened in May 1986 with a capacity of 83 beds, and were renovated in 1995 to increase the capacity by 95 beds. Prefabricated construction has been adopted for the building structure, and aluminum metal panel has been utilized for the roofs and walls. The surface of the aluminum metal panels has not been adequately protected against salt damage and humidity by applying epoxy coating on the inward core of the simple paper-made structure. The surface has expanded as a result, with the emergence of erosion only a few months after the completion. The building was mended in 2001 with aid funding from Taiwan, and additional repairs have been regularly provided with funds from the RMI budget and US assistance. However, a variety of partial problems still continue to appear. With the exception of the mended parts, leaking roofs and damage of the inner walls can be seen. The Hospital Maintenance Department could repair these damages to

extend the durable lifetime for a short time only. The repairs performed by Taiwan did not significantly extend the lifetime of the structure, but rather focused on the surfaces, such as finishing materials. The original Building X, a prefabricated structure similar to the others, was destroyed by a fire in 1995, and a new Building X has been reconstructed adopting a concrete block construction.

Both the Majuro Hospital Bureau and the Bureau of the PHC collectively occupy the hospital site. The two Bureaus are different organizations in the Ministry of Health, but they are regarded as unified since they share mutually complementary jurisdictions over the area, the doctors, and the nurses. In addition, there are other buildings such as one two-storied building belonging to the Ministry of Health (the PHC, including the Reproductive Health Division, occupies the first floor) and one clinic building named Section 177 providing medical care to the people of four atolls of Bikini, Enewetak, Utirik, and Rongerik who have been affected by the U.S. nuclear tests conducted in the 20th century.

The following table outlines the layout of the existing facilities at the Majuro Hospital, with descriptions of the uses and respective areas of the facilities of the Majuro Hospital Bureau and the Bureau of the PHC.

Figure 2-1 Layout of the Existing Facilities at the Majuro Hospital

Table 2-1 Existing facilities at the Majuro Hospital

Name	Use	Area (m^2)
Building-A	Bureau of the PHC (Public Health, Health Promotion & Human Services, Dental Services, Four programs of Immunization, STD/AIDS, TB/leprosy and Chronic disease)	533
Building-B	Administration, Outpatient Clinic, Emergency Unit, Laboratory Services, Radiology, Pharmacy, Medical Records	979
Building-C	Medical Unit (27 beds), ICU (3 beds), Central Supply and Sterilizing Department	577
Building-D	Pediatric Unit (22 beds, including newborn room), Maternity Unit (20 beds)	507
Building-E	Operating Theatre, Obstetrics Unit	570
Building F	Central Storage (medicine and materials, etc.), Laundry services, Building and Ground Maintenance, Biomedical Unit (including oxygen production), Embalming Unit	713
Building-G	Surgical Unit (26 beds), Rehabilitation Unit, Medical Office, Library	979
Building-H	Food Services, Cafeteria (utilized as training rooms at present)	231
Building-X	Mortuary (including refrigerator for corpses), Mourning Room, Generator Room	260
East Corridor	Security Office	170
West Corridor		170
	Total	5,689

Source: the Majuro Hospital

The following table shows the past records of the Majuro Hospital Bureau and the Bureau of the PHC.

Table 2-2 Past Records of the Bureau of the Majuro Hospital

	FY1999	FY2000	FY2001	Average
Number of outpatients	21,957	24,484	31,437	25,959.3
Number of emergency patients	6,718	7,202	7,128	7,016.0
Total	28,675	31,686	38,565	32,957.3
Number of beds	95	95	95	95
Total number of hospitalized patients	3,990	4,036	3,342	3,789.3
-Internal	749	715	614	692.6
-Surgical	479	554	618	550.3
-Obstetric and Gynecologic	2,132	2,099	1,527	1,919.3
-Pediatric	630	668	583	627.0
Number of laboratory tests	57,680	65,150	82,756	68,528.6
Number of radiology tests	27,555	27,165	29,318	28,012.6
Number of operations	765	913	618	765.3
Number of deliveries	1,033	1,022	1,056	1,037.0

Source: the Majuro Hospital

The average number of outpatients per day in the Majuro Hospital is 103.8, and continues to rapidly increase. The number of emergency patients hovers around the 7,000 level per year, or 19.2 per day. The number of hospitalized patients is around 4,000 per year, and the number of beds, 95 in total, has remained unchanged. The number of laboratory tests and X-rays per year tends to

increase in accordance with the introduction of new equipment. The number of operations varies from 600 to 900, depending on the year, while the number of deliveries remains flat, at around 1,000 per year.

Table 2-3 Past Records of the PHC

Items	FY2000	FY2001	FY2002	Average
Outpatients in Dental Services	10,112	10,709	10,985	10,602.0
STD/HIV Prevention Program	7,263	6,335	10,635	8,077.7
Syphilis tests	2,792	2,089	4,211	3,030.7
Gonorrhea tests	610	515	840	655.0
Chlamydia tests	567	599	911	692.3
HIV Tests	3,294	3,132	4,673	3,699,7
Specific Disease Program	971	671	1,688	1,110.0
Newly enlisted tuberculosis	51	60	49	53.3
Leprosy	40	280	312	210.7
Diabetes	880	331	1,327	846.0
Reproductive Health Division	11,474	13,810	13,777	13,020.3
Maternity & Child Health Clinics	1,097 (1999)	3,530	4,006	2,877.7
Maternity examination	4,939	4,996	5,047	4,994.0
Family Planning Clinic	5,438	5,284	4,724	5,248.7
Women	4,753	4,568	4,629	4,650.0
Men	685	716	95	498.7
Immunization (case number)	4,499	3,052	9,090	5,547.0
DPT*1	1,258	902	1,556	1,238.7
Hib	731	427	1,122	760.0
OPV	995	567	1,510	1,024.0
Hep B	945	504	1,289	1,007.0
MMR*2	300	613	329	414.0
BCG	270	39	876	395.0
Programs & Seminars		37*3	40	25.7
Outer Islands traveling clinic		45*3	52	32.3

*1 DPT: diphtheria, pertussis and tetanus vaccine
*2 MMR: measles, mumps and rubella vaccine
*3 total number in FY2000 and FY 2001
Source: the PHC

Dental Services, the STD/HIV Prevention Program, the Specific Disease Program, the Reproductive Health Division, the Immunization Department, Programs & Seminars, and the Outer Islands Traveling Clinic are the core services provided through the PHC. The number of outpatients in the Dental Services has been on the rise, but it remains stable at an average of around 42.4 patients per day (250 working days per year). The STD/HIV Prevention Program carries out more than 8,000 tests per year, mainly for pregnancies, blood transfusions, and operations. The number of tests for syphilis and HIV has been increasing rapidly, and it is expected to increase even more. No statistics have been obtained on the number of patients treated under the Specific Disease Programs,

but they show the number of patients newly identified each year (excluding unproved patients). If each patient takes an examination once a month, then each would receive more than ten tests per year. The treatments for tuberculosis patients would be even more frequent, since the hospital has been adopting the DOTS method. The Reproductive Health Division has the largest number of patients, 52.1 patients per day. The Family Planning Clinic carries out fertility treatment and counseling, and about 9.5% of the patients are men.

To implement the project based on the foregoing conditions, the items described below have been proposed to the RMI side and confirmed.

- With mending and other measures, the lifetime of the existing hospital facilities could maintained for a certain period. Thus, phased extension will be desirable since the rebuilding of the whole facility all at once may impose an excessive burden.
- The Outpatient Department and the Bureau of the PHC are given priority as benefit recipients.
- Giving prior attention to women and children to receive more benefit, the Bureau of the PHC is included as an object of this project.
- Arrangements will be made to enable the Majuro Hospital staff to rebuild their existing hospital facilities independently in the future. With this in view, the Administration Departments of both the Majuro Hospital Bureau and the PHC, both of which are currently located in the existing Buildings A and B, are included in this project. A certain level of functions in the hospital could be maintained in the foreseeable future even without rebuilding.
- The ward nurses in each department concurrently hold posts in the Obstetrics and Gynecologic Unit, the Operating Theatre, the ICU, etc. Accordingly, those departments and the Central Supply and Sterilizing Department shall be excluded from this project, in accordance with the intentions of the Marshall side.

The RMI side has agreed on the contents of this project to extend the buildings while maintaining the existing ones. The departments listed below basically consist of the departments concerned with outpatients. Those departments are located in the existing Buildings A and B, and will be transformed to the extended parts.

- Outpatient Clinic (including Ophthalmology and ENT)
- Emergency Unit
- Laboratory Services
- Radiology
- Pharmacy
- Medical Records
- Administration
- Dental Services
- Public Health (including the Reproductive Health Division)
- Health Promotion & Human Services
- PHC Administration Unit

The implementation of this project is expect to result in the following improvements at Majuro Hospital:

- By establishing waiting areas (154 ㎡) for the exclusive use of outpatients, the current condition (blocked passages, patients forced to wait for long periods in the corridors) could be improved.
- By establishing "examination corridors" interconnecting the treatment rooms in the Outpatient Department and Public Health Division (currently separated) for staff use, organized utilization of staff and medical equipment could be realized.
- By installing one more examination chair in the Dentistry Department, the waiting hours of patients could be shortened, and longer hours could be devoted to patient examination and treatment.

- The current 159 ㎡ floor area in the Laboratory Department will be expanded to 210 ㎡ to improve the narrow and overcrowded space. The efficiency and safety of the laboratory tests could be enhanced by dividing the Laboratory Department into three units: Hematology & Biochemistry Laboratory, Microbiology Laboratory, and Pathology & Cytology Laboratory.
- By establishing the Observation Room in the Emergency Department, nurses could monitor the progress of plural numbers of patients inside the Emergency Department.
- By developing facilities and equipment, the number of patients transferred outside the country for tests could be decreased, as some of the laboratory test not currently available in the RMI would become possible to implement.
- By introducing new equipment, diagnoses currently beyond the technical capabilities of the hospital, for example, ultrasound diagnostic examination for the abdomen and urinogenital tract, respiratory control care by ventilator, and dental arch diagnosis by dental panorama X-ray could become possible to implement.
- By establishing an operation corridor for the exclusive use of radiologists in the Radiology Department, the doses of radiation exposed to the radiologists could be minimized.

Furthermore, since this project will transfer all the departments currently located in the existing Buildings A and B, reconstruction or renovation of the Buildings A and B could be easily done if the RMI side expands the hospital in the future, and future development could be performed without difficulties. A certain level of hospital function could be maintained in the foreseeable future even without the development. As for the equipment, medical equipment will be set and maintained at the extended buildings, and the medical and maintenance staff will be given training for operations and daily inspections. By completing these plans, the functions of medical services should be recovered and reinforced.

2 - 2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

1) Assistance Scale and Grade Planning

At the present condition, the facilities of the Majuro Hospital have been degraded by salt damage, leading to leakage and partial collapse of the roofs and walls. The quality and quantity of health services provided there have declined as a consequence of the aging medical equipment, much of which remains in use well past its intended lifetime. Under the circumstances, the recovery of functions within the Majuro Hospital and improvements in the medical services make suitable objectives of this project.

Originally, the RMI side requested reconstruction of the whole hospital. However, a rapid expansion of the scale of the hospital could impose larger burden on running costs and interfere with the hospital administration. Such problems could potentially hinder a continuous project effect, as many of the medical staff from abroad are hired on 2-year contracts and the costs for facilities and equipment maintenance would be inordinately high for an island country with such a small population. Thus, the phased expansion of the hospital has been deemed a more appropriate option, and the project has been planned within a range that the RMI side can manage.

The departments targeted by the project have been selected in accordance with the following policies.

- The Outpatient Department, Emergency Department, Laboratory Department, and Radiology Department manage many of the patients, and additional hospital functions not directly related to patient management increase their workloads considerably. If the good functioning order of those departments declines, their diagnostic abilities would decline as well, leading to an increase in the number of patients transferred abroad. Therefore, those

departments will be prioritized in the project.

- The Primary Health Care (hereinafter referred to as "the PHC") provides maternal and child healthcare, specific disease programs, immunization, dental services, measures against lifestyle-related diseases, a mobile clinic servicing the outer islands, etc. The PHC has been included as a target of the project since it provides measures against lifestyle-related diseases such as diabetes, hypertension, heart disease, etc., and contributes to the health of children and mothers.
- The wards mostly have patient rooms accommodating four people (8.7 ㎡ per patient), with a certain amount of space secured. The plan focuses exclusively on the Outpatient Department, as it has considerably less space.
- The Operating Theatre, Obstetrics, and ICU have been excluded from the project targets, as required by the RMI side. The nurses in these areas hold concurrent posts in the hospital wards, hence they cannot be deployed at too great a distance from the wards.
- All of the departments that provide care to patients are located on the first floor. The installation of elevators is undesirable in view of the maintenance costs and slower response to emergencies. Ramps are undesirable in view of the space and workloads. Originally, the Marshall side requested that the buildings be converted into two-story structures. However, installing elevators is not desirable since that would make it impossible to provide emergency response for 24 hours in the RMI. The RMI has also requested the installation instead of elevators to make the buildings two-story structures. However many of the nurses who convey patients and many of the assistants who carry food and laundry are women who would possibly be forced to bear an extra workload from walking up and down such ramps. Thus, almost all the buildings have been planned as one-story structures. The exceptions are the administration offices of the Majuro Hospital Bureau and the Bureau of the PHC, both of which will be located on the second floors of structures.
- If the Administration Department is included in the project, all of the departments located in

the existing Building A and B will be covered. As a result, those buildings could be utilized for other purposes or renovated as new buildings to facilitate future development. Thus, the Administration Department has been included as a project target. The administration departments that do not provide medical care to patients are located on the second floor due to limitations in the site area.

- Facilities are given an appropriate grade and scale for hospital administration and maintenance.
- In addition, the Annex Buildings will have rigid structures to secure the role of the hospital as a stronghold of the RMI in time of disaster.

2) Basic Policy for Determining Medical Equipment

Replacements of deteriorated medical equipment will enhance the function of the Majuro Hospital Bureau and the Bureau of the PHC. The main target includes the Radiology, Emergency, Outpatient and Dental Services departments. The range of required equipment has been determined in accordance with the following criteria reflecting the scale of the Annex Buildings and the operational conditions of the existing equipment.

① The departments to be located in the Annex Buildings will be the target of the project.

② Giving priority to the facility construction, the range of procured equipment will be kept to a minimum. In comparison with facility construction, the procurement of equipment can be accommodated through self-help efforts.

③ Equipment will be covered in cases where transferring the existing equipment is problematic and installation work is required.

④ Equipment will be covered in cases where a direct project effect on medical care services can be provided, and project objectives can be effectively achieved.

Several guidelines will be consulted to determine whether to include items within the scope of the project, as well as the planning quantities and specifications. These guidelines include the following "Criteria for Deletion" and lists drawn up in three categories, i.e., "Replacing equipment," "Supplementing equipment," and "Newly introducing equipment," based on the list of required equipment drafted by the RMI side. In determining whether or not to install new equipment, the project team has individually considered the need for increasing medical staff, the cost for operation and maintenance, the frequency of use, and the effects on medical functions.

Table 2-4 Criteria for Deletion

Usage	Equipment for intended for the personal use of hospital staff.
	Equipment for academic research only (not medical care)
	Equipment not yet established to be valid from a medical perspective
Demands	Equipment of more than the minimal quantity (inefficient and overlapping equipment)
	Equipment that can be covered by efficient use of the existing equipment
	Equipment that has low positive cost-effectiveness
	Equipment that has high negative cost-effectiveness
	Equipment that has limited efficiency in conferring benefit
Level of technologies	Equipment too technically sophisticated for the current staff to handle
Administrative/ maintenance	Equipment that requires spare parts and expendable materials that are hard to obtain
	Equipment that cannot be maintained with outsourcing at the objective hospital

Table 2-5 Criteria for Replacing, Supplementing and Newly Introducing Equipment

Replacing equipment	Equipment that has been introduced at least eight years ago and is now old or out of date, and is to be supplied two to three years from the end of the basic design study.
Supplementing equipment	Equipment that hindering activities due to quantitative and/or qualitative inadequateness
Newly introducing equipment	Equipment that will strengthen the medical functions provided at the hospital without imposing technical or financial problems in operation and maintenance, and as a consequence is judged to have high beneficial effects, even though it may not be currently available

(2) Policy on Natural Conditions

1) Building Plan

The RMI has a tropical oceanic climate, high temperature and high humidity. Trade winds blow from east or northeast, and there are occasions when the wind generated from tropical depressions

blows strongly. Reflecting the weather conditions, eaves will be set to avoid direct sunlight and driving rain. With consideration for the basement bearing strength, the building basement will be located as shallow as possible from the ground surface to be free from the influence of water level variations caused by rising and falling of tide levels. Air-conditioning facilities will be basically installed throughout the buildings to improve their livability. The buildings will have a rigid and enduring structure since the hospital will be a stronghold of medical activities with the Ebeye Hospital at a time of disaster in the RMI. As no building laws or codes are enforced in the RMI, the construction will be based on Japanese and/or the U.S. building laws and codes.

2) Medical Equipment Plan

With respect to the equipment materials, stainless steel and reinforced plastic will be proposed taking the effects of salt damage and high humidity into account. Equipment susceptible to adverse effects from high temperatures will be located in rooms that are well ventilated and air conditioned.

(3) Policy on Social Conditions

1) Building Plan

No prominent architectural styles can be seen in the RMI. Many of the buildings are one or two storied, and even general houses are provided with air-condition facilities due to the hot tropical climate. As of 2003, only four buildings in the country are taller than four stories. Elevators are installed in multilevel buildings, but some of them are out of service. Installing elevators in hospitals is deemed improper since maintenance services can only be provided by maintenance agencies in distant Hawaii and Guam. This drives up expenses and makes it quite impossible to establish an emergency maintenance system with a 24-hour response capability, etc.

Many of the buildings have principle structures made of timber structure or reinforced concrete structures combined with concrete blocks. This project basically adopts the general structure as well: a reinforced concrete rigid frame with concrete-block-based steel panels for external walls resistant to saltwater and rust. A weight saving system with heat-insulating materials and

waterproof sheets will be adopted for the roof to ensure good durability and easily managed maintenance in the future.

2) Medical Equipment Plan

The equipment running costs have been increasing in accordance with the increasing amount of equipment owned and the automation of tests. For this reason, the hospital is introducing a system to collect additional revenues from patients receiving expensive tests, to supplement the revenue already paid by the patients under the current system. This project will be planned within a range that will not significantly increase the operating and maintenance budget.

(4) Policy on Construction and Procurement Conditions

1) Building Plan

Construction projects are rarely carried out in the RMI owing to the scale of the country. Since the worker skills in the field of construction cannot reach a sufficient level, foreign skilled workers, engineers, and supervisors have to be brought in for projects that require a certain level of quality. This project will also require Japanese supervision. The complexity and difficulty of arrangements will be avoided as much as possible by adopting a simple and rigid construction. Flow control of construction will be especially important, as many of the construction materials will be imported. Adequate quality inspections and stock control for the materials will also be essential. Application procedures to acquire permissions for building, etc., will not be necessary before commencing the construction. However, there is a duty to give a notification to the Capital Investment Project (CIP) of the Ministry of Public Works and Environment Protection Authority (EPA) for a public construction work.

2) Medical Equipment Plan

As the RMI does not manufacture medical instruments or equipment, it relies entirely on imports from neighboring countries, Japan, and the U.S. The required equipment is manufactured by a

number of Japanese manufacturers, and there are shipping services that travel at regular intervals from Japan to the RMI. Thus, there will be no problem with using Japanese products in the scheme for Japan's grant aid system. However, many of the Japanese products have no history of sale in the RMI, hence no distributor or agent networks have been established in the country. In cases where product prices are extremely high or it will not be possible to build agent networks in the future, equipment and material will be procured from countries other than Japan and the RMI.

(5) Policy on Practical Use of Local Contractors

1) Building Plan

Among the very few domestic construction companies in the RMI, only one company can be referred to as a major domestic construction company. Having the experience of Japan Grant Aid, the company carries out not only construction works but also civil works. It owns a variety of construction machines, including heavy machines, welding machines such as concrete batcher plants, paving asphalt plants, aggregate crusher plants, vibrators, etc. Though this company can procure almost all the necessary construction machines at the site, it may still be necessary to instruct the company on the Japanese approach to management, as it may lack multidisciplinary skills or appropriate consciousness on matters of quality and safety. Japanese supervisors need to be dispatched for the construction, as the number skilled local workers will be limited. Nonetheless, it will still be important to make the maximum use of the local agencies during certain phases of the project.

2) Medical Equipment Plan

Since there is no distributor for medical equipment in the RMI, there is no way to utilize local distributors. The Majuro Hospital purchases consumables and has after-sales service provided by distributors in Hawaii, Guam, the U.S. mainland, Australia, and other countries. Communication with those distributors is possible in English, and there are no problems in the current system.

(6) Policy on Operation and Maintenance Abilities of Execution Organization

1) Building Plan

One Building and Ground Maintenance supervisor, 1 Carpenter, 1 Trade specialist, 1 Plumber and 10 Special Workers, 14 in total, are deployed by the Department of Building and Ground Maintenance of the Majuro Hospital. One Biomedical Engineer and 1 local Biomedical Technician, 2 in total, are deployed by the Department of Biomedical Equipment Maintenance. These staff members are in the charge of facility and equipment maintenance used for facility management, inspection, and daily maintenance. Large-scale renovations and extensions are planned and executed by the Ministry of Public Works and local construction companies. The current maintenance staff manages the existing facilities properly.

In this project, the facilities will be within the range that can be technically maintained by the current staff using cost-effective equipment for maintenance. The facility plan will target low running costs with regard to the hospital budget mainly funded from the budget of the Ministry of Health.

2) Medical Equipment Plan

Employing biomedical engineers for medical equipment maintenance from overseas, the Majuro Hospital handles maintenance of general medical equipment on its own. However, the hospital relies on distributors in neighboring countries for the maintenance of X-ray units, laboratory analyzers, and other equipment. In order not to increase the maintenance costs for the maintenance consigned to overseas distributors, this project will retrain personnel and strengthen operations and daily maintenance training after the procured equipment is installed.

Generally, many of the current equipment breakdowns have been caused by human error, erroneous operation, and/or failure to conduct daily maintenance. In order to avoid these problems, the operation and daily maintenance training provided by suppliers to physicians, nurses, and maintenance personnel will be extended. Re-training will also be provided with respect to general

operation after the equipment has been installed, in order to transfer proper knowledge on the methods for carrying out operation and daily maintenance and other aspects, with the aim of eliminating problems with the startup operation. Re-training will be provided for treatment and diagnostic equipment, where startup operation problems are especially likely to occur.

(7) Policy on Gradation of Building and Equipment

1) Building Plan

Referring to the existing buildings, the extending buildings will have an appropriate grade to avoid being an excessive burden technically and economically over the future management and maintenance carried out by the Majuro Hospital. As a core hospital, the buildings will have a rigid structure, since the hospital will be a stronghold of medical activities among the two hospitals in the RMI at times of disaster.

As for the facility maintenance performed by the 14 maintenance staff deployed at the Majuro Hospital, the selection of construction materials will be based on factors such as ease of repair work, ease of updating and exchanging at the site. The materials will be of a widely obtainable, saltwater-resistant variety, and the construction methods will also be commonly known types that can be performed at the site without specialized skills. The designs for electrical and mechanical equipment and facilities should be based on ease of maintenance and operation, as well as endurance against saltwater.

2) Medical Equipment Plan

Diagnostic functions will be strengthened through the introduction of laboratory analyzers, diagnostic imaging devices and endoscopes. This equipment will be used concurrently with primary and secondary healthcare services, but sophisticated disease treatments for cardiovascular diseases, cerebral diseases, etc., will not be performed at the Majuro Hospital. The project equipment grades will be primarily aimed at providing the primary and secondary healthcare, and designed to support future planning by the RMI. The equipment specifications will be tailored to the technical

level of the medical staff. In order to minimize the burden of operation and maintenance costs, equipment requiring lower-priced consumable items will take precedence.

(8) Policy on Methods for Construction, Procurement and Schedule

1) Building Plan

Many of the construction materials, including building frames and finishing materials, are dependent on imports, and the construction method should be one that can be managed by local techniques in full consideration for future maintenance, etc. Thoughtful preparation for temporary works, personnel schedules, sea shipment schedules, and construction schedules will be essential in procuring materials. The construction schedule should have a margin, especially for the underbed curing during the finishing stages, as the site is subject to heavy rainfalls throughout the year. As for the procurement of aggregates used at the time of establishing building frames, the project will require an early preparatory procurement plan allotting enough time for washing out the salt component in water. Construction materials should be resistant against rapid deteriorations such as rust caused by saltwater, mold caused by humidity, etc. A moisture-free construction method will be adopted for finishing works. Procurement of materials and equipment will largely affect the construction schedule since most of the construction materials will be imported. Thus, quantities of planned and existing materials and equipment should be checked from time to time to avoid the delay caused by shortages. This project is executed through two stages of a single fiscal year base.

2) Medical Equipment Plan

Installation schedules for the equipment that requires installation work such as radiology equipment, operating lights, and dental equipment will be arranged in accordance with the overall construction schedule. As existing equipment will be moved by the RMI side after completion of the Annex Buildings, attention will be given to assure the space to locate the project equipment and transport routes for existing equipment.

2-2-2 Basic Plan

(1) Site Plan

The site of this project is about 5,500 ㎡, including the adjoining west side road and grounds. The site is mostly flat, and there are houses at the north and south sides, and open space to the east lying between the site and the outer sea about a 100 meters away. Though part of the ground will be used for this project, a space will also be secured for softball. The site preparation, including removal of the road, will be undertaken by the RMI. The project team has confirmed with concerning authorities that the infrastructure for water supply/drainage, electricity, etc., will be branched off from the existing facilities, so there will be no problem with this matter. The rainwater pipe (underground) set at the south side of the site from the Capital buildings will be relocated by the RMI side.

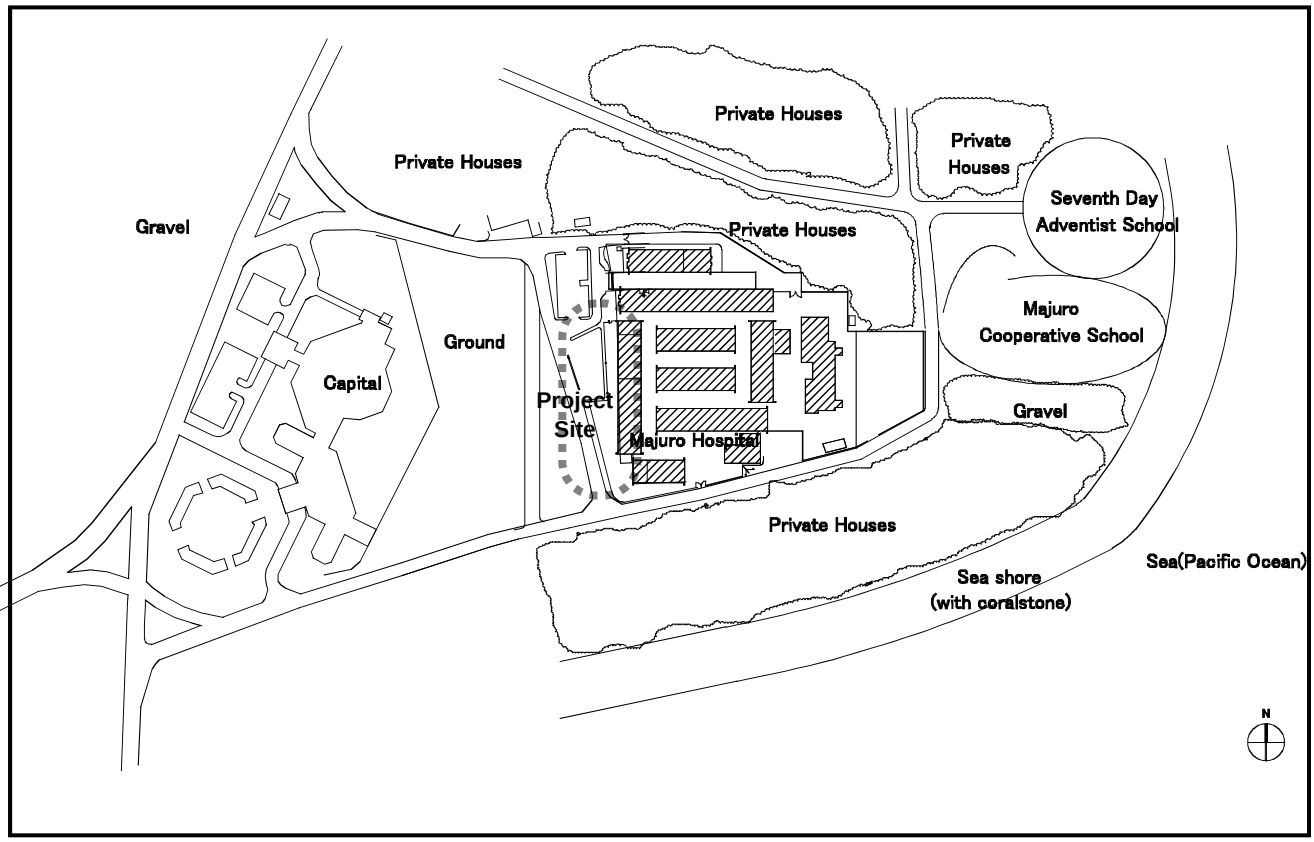


Figure 2-2 The Official Leased Site and Construction Site

The site is a rectangle: 50 meters from east to west, and 110 meters from south to north, with a land area of about 5,500 ㎡. The east side adjoins the existing hospital, and the west side adjoins the ground. There are two approaching roads at the north and south sides. The north side road (8.7

meter width) directly connected to the existing entrance is used as a main approach road, and the south side road (6.7 meter width) is used as a sub-main approach road. This project will also use the north side road as a main road. The road located at the east side of the hospital will be cleared by the RMI side. At present, this road simply connects the north side road and south side road, and its removal will not affect the surrounding residents.

Mostly one-story buildings (partly two-storied) are planned in order to avoid the strong direct sunlight. Only the Administration Departments will utilize a second floor, and the departments involved in patient treatment will utilize the first floors only. Smooth flow lines of outpatients, emergency patients, medical staff, etc., will be arranged in the facility layouts. The departments treating inpatients at the existing hospital will be connected to the existing building by connecting corridors.

The Annex Buildings will be arranged as Building 1 accommodating the first group, Building 2 accommodating the second group, and Building 3 accommodating the third group. The first group consists of Reception (the first place patients visit), the Cashier, the Medical Records Room, the Pharmacy (the last place patients visit), and Dentistry Department. These departments belong to the Bureau of the PHC, where many of the patients have little direct connection to each other. The second group consists of the Outpatient Department, including the Ophthalmology Department and ENT, and the Public Health Division established under the Bureau of the PHC. The third group consists of the Radiology Department, the Laboratory (that must be adjoined to the Emergency Department), and the Reproductive Health Division (that requires the protection of privacy). The Hospital Administration will be arranged in the second floor of Building 1. Those buildings will be linked by connecting corridors, and Building 3 will be linked to the existing building by a connecting corridor. Utilities such as generator room, pumping machine room, water tank, transmitted electricity receiving room, and others will be arranged at the south side.

(2) Building Plan

1) Floor plan

① Departmental scheme

Required rooms for each department are determined based on past records of the Majuro Hospital Bureau and the Bureau of the PHC from the fiscal years 2000 to 2002 (3 years), factoring in the expected population growth rate in the RMI over the decade (2016) commencing from the completion of facilities. The population growth rate is assumed to be 1.5% (actual value) based on "Population Census and Housing Data Dissemination Workshop, Analysis Report" reported by a joint project team consisting of the Asian Development Bank, National Statistics Office (NSO) and National Census Steering Committee (NCSS) in February 2000.

i Outpatient Department

The Outpatient Department in the Majuro Hospital is composed of a general outpatient section and a specialized outpatient section. The first section belongs to the Outpatient Department of the Bureau of the Majuro Hospital, and handles the functions of internal medicine, surgery, maternity treatment, etc. The second section belongs to the Public Health Division and Dentistry Division in the PHC and handles the treatment of STDs/HIV, lifestyle-related diseases such as diabetes and hypertension, family planning, the treatment of tuberculosis/leprosy, the Prenatal and Postpartum Clinic, the Dentistry Department, etc.

Patients entering the Outpatient Department in the Majuro Hospital first go to the reception and then pay their medical fees (US$5.00 for patients with medical insurance, US$17.00 for the uninsured). A file for medical records is prepared at the patients' first visits, and accessed at upon each subsequent visit. Patients go to the Preclinic at the first, second, and subsequent visits. Patients of the PHC, including the Dentistry Department, move with the same flow. Medical records of the PHC patients are stored in the medical records storage area in the Majuro Hospital as well, with the exception of patients visiting the Dentistry Department. At

the Preclinic, nurses interview the patients to ascertain their symptoms, sort them on that basis, and then measure their heights, weights, and blood pressures. After the Preclinic, patients wait in front of the examination rooms directed by the nurses. Open hours in the Outpatient Department in the Bureau are from 8:00 to 12:00 a.m. and 1:00 to 5:00 p.m., Monday to Friday. Patients requiring laboratory work or X-rays are sent to the respective departments. The patients prescribed medicines go to the Pharmacy and receive them to complete the course of circulation. The fees for laboratory and X-ray examinations are included in the medical fees. The number of patients treated in the Outpatient Department of the Hospital Bureau are listed below.

Table 2-6 Number of the Outpatients in the Hospital Bureau

	FY 2000*1	FY 2001	FY 2002	FY'00-'02 Average
Preclinic *2	14,758	15,537	21,801	17,365.3
Internal Medicine	7,337	13,197	25,873	15,469.0
Surgery	1,844	2,321	2,323	2,162.7
Maternity *2	4,111	5,248	5,023	4,794.0

Source: the Majuro Hospital

*1: The fiscal year in the RMI runs from October to September of the next year. Hence, FY2001 runs from October 2001 to September 2002.

*2: Statistics for the Preclinic and Maternity Room are not yet available. Data FY1999 to FY2001 is used.

The basis for determining the number of examination rooms in the Outpatient Department in the Majuro Hospital Bureau is as follows. The number of examination rooms is derived from the number of patients in each unit (i.e., the Preclinic, Internal Medicine(including pediatrics), Surgical Theater, and Maternity). As a result, two rooms for the Preclinic, five rooms for Internal Medicine, one room for Surgery, two rooms for Maternity, plus one additional room for the ultrasound come to a total of nine examination rooms. As there are currently nine examination rooms, this number deemed suitable for the current numbers of doctors, nurses, and medical apparatuses. Five other required rooms, i.e., reception, the waiting room, the staff room, the treatment room, and the staff lavatory, will be established. The Ophthalmology and ENT area rooms will each have one examination room and one treatment room, with shares rooms for reception, waiting, and storage (since they currently posses medical equipment and are recruiting doctors).

Table 2-7 Calculating the Number of Rooms in the Outpatient Department of the Bureau of the Majuro Hospital

	Average number of outpatients per year A	Average number of outpatients per day B	Predicted number of outpatients per day C	Average time of examination (minutes) D	Average number of patients per room E	Calculation for the examination room C÷E	Calculated number of examination rooms	Requested number of examination rooms	Current number of examination rooms
Preclinic	17,365.3	69.5	89.5	10	48.0	1.9	2	2	2
Internal	15,469.0	61.9	79.7	25	19.2	4.2	5	6	6
Surgery	2,162.7	8.7	10.7	30	16.0	0.7	1	2	1
Maternity	4,794.0	19.2	24.7	35	13.7	1.8	2	3	2

A: average number of outpatients per year from FY2000 to FY2002

B: 250 working days for outpatient care (excluding Saturdays, Sundays and holidays) B=A÷250

C: predicted number of patients in 2016, ten years after the takeover, derived from the growth rate of population in the RMI (1.2880 times)

D: examination time per patient set at 10 minutes in the Preclinic, 25 minutes in the Internal Medicine Ward, 30 minutes in Surgery, and 35 minutes in Maternity (based on data collected through hearings and measured values).

E: number of patients per room 8:00-12:00 a.m. and 1:00-5:00 p.m., 8 hours /day in total
E=(8 hours × 60 minutes) ÷ average time of examination (D)

ii Bureau of the PHC

Patients regularly visit two departments in the Bureau of the PHC, i.e., the Public Health Division and Dental Services. The Public Health Division is composed of the Division of Reproductive Health Services and the Division of Public Health. The Division of Health Promotion & Human Services and an Outer Islands Traveling Clinic run by educators providing information on nutrition and health promotion are also operating.

The Division of Public Health is in charge of STD/HIV Prevention Program, Tuberculosis/Leprosy Control, the Program to Prevent Lifestyle-Related Diseases such as Diabetes, and the Immunization Program. The Reproductive Health Division is in charge of the Prenatal and Postpartum Clinic, the Maternity Ward, the Child Health Clinic, and the Family Planning Clinic. The working hours of each division in the Public Health Division differ from day to day, and from morning and evening. None of the activities for the Outer Islands Health Services are offered on Friday afternoons. The working hours of Dental Services are similar to those of the Majuro Hospital.

The table below shows the weekly schedule of the Primary Health Division in the Bureau of the PHC. (For records on PHC activities, refer to “2-1-2 Project Outline”.)

Table 2-8 Weekly Schedule of the Primary Health

Time	MON.	TUE.	WED.	THU.	FRI.
9:00-12:00 a.m.	Diabetes Clinic (3) Diabetes Gangrene (1) STD/HIV (1)	STD/HIV (1)	Hypertension (1) STD/HIV (1)	Healthy Baby Clinic (3) STD/HIV (1)	Hypertension (2) Immunization (2) STD/HIV (1)
1:00-5:00 p.m.	TB/Leprosy (2) STD Follow (1)	Physical Exam (3) TB/Leprosy (1)	Physical Exam (2) High Risk Pediatrics (2)	Physical Exam (2) TB/Leprosy (1)	None, for the visits to outreach Islands (0)
Required Number of rooms	5	4	4	4	5

Source: Bureau of the PHC
( ) indicates the number of clinics

The required numbers of rooms are derived from the weekly schedule and average number of patients treated in the Public Health Division.

Though the weekly schedule shows a maximum of five required, the disinfections for patients in the Diabetes Gangrene Division are performed in the general examination room. Thus, four rooms, the same number of rooms as present, will be adequate for these services.

The Diabetes Clinics open only three times a week. If the 846 registered patients visit once every two months, or six times in a year, the number of patients per week will be about 100, hence three clinics will be required.

One STD/HIV Clinic opens every workday, serving an average of 32 patients per day. Though most of the patients visit to take tests, one room should be secured for the privacy of patients diagnosed as positive.

The TB/Leprosy Clinics open three times (a total of 4 clinics) per week. If 88 tuberculosis patients visit the clinic at least once a week to take tests and medications according to the DOTS (Directly Observed Treatment, Short-Course) protocol, a TB control strategy recommended by the WHO, the total number of patients per clinic will be 22. If 296 Leprosy patients visit the clinic once a month to take confirmation medication, the number of patients per clinic will total 18.5. Adding up both types of patients, the final total could come to a 40.5 per clinic.

The Physical Exam Division opens three times weekly (a total of 7 clinics) for students, workers, etc. If half of the population of about 24,000 in the Majuro Atoll take the examination once a

year, the total number of patients can be calculated as (24,000 x 50% x 12 months ÷ 4 weeks ÷ 7 clinics) = 36. As a result, one room would be required per clinic.

The Healthy Baby Clinic opens three clinics (once a week). If about 1,000 babies born in the Majuro Hospital take four examinations per year, the total number of babies per clinic will be 28.

As summarized above, the four rooms in the Public Health Division should be adequate for the reasons that the four rooms of clinics calculated from the weekly schedule and the number of clinic rooms calculated from the average annual number of patients.

The basis to calculate the required number of rooms for the Reproductive Health Division is described as follows. There will be four examination rooms, reflecting the number of patients. One of the four rooms will be for men. These numbers, three rooms for women and one room for men, is unchanged from the present and can be handled by the current numbers of doctors and nurses. The additionally required rooms will be Reception, Men and Women Waiting Rooms, the Patient Lavatory, the Office, the Storage room, and the Director's Office (as in the current condition).

Table 2-9 Calculating the Number of Rooms in the Reproductive Health Division

	Average number of patients per year A	Average number of patients per day B	Predicted number of patients per day C	Average time of examination (minutes) D	Average number of treated patients per room E	Calculation for examination room C÷E	Calculated number of examination rooms	Requested number of examination rooms	Current number of examination rooms
Repro-ductive Health	8,044.7	32.2	41.5	40	12	3.4	4	4	4

A: average number of outpatients per year from FY2000 to FY2002
B: 250 working days for outpatients (excluding Saturdays, Sundays and holidays) B=A÷250
C: predicted number of patients in 2016, ten years after the takeover, derived from the growth rate of population in the RMI (1.2880 times)
D: examination time per patient set at 40 minutes, including dressing time
E: number of patients per room 8:00-12:00 a.m. and 1:00-5:00 p.m., 8 hours /day total
E=(8 hours × 60 minutes) ÷ average time of examination (D)

There will be 6 treatment chairs in the Division of Dental Services, calculated from the number of patients. Though this is one larger than the current number, it can be sufficiently handled since two persons currently studying at the Department of Dental Therapy in the Fiji School of Medicine will be back in 2004. The other required rooms are Reception, the Waiting Room,

the Dental Laboratory, the Panoramic X-ray Room, the Director's Office, the Staff Room, the Staff Lavatory, and the Dental Chart Storage and Compressor Room. The treatment time (time until the time next patient comes in) is set between 45 to 50 minutes, somewhat longer than in Japan, for the following reasons.

a Seventy percent of the patients are emergency cases who require fairly long treatments.

b Many of the patients are from isolated islands or distant places and cannot visit frequently, hence they require full treatment during single visits, rather than multiple, shorter visits requiring less time.

c X-rays are taken before the patients are directly examined and treated (15 minutes from exposure to image development).

Table 2-10 Calculating the Number of Rooms in the Department of Dental Services

	Average number of patients per year A	Average number of patients per day B	Predicted number of patients per day C	Average time of examination (minutes) D	Average number of treated patients per room E	Calculation for examination room C÷E	Calculated number of examination rooms	Requested number of examination rooms	Current number of examination rooms
Dental Services	10,602.0	42.4	54.6	45-50	10.7-9.6	5.1-5.7	6	6	5

A: average number of outpatients per year from FY2000 to FY2002
B: 250 days of working day of outpatients (excluding Saturdays, Sundays and holidays) B=A÷250
C: predicted number of patients in 2016, ten years after the takeover, derived from the growth rate of population in the RMI (1.2880 times)
D: treatment time per patient set at 45 to 50 minutes
E: number of patients per room 8:00-12:00 a.m. and 1:00-5:00 p.m., 8 hours /day in total
E=(8 hours × 60 minutes) ÷ average time of examination (D)

The Health Promotion & Human Services will have a Multipurpose Room with a capacity of 15 persons, including a kitchen facility to conduct nutrition and diet guidance. Additional rooms will be provided for Nutritional Guidance, Guidance with Media, a room for editing publicity videos, etc., an office for health promotion (manned by social workers), and other functions.

The Health Promotion & Human Services will conduct (1) nutrition education, promotion of breast-feeding, exercising and dieting therapies for diabetic patients; (2) health promotion through seminars, TV, newspapers, radio, etc.; (3) alcohol and suicide prevention, mental healthcare, consultation on social security. The nutrition education and seminars will be conducted periodically in the Multipurpose Room.

iii Emergency Department

One doctor (either an obstetrician or gynecologist) will remain on duty for each of three 8-hour shifts per day. The number of patients per department remains flat through the year, at around 7,000. Many patients with heart disease and accident victims visit the department (including patients with external injuries caused by traffic accidents, alcohol-related mishaps, etc.).

The number of patients is shown below.

Table 2-11 The Number of Emergency Patients

	FY1999	FY 2000	FY 2001	Average
Emergency	6,718	7,202	7,128	7,016.0

Source: the Majuro Hospital

Three rooms, the same as the current number, will be adequate for the department, assuming the projected numbers in the following table are accurate. The department will retain the ability to treat plural cases with accident-related injuries at the same time.

Table 2-12 Calculating the Number of Rooms in the Emergency Department

	Average number of patients per year A	Average number of patients per day B	Number of patients at the peak time C	Predicted number of patients at the peak time D	Average treatment time (minutes) E	Average number of treated patients per room F	Calculation for treatment room E÷E	Number of required treatment rooms	Requested number of treatment rooms	Current number of treatment rooms
Treatment Rooms	7,016.0	19.2	13.4	17.3	45	8.0	2.2	3	4	3

A: average number of emergency patients per year from FY1999 to FY2001
B: working days of the Emergency Department B＝A÷365
C: assuming 70% of patients visit at the peak time, 9:00 a.m. - 3:00 p.m.
D: predicted number of patients in 2016, ten years later from taking over, derived from the growth rate of population in the RMI (1.2880 times)
E: set the treatment time per patient for 45 minutes including preparation and cleaning
F: supposition within the peak time (6 hours×60 minutes)÷45 minutes per person=8.0 persons per room

If the number of patients requiring temporary care in the observation room takes up about 20% of all heart disease patients and accidental injuries (caused by traffic accidents, etc.), then the required number of beds is calculated as three, since the average number of days per stay is assumed to be one half (0.5 day). Many of the patients are taken to the department in the night time and discharged the next morning, or taken in the morning and discharged on the same day.

Table 2-13 Calculating the Number of Beds in the Observation Room of the Emergency Department

	Average number of emergency patients per year A	Average number of emergency patients per day B	Predicted number of patients per day C	Average number of patients need to be observed D	Average number of days of patients' stay E	Calculation for the number of beds in the observation room F	Calculated number of beds in the observation room	Requested number of beds in the observation room	Current number of beds in the observation room
Observation room	7,016.0	19.2	24.7	4.9	0.5	2.5	3	4	0

A: average number of emergency patients per year from FY1995 to FY1999
B: working days of Emergency Department B＝A÷365
C: predicted number of patients in 2016, ten years after the takeover, derived from the growth rate of population in the RMI (1.2880 times)
D: the number of patients requiring observation per day = C×20%
E: set the average length of stay to one-half day
E: calculation for the number of beds in the observation room = D×E

The other rooms to be established in the Emergency Department will be the Reception (operated for 24 hours; combined with a nurse station and staff room), a Waiting Hall (with adequate capacity for a deluge of patients at times of disaster), a Doctors' Duty Room (an anteroom for doctors on duty), a Minor Surgery Room (same as the current one), a Preparation Room, a Sterilizing Room, a Utility Room, a Patients' Lavatory, a Staff's Lavatory, etc.

iv Laboratory Department

The table below lists the number of laboratory tests carried out in the Laboratory Department.

Table 2-14 Number of Laboratory Tests

	FY1998	FY 1999	FY 2000	FY 2001	FY 2002	Average
Number of laboratory tests	47,066	57,690	65,150	82,756	124,062	75,344.8

Source: the Majuro Hospital

The number of laboratory tests has been increasing with each passing year, particularly in FY2002. The increase is due to the increased number of test items following the introductions of a biochemical analyzer, an immunoassay analyzer, a hemacytometer, etc., as well as the reduced time required to conduct the tests.

The department is currently in a saturated state as the number of apparatus increased. The pathology laboratory, hematology laboratory, biochemistry laboratory, and microbiology laboratory are squeezed into one room, with peninsular-shaped laboratory tables separating all areas (except the pathology laboratory).

The capabilities of the laboratories will be further enhanced in this project. The hematology, biochemistry, pathology, and microbiology laboratories will be arranged into three rooms to improve their efficiency. Each one of the laboratories will be given space that can be sufficiently handled by the current staff (four laboratory technicians for hematology, biochemistry, pathology, and microbiology, and seven laboratory assistants). Additional newly established rooms will include a room for collecting blood samples and performing blood transfusions, a bathroom for collecting urine samples, an Autoclave Room, a Storage room with refrigerators for the microbiology laboratory, and a Storage room for the labs.

v Radiology Department

The table below lists the number of radiographic examinations from 1998 to 2002.

Table 2-15 The Number of Radiographic Examinations

	FY1998	FY 1999	FY 2000	FY 2001	FY 2002	Average
Number of radiographic examinations	27,102	27,555	27,165	29,318	15,240	25,276.0

Source: the Majuro Hospital

Though the number of radiographic examinations has decreased in FY2002 compared to FY2002, the annual number of examinations has remained almost the same for many years. A high average of 41.7 examination have been performed per day even in FY2002.

The Radiology Department possesses general X-ray equipment, X-ray fluoroscope equipment, mammography equipment, and transportable X-ray equipment. Three X-ray Rooms, i.e., a General X-Ray Room, a X-Ray Fluoroscope Room, and a Mammography Room, will be established in this project. A control Room will be established between two of the X-ray Rooms to protect radiologists from radiation exposure (the X-ray equipment are currently controlled in the same examination room). A CT Room and CT Control Room will be established since the Majuro Hospital plans to purchase a CT scanner and assign a technician to operate it. The other rooms will include Reception, a Staff Room, a Storage room, and an Operation Corridor with a space for film shelves. Each will be allotted a sufficient area for the current staff (five radiologists) to handle.

Toilets will also be installed in the X-ray fluoroscope room, since barium tests and IVP laboratory tests that require long hours will be carried out there. Toilets will not be installed in the general X-ray room and CT room, since those tests will not be carried out there.

vi Pharmacy

The Pharmacy opens at 8:00 a.m. to 6:00 p.m. on Monday to Friday and 1:00 p.m. to 5:00 p.m. on Saturdays, Sundays, and holidays. At present, the dispensing window area and drug compounding and storage areas are separate. A tablet counter, personal computers, label printers, a refrigerator for insulin, etc., are provided, as well as plenty of drugs. Drug Storage is established in a part of the central storage area for exclusive use. Only the pharmacy will be transformed in this project (the Drug Storage area will remain unchanged). Additionally established facilities will include a dispensing window with a tablet counter, Drug Compounding and Storage Area, and a Director's Office (where advice on the drug will also be given to the patients), each with sufficient space to be handled by the current number of staff members (one pharmacist and four pharmacy staff members). In addition, one pharmacist is under training in the Fiji School of Medicine and will return at the end of 2004.

vii Medical Records Room

All of the medical records have been kept since the opening of the hospital in 1984. The total number of medical records is about 72,000. Half of them have been kept in the Medical Records room located next to Reception/Accounting, and the other half, records on former or deceased patients,' have been kept in the storage rooms in Building F. The medical records of the Bureau of the PHC are kept in the same area, except for the records for Dental Services, which are kept independently by the Division of Dental Services. No retention period has been set for medical records, hence all are still kept in storage. The same system will be established in the current project, with the Medical Records Room located next to Reception/Accounting. Other required rooms will include the Director's Room, Information Processing Room, and Lavatory for Staff Use.

viiiAdministration

The Administration will be arranged with required rooms for the Majuro Hospital Bureau and the Bureau of the PHC, respectively. However, the Meeting Room, Lavatory, Kettle room, etc., will be shared. An Administrator Room, Associate Administrator Room, Chief Nurse Room, Assistant Chief Nurse Room, Administrative Secretary Room (combined with Reception), Communication Room, and Storage room will be established for the Bureau of the Majuro Hospital. An Administrator Room, Associate Administrator Room, Health Promotion and Human Services Director Office, Public Health Director Office, Health Education Director, four Programs Coordinator Spaces, an Administrative Secretary Reception Space, a Communication Room, and a Storage room will be established for the Bureau of the PHC.

② Facility scale calculation

Modern public general hospitals in Japan have an area of around 50 to 80 ㎡ per bed The Majuro Hospital has 95 beds in a floor area of 5,875 ㎡ (including the area of the Bureau of the PHC, which is considered to play a role in the activities within hospital), which comes to an area of 61.8 ㎡ per bed. The scale is equivalent to that of middle-scale hospital in Japan.

The standards and regulations of hospitals regarding to the scale or floor area of each department are not available in the RMI. Thus, the propriety for the planned facility scale will be verified based on the ratio of respective departments in average public hospitals in Japan.

Table 2-16 Calculating the Scale of the Facility

Departments	Standard area ratio (%)	Calculated Area (㎡) (5,875 ㎡ in total)	Planned Area (㎡)
Outpatient	13.0	763.8	1,031.8
Emergency	3.0	176.3	218.3
Laboratory	5.0	293.8	278.9
X-ray	5.0	293.8	290.3
Pharmacy	2.5	146.9	81.6
Administration *1	21.0	1,233.8	1,091.3
Total Area		2,908.4	2,992.2

*1 Common areas such as corridors, lavatories, etc. are included in the Administration category. Though the ordinary ratio for Administration is around 14%, a ratio of 21% has been set for this project, which will comprise the administrations of both the Majuro Hospital Bureau and the Bureau of the PHC (increase in the ratio by 50%).

The appropriateness of the facility scale for this project is verified, taking the following points in consideration. The Outpatient Department is enlarged because it contains the Bureau of the PHC. The area of the Pharmacy is small, with drug storage at the existing side. In margin of error in the comparison of calculated and planned areas for the other departments is 10%, and the total area also has slight differences (and so on).

The comparisons between the current areas and planned areas for the respective department rooms, are listed in the following pages.

Table 2-17 Calculations for Area Comparisons

Dept. Name	Section Name	Room Name	Existing			Application			Plan			Note
			Q'ty	Unit Area	Total	Q'ty	Unit Area	Total	Q'ty	Unit Area	Total	
Building-1 1st Floor												
Common Space		Entrance Hall	-	-	-	1		794.3	1		70.3	
		Toilet (M)	-	-	-	1		18.0	1		16.7	
		Toilet (W)	-	-	-	1		18.0	1		17.0	
		Handicapped Toilet	-	-	-	1	-	-	1		4.6	
		Total of Common Space						**890.0**			**108.6**	
OUTPATIENT DEPT.	Reception	Cashier/Registration/Reception	1		16.5	1	70.6	70.6	1		19.4	
		Medical Records Room	1		47.2	1	72.0	72.0	1		67.1	
		Information System Data Office	1		28.0				1		40.1	
		Director's Office	1		13.1				1		19.3	
		Waiting Room	1		51.9			Included in Hall	1		33.3	
		Total of Outpatient Reception			**156.7**			**142.6**			**179.2**	
	Pharmacy	Dispensing Window	1		8.7	1	36.0	36.0	1		15.6	2 windows
		Compounding Room	1		9.0				1		14.1	
		Drug Storage with Refrigerator	1		17.5				1		24.6	
		Director's Office							1		9.7	
		Waiting Room	1		26.0	1	18.0	18.0	1		13.7	
		Total of Pharmacy			**61.2**			**54.0**			**77.7**	
PHC	Dentistry Department	Reception with Nursing Office	1		6.5	1	108.0	108.0	1		13.2	
		Dental Examination Room	5	12.2	61.0				6	13.3	79.7	6 Chairs
		Sterilization Corner			-				1		8.6	
		Panoramic X-Ray Room			-				1		3.8	
		Director's Office	1		10.2				1		13.8	
		Staff Room	1		15.3				1		7.8	
		Dental Laboratory	1		18.4				1		16.3	
		Compressor Room	1		2.3				1		8.7	
		Bathroom	1		2.2				1		1.8	
		Storage	1		3.0				1		14.8	
		Waiting Hall	1		32.6				1		25.6	
		Total of Dentistry Department			**238.7**			**108.0**			**194.1**	
Building-1 2nd Floor												
HOSPITAL ADMINISTRATION	Administration	Administrative Secretary Reception	1		41.5			190.4	1		49.5	
		Administrator	1		20.0				1		20.2	
		Associate Administrator	1		8.7				1		11.9	
		Chief Nurse	1		13.4				1		15.4	
		Assistant Chief Nurse	1		8.4				1		11.9	
		Communication Room	1		10.1				1		8.6	
		Storage	1		3.2				1		3.5	
		Conference Room -1	-		-				1		20.8	
		Conference Room -2	-		-				1		20.8	
		Total of Hospital Administration			**105.3**			**190.4**			**162.6**	
PHC ADMINISTRATION	Administration	Assistant Secretary Office	1		29.3			180.0	1		20.9	
		Public Health Director Office	1		11.5				1		14.3	
		Health Education Director	1		11.5				1		12.0	
		4 Programs Coordinator Spaces	1		13.3				1		14.3	
		Administrative Secretary Reception Space	1		35.4				1		58.1	
		Communication Room	1		6.3				1		8.9	
		Storage	1		6.3				1		14.7	
		Total of the PHC Administration			**113.6**			**180.0**			**143.2**	

Dept. Name	Section Name	Room Name	Existing			Application			Plan			Note
			Q'ty	Unit Area	Total	Q'ty	Unit Area	Total	Q'ty	Unit Area	Total	
PHC	Health Promotion & Human Services	Director of Health Promotion	1		13.3			145.0	1		11.9	
		Media Room	1		12.5				1		10.3	
		Multipurpose Room	1		25.1				1		27.2	15 Mothers
		Kitchen	-		-				1		9.4	
		Health Education Office & Social Workers Office	1		13.3				1		25.5	5persons
		Nutrition Room	1		13.3				1		19.4	3 persons
		Bathroom for Men	1		3.3				1		8.4	
		Bathroom for Women	1		3.3				1		9.6	
		Kettle Room	-		-				1		5.2	
		Total of the PHC Health Promotion & Human Service			**84.1**			**145.0**			**126.9**	
Building-2												
OUTPATIENT DEPT.	General Examination	Reception	1		16.5			155.0	1		6.1	
		Staff Room	-		-				1		11.3	
		Interview & Triage Room	2	5.2	10.3				2	6.8	13.6	
		Examination Room	9	9.5	85.5	10	14.4	144.0	3	10.5	31.7	3 Beds for women
		Examination Room	-		-				5	10.8	53.9	
		Treatment Room	1		15.1				1		16.1	
		Ultrasound Room	-		-				1		17.6	
		Examination Corridor	-		-	1		72.0	1		16.5	
		Examination Corridor	-		-				1		25.8	
		Storage	-		-				1		16.3	
		Bathroom for Staff	-		-				1		3.4	
		Total of Outpatient Dept. General Examination			**127.4**			**306.0**			**212.3**	
	Ophthalmology & ENT	Reception	-		-	Including General Examination			1		8.6	
		Storage	-		-				1		3.4	
		Examination Room	1		15.1				1		13.4	
		Treatment Room	-		-				1		20.8	
		Examination Room	-		-				1		13.4	
		Treatment Room	-		-				1		20.8	
		Total of Ophthalmology & ENT			**15.1**						**80.4**	
PHC	Public Health	Reception	1		5.5			145.0	1		10.1	
		Nurses Office	1		4.8				1		32.9	
		Medical Supply Storage	1		5.5				1		8.5	
		Medical Staff Office	1		4.8				1		10.1	
		Examination Room	3	13.3	39.9				4	14.4	43.3	
		Bathroom for Staff	1		2.3				1		3.9	
		Examination Corridor	-		-				1		22.7	
		Storage	1		2.1				1		2.5	
		Total of Public Health			**64.9**			**145.0**			**134.0**	
Building-3												
LABORATORY	Laboratory	Reception	1		3.6			72.0	1		10.5	
		Blood Sample Collection	1		7.2				1		5.3	2 persons
		Blood Transfusion	1		7.0				1		3.6	1Bed
		Bathroom for Urine Sample Collection	1		4.0				1		6.4	
		Hematology & Biochemistry Lab.	1		34.9				1		55.3	
		Microbiology Lab.	1		28.9				1		42.4	
		Storage with Refrigerators	-		-				1		12.9	
		Pathology & Cytology Lab.	1		34.9				1		46.6	
		Autoclave Room	1		7.6				1		9.5	
		Bathroom for Staff	1		2.5				1		2.0	
		Toilet (M)	-		-				1		7.7	
		Toilet (W)	-		-				1		8.7	
		Total of Laboratory			**159.5**			**72.0**			**210.9**	

Dept. Name	Section Name	Room Name	Existing			Application			Plan			Note
			Q'ty	Unit Area	Total	Q'ty	Unit Area	Total	Q'ty	Unit Area	Total	
EMERGENCY DEPT.	Emergency	Waiting Hall	1		12.0			96.0	1		39.1	
		Security Office	-		-				1		4.9	
		Nursing Station & Staff Room	1		7.7				1		17.9	
		Doctor's Duty Room	-		-				1		12.2	
		Examination Cubicles	3	8.9	26.7				3	8.3	25.0	
		Observation Room	-		-				1		25.2	
		Treatment	1		8.9	8	19.5	156.0	1		8.4	
		Bathroom for Patients	-		-				1		4.9	
		Minor Surgery Room	1		22.8				1		32.9	
		Preparation Room			6.4				1		7.5	
		Bathroom for Staff	-		-				1		6.2	
		Utility Room	1		6.3				1		14.2	
		Storage/Cylinder Room	-		-				1		8.5	
		Total of Emergency Dept.			**90.8**			**252.0**			**206.9**	
X-RAY DEPARTMENT	X-Ray	Reception with Staff Room	1		7.1	1		36.0	1		13.1	
		Mammography Room	1		11.2				1		13.2	
		General X-Ray Room	1		18.4	1		27.0	1		25.2	
		Locker Room	-		-				1		1.8	
		X-Ray Fluoroscope Room	1		19.1	1		27.0	1		23.4	
		Locker Room	-		-				1		1.8	
		Bathroom	1		3.0				1		1.8	
		Control Corner	2	3.0	6.0	1		18.0	1		11.9	
		CT Room	-		-	1		36.0	1		26.0	
		CT Control Corner	-		-	1		18.0	1		9.6	
		Locker Room	-		-				1		2.4	
		Operation Corridor	1		40.2				1		54.0	
		Dark Room	1		6.9				1		14.2	For 2 film procedures
		Radiologist Room with illuminators	1		8.8				1		12.0	
		Film Storage	1		14.8				1		4.3	
		Storage	-		-				1		5.6	
		Total of Radiology Department			**135.5**			**162.0**			**220.3**	
PHC	Reproductive Health	Reception with Staff Room	1		15.6			145.0	1		19.4	
		Office	2	17.2	34.4				1		11.3	
		Storage	4	10.1	40.4				1		11.3	
		Director's office	1		10.9				1		12.4	
		Examination Room	3	6.2	18.6				1		12.5	
		Examination Room	-		-				1		12.4	
		Examination Room for Men	1		13.8				1		13.4	
		Bathroom for Patients	2	4.4	8.8				1		2.1	
		Internal Waiting Room	1		43.5				1		31.4	
		Internal Waiting Room	-		-				1		8.5	
		Total of Reproductive Health			**186.0**			**145.0**			**134.7**	
ENERGY BLDG.												
		Generator Room	-		-				1		34.8	
		Pumping Machine Room	-		-				1		9.4	
		Total of Energy Building									**44.2**	
COMMON		Connection Corridor	-		-				3	18.2	54.6	
		Cleaners Room	-		-				1		14.8	
		Storage	-		-				1		9.5	
		Electrical Room	-		-				1		9.3	
		PBX ROOM	-		-				1		3.8	
		Total of Common									**92.0**	

③ Floor Plan

i Dental Examination Room (Building-1)

- The module for Dental Examination Room is set as 2.3m×3.6m. Examination chairs will be installed facing outside.
- Examination Corridor for staff use will be installed at the window side and cabinet side.

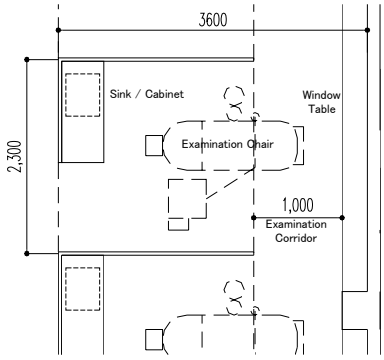


Figure 2-3 Dental Examination Room

ii Outpatient Department (Building-2)

- The module for the Outpatient Department is set as 4.2m×2.5m (1.3m of the examination corridor).
- The Examination Corridor for staff use will be installed at the window side of each room. Working tables and sinks will be installed.

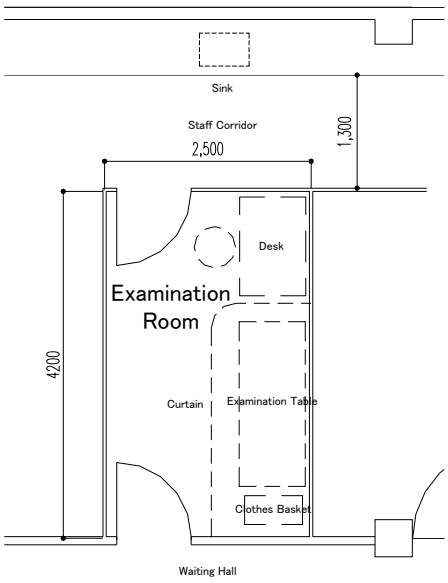


Figure 2-4 Floor plan of the Outpatient Department

iii Treatment Room in the Emergency Department (Building-3)

- The module for the treatment room in the Emergency Department is set as 2.4m×3.3m, partitioned with a curtain.

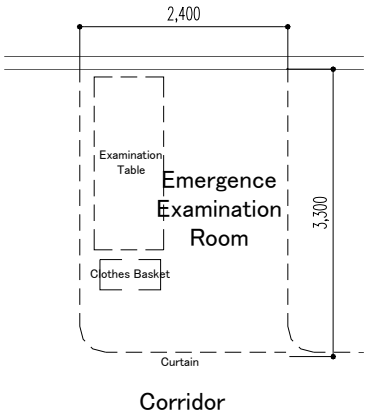


Figure 2-5 Floor plan of the Treatment Room in the Emergency Department

iv Surgery Room in the Emergency Department (Building-3)

- The module for the Surgery Room in the Emergency Department is set as 5.0m×4.5m.
- Central gas piping for medical gas (oxygen and laughing gas) and outlets will be established in the surgery rooms in the Emergency Department.

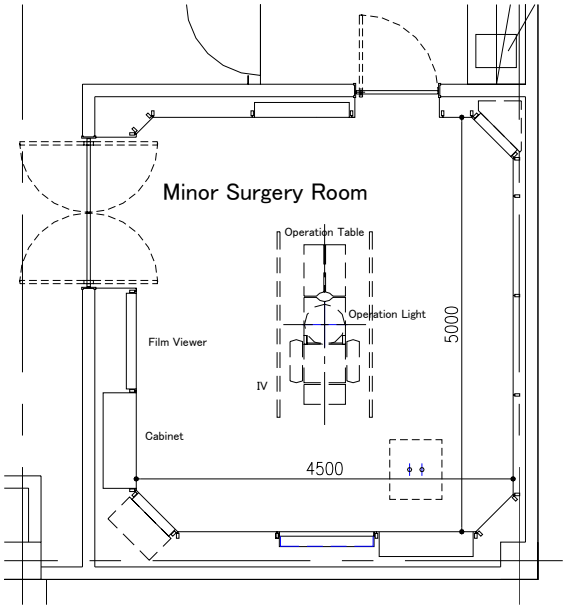


Figure 2-6 Surgery Room in the Emergency Department

v Examination Rooms in the Public Health Division (Building-2)

- The module for the Examination Room in the Public Health Division is set as 4.2m×2.5m (1.3m of examination corridor).
- An Examination Corridor for staff use, work tables, and sinks will be installed.

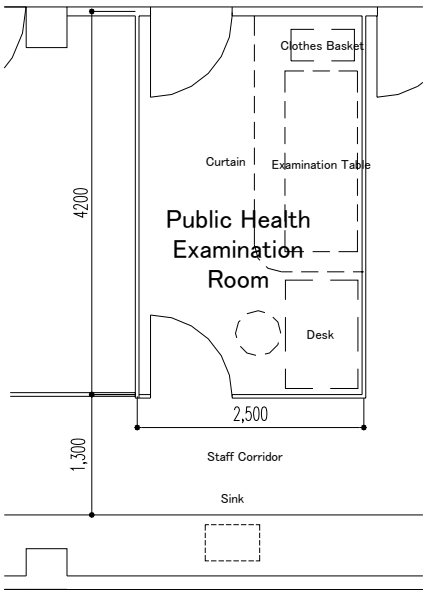


Figure 2-7 Floor Plan of Examination Room in the Public Health Division

vi Reproductive Health Division (Building-3)

- The module for Examination Rooms in Reproductive Health Division is set as 4.0m×3.0m. Examination corridors will not be installed to protect privacy.

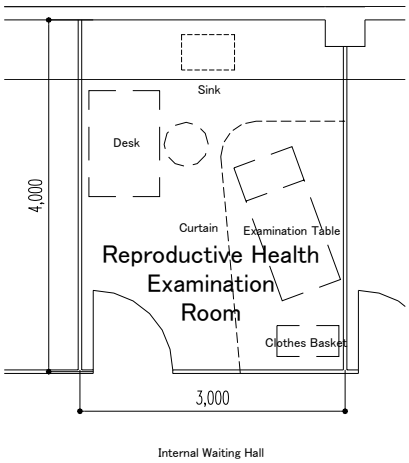


Figure 2-8 Floor Plan of the Examination Room in the Reproductive Health Division

2) Sectional Plan

- The site has a slight slope (about 0.4 % gradient) from the south side to the north side. In the current condition, this results in an approximately 30cm difference between the south end of the site and the north end of the site. This gap is too small to require large-scale civil works for grading to by the RMI side.
- The floor level of the first floor will be set at the same level as the existing hospital, and the entrance at the north side will be 90cm above the ground level to avoid flood damage caused by concentrated heavy rains or spring tide. An appropriate slope will be set to accommodate wheelchairs, stretchers, and carrying in and out of supplies.
- Roofs will be flat, and rainwater will be collected and forwarded to a tank.
- Living rooms will be provided with ceilings. Airspace inside of ceilings will be provided with heat insulation. Window sizes facing the west side will be minimized to avoid the strong west sunlight.
- Each building will be provided with eaves to avoid the direct sunlight from coming into the rooms as much as possible.
- The floor heights of each building (from the first floor level to the top of beam) will be fixed on the following conditions.

  -Building-1 determined with a 2.8m of the ceiling height; the same as the existing building

  -Building-2 determined with as 2.8m of the ceiling height; the same as the existing building

  -Building-3 determined with a required height of 3m to accommodate operation lights in the emergency surgical room

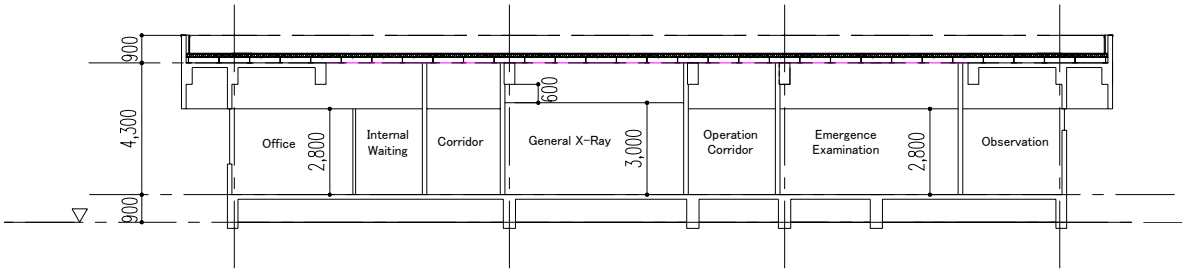


Figure 2-9 Section Plan

3) Structural Plan

① Conditions for structural planning

Earthquake: The RMI is far away from the Circum-Pacific earthquake belt, and there is no record of earthquake.

Typhoon: Though the RMI is out reach of typhoons, there are records of typhoon damage.

Ground conditions: According to the geological report of neighborhood areas, the topsoil from the surface to the depth of 2m is a sand layer, and the deeper layers comprise alternating strata of coral calcareous gravel and coral rock. Strong soil bearing capacity cannot be expected due to the high degree of inhomogeneity of layers: most of the parts are fully hard with N values of more than 30, but there are soft layers at intervals with N value of only 1 to 3. Cavities that can be occasionally seen in limestone do not seem to exist. According to the investigation by the project team, the underground water level is linked with the tide level, and never falls below about 1m in depth (at the shallowest).

② Structural plan

Type of Structure: A reinforced concrete structure will be adopted since the site is located along the coast and susceptible to direct damage from salt.

Frame Structure: A simple rigid frame structure will be adopted for weight saving, primarily because the soil bearing capacity is undependable. Concrete walls are deemed not to be necessary, as there are no records of earthquakes in the area. Lightweight roofs will be adopted (no roofs with concrete slabs). Structural slab will be adopted for since the flooring of the first floor is 1m higher than the ground surface.

③ Foundation Plan

Foundations will be continuous footing between the columns (no isolated spread foundation will be adopted, since the heterogeneous ground condition makes the soil bearing capacity undependable).

Raft foundation will be adopted for Building-1, a two-storied building.

The design will be based on the assessed value of soil bearing capacity. The safety of the soil bearing capacity will be tested after the commencement of work.

Taking into account the high level of groundwater, the height of the foundation will be planned as shallow as possible.

④ Design Load

Earthquake Load: There is no record of earthquake so far, hence the earthquake load will not be taken into account.

Wind Load: An American standard (Uniform Building Code, UBC) is adopted in the RMI for calculating the wind pressure force.

$P = Ce \times Cq \times Qs \times I$

P ; wind pressure force (psf)

Ce; coefficient determined based on the heights and relative roughness of the ground surface

Cq; wind force coefficient

Qs; standard wind pressure force is 26psf (=127kg/m2) at the standard wind velocity of 44.7m/sec. (=100mph; in the RMI).

I ; coefficient of importance level, 1.15 (hospital)

Calculate from the above,

$P = Cq \times 190$ (kg/m2)

Since the figure is equivalent to the level of Tokyo according to the building standards of Japan, the wind load is determined as equivalent to the level in Tokyo. Relative roughness at the site is categorized as Ⅰ (waterfront).

Live Load: Determined as shown in the table below, referring to the building standards of Japan.

Table 2-18 Live Load

Room	Live Load (N/m2)			Note
	Floor	Frame	Earthquake	
Examination and related rooms	2900	1800	800	
X-ray and related rooms	5000	2400	1300	Excluding heavy equipment
Waiting rooms	2900	2600	1600	
Offices and related rooms	2900	1800	800	
Storage and medical records rooms				Determined separately

Source: Building Standards of Japan

⑤ Structural Material

Concrete: The aggregate in the site is made of salty coral sand or rock and needs to be washed out before utilization. Adequate mixing and test mixing should be planned and conducted in determining the strength of the design, since the coral aggregate does not confer high strength.

Steel Bar: Epoxy-coated steel bar will be utilized to prevent rust, as the utilization of beach sand causes early erosion of steel bar (passive state coating destroyed by the effects of chloride ions).

4) Electrical and Mechanical Plan

① Electrical Equipment

i High-Voltage Equipment

a Main Power Equipment

Electricity will be installed via high-voltage branch of power lines that supply power to the existing hospital through Marshall Energy Co. (MEC).

The high-voltage branch will be branched off from the branch line placed precedent to the existing transformer at the existing hospital site and distribute power to the new site at 3 voltage phases x 4 wires, 13,800V, 60Hz via a high-voltage branch switch with a transformer installed outside (3 phases x 4 wires, 13,800V, 750KVA, 60Hz). All wires and pipes will be installed underground. The demarcation point for asset and responsibility with the electric power company, MEC, will be up to the site of the newly established transformer facility (including the meter).

b Power Transforming Facility

The supplied power will be transformed via a transformer (outside insulation type; 3 phases x 4 wires, 480V, 277V, 208V/120V) to be established by the RMI side (MEC) at the south side road of the site. The distribution range from the power source will be confined within the newly Annex Building. Automatic voltage adjustment equipment will not be installed at the Emergency Department, etc., since there is no unusual fluctuation on the receiving voltage.

c In-house Generator

The in-house generator for emergencies will be installed at a part of electric room providing for failure of power supply, though the status of the power supply is stable. The capacity of the generator will be 3 phases x 4 wires, 150KVA, 60Hz to supply disaster prevention and emergency load. Fuel sufficient for around 24 hours of operation will be prepared. In consideration for the formation of the site, soundproofing devices will be installed at the inlet and outlet of the generator as a measure to shield the neighboring community from noise.

d Main Power Facilities

Past the electric room, each distributing area will be provided with vinyl insulation cable basically using suspended cable wiring to distribute power to each power board. The installation sites for pumps, fans, package type air-conditioning facilities, etc. will be provided with power boards. Wiring and piping will be supplied to connect the power boards to each piece of equipment and motor.

The alarm from the power equipment will be displayed on the monitor placed at the security room of the Emergency Department. Major items to be displayed will include running indications and failures of the generators, fire pump, etc.

e Lighting Fixture & Receptacles

The power board will be placed in each distribution area to connect to lighting equipment

and plug outlet by piping. The quantity of lighting equipment will be determined in conformity with Japanese Industrial Standard (JIS). (Refer to the table below.) Emergency lighting will be installed in the emergency surgery room of the Outpatient Department and corridors as navigation lights for evacuation, etc. The type of plug outlet (general plug outlets, generator plug outlets, surgery- and emergency-use plug outlets, etc.) will be clearly distinguished by color coding. The earth for medical use will be separated from the power supply to prevent micro-shocks and macro-shocks from occurring during medical procedures. In addition, outdoor lights will be installed in the parking area and the entrance of the Emergency Department.

Table 2-19 Lighting Intensity Plan

Rooms	Lighting Intensity	Lighting Facilities
Treatment room	300Lx	Recessed fluorescent lamp
Laboratory	300Lx	Recessed fluorescent lamp
Emergency surgery room	500Lx	Recessed fluorescent lamp
Nurse station	200Lx	Surface mounted fluorescent lamp
Waiting hall	100Lx	Pendent fluorescent lamp
Administration and others	200Lx	Recessed fluorescent lamp
Meeting room	300Lx	Recessed fluorescent lamp

ii Low-Voltage Equipment

a Telephone Exchange Facility

There will be a total of 20 telephone circuits, the existing 15 circuits plus an additional 5. The telephone circuits will be fed to the Administration Office along the existing paths to the existing buildings. Outside lines and internal lines connecting parties will operate once an electronic exchange facility is established. The capacity of the exchange facility will be 20 outside lines and 200 internal lines, and one or more telephones will be installed in each department.

b Public Address System

A public address system will be installed for announcements in the newly established Annex Buildings and emergency announcements throughout the entire hospital. The

announcements will be made through loudspeakers installed in each room, corridor, hall, etc. through the use of a telephone paging method. Calls for the existing hospital, etc. will be announced through interfaces.

c Interphone Facility

Interphone facilities will be installed in the newly established Annex Buildings for contacts between security officers and staff entering and leaving at night, general emergency contact, and the communication of notices on emergency patients visits. Installation sites will include the security room in the Emergency Department, Nurse Station and Administration Offices, etc.

d Fire Alarm System Equipment

A General Board with a built-in alarm button, bell, and red lamp will be installed at indoor fire hydrants. When the alarm button is pressed at the time of a fire, a fire alarm will be displayed on the fire-alarm-receiving set installed in the security room in the Emergency Department.

② Mechanical Facility

i Water Supply Facility

The water supply facility in the RMI utilizes seawater, well water, and rainwater as water resources. A mixture of seawater and well water is utilized as flush water for toilet water and other uses inside the buildings. Rainwater is gathered from the building roofs, sent with pressure to a reservoir within a certain region, mixed with the well water, filtrated, passed through sterilizer equipment, and finally used as domestic noncommercial water.

The domestic noncommercial water and flush water supplied to the site of the existing hospital will be rerouted for the water supply for the planned buildings (respective water sources to be branched apart). The existing water storage tank for gathering rainwater will be used. Thus, the rainwater from the planned building roofs will be connected to the existing water storage tank. Providing for the water shortage at dry season, a water tank with a capacity of 38 to 40

tons will be installed for domestic noncommercial water. Elevated water tanks will not be installed, and water will be supplied to the respective sites via pressurized pumps requiring only small installation areas.

ii Hot Water Supply System

Lavatory sinks, showers, and other facilities will utilize only unheated water. Localized hot-water-storage-type electric water heaters will be installed to supply hot water to the kitchens in the Emergency Department and Public Health Division.

iii Drainage Facility

Drainage pipes have been installed underground at the south side road adjacent to the planned buildings. Drainage is discharged to the sea through pressurized pumping equipment.

The drainage from the planned buildings will be sorted out into sewage and general wastewater, combined at the first measuring box located outside, and fed into the existing drainage pipes (8 inches) to be discharged. Particular drainage from respective facilities is as follows.

- Drainage from laboratory: Concentrate solution and heavy metal will be collected. Only washing water will be discharged.
- Waste liquid from photofinishing: To be collected.
- Dentistry Department: Plaster Trap will be installed.

iv Fire control equipment

Indoor fire hydrant equipment and fire extinguishers will be installed (within the range of the RMI works) according as the Fire Defense Law of Japan (no fire defense law is established in the RMI).

v Medical Gas Equipment

Pipes for oxygen and laughing gas have been installed at the existing hospital by means of a central piping method, but they are not utilized at present (the gases are locally provided). Oxygen is produced by the hospital.

The oxygen and laughing gas to be provided to the surgery rooms of the Emergency Department

will be supplied via the Manifold Room. The other areas will be supplied from local sources.

vi Cooling Facility

The cooling facility is essential in Majuro, a country with high temperature and humidity year round. The entire existing hospital has been equipped with a cooling facility.

Treatment rooms and offices in planned buildings will be basically provided with floor-top packages. Maintenance, breakdown, etc. will be taken into consideration, with investigations for adequate zoning duly performed.

In addition, the surgery room in the Emergency Department will be provided with its own floor-top, packaged-type cooling facility.

vii Ventilation System

Mechanical ventilation systems will be installed in hermetically sealed rooms, rooms lacking sufficient heat, and rooms in which smell and water vapor are generated.

5) Finishing Materials

Many of the finishing materials in the RMI are imported products. The major finishing materials to be selected should protect against salt damage, be commonly used in the RMI, and be easy to maintain by the Majuro Hospital itself in the future.

The tables below show the schedules for major interior and exterior finishing.

Table 2-20 Exterior Finish Schedule

Position	Finish Schedule
Roofing	Mechanical Attached Single Ply Reinforced Tpo Roofing System
Outside Wall	PVF Film Laminated Galvanized Steel Sheet
Outside Windows & Doors	Colored Aluminum Sash, Colored Aluminum Door
Parking	Asphalt Pavement

Table 2-21 Interior Finish Schedule

Department Name	Section Name	Room Name	Finishing Schedule			
			Floor	Basement	Wall	Ceiling
COMMON SPACE		Waiting Hall/Connection Corridor	Plastic Tile & Ceramic Tile		Vinyl Paint (VP)	Rockwool Board
BUILDING -1 1F						
COMMON SPACE		Entrance Hall	Plastic Tile		VP+Partition	do.
OUTPATIENTS DPT.	RECEPTION	Cashier/Registration/ Reception	do.	Vinyl Base	do.	do.
		Medical Records Room	do.	do.	do.	do.
		Information System Data Office	do.	do.	do.	do.
	PHARMACY	Dispensing Window	do.	do.	do.	do.
		Compounding Room	do.	do.	do.	do.

Department Name	Section Name	Room Name	Finishing Schedule			
			Floor	Basement	Wall	Ceiling
	PHARMACY	Drugs Storage with Refrigerator	Plastic Tile	Vinyl Base	VP+Partition	Rockwool Board
PHC	DENTRISTY DEPARTMENT	Reception with Nursing Office, Director's Office, Staff Room	do.	do.	do.	do.
		Dental Examination Room	Vinyl Sheet	do.	do.	do.
		Panoramic X-Ray Room	Plastic Tile	do.	do.	do.
		Dental Laboratory	do.	do.	do.	do.
BUILDING-1 2F						
HOSPITAL ADMINISTRA-TION	ADMINISTRATION	Administrative Secretary Reception	do.	do.	do.	do.
		Administrator, etc.,	do.	do.	do.	do.
		Communication Room	do.	do.	do.	do.
		Conference Room	do.	do.	do.	do.
PHC ADMINISTRA-TION	ADMINISTRATION	Administrative Secretary Reception	do.	do.	do.	do.
		Administrator, etc.,	do.	do.	do.	do.
		Communication Room	do.	do.	do.	do.
PHC	HEALTH PROMOTION & HUMAN SERVICES	Director of Health Promotion, etc.	do.	do.	do.	do.
		Media Room	do.	do.	do.	do.
		Multipurpose Room	do.	do.	do.	do.
BUILDING-2						
OUTPATIENTS DPT.	GENERAL EXAMINATION	Reception/Staff Room	Vinyl Sheet	do.	do.	do.
		Interview & Triage Room	do.	do.	do.	do.
		Examination Room	do.	do.	do.	do.
		Treatment Room	do.	do.	do.	do.
		Ultrasound Room	do.	do.	do.	do.
OUTPATIENTS DPT.	OPHTHALMOLOGY & ENT	Reception	do.	do.	do.	do.
		Examination Room	do.	do.	do.	do.
		Treatment Room	do.	do.	do.	do.
PHC	PUBLIC HEALTH	Reception/Staff Room/Medical Staff Office	do.	do.	do.	do.
		Examination Room	do.	do.	do.	do.
BUILDING-3						
LABORATORY DPT.	LABORATORY	Reception	do.	do.	do.	do.
		Blood Sample Collecting Room/ Blood Transfusion Collecting Room	do.	do.	do.	do.
		Bathroom for Collecting Urine Samples	do.	do.	do.	do.
		Hematology & Biochemistry Lab.	do.	do.	do.	do.
		Microbiology Lab.	do.	do.	do.	do.
		Storage with Refrigerators	do.	do.	do.	do.
		Pathology & Cytology Lab.	do.	do.	do.	do.
		Autoclave Room	do.	do.	do.	do.
EMERGENCY DPT.	EMERGENCY	Nursing Station & Staff Room/ Security Office	Plastic Tile	do.	do.	do.
		Doctor's Duty Room	do.	do.	do.	do.
		Observation Room/Treatment/ Examination Cubicles	Vinyl Sheet	do.	do.	do.
		Minor Surgery Room	Vinyl Sheet Flooring Conductive Floor	Stainless	Reinforced Fiber Cement Board with Baked Color Coating	Reinforced Fiber Cement Board with Baked Color Coating
X-RAY DPT.	X-RAY	Reception with Staff Room	Plastic Tile	Vinyl Base	VP+Partition	Rockwool Board
		Mammography Room	Vinyl Sheet	do.	Vinyl Paint	do.
		General X-Ray Room	do.	do.	do.	do.
		X-Ray Fluoroscope Room	do.	do.	do.	do.
		Control Corner	do.	do.	do.	do.
		CT Room	do.	do.	do.	do.

Department Name	Section Name	Room Name	Finishing Schedule			
			Floor	Basement	Wall	Ceiling
X-RAY DPT.	X-RAY	CT Control Corner	Vinyl Sheet	Vinyl Base	Vinyl Paint	Rockwool Board
		Locker Room	do.	do.	VP+Partition	do.
		Operation Corridor/Dark Room	do.	do.	Vinyl Paint	do.
		Radiologist Room with Illuminators	Plastic Tile	do.	VP+Partition	do.
PHC	REPRODUCTIVE HEALTH	Reception with Staff Room	Vinyl Sheet	do.	do.	do.
		Director's office/Office	do.	do.	do.	do.
		Examination Room	do.	do.	do.	do.
		Storage	do.	do.	do.	do.
		Examination Room	do.	do.	do.	do.
		Examination Room for Men	do.	do.	do.	do.
		Internal Waiting Room	do.	do.	do.	do.
		Toilet	Tile	Tile	Tile	Asbestos Silicate Calcium Board
UTILITY BLDG.						
		Generator Room	Dust Preven-tive Resin	Vinyl Base	Acoustic Glasswool Board	Cemented Excelsior Board
		Pumping Machine Room	do.	do.	Vinyl Paint	do.

(3) Equipment Plan

The basic design of the equipment, along with the checkup items noted below, were examined separately for each item of equipment, based on the final required equipment confirmed in the field study (19 items). The selection criteria and results are as noted below.

<Checkup Items>

Classification of equipment

① Replacement because the existing equipment is out of order

② Replacement because the existing equipment is old and deteriorated

③ Supplementation because the quantities of equipment are insufficient

④ Newly introduced equipment that has never been used in the existing sections, but well workable at the site

<Selection Criteria>

①Usage

○: Equipment that is in line with the activities of the hospital and its sections

×: Equipment intended for the personal use of hospital staff or

equipment for academic research purpose without medical care purpose, etc.

②Demands

○: Equipment that shall be replaced upon obsolescence or at failure, or that has to be introduced or added (indispensable for the institution)

×: Equipment of more than the minimal quantity (redundant and inefficient), equipment that can be covered by efficient use of existing alternatives, equipment that has limited efficiency in delivering benefit, equipment that has high negative cost-effectiveness, general furniture, general OA equipment or equipment that can be procured with the budget of the RMI side itself, etc.

③ Level of technologies

○: Equipment in line with their current level of technologies

×: Equipment that cannot be handled at the present technical level and that additionally needs to be accessed by highly skilled personnel, etc.

④ Administrative operation & maintenance

○: Equipment that can be managed continuously, and whose operation & maintenance can be easily administrated.

×: Equipment whose operation & maintenance are difficult or problematic to administrate, equipment that has the potential to cause problems after implementation, or equipment that uses consumables or spare parts are unavailable on the site.

⑤Quantity

○: Equipment for which reasonable layout and quantities of items are planned, with reference to the activities, number of patients, and health professionals in comparison

×: Equipment whose layout and quantities need to be replanned, redundant equipment, or equipment that can be shared with other equipment.

〈Validation〉

Final quantity: Final quantity of the equipment to judge to be suitable.

×: Equipment not included into the project.

The following table shows the results based on the foregoing Selection Criteria.

Table 2-22 Result of the Equipment Selection

No.	Department	Description	Quantity	Priority	Category of Equipment	Selection Criteria					Validation (Final Quantity)
						Usage	Demands	Technologies	AO & M	Quantity	
1	Radiology	X-ray Apparatus (General)	1	A	②	○	○	○	○	○	1
2		X-ray Apparatus (Fluoroscopy)	1	A	②	○	○	○	○	○	1
3		Film Illuminator	2	C	②	○	×	○	○	×	×
4		Film Processor	1	B	③	○	×	○	○	×	×
5	Outpatient	Ultrasound Diagnostic Apparatus	1	A	③	○	○	○	○	○	1
6	Emergency	Ventilator	1	B	④	○	○	○	○	○	1
7		Ventilator (Infant)	1	B	④	○	○	○	○	○	1
8		Operating Table	1	A	②	○	○	○	○	○	1
9		Film Illuminator	2	C	②、③	○	×	○	○	×	×
10		Patient Monitor	2	A	①、②	○	○	○	○	○	2
11		Electrocardiogram	1	C	④	○	×	○	○	×	×
12		Operating Light	1	A	②	○	○	○	○	○	1
13		Electrosurgical Unit	1	B	②	○	○	○	○	○	1
14	Dental	Dental Unit	5	A	②	○	○	○	○	×	4
15		Dental X-ray Unit	1	A	②、④	○	○	○	○	○	1
16		Dental X-ray Processor	1	B	③	○	○	○	○	○	1
17		Treatment Cabinet	6		①	○	○	○	○	○	6
18	Laboratory	Laboratory Center Table	6		①	○	○	○	○	×	4
19	Outpatient P.H.	Instrument Cabinet	10		①	○	○	○	○	×	8

Priority: A: 1st priority B: 2nd priority C: 3rd priority

Most of the equipment meets the selection criteria, since the equipment has been narrowed down to 19 items of required equipment in accordance with the basic policy. As shown in the table above, however, four items were eliminated as project targets, and the quantities of the three items were decreased.

Additional remarks on the project equipment for each department are given below.

1) Radiology Department

The general X-ray apparatus and fluoroscopy X-ray apparatus has been used for more than 15,000

general radiography, barium and IVP examinations per year. These apparatuses were installed when the Majuro Hospital was first opened, and their replacement is considered. Film illuminator and film processor can be dealt with by efficiently utilizing the current equipment, and thus were excluded from the project.

2) Outpatient Department

The OB-GYN room has one ultrasound diagnostic apparatus used for diagnosing fetal abnormalities, maternal diseases, and gynecological diseases. It is also used for the OB-GYN ward and emergency patients. This precludes its use for abdominal examinations, even though there are several internists. It has been decided that the addition of one supplementary unit would enable abdominal examinations for outpatients and improve the diagnosis of internal diseases.

3) Emergency Department

A ventilator and infant ventilator are used for respiratory control of different patient groups; the former is used for children and adult patients, and the latter for newborns and infants. The equipment will be the newly introduced equipment in the Emergency Department, and has been included as projected equipment under the basis outlined below.

① Highly efficient in saving the lives newborns to adult patients, and the minimum necessary equipment for the only major hospital in the Majuro Atoll.

② These items are currently used in operation theaters, and many physicians, primarily anesthesiologist, are knowledgeable about them and able to use them.

③ It has already been decided to hire new respiratory therapist who will use ventilators.

④ Nurses to carry out intensive care of patients have been newly hired, and training has being provided to the current medical staff.

⑤ Operation and maintenance costs will not increase significantly.

Film illuminators are excluded from the target of the project as this equipment can be provided by effective utilization of the existing equipment, or procured from the budget of the Majuro Hospital

itself.

The electrocardiogram apparatus is excluded from the project because ECG examinations are currently being done in the Radiology Department and the existing equipment can be used.

An operating table, set of operating lights and electrosurgical unit have been included in the project as replacements for the deteriorated equipment currently used in the minor surgery rooms in the Emergency Department. The electrosurgical unit can be utilized commonly with the existing equipment in the central operation theater for scheduled surgeries, and thus has a high effectiveness. And the emergency operation room can be utilized for general surgeries, caesarian operations, and emergency deliveries in case technical problems arise with the aging facilities in the existing central operation theater and delivery rooms. This adds high effectiveness in supplementing the hospital medical care.

As patient monitors are indispensable for emergency treatments that require careful monitoring of the patient's condition, one monitor will be replaced and one additional monitor will be provided as a supplement. The Emergency Department accepts emergency patients and critical patients year round, including nights and holidays, and the monitors are used on a shared basis in the Examination Cubicles, Minor Surgery Room, and Observation Room. Thus, a quantity of two monitors is considered appropriate.

4) Dental Department

Dental units and dental treatment cabinets will be planned as replaced equipment in quantities based on the six dental clinics in the Annex Building. Four replaced dental units and six replaced dental treatment cabinets will be included.

The Dental X-ray unit included in the project comprises an intraoral X-ray unit used for intraoral radiography of teeth and a panoramic X-ray unit that can produce wide-range images of the dental arch. The panoramic X-ray unit will be newly introduced, and this is included in the project equipment based on the following points.

① The panoramic X-ray unit can be used for comprehensive diagnosis of dental arches, occlusion conditions, and periodontal disease that cannot be diagnosed using an intraoral X-ray unit.

② Dentists have experience in using them, and there are no technical problems.

③ They are effective in prosthetic treatment and in making dentures.

④ There will be no significant increases in operation and maintenance costs.

Dental X-ray processors are planned in the project as necessary equipment when the panoramic X-ray unit is introduced. Because panoramic film cannot be used with the existing processor, a type that can process both panoramic and intraoral film will be used in order to keep down increases in running costs.

5) Laboratory Department

The laboratory is already equipped with most of the necessary equipment. For this reason, the project will include only laboratory center tables that cannot be transferred the existing tables to the Annex Building. Six tables were requested, but only four will be included (for better coordination with the width of the tables in the facility plan).

6) Others

A total of eight instrument cabinets will be replaced: six for the Outpatient Department, one for the Public Health Division, and one for the Reproductive Health Clinic. The existing cabinets are wall-mounted units that were installed when the facilities opened. They are used for storage of treatment materials, sterilized instruments, and narcotic medicines. The number of instrument cabinets will be kept to a minimum, and the cabinets will be located in the treatment rooms and staff corridors.

The specifications, quantities and usage purposes of the principal project equipment are outlined below.

Table 2-23 The Specifications and Purpose of Principal Equipment

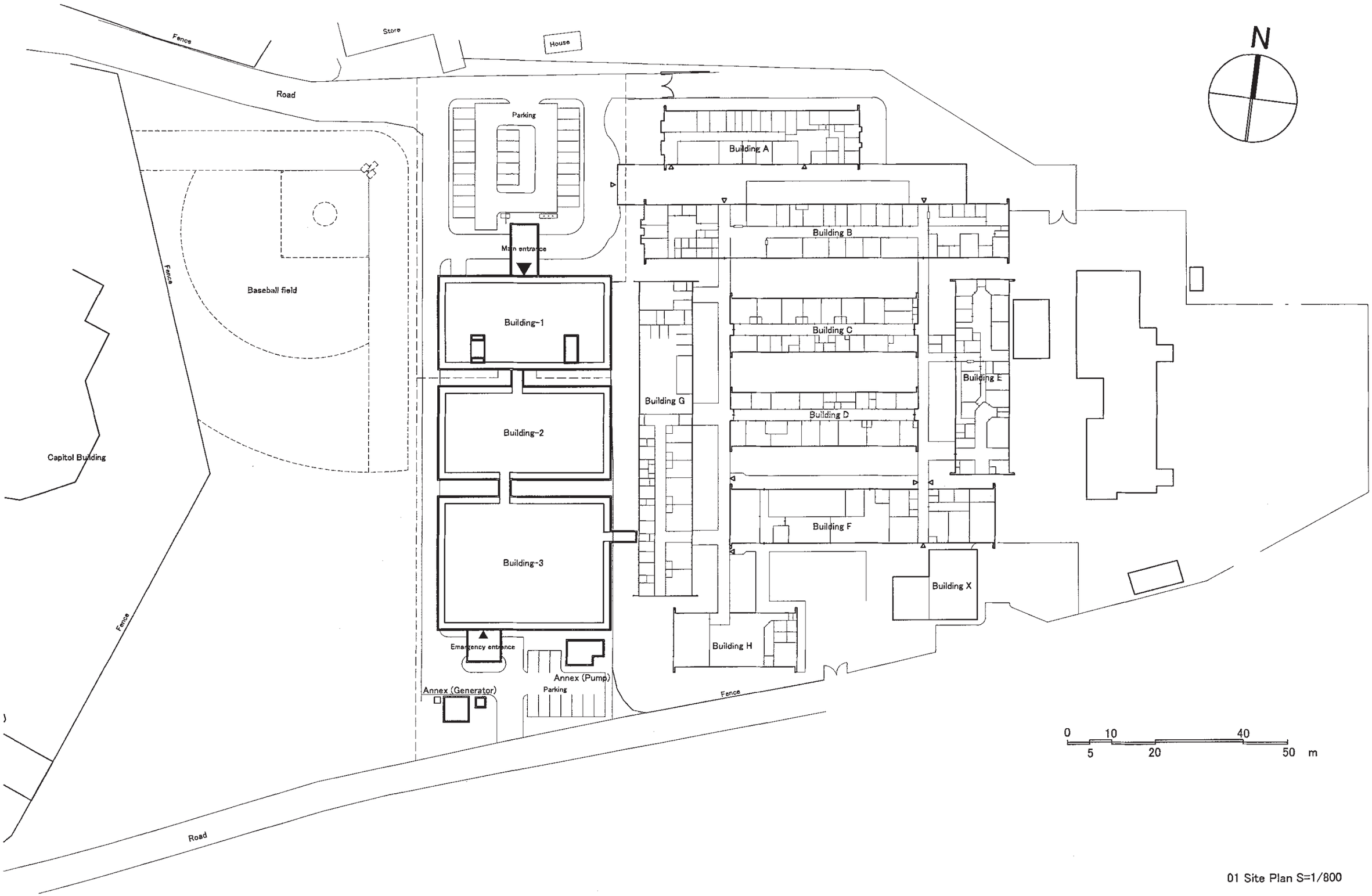
Description	Specifications	Q'ty	Purpose
X-ray Apparatus (General)	Composition: X-ray generator, X-ray tube unit, tube support, bucky stand and bucky table. Max. tube current: 600mA. Max. tube voltage: 150kV.	1	For fracture and chest examination.
X-ray Apparatus (Fluoroscopy)	Composition: X-ray generator, X-ray tube unit, fluoroscopy table, TV camera and monitor with cart. Max. tube current: 600mA. Max. tube voltage: 150kV.	1	For fluoroscopy barium examination and IVP test.
Ultrasound Diagnostic Apparatus	Scanning method: Electronic convex and linear. Display format: B Mode, M Mode, B/M Mode, Monitor: B/W Applicable probe: Linear and convex	1	For general diagnosis of abdomen
Ventilator	Applicable patient: child to adult. Mode: CMV, SIMV, SPONT Tidal volume: 50 - 1,300ml Breath rate: 6 - 40 bpm	1	For respiratory control for children to adults. Distribute in the Emergency Department.
Ventilator (Infant)	Applicable patient: newborn baby to infant Mode: CMV, IMV, PEEP/CPAP Inspiratory time: 0.1 - 3.0 sec. Breath rate: 5 - 120 bpm	1	For respiratory control for newborns to infants. Distribute in the Emergency Department.
Operating Table	Composition: arm rest, shoulder supports, knee crutches, X-ray cassette tray Hi-Lo adjustment: manual hydraulic type Table position adjustment: Trendelenburg, lateral tilting, back section, leg section	1	For minor surgery for all emergency patients.
Patient Monitor	Composition: with cart, battery pack Parameter: ECG, RESP, TEMP, Non-Invasive and Saturation Monitor size: at least 6 inch Alarm setting: equipped	2	For patient observation for ECG, non-invasive blood pressure, temperature and respiration rate.
Electrosurgical Unit	Composition: patient plate, electrode tip, bipolar forceps, with cart. Output mode: Cutting, coagulation and bipolar Max. output: 250W by monopolar cutting	1	For cutting, hemostatic cutting, and coagulation in general surgery.
Dental Unit	Composition: Treatment chair, control unit, operation light, air compressor and vacuum pump, doctor's chair	4	For all dental treatments (composed of the treatment chair and instrument unit).
Dental Panoramic X-ray Unit	<Panoramic X-ray unit> Max. tube voltage: 80kV Max. tube current: 10mA, Focal spot: 0.5-1.0mm	1	For panoramic dental arch examinations.

2-2-3 Basic Design Drawing

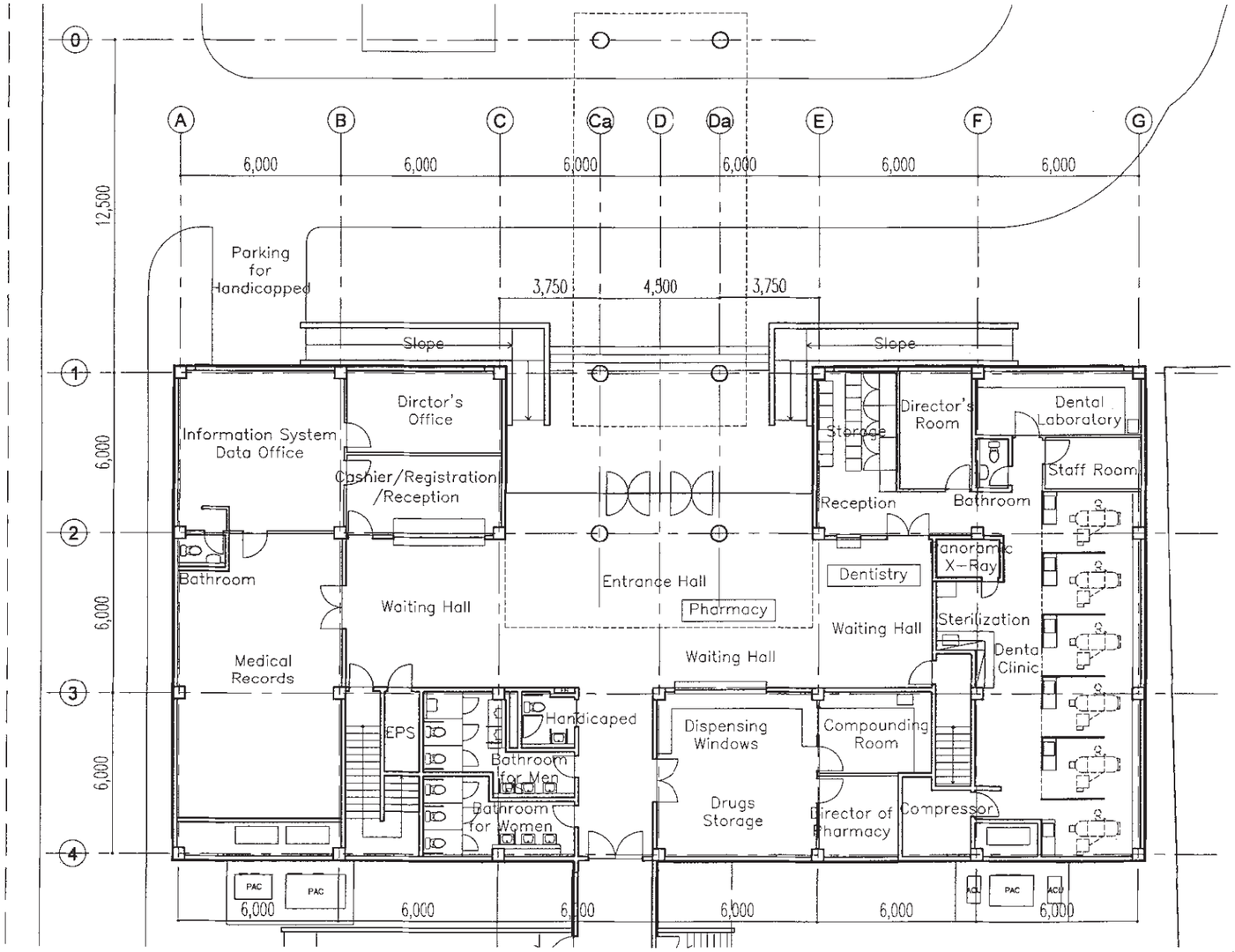
01	Site Plan		1/800
02	Building-1	Floor Plan of the First Floor	1/200
03	Building-1	Floor Plan of the Second Floor and Penthouse	1/200
04	Building-1	Elevation, Section	1/300
05	Building-2	Floor Plan	1/200
06	Building-2	Elevation, Section	1/300
07	Building-3	Floor Plan	1/200
08	Building-3	Elevation, Section	1/300

Table 2-24 Planning Contents

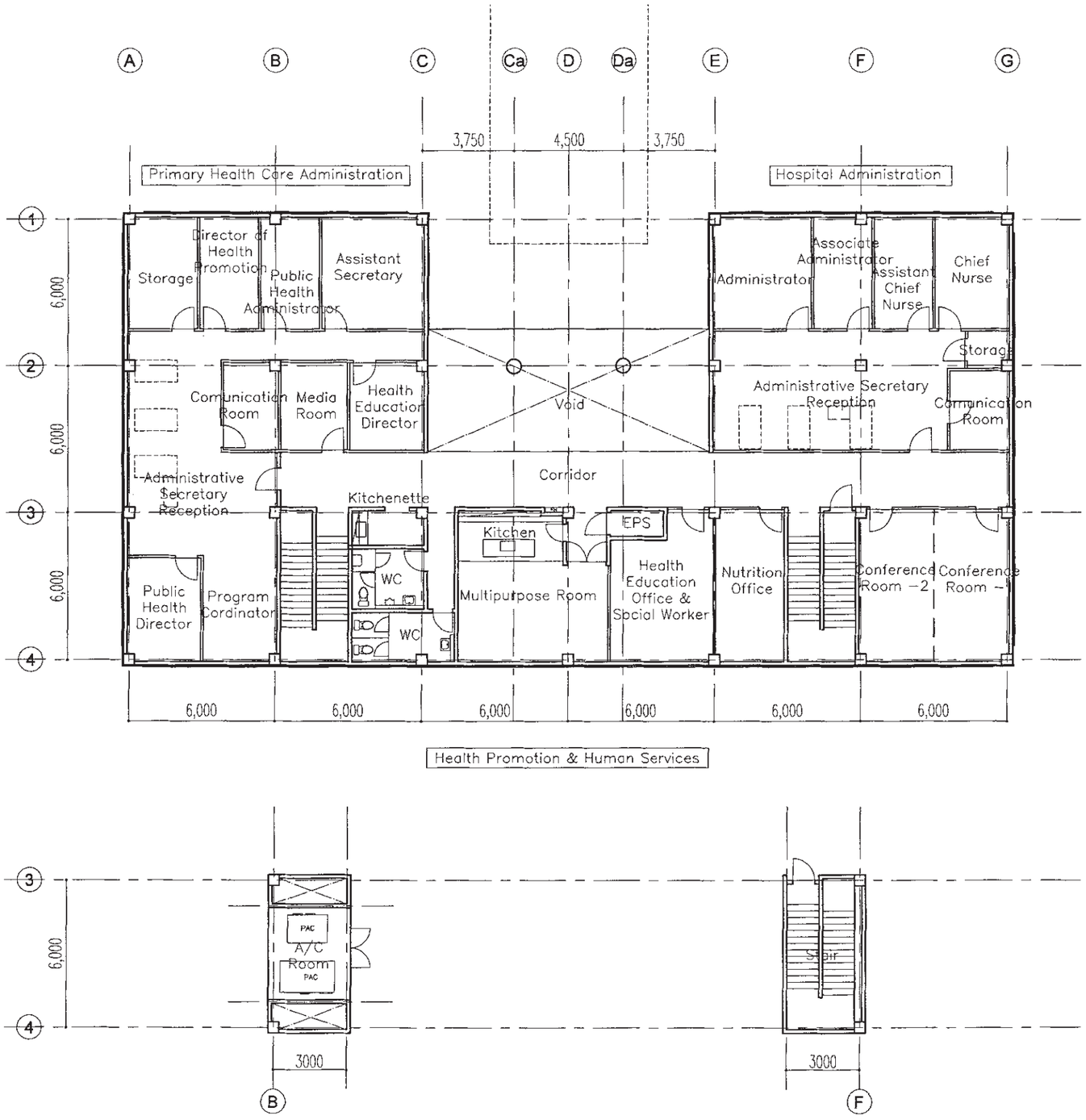
Stage	Buildings	Structures/Scales		
1st stage	Building-2	RC	One-story	697.96 ㎡
	Building-3	RC	One-story	1,006.01 ㎡
	Utility Buildings	RC	One-story	82.52 ㎡
	Subtotal			1,786.49 ㎡
2nd stage	Building-1	RC	Two-story	1,205.74 ㎡
	Subtotal			1,205.74 ㎡
Total of 1st and 2nd stages				2,992.23 ㎡



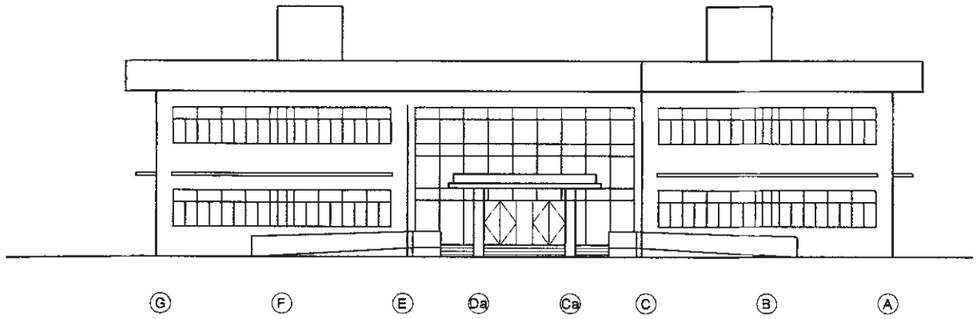
01 Site Plan S=1/800



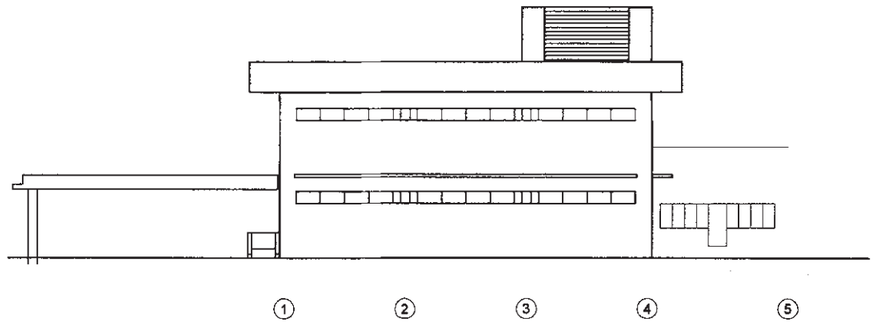
02 Building-1 1st Floor Plan S=1/200



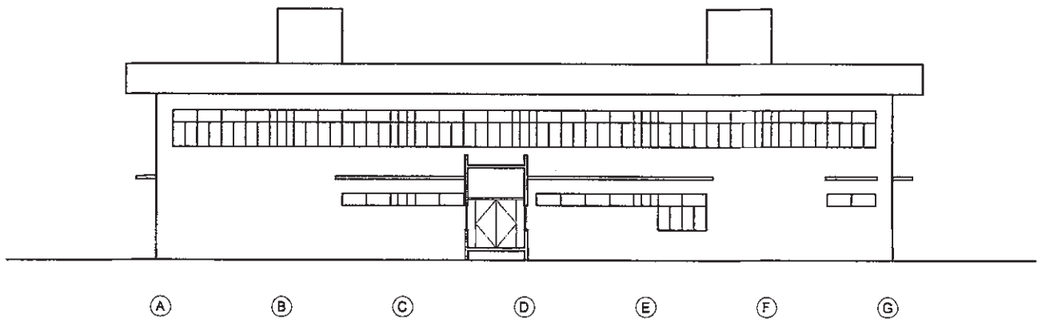
03 Building-1 2nd Floor and PH Floor Plan S=1/200



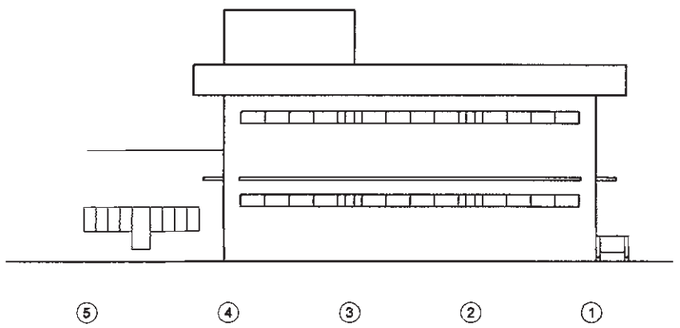
Building－1 North



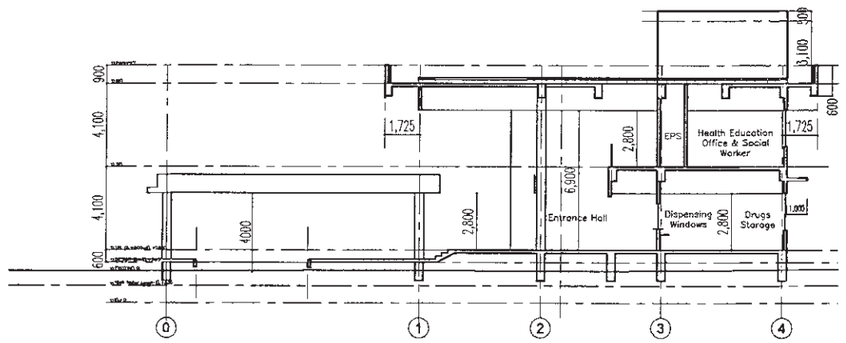
Building－1 West



Building－1 South

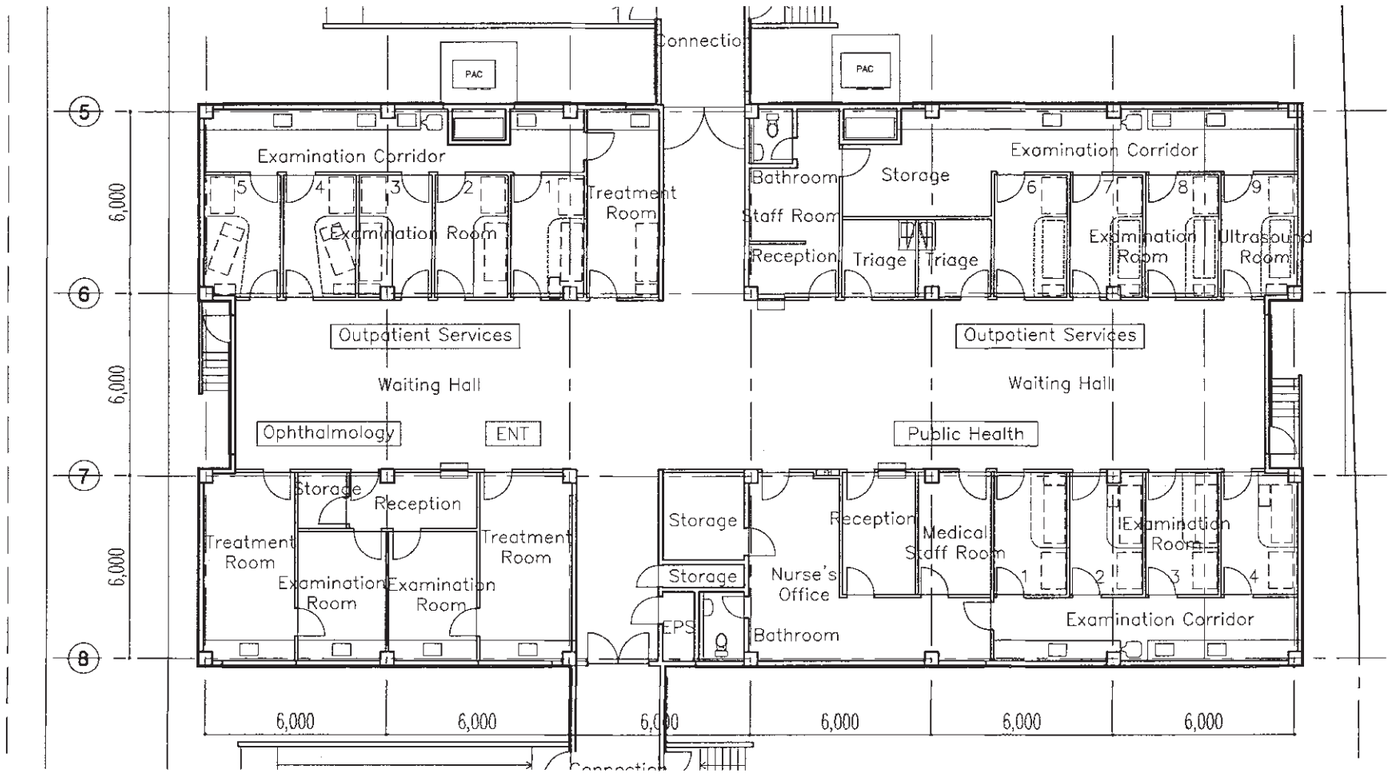


Building－1 East

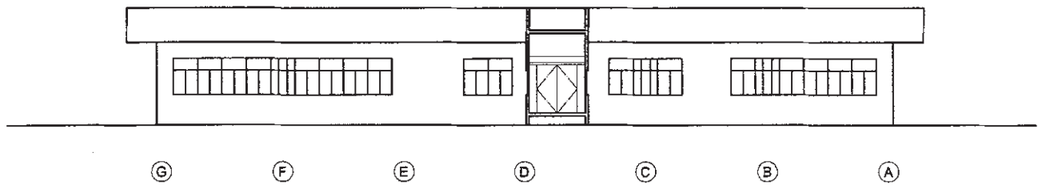


Building－1 Section

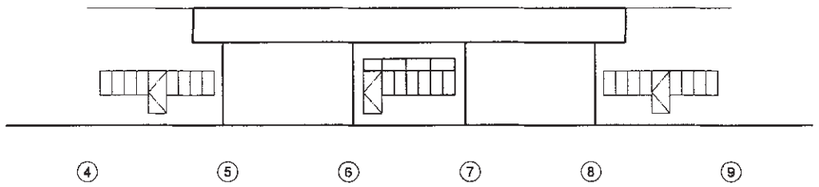
04 Building－1 Elevations and Sections S=1/300



05 Building-2 Plan S=1/200



Building–2 North



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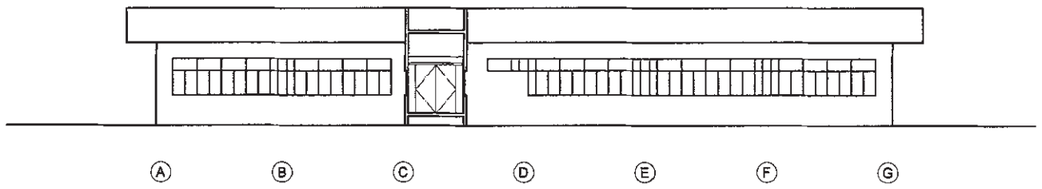
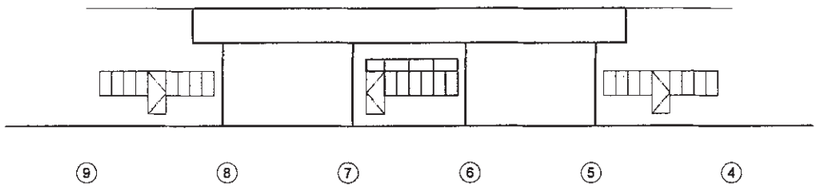


Building–2 South



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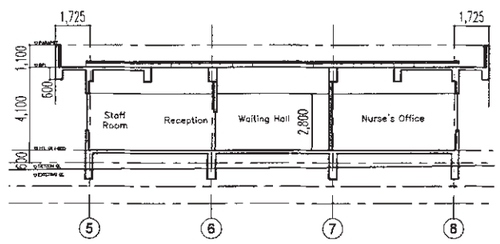
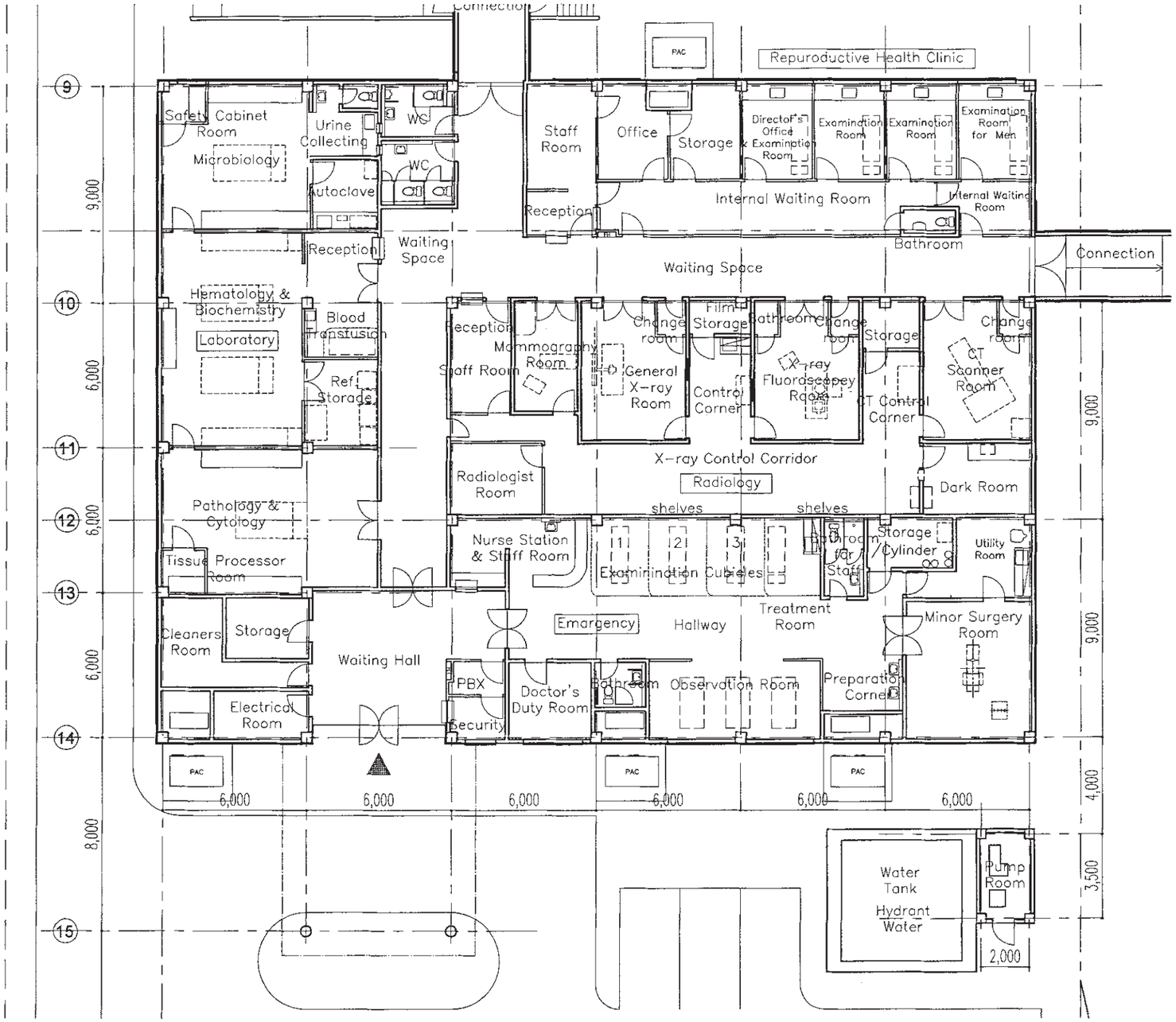
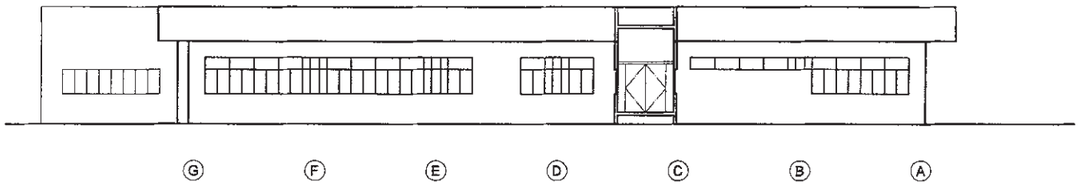


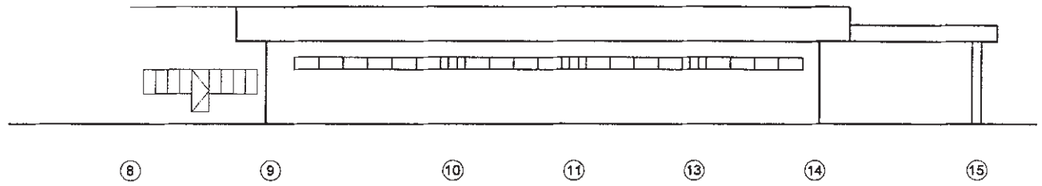
Building–2 Section



07 Building-3 Plan S=1/200



Building–3 North



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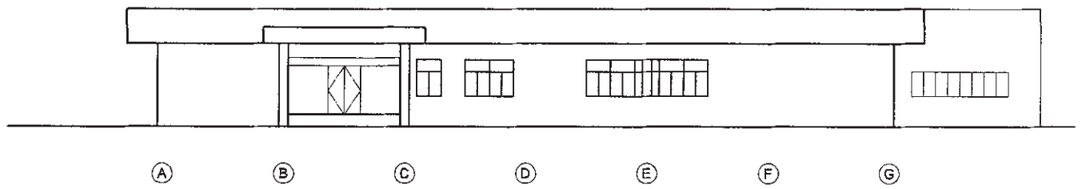
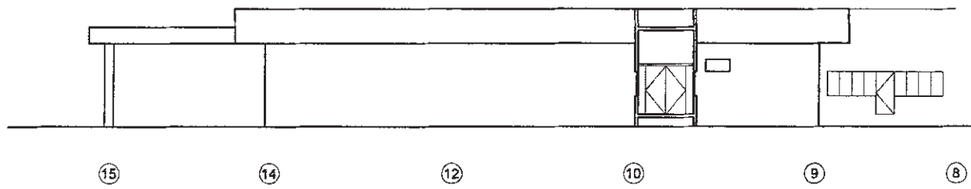
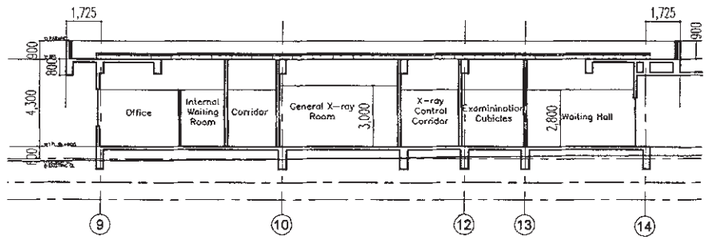


Building–3 South



Building–3 East



Building–3 Section

08 Building-3 Elevations and Sections S=1/300