Ministry of Health
The Kingdom of Tonga

PREPARATORY SURVEY (BASIC DESIGN) REPORT ON THE PROJECT FOR UPGRADING AND REFURBISHMENT OF VAIOLA HOSPITAL (PHASE Ⅱ) IN THE KINGDOM OF TONGA

November 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

THE CONSORTIUM OF
NIHON SEKKEI INTERNATIONAL INC. AND NIHON SEKKEI, INC.

PREFACE

In response to a request from the Government of the Kingdom of Tonga, the Government of Japan decided to conduct a preparatory survey (basic design) on the Project for Upgrading and Refurbishment of Vaiola Hospital (Phase Ⅱ) and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Tonga a preparatory survey (basic design) team from March 10th to April 1st, 2009.

The team held discussions with the officials concerned of the Government of Tonga, 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 Tonga 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 Kingdom of Tonga for their close cooperation extended to the teams.

November 2009

Yoshihisa Ueda
Vice President
Japan International Cooperation Agency

November 2009

Letter of Transmittal

We are pleased to submit to you the preparatory survey (basic design) report on the Project for Upgrading and Refurbishment of Vaiola Hospital (Phase Ⅱ) in the Kingdom of Tonga.

This survey was conducted by the Consortium of Nihon Sekkei International Inc. and Nihon Sekkei, Inc. under a contract to JICA, during the period from February to November 2009. In conducting the survey, we have examined the feasibility and rationale of the project with due consideration to the present situation of Tonga 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,

Takeshi Endo
Project Manager

Preparatory Survey (Basic Design) Team on
the Project for Upgrading and Refurbishment of Vaiola Hospital (Phase Ⅱ)
in the Kingdom of Tonga

The Consortium of Nihon Sekkei International Inc. and Nihon Sekkei, Inc.

Summary

The Kingdom of Tonga (hereinafter referred to as "Tonga") is a constitutional monarchy in Oceania located at about 2,000 km to the north of New Zealand and comprised of about 172 large and small islands. Tonga was united into a kingdom by Tupou I in 1845 and became a constitutional monarchy in 1875. Its total land area is 700 km^2 (roughly the same size as Tsushima, Japan) with a population of 101,991 (2006, Tonga Department of Statistics, Ministry of Finance and National Planning). The subject site is located in the capital city of Nuku'alofa (population: about 34,000) on Tongatapu Island (population: about 70,000), which is the country's largest island and lies in the southern area. Geographically, the subject site is located at 21° 9' south latitude and 175° 14' east longitude. The annual mean temperature is 23°C, but it is cooler in winter from June through September, with temperatures varying between 17 and 22°C in the morning and evening. In contrast, the temperature rises to nearly 30°C in summer, which lasts from December through March and is also the season of high-precipitation cyclones. The annual precipitation is about 1,650 mm.

Tonga is not an industrial country and hence most commodities are imported from other countries. The main industries are agriculture, fishery, and tourism. The distribution of industries is about 60% primaries industry, including agriculture, forestry, and fishery; 5% secondary industries such as manufacturing and 35% tertiary industries such as commerce and services. Tonga's annual exports are US$7.3 million (2006, Asian Development Bank) and the annual imports are US$128.8 million (2006, Asian Development Bank), showing a significant excess of imports. The country's economy is partly supported by money sent from Tongan people living abroad and financial aid from other countries. Since the Government has focused on private sector development (tourism, etc.) by introducing foreign investment and on the improvement of infrastructure related to education and healthcare, related social infrastructure are being rapidly developed. Although per-capita GNI is US$ 2,320 (2007, World Bank), the economic growth rate is -3.5% (2007, World Bank). The unit price of various materials and equipment, including construction materials, appear to be rising as they are mostly imported from other countries.

Tonga completed its 8th Strategic Development Plan (Jul. 2006 to Sept. 2008) as part of the nation's 50-year National Strategic Development Plan. This plan sets out sustainable development in politics, the economy, the environment, and culture as long-term goals for the year 2025. To achieve these goals, the Government of Tonga is putting emphasis on good governance, equitable and environmentally sustainable private sector-led economic growth, improved education and health standards, and cultural development to create a society in which all Tongans enjoy higher standards of living and a better quality of life. In the health sector, healthcare improvement is taken up as one of the most important priorities, and efforts are directed toward establishing a medical service environment the Tonga people can be proud of by the year 2020.

The health situations in Tonga are mostly favorable. The mortality of infants less than five years old is 24 per 1000, placing Tonga 105th in ranking (The State of the World's Children 2005 by UNICEF). The maternal mortality was 227.8 in 2005 (per 100,000 births) but improved to 36.5 in 2007. On the other hand, according to the WHO report regarding the health situations not picked up by indices, a number of people are suffering from diabetes, eye troubles, and heart disease due to obesity. The number one cause of death in 2005 was circulatory disease, the number two cause was tumors, followed by metabolic, respiratory, and digestive diseases (Annual Report 2007 of the Ministry of Health).

The health administration in Tonga is divided into six administrative regions, but only four of them have hospitals. Each hospital has healthcare centers beneath them and maternal and child clinics come beneath the healthcare centers. This vertical line makes up the healthcare structure. Private hospitals in Tonga are mostly small clinics.

There are seven healthcare centers and 19 maternal and child clinics on Tongatapu Island, where Vaiola Hospital, the subject of the current grant aid project, is located. Although this hospital is positioned as a tertiary (third-level) medical facility, it also provides primary medical services to local residents, and hence no distinction is made among the facilities of the hospital.

Vaiola Hospital opened in 1971. Presently, the hospital holds 199 beds and its general and special clinics receive about 73,000 outpatients a year (Vaiola Hospital, 2008), making it the only hospital on Tongatapu Island and the largest hospital in the country. However, due to the deterioration of hospital facilities and medical equipment and an increase in outpatients, not only surgery rooms but also the beds for post-surgery recovery and intensive care (ICU) are not sufficient to provide good medical services to hospitalized patients, which are the largest in number in the country. In addition to this problem, the hospital is faced with other safety and environmental problems, including hospital infection risks, as the sterile/unsterile areas are not clearly divided in the surgery rooms and main material sterilizing room; inefficient handling of sterilization requirements because of a deteriorated sterilizer in the main sterilizing room; interruption of proper diagnosis due to troubles of X-ray equipment; and contamination risks due to insufficient capacity of wastewater treatment tanks which receive wastewater from the entire hospital.

In view of these situations, the Government of Tonga drew up the Vaiola Hospital Improvement Master Plan (hereinafter referred to as "M/P") with support from the World Bank, aiming at overall improvement of Vaiola Hospital as a whole. The improvement policy presented in M/P was such that the entire hospital would be improved with assistance from donors by dividing construction and renovation work into six work sections. In the first stage of M/P, the main examination ward, the obstetrics ward, the surgery ward, the septic tank as well as related medical equipment were improved with grant aid from Japan in 2004. In the second stage of M/P, the internal medicine ward, the pediatrics ward, and the mental health ward were constructed with financial aid from the World Bank. Owing to these improvements, Vaiola Hospital is now becoming a modern hospital equipped with 199 beds, three surgery rooms, an ICU, and other facilities.

As the final stage of M/P, the Tongan side requested that Japan construct and renovate the remaining clinical, emergency, and administration divisions and improve related medical equipment with grant aid from Japan.

Therefore, the purpose of the current project is to improve the quality and quantity of medical services at Vaiola Hospital through the construction and renovation of facilities and the procurement of medical equipment, thereby making it a hub hospital that can provide three kinds of medical services: advanced medical service as a tertiary referral hospital, secondary level medical services to the people on Tongatapu Island, where the capital city of Nuku'alofa is located, and emergency medical services in case of disasters.

If this project is implemented with grant aid from Japan, it will secure a key medical service base that can offer high-level services for the entire nation, intermediate level services mainly for the local people, and emergency services in case of disasters, eventually raising the overall health indices of the Tongan people.

In response to this request, the Government of Japan decided to conduct a basic design survey and the Japan International Cooperation Agency (JICA) sent a basic design survey team to Tonga in March 2009. The survey team carried out a range of surveys, including consultations with relevant parties in Tonga, a field survey of related facilities, collection of necessary reference materials, and an in-situ survey of the construction site. After conducting analyses back in Japan and holding an explanatory meeting on the outline of basic design in Tonga in August 2009, this Preparatory Survey (basic design) report was compiled, drawing the conclusion that the construction and rehabilitation of the facility and the procurement and installation of related equipment for Vaiola Hospital are justified.

The outline of the Vaiola Hospital Renovation Project is as follows:

Competent authority:	Ministry of Health, Government of Tonga
Executing authority:	Ministry of Health, Government of Tonga
Project period:	26 months including the detailed design and bidding periods
Construction site:	City of Nuku'alofa

Project contents: As shown in the table.

Building structure: As shown in the table.

Major project breakdown (total floor area)	Composition of Facilities	Contents of each Composition
Facility (5,108.6 m^2) of which New Construction 3,538.5 m^2 Renovation 582.4 m^2 Passageway Waiting Space 987.7 m^2	O.P.D. New two storied building, 2,280.0 m^2 Reinforced concrete structure and steel roof framing	Basement floor: Pit for Rainwater Reservoir First floor O.P.D.: Waiting Hall, General Clinic, Accident and Emergency, Special Clinic Second floor Antenatal: Waiting Hall, Consulting rooms Administration: Medical Office, Accounts Training: Training room, Lecture room IT Service: IT office, Server room
	O.P.D. ANNEX Renovated single storied building, 582.4 m^2 Reinforced concrete structure and wood roof framing	Ophthalmology, Diabetes, Physiotherapy
	Dental Unit New single storied building 396.1 m^2 Reinforced concrete structure and steel roof framing	Dental room, Dental tech. room, Dental X-ray room, Machine room, Waiting Space
	Multipurpose New single storied building 126.0 m^2 Reinforced concrete structure and steel roof framing	Waiting Space (Multipurpose use), Storage for furniture
	Nursing School New single storied building 596.1 m^2 Reinforced concrete structure and steel roof framing	Class room, Simulation room, Library, Computer room, Office
	Mortuary New single storied building 98.4 m^2 Steel structure	Morgue, Hall
	Outside waiting space, Passage with covered roof 987.7 m^2 Steel structure	Waiting space for Pharmacy of Outpatients, Ophthalmology, Diabetes, Physiotherapy Covered Passage connecting the project facilities and existing facilities
	Ancillary Mechanical Facility New single storied building 41.9 m^2 Reinforced concrete structure and steel roof framing	City Water pump room、Sewage water pump room, City Water Reservoir Tank, Elevated water reservoir tank, Sewage treatment plant
Medical Equipment	The equipment necessary for the project facilities (Accident and Emergency, General Clinic, Special Clinic, Antenatal, Physiotherapy, Pharmacy of Outpatients, Dental, Nursing School, Mortuary, etc)	

From the cost estimate, it was found that the following expenses would be required by the specified date to cover the works of the Tongan side: 435,500 Tonga Pa'anga (hereinafter referred to as "T$") by July 2010 before commencement of the current project; T$50,000 by October 2011, which is during the main work; and T$2,294,950 after April 2012, which is after the handover of the completed facility. (Tonga's fiscal year starts in July and ends at the end of the next June).

Those expenses will be appropriated from the budget of the Ministry of Health in FY2009, 2010, and 2011. If those amounts covering the Tongan work are compared with the maintenance budget of the Ministry of Health in FY2008, they account for 27.8%, 3.2%, and 146.3%, respectively. According to our confirmation, the Tongan side has already secured a budget for the expense paid out by July 2010 and is now preparing its execution. No problems should arise in terms of expenses for the works after FY2011, which will be executed over two fiscal years, as Tonga has issued assurance that it will secure a budget for those works.

The maintenance budget of Vaiola Hospital is included in the budget of the Ministry of Health. It is estimated that the maintenance budget of the hospital will increase to T$178,334 (ca. JPY8.50 million) in FY2011 when this grant aid project is completed, and increase to T$250,873 (ca. JPY12.00 million) in FY2012 and beyond. This accounts for about 13.2% and 19.0%, respectively, of the maintenance budget of Vaiola Hospital in FY 2008, which is a significant increase. The total maintenance budget of the Ministry of Health, including the above increases at Vaiola Hospital, respectively accounts for 7.3% and 7.7% of the total budget of the Ministry in FY 2008. Recognizing the importance of facility and equipment maintenance, Tonga explained to the Japanese side that it would secure 7% of the Ministry's budget for the maintenance of hospitals. However, the Japanese side conveyed that the maintenance budget should be further increased, and the Ministry of Health promised that they would take responsibility for securing the necessary amounts.

If the current project (the works undertaken with grant aid from Japan and those undertaken by Tonga) is implemented, the following direct benefits are expected to be attained.

i) Recovery of functionality and improvement of medical service as a general clinical and emergency medical facility.
The functions of the general clinical and emergency divisions will be enhanced by the improvement of the hospital facilities and medical equipment. This will improve hospital indices, indicated by the number of outpatients, which is currently 66,625 in the general clinic (Vaiola Hospital, 2008); 7,173 in the special clinic; 5,581 in wound and minor treatments; 26,321 in the dental clinic; and 9,204 in prenatal examination. In addition to those indices, the contents and quality of service as a medical service facility will be improved.

ii) Improvement of the secondary medical facility on Tongatapu Island, where the nation's capital is located.
Improvement of this secondary medical facility, which serves about 70,000 people on the island, will enable improvement in the content and quality of medical service.

iii) Enhanced functionality by improving the nursing school building
The improvement of the school facility and educational equipment will help increase the number of nursing students (92 students in 2008) and exchange programs with other countries (three programs in 2008).

iv) Efficient administration by improving educational and training facilities
Currently, education and training-related efficiency is poor. For example, gatherings of many people, such as graduation ceremonies and PTA assemblies, which take place about 10 times a year, are being held at external rental halls because the hospital has no suitable space. Also, all-school meetings, which take place 24 times a year, are being held by dividing students into small groups. If the facility is improved, it becomes possible to hold education meetings, training sessions, and workshops efficiently in the hospital.

Through implementing the current project, the following indirect benefits are expected to be realized.

i) Improvement in the health of all Tongan people
The nation's top referral medical facility, when improved, can provide improved medical service to Tonga's total population of about 100,000, contributing to improving the health of all Tongan people.

ii) Improvement of Tonga's key emergency rescue base
The hospital will be able to embark on rescue/relief activities and receive victims in case of major disasters such as cyclones, earthquakes, and plane crashes (a rescue scheme during these kinds of accidents is being promoted by WHO and other related organizations) by working as the key base by mobilizing the general clinic and emergency wards, which have earthquake-resistant structures.

iii) Reduction in maintenance costs by actively using natural energy.
A range of improvements, including renewable energy-based power generation with the introduction of a solar panel system and the installation of a rainwater tank to cover the chronic shortage of municipal water, will contribute to improving the chronic limitations of utilities common to island countries.

As described above, implementation of the current project with grant aid from Japan will make it possible for the hospital to achieve appropriate functionality as the nation's top referral medical facility, as the secondary medical facility serving Tongatapu Island, and as the key emergency rescue base in case of disaster. It will directly improve the content and quality of medical service on Tongatapu Island and eventually the overall health of the nation's approximately 100,000 people. In that sense, it is very meaningful to carry out this project with grant aid from Japan, and therefore the appropriateness of and need for this project are extremely high.

In initiating the current grant aid project, it is very important that the Tongan work is executed at an appropriate time. In particular, the demolition of existing facilities, grading work, and transfer of infrastructures existing in the construction site should be completed before the commencement of Japanese side work. Furthermore, in order to administer Vaiola Hospital smoothly and effectively and to produce the aforementioned direct and indirect benefits after improving the hospital through this project, the following improvements should also be ensured.

(1) To improve referral functions in Tonga, establish a cooperative and coordinative system with the lower-level medical institutions and then utilize the system toward the overall improvement of regional medical services, including preventive healthcare.

(2) To facilitate future renewal of equipment, establish a financial plan such as a reserve fund for equipment purchase by considering the service life and long term deterioration of principal equipment.

(3) Secure the required number of personnel in charge of maintenance consecutively to ensure that the completed facility and procured equipment are continually used in good condition.

(4) When installing equipment, make arrangements to give technical guidance on their actual operation in addition to the explanations in the maintenance manual, operation manual, and circuit diagrams from suppliers. Additionally, give instructions on the effective use of manuals to enable appropriate equipment maintenance.

(5) Keep a record of the delivery date, frequency of use, and repair history in the ledger for each equipment which is procured in this project. Also, prepare a spare parts purchase plan and an equipment renewal plan, and develop a medium to long term equipment maintenance budget plan based thereon.

(6) After the completion of the current project, prepare an annual report on the administrative status of the project facilities and equipment. Utilize the report to keep track of the operational performance thereof and as the reference material to seek further improvement in hospital administration.

(7) It will be recommended that care be taken in the handling of asbestos when demolishing existing buildings.

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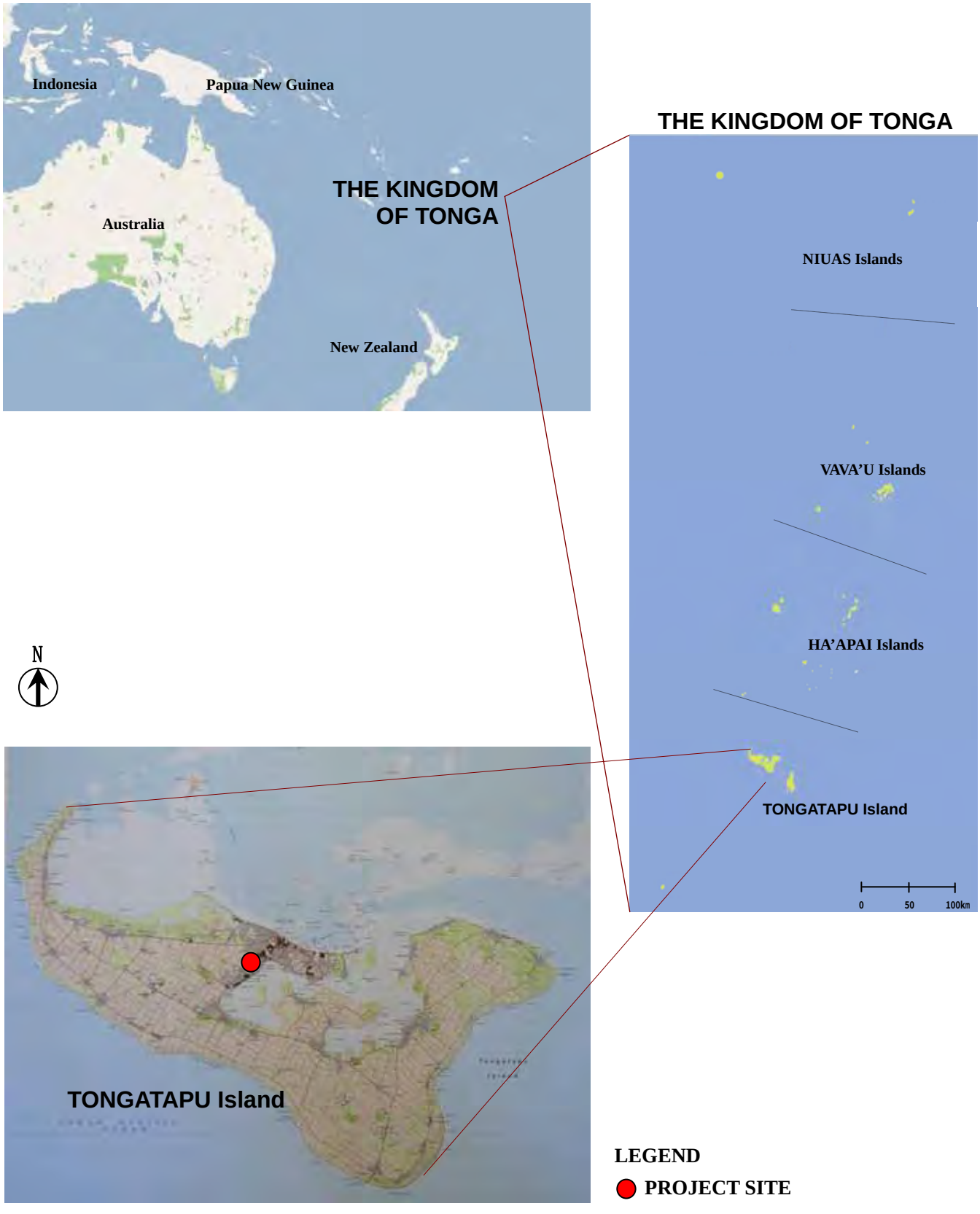
Location Map



PERSPECTIVE

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CHAPTER 2. CONTENTS OF THE PROJECT

ABBREVIATIONS

A/P	Authorization to Pay
AusAID	Australian Government's overseas aid program
A&E	Accident and Emergency
B/A	Banking Arrangement
E/N	Exchange of Notes
G/A	Grant Agreement
GNI	Gross National Income
ISO	International Organization for Standardization
JASS	Japanese Architectural Standard Specification
JICA	Japanese International Cooperation Agency
JIS	Japanese Industrial Standard
MDF	Main Distribution Frame
NGO	Non-Governmental Organization
O.P.D.	Outpatient Department
ODA	Official Development Assistance
PBX	Private Branch Exchange
WB	World Bank
WHO	World Health Organization
UNFPA	United Nations Population Fund

Chapter 1. Background of the Project

CHAPTER 1. BACKGROUND OF THE PROJECT

(1) Outline and Background of the Requested Japanese Assistance

The Kingdom of Tonga (hereinafter referred to as "Tonga") is a constitutional monarchy in Oceania located at about 2,000 km to the north of New Zealand and comprised of about 172 large and small islands. Tonga was united into a kingdom by Tupou I in 1845 and became a constitutional monarchy in 1875. Its total land area is 700 km^2 (roughly the same size as Tsushima, Japan) with a population of 101,991 (2006, Tonga Department of Statistics, Ministry of Finance and National Planning).

Tonga is not an industrial country and hence most commodities are imported from other countries. The main industries are agriculture, fishery, and tourism. The distribution of industries is about 60% primaries industry, including agriculture, forestry, and fishery; 5% secondary industries such as manufacturing and 35% tertiary industries such as commerce and services. Although per-capita GNI is US$ 2,320 (2007, World Bank).

The health situations in Tonga are mostly favorable. The mortality of infants less than five years old is 24 per 1000, placing Tonga 105th in ranking (The State of the World's Children 2005 by UNICEF). The maternal mortality was 227.8 in 2005 (per 100,000 births) but improved to 36.5 in 2007. On the other hand, according to the WHO report regarding the health situations not picked up by indices, a number of people are suffering from diabetes, eye troubles, and heart disease due to obesity. The number one cause of death in 2005 was circulatory disease, the number two cause was tumors, followed by metabolic, respiratory, and digestive diseases (Annual Report 2007 of the Ministry of Health).

Vaiola Hospital opened in 1971. Presently, the hospital holds 199 beds and its general and special clinics receive about 73,000 outpatients a year (Vaiola Hospital, 2008), making it the only hospital on Tongatapu Island and the largest hospital in the country. However, due to the deterioration of hospital facilities and medical equipment and an increase in outpatients, not only surgery rooms but also the beds for post-surgery recovery and intensive care (ICU) are not sufficient to provide good medical services to hospitalized patients, which are the largest in number in the country. In addition to this problem, the hospital is faced with other safety and environmental problems, including hospital infection risks, as the sterile/unsterile areas are not clearly divided in the surgery rooms and main material sterilizing room; inefficient handling of sterilization requirements because of a deteriorated sterilizer in the main sterilizing room; interruption of proper diagnosis due to troubles of X-ray equipment; and contamination risks due to insufficient capacity of wastewater treatment tanks which receive wastewater from the entire hospital.

In view of these situations, the Government of Tonga drew up the Vaiola Hospital Improvement Master Plan (hereinafter referred to as "M/P") with support from the World Bank, aiming at overall improvement of Vaiola Hospital as a whole. The improvement policy presented in M/P was such that the entire hospital would be improved with assistance from donors by dividing construction and renovation work into six work sections. In the first stage of M/P, the main examination ward, the obstetrics ward, the surgery ward, the septic tank as well as related medical equipment were improved with grant aid from Japan in 2004. In the second stage of M/P, the internal medicine ward, the pediatrics ward, and the mental health ward were constructed with financial aid from the World Bank. Owing to these improvements, Vaiola Hospital is now becoming a modern hospital equipped with 199 beds, three surgery rooms, an ICU, and other facilities.
As the final stage of M/P, the Tongan side requested that Japan construct and renovate the remaining clinical, emergency, and administration divisions and improve related medical equipment with grant aid from Japan.

Therefore, the purpose of the current project is to improve the quality and quantity of medical services at Vaiola Hospital through the construction and renovation of facilities and the procurement of medical equipment, thereby making it a hub hospital that can provide three kinds of medical services: advanced medical service as a tertiary referral hospital, secondary level medical services to the people on Tongatapu Island, where the capital city of Nuku'alofa is located, and emergency medical services in case of disasters.

(2) Natural Conditions

1) Temperature and Humidity

The climate of Tonga is categorized as a tropical oceanic climate. The annual mean temperature is 23°C, but the temperature difference is not large, with high and low mean temperatures of 27.3°C and 20.9°C, respectively. It is rather cool from May to October due to southeasterly trade winds. The humidity is relatively high with an annual mean humidity of 76%, fluctuating between 73% and 79%.

2) Precipitation

The annual precipitation in Tonga varies by island. The annual mean precipitation over the past 20 years on Tongatapu Island, where the project site is located, was about 1,650 mm. This is slightly higher than that of Tokyo, which is about 1,500 mm. December through March is the rainy season.

3) Wind Direction and Wind Force

The entirety of Tonga belongs to the southeast trade wind zone. According to the records at the meteorological observatory on Tongatapu Island, the wind direction changes between east and south, and east-southeasterly winds are the most prevalent throughout the year. The annual mean wind velocity is about 3.6 m/s. The prevailing wind in April is a southeasterly wind and that in September is an easterly wind. The mean wind velocity of these prevailing winds is about 4.6 m/s, which is rather strong.

4) Solar Radiation

The City of Nuku'alofa, where Vaiola Hospital is located, lies at 21° south latitude on the north of the Southern Circle. The solar altitude is relatively high and hence strong solar radiation falls from the direction directly above the building.

5) Cyclones

Many cyclones are generated around the Fiji islands, situated to the north-northwest of Tonga, and one or two pass through this country each year. Possibly due to the influence of El Nino, three cyclones caused damage to the southern part of the country in 2000 through 2003. Some cyclones have an instantaneous wind velocity of 70 m/s, which is larger than that of some typhoons hitting Japan.

6) Earthquakes

An ocean trench lies in the ocean bottom to the east of Tonga, where a number of ocean plate earthquakes occur. In May 2006, a strong earthquake with a magnitude of 7.9 occurred around Manuai Island, approximately 170 km to the northeast of Nuku'alofa. In October 2008, a 6.9-magnitude earthquake occurred near the ocean trench to the east-southeast of Nuku'alofa, followed by another 7.6-magnitude earthquake in March 2009 near the ocean trench approximately 220 km to the south-southeast of Nuku'alofa. The March 2009 earthquake struck while we were conducting a basic design survey in Tonga. The tremor felt in Nuku'alofa was roughly equivalent to a 3 to 4 lower on the Japanese seismic intensity scale. However, the possibility of occurrence of epicentral earthquakes on Tongatapu Island is considered small because the ground is made up of stable uplifted limestone.

The project site is not susceptible to tsunamis since it is located in a location facing a large lagoon on Tongatapu Island and not the open sea.

(3) Environmental and Social Considerations

This project is likely to have little effect on the surrounding environment as the target facilities are the rebuilding and renovation of the existing general clinic and emergency division, the special clinic division, the administration division, the dental clinic division, the education and training division, and the nursing school. However, there exists the possibility that the facilities and equipment may have a slight impact on the surrounding environment.

There are no sewerage systems in Nuku'alofa, so all wastewater should be treated in each premises and then discharged into the ground for permeation drainage. In the newly installed treatment facility, wastewater will be treated into an acceptable quality. As such, the wastewater from the facility will have little effect on the environment.

The refrigerant of air conditioning units is likely to have an effect on the environment. To address this problem, the minimum necessary number of units will be installed and types of unit that have minimum effect on the environment will be selected.

In terms of electricity, a solar power generation system will be installed to utilize natural energy and reduce environmental load. This system will be designed to cover much of the present electricity demand without causing a reverse power flow and with no effect on the fluctuations of generator loads at the power station.

In terms of land use, a landscaping plan will be designed that will alter existing elevation differences on the site as little as possible to minimize the effect on the environment.

Chapter 2. Contents of the Project

CHAPTER 2. CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

(1) Overall Goal and Project Objective

The Kingdom of Tonga (hereinafter referred to as "Tonga") has completed its 8th Strategic Development Plan (July 2006 to September 2008) as part of the nation's 50-year National Strategic Development Plan. This plan has set sustainable development in politics, the economy, the environment, and culture as its long-term development goal to be accomplished by 2025. The plan is pushing development in the health care field under slogan of "establish a medical service environment the Tongan people can be proud of by 2020". The Government of Tonga is directing its efforts on good governance, equitable and sustainable private sector-led economic growth, improved education and health standards, and cultural development to create a society in which all Tongans enjoy higher living standards and a better quality of life. Health care improvement is clearly being addressed as one of the important targets.

Vaiola Hospital is the only hospital in Tonga that provides high-level medical services. It is not tertiary referral hospital, but also provides primary health care service to the people on Tongatapu Island, where the capital city of Nuku'alofa is located.

This hospital opened in 1971, but problems have been found in terms of efficiency, safety, and hygiene due to insufficient operation rooms, insufficient intensive care beds, and separation of related divisions. Therefore, with the goal of redeveloping the entire infrastructure at Vaiola Hospital, the government has drawn up the Vaiola Hospital Improvement Master Plan (M/P) with support from the World Bank. It revealed a policy to advance new construction and rehabilitation works in six sections toward overall improvement of the facilities with aid from donors.

As the first stage of the project, the main examination ward, the obstetrics ward, the surgery ward, and the septic tank were constructed and related medical equipment furnished in 2004, with grant aid from Japan. The second stage saw the construction of facilities such as the internal medicine ward, the pediatrics ward, and the mental health ward with financial aid from the World Bank.

The Government of Tonga has requested grant aid from Japan to construct and renovate the remaining facilities such as the outpatient department, accident and emergency department, and hospital administration, as well as to furnish related equipment as the final stage of the M/P.

When this project is completed, Vaiola Hospital will properly function. It will not only be improved as a medical facility for about 70,000 people in Tongatapu Island, where the nation's capital city Nuku'alofa is located, but also become capable of providing adequate medical services for Tonga's total population of about 100,000 (as of 2006) as a tertiary referral hospital, thereby improving the nation's various health indicators. Furthermore, this project secures a key medical facility for the area in terms of local health care and emergency medical care in time of disaster.

(2) Basic Concept of the Project

The current project is the third (final) stage as defined in the M/P. This stage consists of construction of new and renovation of existing medical service-related facilities, including general and special clinical departments (ENT, ophthalmology, diabetes, and physiotherapy), the emergency division, the dental clinic, the mortuary, and the nursing school, as well as furnishing of the equipment necessary for the medical services at these facilities.

The Basic concept of the project is construction and renovation of the facilities listed in Table 2-1 and provision of the medical equipment needed for medical services there, excluding those easily procured locally.

Table 2-1 Outline of the Cooperation Project for Vaiola Hospital

Major project breakdown (total floor area)	Composition of Facilities	Contents of each Composition
Facility (5,108.6 m^2) of which New Construction 3,538.5 m^2 Renovation 582.4 m^2 Passageway Waiting Space 987.7 m^2	O.P.D. New two storied building, 2,280.0 m^2	Basement floor: Pit for Rainwater Reservoir First floor O.P.D.: Waiting Hall, General Clinic, Accident and Emergency, Special Clinic Second floor Antenatal: Waiting Hall, Consulting rooms Administration: Medical Office, Accounts Training: Training room, Lecture room IT Service: IT office, Server room
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	Dental Unit New single storied building 396.1 m^2	Dental room, Dental tech. room, Dental X-ray room, Machine room, Waiting Space
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	Ancillary Mechanical Facility New single storied building 41.9 m^2	City Water pump room、Sewage water pump room, City Water Reservoir Tank, Sewage treatment plant
Medical Equipment	The equipment necessary for the project facilities (Accident and Emergency, General Clinic, Special Clinic, Antenatal, Physiotherapy, Pharmacy of Outpatients, Dental, Nursing School, Mortuary, etc)	

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

This grant aid project for Vaiola Hospital shall be planned based on the following policies and by taking into consideration the content of requests from Tonga, the results of the on-site survey, and agreements reached though discussions, in order to construct facilities of the general and emergency clinic, the special clinic, the dental clinic, the diabetes clinic, and other divisions and to furnish the minimum necessary equipment appropriate for the top referral hospital in Tonga. This is based on its equipment and the overall improvement master plan which Tonga formulated with the intent of completely resolving the current difficulties at the hospital: reduced safety and a low hygienic environment due to deteriorated facilities as well as degraded functions due to narrow space of the medical service area.

i) The layout plan shall be designed to create facilities in the open space between existing wards in such a way as to produce a natural link throughout the entire hospital while maintaining existing functions.

ii) The plan shall be designed to have the least possible impact on existing medical services, existing circulation of medical materials, patients, and staff as a result of the current project.

iii) The plan shall incorporate preparedness for future expansion so that the hospital can be expanded without impairing medical service functions in order to address possible patient increases due to medium- to long-term population increases. In formulating an architectural plan, a sustainable facility plan shall be realized in consideration of the following items.

iv) The Tongan standard is primarily used as the facility design standard, but is complemented by the standards of New Zealand, Australia, and Japan. The necessary facility scale shall be estimated by calculating the necessary room number based on the past and present medical service status, by referring to the Japanese Standard on the Floor Area of Medical Facilities (Design Materials Collection complied by the Architectural Institute of Japan (AIJ)), and by taking into consideration the existing facility conditions and the average physical size and customs of the Tongan people.

v) The facility shall be designed to become a comfortable, healthy, and fresh and clean hospital for both patients and medical staff through active introduction of natural energy such as natural sunlight and natural ventilation as well as devices for thermal and light shielding.

vi) The utility cost and the maintenance cost of the hospital shall be reduced through the active use of natural energy by such means as complementing electricity with solar power generation and complementing municipal water with rainwater stored in the rainwater tank.

vii) The facility plan shall be designed to create a medical facility with resistant building systems that can function as the key medical service base in case of natural disasters such as earthquakes and cyclones.

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viii) The wastewater drainage plan shall be designed to have least impact on the surrounding environment. The medical waste disposal plan shall be designed to be consistent with the medical waste disposal system of the existing hospital.

ix) The equipment plan shall be designed based on the fundamental approach, which is to renew deteriorated equipment and fill up insufficient equipment by considering the present situations at Vaiola Hospital. The equipment type shall be selected in consideration of the operational level and ability of existing medical staff at the hospital.

x) To minimize the increase in operational maintenance costs, preferential selection for the type of equipment which is operable and manageable with existing technical levels and the work system of the staff, and the consumables and spare parts of which are obtainable in Tonga or neighboring countries.

xi) The division of responsibilities between Japan and Tonga shall be clearly defined in understanding of the overall scheme of the entire project, including the current assistance project.

xii) The plan shall be designed to eliminate overlap of aid content while seeking cooperation and coordination with other donors and NGOs by understanding their activities.

The public health division was excluded from the scope of the current grant aid project due to Tongan requests through discussions with Tonga side, based on the view that the content of that division are basically those of the Ministry of Health, and that the project is primarily aimed at improving Vaiola Hospital.
Also, the following equipment was excluded from the procurement items through consultation with Tonga: equipment which is procurable by their own effort such as digital thermometers, analog thermometers, and digital cameras; and equipment which can utilize previously procured equipment, such as pulse oximeters, hydro flasks, and dummies for medical treatment training.

(2) Policy toward natural conditions

1) Temperature and humidity

Roofs should be designed to have good insulation, because they bear the highest temperatures under direct sunlight from a high solar altitude. It is also necessary to install individual air conditioning units at each location due to the need for functional air conditioning for medical services. Architecturally, natural draft ventilation can be introduced if the roof is thermally insulated and enough cubic space is secured by raising the ceiling height. This creates a design that allows air to circulate from the bottom and exhaust from the top even on windless days.

2) Precipitation

The municipal water supply on the island is sometimes insufficient. Therefore, a rainwater storage tank will be constructed in the foundation structure in order to utilize rainwater proactively. Rainwater from the roof is collected into the tank and used for ordinary purposes and for fire water at the hospital. Because Tonga's precipitation is sometimes concentrated in a short period of time, it is important to carefully plan the roof gradient, the size of rain water pipes, and measures against overflows due to blockage of the drainage system, as well as the rain water drainage plan on the premises.

3) Wind direction and wind speed

Facility layout and window opening positions should be carefully implemented in the architectural plan in order to actively utilize wind direction and force for natural draft and ventilation. All general clinical rooms should be designed to ventilate by natural draft and ceiling fans.

4) Sunlight and salt damage

As Tongatapu Island is located at 21°C south latitude, the solar altitude is high and strong sunlight comes obliquely from above the buildings. Therefore, louvers, deep eaves, shielding glasses, and shielding wire screens should be provided to prevent sunlight from windows. Building areas exposed to direct sunlight should be finished using antiweathering materials and techniques.

The basic design survey revealed that existing buildings suffered carbonated deterioration due to seawater which had seeped into the structural body during severe storms and that measures should be taken against this hazard. As the planned buildings are located close to the ocean, building materials such as corrosion-preventive paint should be applied to external surfaces. Salt damage prevention measures are also necessary for equipment facing the exterior, including the fins of air conditioners, fans, pipe fixing metals, street lamps, and electric panels. Salt damage prevention should be taken into consideration in every aspect of planning, not only limited to these kinds of equipment but also including material selection, with particular care given to the use of steel plate materials.

5) Natural disasters (cyclones, earthquakes, etc.)

Structural members and window sashes, etc. will be designed in compliance with local codes to withstand passing cyclones and probable earthquakes.

The project site is not susceptible to tsunami damage, because it does not face the open sea side of Tongatapu Island but face the lagoon side.

(3) Policy toward socioeconomic conditions

Tonga is a constitutional monarchy that has been undergoing political reform since November 2005 with the establishment of the Political Reform Commission and with financial support from Australia and New Zealand. In November 2006, a riot fomented by a radical democratization movement group broke out and about 80% of shops and services in Nuku'alofa City were set aflame, vandalized, or looted. But, today the situation is under control and there are no such disturbances in everyday life. GNI per capita is USD 2,320 (2007, World Bank), but the economic growth rate is -3.5 % (2007, World Bank). Because Tonga is not an industrial production country, most of its commodities are imported from other countries. Tonga's main industries are tourism and small scale export of agricultural products such as pumpkins, copra, and bananas. The nation's economy is also dependent on remittance from Tongan people living abroad as well as economic aid from other countries. The government has been putting efforts with the introduction of foreign investment especially toward the development of the private sector (tourism, etc.), education, public health, and other social infrastructure, which has been gradually put into place. Most construction equipment and material is imported from abroad and the unit prices thereof are generally rising. Because construction works now under way in Tonga are not going smoothly, we must occasionally confirm construction market information.

(4) Policies on Construction/Procurement Situations or Special Situations/Business Practices in the Construction Industry

The scale of the construction market in Tonga is not large and most construction works are of a medium scale, such as steel frame warehouses and one-story shopping facilities. Therefore, large local construction companies are almost nonexistent and the only companies available provide labor only. Chinese construction companies are now constructing buildings in the center of the city area. Materials for former construction work are procured from New Zealand and Australia, but for the latter works procured from China. Chinese companies created competitive relationships with local companies by including not only equipment and materials but also workers in their contract work.

In view of this, care is needed in using Chinese companies as subcontractors for this grant aid project, because in doing so there is a possibility that we may not be able to obtain consent from local parties.

Building size in Tongatapu Island, where the project site is located, is not very large, but careful advance preparation is indispensable regarding the procurement of equipment, materials, and workers. To execute the current project efficiently, procurement of technical workers from overseas is imperative. Securement and mobilization will be the key to the successful completion of good buildings.
In terms of working hours, Saturdays and Sundays are basically non-working days. According to the local law, all physical activities including jogging are prohibited on Sundays. Therefore, care is needed not to make a tight construction schedule.

(5) Policy on the Utilization of Local Companies

As this project is a hospital construction project which is relatively difficult in terms of work level, a company with sufficient technical experience should be used. However, the number of large-scale construction companies in Tonga is limited and companies with experience in Japan's ODA-related works are small in scale. Accordingly, this work would probably be advanced by a Japanese prime contractor with the help of local subcontractors. Advancement of work utilizing the local workforce and cultivating good relationships with them would directly determine the quality of completed buildings. The ability of the prime contractor will be very important.

(6) Policy on the Management and Maintenance Ability of Hospital Administrators

The maintenance of the existing hospital, including medical and dental equipment, is being undertaken by eleven people. The annual budget is T$1,605,200 (ca. JPY 76 million) including the cost of small scale construction. At present, the maintenance chief post is vacant after the retirement of the previous chief and a mechanical technician is co-holding the post. Therefore, a maintenance chief and other electrical technicians must be hired to fill the vacant posts. In terms of maintenance capabilities, the treatment of medical/general wastewater and the disposal of medical waste are not properly carried out now and the overflow of wastewater was observed at the site, which may have detrimental effect on the environment. It is therefore very important to conduct training and detailed document checking when handing over completed facilities and equipment to enable continuous proper maintenance. For the ultrasonic diagnostic system (Color Doppler) which needs a maintenance contract after installation, a type of system that enables smooth and economical maintenance by an agent or a maintenance company located in neighboring countries should be preferentially selected.

1) Facility plan

In drawing up a facility plan, the most important things are a building systems design that allows easy maintenance and the reduction of running costs. Building systems of appropriate quality must be selected with the expectation of proper maintenance by existing staff. In terms of maintenance, the possibility to procure equipment from neighboring countries was studied. However, the building system components from New Zealand which is most widely distributed in Tonga was found to be very expensive. Based on further study, it was decided to procure building system components from New Zealand, Thailand, and Japan.

2) Equipment plan

The maintenance of medical and dental equipment is currently undertaken by the maintenance division and one person each is assigned for the maintenance of medical equipment and dental equipment. They are stationed in different rooms and do not collaborate with each other, as the dental division is highly independent in the structure of this hospital. This equipment is repaired when needed and periodically checked, roughly once a year, through a maintenance contract between the Ministry of Health and equipment agents in Australia, New Zealand, and other countries.

Equipment that allows the preparation of consumables such as reagents at the hospital or consumables available on the market in Tonga or neighboring countries should be selected preferentially to reduce equipment maintenance cost as much as possible. Equipment needing a maker's proprietary consumables or spare parts can be selected on the condition that their agents are found in Tonga or neighboring countries.

(7) Policy toward Setting of Grades of Facilities, Equipment, etc

1) Facility plan

The grading of facilities and building systems constructed in this project should basically be the same as that of the first- and second-stage construction projects which were executed in accordance with the Vaiola Hospital Master Plan, although the usage and function may differ.

The facilities should be constructed to satisfy the hospital functions of Vaiola Hospital, which serves as Tonga's top referral facility and as a secondary medical facility in Tongatapu Island, the largest island of the Tongan archipelago. The facilities should be constructed with consideration given to environmental preservation, prevention of nosocomial infections, and barrier-free access for the physically disabled, as well as with preparedness for potential disasters in Tonga, including earthquakes, cyclones, and plane crashes.

Tonga's laws and standards should be primarily used as the laws and standards governing the plan and should be supplemented by those of New Zealand, Australia, and Fiji, which are the prime exporters of equipment to Tonga, as shown below.

Design Item	Standards / Grade / Performance
Building standards on corridors and evacuation, quality of building materials	Building Standards of New Zealand. If no provisions are available, Japanese Building Standards shall be applied.
Seismic design	Local standards established in accordance with New Zealand's Standard
Barrier-free access and other functionality for the physically disabled	Japanese Building Standards and JIS
Architectural plan	The grade should be determined in consideration of role-sharing with the National Central Hospital which is a third-line medical facility. Each division and room should be planned to seek a maximum cost-effectiveness while fulfilling a required capacity.

2) Equipment plan

The grade of equipment procured in this plan in accordance with the basic policy should in principle be the same as that of the equipment currently used in the existing hospital or other hospitals of a similar level. In addition, the equipment should conform to the technical level of the medical staff and the required medical service in each division, but care must be taken not to increase the maintenance cost.

(8) Construction/Procurement Method and Construction Period Policies

1) Construction method policies

Relatively large buildings in Tonga have been constructed by various constructors with funds from various sources, including Australia, New Zealand, Japan (grant aid), and the World Bank. Besides, Chinese companies are also constructing buildings by the design build system. The structure shall be RC frame with concrete block infill walls which is common type for local large scale construction components which are often plagued with functional problems due to hardiness and water-tightness shall refer to Japanese standards.

2) Policy on the procurement method

Much of the equipment being used in the medical facilities in Tonga are made in the U.S., Europe and Japan. But, equipment made in neighboring Australia and New Zealand is rarely seen except for an oxygen generator and some other limited equipment, because there are few medical equipment makers in those countries. Although no agents are stationed in Tonga, many medical equipment makers, including Japanese makers, have their agents in Australia and New Zealand and they provide after-sales service to the equipment in Tonga.

On the other hand, spare parts of some equipment provided from Australia and New Zealand vary greatly in price. So, if those kinds of equipment are selected, they may impose a financial burden on Tonga after the handing-over. To solve this problem, it would be appropriate to increase competitiveness in the bidding process.

A regular schedule container ship from Japan arrives at Nuku'alofa Port once a month. Similar regular services, usually once a month, are also available from Australia, New Zealand, and other Southeast Asian countries like Thailand and Singapore. All those services take about one month to arrive at Tonga's port. Cargos are unloaded at Nuku'alofa Port, cleared through customs, and then carried to Vaiola Hospital located 5 km away. The road is paved, so transportation will not be a problem.

3) Policy on the construction period

To minimize disturbance to existing medical service, the construction site of this project will be divided into two areas and secure circulation between the existing outpatient ward and the X-ray/ultrasonic examination ward. Doors will be provided to each construction area to allow visits for construction management. Enough working space and carry-in routes can be secured because the hospital premises is rather spacious.

The securement of construction personnel is indispensable to execute work in accordance with the construction period and schedule. The procurement of good manpower from overseas to supplement insufficient workers in Tonga should be advanced in close cooperation with construction-related parties in Tonga with a view to promoting mutual understanding with the local workforce and transfer of skills for the future.

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

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

(1) Development of Request Content

1) Initial request and review items

The initial request and review items before the dispatch of the Preparatory Survey Team from Japan are shown in the table below.

With regard to the divisions agreed upon with Tonga during the preliminary survey in July 2008, the policy regarding preparatory survey (basic design) on the Japanese side was determined as follows by taking into account the results of the survey.

Table 2-2 Background of the Initial Request from Vaiola Hospital (for Facility)

	Contents of Function	Policy for Facility Plan
①	Accident and Emergency, Accounts, Administration	New Building (Approx.1,460 m^2)
②	Dental	New Building (500 m^2)
③	Training/Education	New Building (500 m^2)
④	Special Clinic and Antenatal	New Building (570 m^2)
⑤	Canteen	New Building 280 m^2)
⑥	Public Health, Diabetes, Physiotherapy	Renovation(700 m^2)
⑦	Nursing School	To be covered by the Tonga side, Renovation (Approx. 1,100 m^2)
⑧	Dormitory	
⑨	Mortuary/Gathering Facility	To be covered by the Tonga side, Renovation(175 m^2) and New Building(260 m^2)
⑩	Workshop	To be covered by the Tonga side, Renovation(Approx. 350 m^2)
⑪	Stores	To be covered by the Tonga side, Renovation (Approx. 350 m^2)
	Total floor area of new buildings above by Japan side except common floor area	3,310 m^2
	Total floor area of renovated buildings above by Japan side except common floor area	700 m^2
	Total floor area of buildings above by Tonga side	2,235 m^2

2) Major revisions confirmed by the field survey

In the Vaiola Hospital Master Plan, the existing buildings of the O.P.D., the nursing school, the mortuary, gathering facility, the workshop, and the stores were to be improved by rehabilitation. However, the field survey discovered that the buildings in 6, 7, 8, and 9 above had serious structural deterioration and renovation was impossible. Therefore, it became necessary to readjust the demarcation that had been agreed upon between Tonga and Japan during the preliminary survey. The two countries again discussed the priority of facilities in this project, and determined the following:

i) Facilities expected to have a direct effect on the improvement of medical service divisions in Vaiola Hospital

(The nursing school has moved up in rank, while the canteen room was deprioritized.)

ii) Separation of the Ministry of Health's function located in Vaiola Hospital

(Public health moved down in rank.)

The following table shows the results of this readjustment. Priority 2) includes a diabetes clinic and a mortuary as medical service-related facilities, and the nursing school as an education-related facility. It is judged that the public health division supervising the field of preventive health care is a specific function of the Ministry of Health.

3) Content of final facility requests

The basic design survey was conducted from March 9 to April 3, 2009. The following are the contents of the final request agreed upon between Tonga and Japan through the discussions during that survey.

Table 2-3 Content of the Final Request (for Facility)

Request at Preliminary Study		Final Request		
Section	Components	Priority	Section	Components
Administration O.P.D. A&E	・General Clinic ・A&E ・Special Clinic ・Ophthalmology / ENT ・Antenatal ・Physiotherapy ・Dental ・Outpatient Pharmacy ・Accounts, Hospital Administration ・Training ・Education ・Diabetes ・Pubic Health ・Canteen	①	Administration O.P.D A&E	・General Clinic ・A&E ・Special Clinic ・Ophthalmology (Renovation)) ・ENT ・Antenatal ・Physiotherapy (Renovation) ・Dental (Renovation Partly) ・Outpatient Pharmacy ・Main Entry, Reception, Admission, Office ・Accounts ・Medical Record
Hospital Education	・Mortuary/Gathering Facility (renovation or new building) ・Nursing School(renovation) ・Dormitory	②	Hospital Education Hospital MOH	・Diabetes (Renovation) ・Nursing School/Training/Education ・Mortuary ・Public Health
Hospital	・Workshop ・Stores	Out of Request	Hospital	・Gathering Facility of Mortuary ・Canteen ・Workshop ・Stores (Dormitory has been decided to be closed from 2010 onward)

4) Content of medical equipment requests

① Change from initial request

The following change was made from the initial request presented during the preliminary survey as a result of discussions on the equipment list.

Table 2-4 Additional Requested Medical Equipment

Section	Additional Requested Medical Equipment	Major Reason
A&E, General Clinic	Treatment Instrument Set, Laryngoscope, Tracheotomy Instrument Set, Resuscitation Bag, Film Illuminator, Oxygen Flowmeter, Surgical Scrub Station, Instrument Cabinet, Examination Table, Syringe Pump, Portable Pulse Oximeter, Color Doppler Ultrasound	Equipment necessary in A&E and General clinic are reexamined.
ENT	ENT Treatment Unit, ENT Instrument Set, Film Illuminator, Audiometer, Sound Proof Unit, Suction Unit, Bronchofiberscope, Nasal Polypectomy Instrument Set, Tonsillectomy Instrument Set, Laryngectomy Instrument Set, Cleft Lip Plasty Instrument Set, Mastoidectomy Instrument Set	Equipment necessary are reexamined based on contents of clinic and facility plan.
Outpatient Pharmacy	Cupboard for Dangerous Drugs, Medical Refrigerator, Water Distilller, Water Purifier, Electronic Balance, Medicine Trolley, Small Instrument Set	According to reexamination of management plan of outpatient pharmacy.
Dental Heath Clinic	Oral Surgery Instrument Set, Surgical Micromotor, Apex Locator, Water Distiller	Equipment necessary are reexamined
Dental Tech. Room	Hydro Flask, Dental Bunsen Burner, Hanging Motor, Thermo Forming Unit, Electric Wax Knife, Polishing Unit, Dust Collector, Dental Laboratory Instruments	According to reexamination of work plan of the room.
Nursing School	Sphygmomanometer, Thermometer, VTR, Computer with Printer, Printer for Computer, Digital Recording Camera	According to reexamination of equipment for simulation.

On the other hand, we decided to exclude the equipment shown in the table below from the equipment list as a result of discussions after reviewing the medical service content, the number of medical staff, and the conditions of the equipment at Vaiola Hospital.

Table 2-5 Excluded Equipment and the Reason

Section	Excluded Equipment	Major Reason
A&E, General Clinic	Mobile X-ray Machine, Plaster Cutter	Existing equipment in existing facility can be used.
	Operation Table, Bedpan Sanitizer	Necessity in O.P.D. is low.
	Wound Care/Dressing Stand	The equipment is made in local area, made of wood and is not sold in general market.
ENT	Tracheotomy Instrument Set	Tracheotomy is not operated in O.P.D..
Antenatal	Cardiotocograph	Frequency of use is low and equipment in delivery division can be used.
	Medical Record Trolley	The equipment is made in local area, made of wood and is not sold in general market.
	TV/DVD/VCR Set	The equipment can be furnished by Tonga side.
Diabetes	Emergency Cart	The existing equipment can be used.

Section	Excluded Equipment	Major Reason
Laundry	Laundry Trolley	The equipment can be furnished by Tonga side.
Kitchen	Dish Washer, Freezer Room, Refrigeration Room	The type of the equipment is not covered in equipment plan generally.
Mortuary/ Autopsy	Mortuary Cooler	The facility where this equipment is furnished is deteriorated considerably.
	Autopsy Table, Post Mortem Surgical Instrument Set, Trolley	The existing equipment can be used.
	Autopsy Operating Light, Fume Extraction Fan	Necessity is low.
Dental Tech. Room	Porcelain Furnace	Porcelain is not used in the project facilities.
Nursing School	Cardiotocograph, Defibrillator, Pulse Oximeter, Table-top Autoclave, etc. (Total 25 items)	The equipment of antenatal, delivery, A&E, and O.P.D. can be used on the job training.
	Slide Projector, Tape Recorder	Necessity is low.
Public Health	HDV Camera Kit, USB Microphone, Audio Mixer, Visual Mixer, etc. (Total 17 items)	Basic equipment is already furnished and procurment plan for additional equipment is ongoing.
	Weighing Scale (Capacity 270kg)	Weighing Scale (Capacity 200kg) can be used.

② Content of final request

The following table shows the content of the final equipment request that was agreed upon through discussions during the field survey and recorded in the minutes signed between Japan's Basic Design Survey Team and Tonga on March 24, 2009.

Table 2-6 Contents of Final Requested Equipment

No.	Equipment	Prio-rity	Req. Q'ty
A&E and Outpatient Department			
1	Defibrillator	A	1
2	Emergency Cart	A	1
3	Electrocardiograph	A	2
4	Patient Monitor	A	2
5	Nebulizer	A	2
6	Suction Unit	A	2
7	Examination Light	A	5
8	Patient Trolley	A	2
9	Emergency Trolley	A	1
10	Tabletop Autoclave	A	2
11	Weighing Scale, Adult	A	1
12	Weighing Scale, Infant	A	1
13	Height Scale	A	1
14	Operating Light	A	1
15	Wheel Chair	A	1

No.	Equipment	Prio-rity	Req. Q'ty
16	Digital Thermometer	A	1
17	Pulse Oximeter	A	2
18	Infusion Pump	A	1
19	Portable Glucometer	A	1
20	IV Stand	A	8
21	Observation Bed	A	6
22	Triage Beds	A	2
23	Diagnostic Set	A	3
24	Dressing Trolley	A	8
25	Sphygmomanometer	A	6
26	IVF Warmer	A	1
27	Ultrasound with Doppler	B	1
28	Treatment Instrument Set	B	2
29	Laringoscope for Adult	B	1
30	Laringoscope for Infant	B	1
31	Tracheotomy Instrument Set	B	1

No.	Equipment	Prio-rity	Req. Q'ty
32	Resuscitation Bag for Adult	B	1
33	Resuscitation Bag for Infant	A	1
34	Film Illuminator	B	6
35	Oxygen Flowmeter	A	6
36	Surgical Scrub Station	B	2
37	Instrument Cabinet	B	1
38	Examination Table	A	7
39	Syringe Pump	A	1
40	Portable Oximeter	B	1
Special Clinic			
1	Weighing Scale, Adult	A	1
2	Weighing Scale, Infant	A	1
3	Diagnostic Set	A	2
4	Sphygmomanometer	A	1
5	Pulse Oximeter	A	1
6	Height Scale	A	1
ENT			
1	Nasal Polypectomy Instrument Set	B	1
2	Tonsillectomy Instrument Set	B	1
3	Laryngectomy Instrument Set	B	1
4	Suction Machine	B	1
5	Pulse Oximeter	A	1
6	Bronchofiberscope	B	1
7	Cleft Lip Plasty Instrument Set	B	1
8	Mastoidectomy Instrument Set	B	1
9	ENT Treatment Unit	B	1
10	Examining Instrument Set	B	1
11	Film Illuminator	B	1
12	Audiometer	B	1
13	Sound Proof Unit	B	1
Ante-natal			
1	Fetal Doppler	A	2
2	Examination Light	A	4
3	Fetoscope	A	1
4	Sphygmomanometer	A	1
5	Weighing Scale, Adult	A	1
6	Weighing Scale, Infant	A	1
7	Examination Table	A	2
8	Gynecological Examination Table	A	2
9	Portable Glucometer	A	1
10	Instrument Trolley	A	1
11	Patient Trolley	A	1
12	IV Stand	A	1
13	Wheel Chair	A	1
14	Vaginal Instrument Set	A	6

No.	Equipment	Prio-rity	Req. Q'ty
Physiotherapy			
1	Therapy Bed	B	1
2	Ultrasound Therapy Apparatus	A	1
Outpatient's Pharmacy			
1	Cupboard for Dangerous Drugs	B	1
2	Medical Refrigerator	B	1
3	Water Distiller	B	1
4	Water Filter	B	1
5	Electronic Balance	B	1
6	Medicine Trolley	B	1
7	Small Instrument Set	B	1
Dental Clinic			
1	Dental Unit	A	11
2	Tabletop Autoclave	A	2
3	Dental X-ray Unit	A	1
4	Panoramic X-ray Unit	B	1
5	X-ray Film Developer	A	1
6	Ultrasonic Scaler	A	6
7	Amalgamator	A	6
8	Light Curing Unit	A	6
9	Extraction Instrument Set	A	1
10	Dental Instrument Set	A	4
11	Oral Surgery Equipment Set	B	2
12	Surgical Micromotor	B	1
13	Apex Locator	B	1
14	Water Distiller	B	1
Dental Tech. Room			
1	Model Trimmer	A	1
2	Resin Curing Unit, Pressure Pot	A	1
3	Vibrator	A	1
4	Laboratory Lathe	A	1
5	Resin Curing Unit	A	1
6	Vacuum Mixer	A	1
7	Pencil Stand Blaster	A	1
8	Thermoplastic Pressure Former	A	1
9	Laboratory Micrometer	A	1
10	Centrifugal Casting Machine	A	1
11	Burnout Furnace	A	1
12	Hydraulic Flask Press	A	1
13	Articulator	A	1
14	Impression Tray	A	1
15	Flasks Set	A	20
16	Hydro Flask	B	1
17	Dental Bunsen Burner	B	2
18	Hanging Motor	B	1
19	Thermo Forming Unit	B	1
20	Electric Wax Knife	B	1

No.	Equipment	Prio-rity	Req. Q'ty
21	Polishing Unit	B	1
22	Dust Collector	B	1
23	Dental Laboratory Instruments	B	1
School of Nursing - Model, Manequin, etc.			
1	Anatomical Human Body Male	B	1
2	Anatomical Human Body Female	B	1
3	Human Skelton	A	1
4	Circulatory System Model	A	1
5	Respiratory Organ Model	A	1
6	Nasal/Throat/Pharynx Model	A	1
7	Pregnant Uterus Model	A	1
8	Training Dummy for Dressing	A	1
9	Phantom for Delivery	A	1
10	Injection Simulator	A	2
11	Nursing Care Manikins for Dressing Techniques	A	1
12	Nursing Care Manikins for Patient Care	A	1
13	Clinical Procedure Training Manikin	A	1
14	Resuscitation Simulator	A	1
15	Child Care Simulator	A	1
16	Pediatric Care Simulator	A	1
17	Newborn Advance Care Simulator	A	1
18	Torso Model	A	1
19	Heart Disease 3D Display Model	B	1
20	Death of an Artery Model	A	1
21	Nasogastric Tube Feeding Model	B	1
22	Heart Model	B	1
23	Functional Larynx Model	B	1
24	Mini Brain model	B	1
25	Mini Kidney Model	B	1
26	Skin Section Model	A	1
27	Median Section of the Head Model	B	1
28	Functional Heart System model	B	1
29	Functional Eye	B	1
30	Placenta Model	B	1
School of Nursing - Education Charts, etc			
1	Cholesterol Anatomy Poster	A	1
2	3-D Pyramid	B	1
3	Diabetes Teaching Kit	A	1
4	Nutrition Diabetes Folding Display	A	1
5	Understanding Diabetes Poster	A	1
6	Chart Stand	A	1
7	Arthritis Chart	A	1
8	Human Ear Wall Chart	A	1
9	Skin Cancer Chart	A	1
10	Asthma Chart	A	1
11	Hypertension Chart	A	1
12	Hepatitis Chart	A	1
13	Cholesterol Chart	A	1
School of Nursing - Medical Equipment for Education			
1	Neonatal Cot	A	1
2	Wheel Chair	A	1
3	Nursing Utensils Set	A	1
4	Irrigator Stand	A	1
5	Instrument Trolley	B	1
6	Binocular Microscope	A	1
7	Nebulizer	A	1
8	Walking aids-crutches, Walter and Tripod	B	1
9	ECG Machine	A	1
10	Sphygmomanometer	A	1
11	Thermometer	A	1
12	Patient Bed	B	2
13	Stretcher	B	1
14	Weighing Scale for Infant	B	1
15	Examination Instrument Set	B	1
16	Suction unit	B	1
17	Oxygen Set	B	1
18	Commode Chairs	B	1
School of Nursing - Equipment for Education			
1	TV System	B	1
2	VTR	B	1
3	VCD	B	1
4	Screen	B	1
5	LCD Projector System	B	1
6	White Board	A	3
7	Amplifier System	B	1
8	Copying Machine	B	1
9	Small Printing Machine	B	1
10	Computer with Printer	B	1
11	Printer for Computer (MP-3)	B	1
12	Cabinet	B	1
13	Digital Recording Camera	B	1
Public Health			
1	Weighing Scale, up to 200kg	A	2
2	Height Scale	A	2

(2) Study of the Request

The following shows the results of the review regarding the content of the final request presented from Tonga.

1) Facility plan

① Background of selecting Vaiola hospital to request Japanese assistance

Tonga's National Health Strategic Plan for 2006 – 2010 upholds eight important priority areas, one of which is the improvement and strengthening of the health care service system. As part of this development effort, Vaiola Hospital, which is Tonga's top referral hospital and the secondary medical facility in Tongatapu Island, where the capital city of Nuku'alofa is located, has already undergone two improvement projects based on the Vaiola Hospital Improvement Master Plan (M/P) formulated in 2004. The first improvement project was implemented with grant aid from Japan, while the second was undertaken with support from the World Bank.
This project is the third and final improvement project.

② Role as the key hospital in the local area and neighboring islands

Tonga is made up of four island groups and 170 islands and spans an area of about 600 km north to south and about 200 km east to west. Tongatapu Island, where the project site is located, lies in the southern part of the country and its land area is about 295 km^2, roughly half the total land area of the country. Tongatapu Island is nearly the same size as Tokunoshima Island of Japan and its total population is about 70,000. Vaiola Hospital serves not only those people on this island as the secondary medical facility but also the country's population of over 100,000 as Tonga's top referral hospital. However, with the forecasted patient increase due to population increase, the recovery and strengthening of Vaiola Hospital's functions through an improvement project is urgently needed.

③ Master plan and the results of structural diagnosis of existing buildings

In the Master Plan, the three-story former medical ward was to be demolished because it was dangerous due to structural deterioration. Additionally, other buildings such as the existing O.P.D building, the former laboratory building, the existing nursing school, and the existing mortuary, were planned to be improved by renovation. However, these buildings were also built around 1971, roughly the same time as the former medical ward, and nearly 40 years have already passed since their construction. Therefore, it was believed that their structural strength needed to be checked before agreeing to their renovation in this project. The Consultant independently conducted a visual check of exterior and interior and a measurement of carbonated deterioration.
These tests found that all the buildings, excluding the former laboratory building are suffering from serious structural deterioration and the renovation of those buildings would require more cost and time than needed for new construction. Therefore, we determined it appropriate to exclude those buildings from the project's renovation list.
On the other hand, the former laboratory building was found to be relatively sound, although slight carbonated deterioration was observed. The continued use of this building is possible if it is renovated by applying high durability paint, replacing roofing materials, and applying finishing materials to prevent further deterioration.
It was recommended to Tonga that the existing O.P.D. be demolished, but Tonga side requested its continued use. Therefore, the Consultant advised to provide the following minimum renovations to this building on condition that it would not be used for long period in consideration of the fact that it is a one-story building compared with the nursing school (two-story) even though structural deterioration is present. Tonga side agreed.

a. Application of high durability paints to the surfaces to inhibit the progression of deterioration.

b. Do not impose additional loads on the structure by increasing floor loads, removing partition walls, or adding new structures.

c. Replacement of roofing materials around the leaks on the roof.

d. Replacement of wires and pipes related to electricity, water supply, and water drainage.

④ Coordination with the Master Plan and adjustments

In summary, the M/P shows the zoning by function and delineation of new construction or renovation as shown in Figure 2-1.

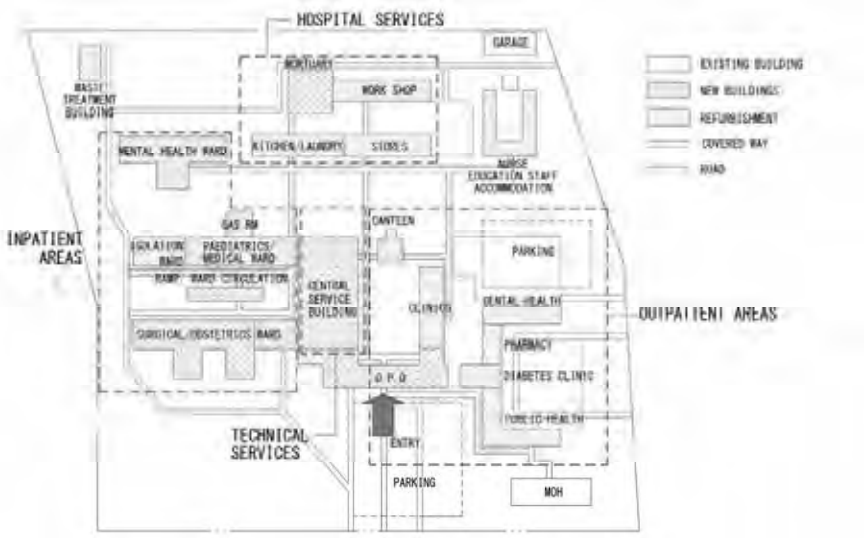


Figure 2-1 Master Plan

The current project basically follows the zoning of the M/P. However the existing O.P.D. building (Emergency, General O.P.D., Special clinics, Antenatal clinic and public health), existing nursing school and the mortuary were changed from renovation to new construction. Following the Final Request contents finalized by the preparatory survey (basic design), the layout of the facilities to be provided by the current project was set as shown in Figure 2-2.

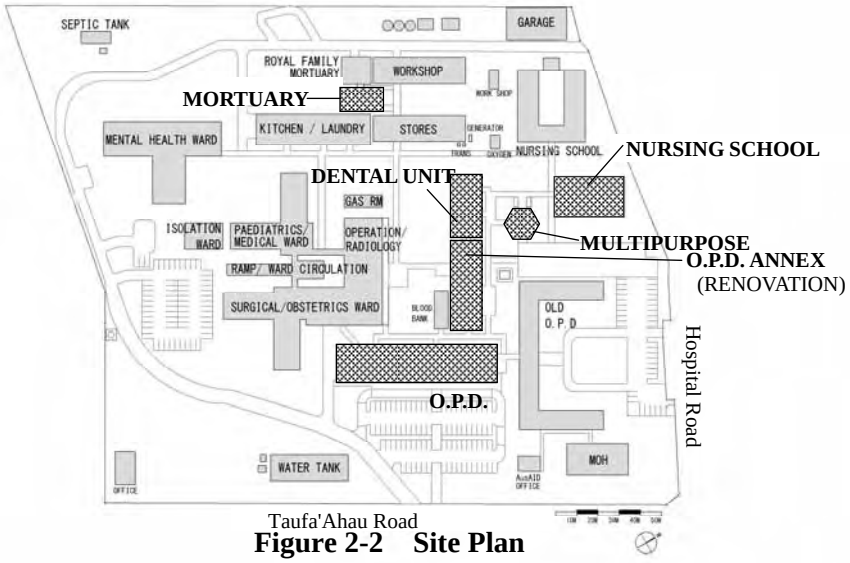


Figure 2-2 Site Plan

⑤ Scope of cooperation

For Vaiola Hospital to perform its expected role in Tonga's health care service system, the overall improvement, renovation, and replacement of other related facilities, and equipment including support functions, are also needed along with this project. This includes the transfer and renovation of the laundry and kitchen, and improvement of the mortuary's ceremony facilities, canteen, workshops, warehouses, and more. Within the framework of a grant aid project, we evaluated the need and appropriateness of the target facilities from two basic viewpoints: facilities with a direct effect on the improvement of top referral medical service and the hospital's role as the education hospital, and facilities requiring relatively advanced construction techniques that are difficult to do with local technology. From these viewpoints, we determined that: a) the nursing school is to be included in the project because Vaiola Hospital also serves as an education hospital in Tonga; b) the request for canteen is satisfied by the allocation of a staff room to each division, which also improves the situation taking meals in rooms at medical service/consulting divisions; c) Presently, the royal family's mortuary is being co-used temporarily. Only the dead bodies storage will be constructed excluding the body preparation room and the autopsy room, which are available for shared use of existing facilities; and d) the priority of the public health division is lowered considering that it is not a hospital-specific function but a function belonging to the Ministry of Health (MOH). The overall approach is to focus on divisions directly related to the improvement of hospital functionality.

⑥ Hospital facilities with no disruption of medical service even under disasters

Tonga has a tropical oceanic climate and cyclones generated around the neighboring Fiji Islands pass though the country once or twice a year. These cyclones have wind velocities of 70 m/s or more and the precipitation is considerable in the rainy season. Glazing strong enough to withstand such winds should be adopted to ensure the safety of the users. Also, the roof structure is constructed to prevent water leakage. Because the Tonga ocean trench lies to the east, this country is susceptible to severe ocean trench-type earthquakes.
National-level disaster center functions will be incorporated into Vaiola Hospital to respond to these natural disasters as a key disaster-relief center. Joint training on plane crash response has also been conducted mainly by the airport and this hospital. Therefore, the construction plan should also enable continued medical service even in cases of such disasters.

⑦ Technical and financial self-sustaining development

Construction materials which are sufficiently strong, virtually maintenance-free, easily procurable locally, and easily repaired and replaced should be selected. In doing so, it becomes possible to stabilize medical service, reduce financial burdens on maintenance, and provide highly reliable medical services continuously despite the adverse geographical conditions of an island country distant from suppliers.

⑧ Prevention of nosocomial and out-of-hospital infection (consideration for the environment)

To prevent nosocomial infection, the facility plan should avoid crossing circulation of patients, medical staff, and equipment. To maintain cleanness, hand-washing basins should be provided in each room where treatment is made or patients use. Other aspects such as disposal of medical waste, water supply, and wastewater drainage should also be well addressed in the plan to prevent nosocomial and out-of-house infections.

⑨ Construction plan not disruptive to ongoing medical service

The construction site of this project is roughly divided into two sections Plot A and Plot B in order to secure circulation of patients and medical staff between the existing O.P.D.

and the main examination building and the medical ward while under construction. The location of entry for construction vehicles and materials will be carefully located to allow direct access from fronting roads and to minimize danger to patients and hospital staff. The road on the east of the hospital is the only arterial road linking the central area of Nuku'alofa City and the tsunami-stricken eastern coast. As such, construction vehicles for the restoration of that area may go through this road frequently. The consideration of traffic during construction is necessary according to the situation.

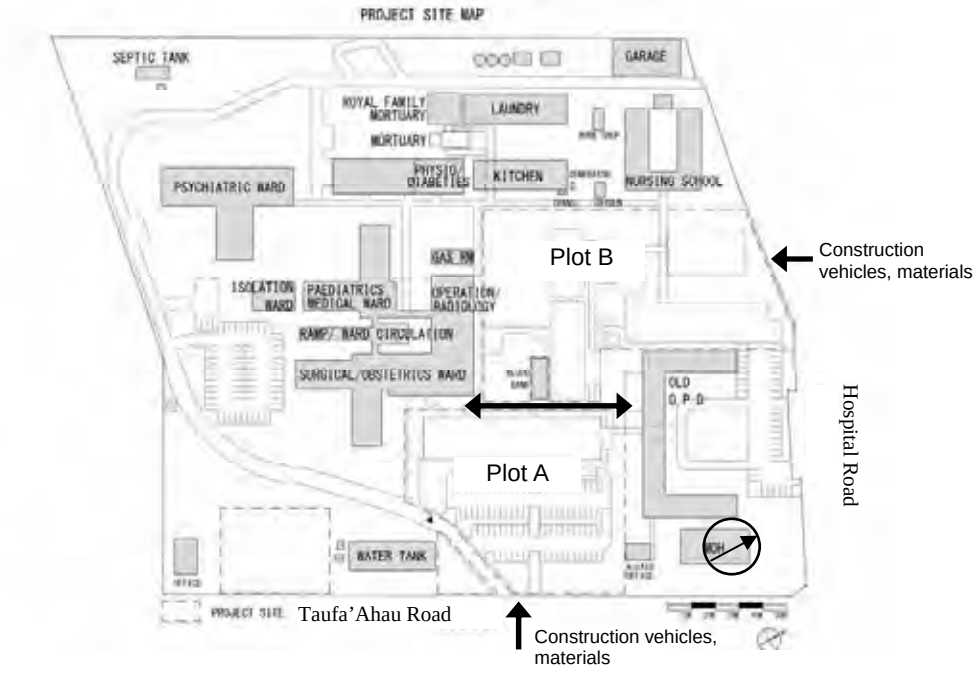


Figure 2-3 Zoning of Construction

2) Equipment plan

① Scope of medical equipment in the project

Based on the results of field survey, it was agreed with Tonga that equipment used in the divisions shown in Table 2-7 would be procured with the facility construction.

Table 2-7 Equipment Procurement Plan

Targeted Departments	
1. Outpatient Department	3. Dental Clinic
1.1 General Clinic	4. Antenatal
1.2 Special Clinic	5. Outpatient Pharmacy
1.3 Accident&Emergency	6. Mortuary
2. Physiotherapy	7. Nursing School

② Basic policy on equipment selection

Equipment procured in this plan should be selected on the criteria that equipment is indispensable for medical services in the divisions covered by this project and by considering other aspects shown below.

a. Equipment for which operation is possible with the technical level of the hospital and capable medical staff are available in the hospital.
b. Equipment for which spare parts, reagents, and consumables are easily procurable, and

whose operation and maintenance are technically and financially feasible.

c. Equipment that confirm to the functions and service of the object facilities.

d. Equipment that directly benefit to the recovery of medical service functions at the object facilities, but are not consumables.

③ Summary of review on equipment request

The results of the review of equipment requests by division are shown below.

A&E・General Clinic

Table 2-8 A&E・General Clinic

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Defibrillator	A	1	1	21	Observation Bed	A	6	3
2	Emergency Cart	A	1	1	22	Triage Beds	A	2	2
3	Electrocardiograph	A	2	2	23	Diagnostic Set	A	3	4
4	Patient Monitor	A	2	2	24	Dressing Trolley	A	8	8
5	Nebulizer	A	2	2	25	Sphygmomanometer	A	6	4
6	Suction Unit	A	2	2	26	IVF Warmer	A	1	1
7	Examination Light	A	5	5	27	Ultrasound with Doppler	B	1	1
8	Patient Trolley	A	2	2	28	Treatment Instrument Set	B	2	2
9	Emergency Trolley	A	1	1	29	Laringoscope for Adult	B	1	1
10	Tabletop Autoclave	A	2	3	30	Laringoscope for Infant	B	1	1
11	Weighing Scale, Adult	A	1	1	31	Tracheotomy Instrument Set	B	1	1
12	Weighing Scale, Infant	A	1	1	32	Resuscitation Bag for Adult	B	1	1
13	Height Scale	A	1	1	33	Resuscitation Bag for Infant	A	1	1
14	Operating Light	A	1	1	34	Film Illuminator	B	6	6
15	Wheel Chair	A	1	1	35	Oxygen Flowmeter	A	6	3
16	Digital Thermometer	A	1	0	36	Surgical Scrub Station	B	2	2
17	Pulse Oximeter	A	2	2	37	Instrument Cabinet	B	1	1
18	Infusion Pump	A	1	1	38	Examination Table	A	7	9
19	Portable Glucometer	A	1	1	39	Syringe Pump	A	1	1
20	IV Stand	A	8	8	40	Portable Oximeter	B	1	1

In the emergency-general clinical division, the following equipment is insufficient to provide necessary medical service. Supply thereof will enable accurate, efficient consulting.

- Each of the following shall be procured: an emergency trolley, a weight scale (for adults and infants), a height scale, an infusion pump, a syringe pump, an IVF heater, a tracheotomy instrument set, a portable oximeter, a examination table and a instrument cabinet.

- One hand-washing set is necessary for both the resuscitation room and the treatment room. Medical lights are necessary to complement examination light in consulting rooms. They should be movable and their allocation is one light for every two or three examination tables so that they can be shared.

- For safe and hygienic medical services, procure table top autoclaves. The necessary number is determined for shared use in the emergency-general clinical division, the

special clinical division, and the ENT clinic by allocating one table top autoclave each to the treatment room, the ENT clinic, and the antenatal division.

The following equipment will be included in sufficient numbers in the plan because the existing equipment is aged and insufficient in number to provide appropriate medical services.

- Replace the following (one for each): a defibrillator, an emergency cart, a operating light, a wheelchair, a ultrasound with doppler, a laryngoscope (for adults and newborn babies) and a resuscitation bag (for adults and infant); each of these are out of order or broken due to aging and continued use is not possible. A operating light in the treatment room should be movable to allow for it to be shared with the resuscitation room.

- Replace the existing nebulizers, suction unit, and patient trolley treatment beds (2 sets each) because they have safety problems due to aging.

- In veiw of current medical services, two sets of elector cardiographs, patient monitors, and pulseoximeters are necessary. Procure two sets of each because the existing sets are obsolete and the procurement of spare parts is difficult.

- In view of current services, two sets of portable glucose meters are required. The existing set may be used continuously.

- Existing IV stands are broken, so they should be replaced. One IV stand is necessary for each of the three beds in the observation room. For the other rooms, allocate one irrigator to two beds for shared use. In total, eight IV stands will be procured.

- Existing observation beds and examination tables should be replaced because they are seriously aged and damaged. In addition to being aged, triage beds should also be replaced because they are fixed to the walls and it is not possible to move them. Three observation beds, nine examination tables, and two triage beds will be procured in this plan. The specifications of the triage beds are the same as those of the examination tables.

- The portable type diagnostic instrument sets which were procured in 2008 will be continuously used in the new facilities. However, deteriorated wall-fixed type sets need to be replaced because they are impossible to transfer. Four sets of wall-fixed type examination instruments sets will be procured in this plan.

- Treatment instrument sets are damaged due to aging. Forcipes are insufficient in both number and kind. Therefore, of the four existing sets, two will be replaced.

- Existing dressing trolley instrument tables need to be replaced because they are not working properly due to damage to casters. A total of eight tables will be procured for allocation to the resuscitation room (one for each of two patient trolleys), the treatment room (one for the treatment table and one for the examination table), the observation room, the general clinical division, the special clinical division, and the ENT clinic.

- One of the existing three film illuminators is broken. The remaining two are deteriorated, being unable to obtain diffusion and uniformity of light. They will be replaced because they may cause an erroneous diagnosis. A total of six film illuminator will be provided based on the facility plan.

- The pressure gauges of oxygen flow meters which are fixed to oxygen cylinders are not working properly. The hospital requested one oxygen flow meter for each of existing six oxygen cylinders. However, only three oxygen flow meters will be provided in this

plan, because only three oxygen cylinders are in constant use – one for the ambulance, one for the resuscitation room, and one for the general-special clinical division.

Digital thermometers are excluded from the plan, given that the hospital can purchase them on the local market through their own efforts.

Special Clinic

Table 2-9 Special Clinic

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Weighing Scale, Adult	A	1	1	4	Sphygmomanometer	A	1	1
2	Weighing Scale, Infant	A	1	1	5	Pulse Oximeter	A	1	1
3	Diagnostic Set	A	2	2	6	Height Scale	A	1	1

Currently, basic equipment, such as infant weight scales, diagnostic sets, and height scales, is not available. Provision thereof will enable accurate and efficient diagnosis based on exact measurements. Diagnostic instrument sets will be provided in line with the facility plan.

The sensitivity of the existing weight scale for adults is poor because of deterioration. Also, the measurement of the pulse oximeter is not accurate. In this division, only one sphygmomanometer is used for all patients. As such, the cuff (the part wrapped around the arm) and the valve are damaged due to abrasion and are in need of replacing.

ENT

Table 2-10 ENT

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Nasal Polypectomy Instrument Set	B	1	1	8	Mastoidectomy Instrument Set	B	1	1
2	Tonsillectomy Instrument Set	B	1	1	9	ENT Treatment Unit	B	1	1
3	Laryngectomy Instrument Set	B	1	1	10	Examining Instrument Set	B	1	1
4	Suction Machine	B	1	1	11	Film Illuminator	B	1	1
5	Pulse Oximeter	A	1	0	12	Audiometer	B	1	1
6	Bronchofiberscope	B	1	1	13	Sound Proof Unit	B	1	1
7	Cleft Lip Plasty Instrument Set	B	1	1					

Currently, the ENT clinic is not equipped with essential equipment, including an ENT treatment unit, a bronchofiberscope, an audiometer, and a sound proof room. Therefore, each of the above must be provided. These are newly-introduced equipment, but a responsible doctor in this clinic has sufficient experience using them in Australia, so, there should be no problems regarding operation.

The following existing surgical sets are damaged due to aging and pose problems for safe surgery. Hence, their replacement and replenishment are essential. This set includes a nasal polyp ectomy instrument set, a tonsillectomy instrument set, a laryngectomy instrument set, a suction machine, a cleft lip plasty instrument set, a mastoid ectomy instrument set, an examination instrument set, and a film illuminator.

The provision of a pulse oximeter is excluded from this plan, as the portable oximeter in the resuscitation room can be shared because it is not frequently used in the ENT clinic.

Antenatal

Table 2-11 Antenatal

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Fetal Doppler	A	2	2	9	Portable Glucometer	A	1	1
2	Examination Light	A	4	3	10	Instrument Trolley	A	1	2
3	Fetoscope	A	1	7	11	Patient Trolley	A	1	1
4	Sphygmomanometer	A	1	1	12	IV Stand	A	1	1
5	Weighing Scale, Adult	A	1	1	13	Wheel Chair	A	1	0
6	Weighing Scale, Infant	A	1	1	14	Vaginal Instrument Set	A	6	6
7	Examination Table	A	2	2	15	Height Scale	-	-	1
8	Gynecological Examination Table	A	2	2					

The antenatal division currently lacks a portable glucose meter, an instrument trolley, a patient trolley, an IV stand table, a height scale and a weight scale for infant. This equipment is essential in performing antenatal examination in the consulting rooms and examination rooms to be constructed in this project. The instrument trolley is a table for placing various treatment instruments when performing gynecological examinations. One instrument table is necessary for every two examination tables.

The existing weight scale for adults and sphygmomanometer are aged and their measuring sensitivity is poor. Both of them need to be replaced because they are frequently used (50-60 times per day).

The fetal doppler is an indispensable equipment for performing antenatal examination. Assuming that two examination rooms share one fetal doppler, a new doppler will be provided for each of the consulting rooms.

Examination lights are essential equipment for all four consulting and examination rooms. One existing examination light is still usable, so three new examination lights will be provided.

The three existing examination tables are all fixed to the wall and it is impossible to move them to a new facility. A new examination table will be provided for each of the two consulting rooms to be constructed in this project.

The existing gynecological examination table is impossible to continue to use because of aging damage. Therefore, one table will be provided for each of the two examination rooms.

A fetoscope is an indispensable equipment for examining fetal heart beats. However, four out of the five existing fetoscope are not usable for proper diagnosis because of ragged surfaces due to aging. One fetoscope is necessary for each of the four consulting and examination rooms. In addition, four fetoscopes are needed for the training of students at the nursing school and for the on-the-job training of obstetricians. Therefore, a total of eight fetoscopes are necessary. In addition to the one existing fetoscope which can still be used, seven new fetoscopes will be replaced.

Existing vaginal instrument sets are damaged due to aging and may pose a risk for safe diagnosis. Also, both the number and kind of forcepes are insufficient. As this equipment is indispensable for antenatal examination, the four existing sets will be replaced and two new sets added to train nursing school students and obstetricians. In total, six sets will be provided.
Procurement of a wheelchair is excluded from the plan because the existing wheelchair can continued to be used in the new facility.

Physiotherapy

Table 2-12 Physiotherapy

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Therapy Bed	B	1	1	2	Ultrasound Therapy Apparatus	A	1	0

Of the existing two therapy beds for physiotherapy, one will be replaced because it is damaged due to aging and dangerous to use. The ultrasonic therapy apparatus is excluded from the plan because the existing apparatus introduced in 2007 can continued to be used.

Outpatients Pharmacy

Table 2-13 Outpatients Pharmacy

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Cupboard for Dangerous Drugs	B	1	1	5	Electronic Balance	B	1	1
2	Medical Refrigerator	B	1	1	6	Medicine Trolley	B	1	2
3	Water Distiller	B	1	1	7	Small Instrument Set	B	1	1
4	Water Filter	B	1	0					

Essential equipment for the pharmacy will be introduced, including a water distiller, an electronic balance, and small instrument sets for pharmaceutical use. All of these are easy-maintenance.

The existing fixed cupboard for dangerous drugs chemical safety closet is aged and rusted, and so will be replaced in this plan.

The existing medical refrigerator can continued to be used; however, one will be added because the storage space is insufficient due to the increase of drugs.

Two medicine trolley are currently in use, and used in tandem to carry medicines for patients to four medical wards. To avoid erroneous supply of medicines due to shared use of carts, two new carts will be added to allocate one cart to each ward.

The survey found that consumables (special filter) of the pure water maker are not procurable in Tonga, so this water maker is excluded from this plan. However, distilled water produced by the said water distiller is usable as a substitute for ultrapure water. Therefore, the water distiller should be enlarged in capacity to cover the volume.

Dental Clinic

Table 2-14 Dental Clinic

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Dental Unit	A	11	11	8	Light Curing Unit	A	6	3
2	Tabletop Autoclave	A	2	3	9	Extraction Instrument Set	A	1	1
3	Dental X-ray Unit	A	1	1	10	Dental Instrument Set	A	4	3
4	Panoramic X-ray Unit	B	1	1	11	Oral Surgery Equipment Set	B	2	1
5	X-ray Film Developer	A	1	1	12	Surgical Micromotor	B	1	1
6	Ultrasonic Scaler	A	6	5	13	Apex Locator	B	1	1
7	Amalgamator	A	6	5	14	Water Distiller	B	1	1

The 11 existing dental units are donated as secondhand units. Ten of them need to be replaced because they are seriously deteriorated and/or damaged due to many years of use and unavailable repair parts. The remaining unit is scheduled to be transferred to the dental division of a hospital in Vava'u Island in 2011. The final requested number of dental units is 11, all of which will be new units. A centralized shared compressor and a vacuum device will be provided for each of those 11 dental units.

Four table top autoclaves are currently used in the dental clinic. However, they are aged, dangerous, and may burn users. Currently, sterilization is done roughly 15 times per day. If the appropriate number of sterilizations per unit per day is five, then 3 units x 5 times/unit = 15 sterilizations/day. Thus, the necessary number of sterilizers was calculated to be three.

There exist three wall-hanging dental X-ray units, but all have safety problems because degraded equipment is being used without protective facilities. The existing panoramic X-ray unit is secondhand equipment donated in 2002 and is not usable any more because of equipment failure. These two kinds of equipment will be provided for each X-ray room constructed with appropriate radiation protection.

The existing X-ray film developer is secondhand equipment donated in 2007. It is being used with occasional repair, but spare parts are no longer obtainable because production of the parts has stopped. Hence, it will be replaced in this plan.

The existing five ultrasonic scalers are seriously deteriorated and are no longer appropriate for treatment. Based on the facility plan, one scaler is needed for each of the two dental units. For the remaining nine dental units, it is planned to allocate one ultrasonic scaler to three dental units for shared use. Therefore, five ultrasonic scalers will be replaced in this plan.

The six existing amalgamators are seriously deteriorated and not usable to produce appropriate tooth fillers. Therefore, as with the ultrasonic scalers mentioned above, five amalgamators will be replaced.

Similarly, five light curing units are necessary. However, three out of the eight light curing units introduced in 2007 are still usable. Of the three light curing units, one is planned to be transferred to the dental division of a hospital in Vava'u Island. Therefore, three light curing units will be procured in this plan.

As the existing extraction instrument set is significantly degraded due to the use over the years, a new set will be procured in this plan for safe and efficient treatment.

The existing dental instrument sets have damage due to frequent use and aging. Additionally, the number and kind of forceps is insufficient. Three sound sets were selected from the existing six sets and after their three new sets will be procured in the plan. A dressing trolley required to move dental instruments from the sterilization room to the dental unit is missing ad will be procured in this plan.

Oral surgery equipment sets are also in a similar condition to the above dental instrument sets. Additionally, forceps are insufficient in both number and kind. Of the two existing sets, one will be replaced. It is planned to replace the oral surgery equipment set into the following five sets which are indispensable to the dental surgeries currently being performed at the hospital: i) Maxillofacial surgery set; ii) High speed micro drill set; iii) Wire loop set; iv) Osteosynthesis set; v) Tooth extraction set.

The existing water distiller will be replaced because it cannot produce the necessary amount of distilled water due to aging.

In the dental division, the surgical micromotor for dental surgery is insufficient. With the introduction of a new micro-motor, dental surgery will become speedy and efficient. Although this is the first introduction of such an apparatus to the hospital, a responsible dentist has experience using it in Australia and so its operation and maintenance will not be a problem. As to the root apex locator, the dental division does not have it and the currently available kit is the personal property of a dentist who brought it into the hospital for treatment. Therefore, it is appropriate to procure one apex locator in this plan.

Dental Tech. Room

Table 2-15 Dental Tech. Room

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Model Trimmer	A	1	1	13	Articulator	A	1	2
2	Resin Curing Unit, Pressure Pot	A	1	1	14	Impression Tray	A	1	10
3	Vibrator	A	1	1	15	Flasks Set	A	20	13
4	Laboratory Lathe	A	1	1	16	Hydro Flask	B	1	0
5	Resin Curing Unit	A	1	1	17	Dental Bunsen Burner	B	2	2
6	Vacuum Mixer	A	1	1	18	Hanging Motor	B	1	0
7	Pencil Sand Blaster	A	1	1	19	Thermo Forming Unit	B	1	0
8	Thermoplastic Pressure Former	A	1	1	20	Electric Wax Knife	B	1	1
9	Laboratory Micrometer	A	1	2	21	Polishing Unit	B	1	0
10	Centrifugal Casting Machine	A	1	1	22	Dust Collector	B	1	1
11	Burnout Furnace	A	1	1	23	Dental Laboratory Instruments	B	1	1
12	Hydraulic Flask Press	A	1	1					

- The following equipment is seriously deteriorated due to aging and is losing its normal functionality. Therefore, replace one of each of the following in this plan:
  A model trimmer, a resin curing unit & pressure pot, a vibrator, a Laboratory Lathe, a resin curing unit, a vacuum mixer, a laboratory micromotor, a hydraulic flask press, a dust collector, and a dental laboratory instrument.

Two sets each of the laboratory micromotor, the articulator, and the dental bunsen burner, will be procured to enable smooth and efficient work in the dental tech. room, because their use is frequent and two or three dental technicians use them concurrently.

- Pencil sand blaster, thermoplastic pressure former, and a centrifugal casting machine are indispensable equipment in the dental tech. room. However, as they have already been discarded due to aging, new equipment will be procured for each.

- The facility lacks a burnout furnace for making metal covers placed over teeth and an electric wax knife used for the production of models using plastics. These are new equipment to the dental division, but they will be introduced as they are simple, easy to maintain equipment, they each will be introduced.

- Of the 15 impression trays, five were found to be able to continue to be used, so 10 will be replaced in this plan. The necessary number of flask sets is enough to make a denture mold for 18 patients per day, which is derived as approximately 15% of the total patients a day, 120 patients (120 patients×0.15%= 18 patients). As existing five trays are still usable, 13 trays will be replaced in this plan.

- Hydro-flasks, hanging motors, thermoforming units, and polishing units are excluded from the procurement plan considering that their functions are substituted with the use of resin curing unit & pressure pot, laboratory micrometers, thermoplastic pressure former, and laboratory Lathe.

Nursing School－Models, Manikins, etc

Table 2-16 Nursing School－Models, Manikins, etc

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Anatomical Human Body Male	B	1	1	16	Pediatric Care Simulator	A	1	1
2	Anatomical Human Body Female	B	1	1	17	Newborn Advance Care Simulator	A	1	1
3	Human Skelton	A	1	1	18	Torso Model	A	1	1
4	Circulatory System Model	A	1	1	19	Heart Disease 3D Display Model	B	1	1
5	Respiratory Organ Model	A	1	1	20	Death of an Artery Model	A	1	
6	Nasal/Throat/Pharynx Model	A	1	1	21	Nasogastric Tube Feeding Model	B	1	1
7	Pregnant Uterus Model	A	1	1	22	Heart Model	B	1	1
8	Training Dummy for Dressing	A	1	0	23	Functional Larynx Model	B	1	1
9	Phantom for Delivery	A	1	1	24	Mini Brain model	B	1	1
10	Injection Simulator	A	2	2	25	Mini Kidney Model	B	1	1
11	Nursing Care Manikins for Dressing Techniques	A	1	0	26	Skin Section Model	A	1	1
12	Nursing Care Manikins for Patient Care	A	1	1	27	Median Section of the Head Model	B	1	1
13	Clinical Procedure Training Manikin	A	1	1	28	Functional Heart System model	B	1	1
14	Resuscitation Simulator	A	1	1	29	Functional Eye	B	1	1
15	Child Care Simulator	A	1	1	30	Placenta Model	B	1	0

The existing teaching equipment at the nursing school is damaged or lacks certain models, and it is difficult to continue to use them. Each will be replaced to enable effective and efficient nursing education at the nursing school to be built in this project. Two injection simulators will be procured because the usage time per student is rather long.

The models used in each curriculum are as follows:

- General science, Anatomy: A anatomical human body (male, female), a human skeleton, a respiratory organmodel, a nasal/throat/pharynx model, a torso model, and an arterioschelosis model
- Circulatory system physiology: A circulatory system model
- Obstetrical nursing science, mid-wife science: A pregnant uterus model
- Basic nursing science: A phantom of delivery, an injection simulator, and a clinical procedure training dummy
- Emergency care procedure, ICU training: A resuscitation simulator
- Basic nursing science, children nursing science: A child care simulator, a pediatric care simulator and a newborn advance care simulator
- General science, internal medicine nursing science, basic nursing science: A heart disease 3D display model
- General science, digestive organ science: A nasogastric tube feeding model and a heart model
- General science: A function larynx model, a brain model, a kidney model, a skin section model, an Median Section of the head model, a heart function model, and an function model eye

A training dummy for dressing, a Nursing Care Manikins for Dressing Techniques, and a placenta model will not be procured in this plan, because they are respectively substituted with one nursing care mannequin each for patient care, clinical procedure, and delivery.

Nursing School－Education Charts, etc

Table 2-17 Nursing School－Education Charts, etc

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Cholesterol Anatomy Poster	A	1	0	8	Human Ear Wall Chart	A	1	1
2	3-D Pyramid	B	1	1	9	Skin Cancer Chart	A	1	1
3	Diabetes Teaching Kit	A	1	1	10	Asthma Chart	A	1	1
4	Nutrition Diabetes Folding Display	A	1	1	11	Hypertension Chart	A	1	1
5	Understanding Diabetes Poster	A	1	1	12	Hepatitis Chart	A	1	1
6	Chart Stand	A	1	1	13	Cholesterol Chart	A	1	1
7	Arthritis Chart	A	1	1					

Existing teaching materials, such as wall-hung illustrations, used for the education of general science and diabetology are damaged or faded due to aging and need to be replaced.

- The 3D pyramid is listed as the “food pyramid kit” in the medical equipment list.
- A diabetes education kit and an illustration of diabetic patient diet therapy are listed as “diabetes teaching kit” including a nutrition diabetes folding display..
- Nine charts, including a understanding diabetes poster, a chart stand, an arthritis chart, an human ear wall chart, a skin cancer chart, an asthma chart, a hyper tension chart, a hepatitis chart, a cholesterol chart, are listed under the single name of the “chart for educational”.

A cholesterol anatomy poster is excluded because it is overlapped with a cholesterol chart.

Nursing School－Medical Equipment for Practical Training

Table 2-18 Nursing School－Medical Equipment for Practical Training

Req. No.	Requested Equipment	Priority	Req. Q’ty	Plan. Q’ty	Req. No.	Requested Equipment	Priority	Req. Q’ty	Plan. Q’ty
1	Neonatal Cot	A	1	1	10	Sphygmomanometer	A	1	2
2	Wheel Chair	A	1	1	11	Thermometer	A	1	0
3	Nursing Utensils Set	A	1	1	12	Patient Bed	B	2	2
4	Irrigator Stand	A	1	1	13	Stretcher	B	1	1
5	Instrument Trolley	B	1	2	14	Weighing Scale for Infant	B	1	1
6	Binocular Microscope	A	1	1	15	Examination Instrument Set	B	1	1
7	Nebulizer	A	1	1	16	Suction unit	B	1	1
8	Walking Aids-crutches, Walter and Tripod	B	1	1	17	Oxygen Set	B	1	1
9	ECG Machine	A	1	1	18	Commode Chairs	B	1	1

These are basic equipment used for the practical training in the courses of basic nursing science, children nursing science, physiology, molecular biology, and internal medicine.

At present, the following are insufficient: a neonatal cot, a wheelchair, a nursing utensil set, a binocularmicroscope, a suction unit, an oxygen set, a commode chair, a weighting scale for infant, and a Walking Aids-crutches. Other existing equipment besides the above is secondhand equipment obtained by Vaiola Hospital and is out of order or damaged presently.

Therefore, it is necessary to procure all of the listed equipment, one for each, for use in the simulation rooms to be built in this project. However, two each of the patient bed, Instrument Trolley and Sphygmomanometer are needed because they may be used concurrently in the two simulation spaces.

The procurement of thermometers is excluded from this plan, because the hospital can procure them on the local market at low cost through their own effort.

Nursing School－Equipment for Education

Table 2-19 Nursing School－Equipment for Education

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	TV System	B	1	1	8	Copying Machine	B	1	0
2	VTR	B	1	1	9	Small Printing Machine	B	1	0
3	VCD	B	1	1	10	Computer with Printer	B	1	0
4	Screen	B	1	0	11	Printer for Computer (MP-3)	B	1	0
5	LCD Projector System	B	1	0	12	Cabinet	B	1	1
6	White Board	A	3	0	13	Digital Camera	B	1	0
7	Amplifier System	B	1	0					

- VTR and VCD are integral parts of the TV system.
- LCD projector system, copying machines, computers with printers are excluded from the equipment plan because they may overlap with those provided in other projects.
- A screen is a sheet to project images from an LCD projector. It is excluded from the equipment plan because walls are usable as a substitutes. Small printing machines and printers are also excluded because copying machines and computer with printer can be used as substitutes.
- White boards are excluded from the equipment plan because white boards will be furnished to each of the three classrooms in the facility plan. An amplifier system for the multi-purpose room is also excluded from the plan because it will be included in public address system of the facility plan.
- Digital cameras are excluded from the plan because the hospital can procure them on the local market through their own effort.

Public Health

Table 2-20 Public Health

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
1	Weighing Scale, up to 200kg	A	2	0	2	Height Scale	A	2	0

After consultation with Tonga, the public health division is excluded from the scope of this plan.

Mortuary

Table 2-21 Mortuary

Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty	Req. No.	Requested Equipment	Priority	Req. Q'ty	Plan. Q'ty
-	Mortuary Refrigerator	-	5	2					

The mortuary is included not as a renovated building but as a new building in the scope of facility plan. Although five mortuary Refrigerators for ten deceased bodies were requested, two mortuary refrigerators for four deceased bodies will be provided because the period there under four bodies are in storage in the majority.

Based on the results of the above review on the equipment request, the needs for and appropriateness of each item of equipment were further examined in accordance with the following selection criteria.

a) The equipment should be indispensable for the provision of medical services in the outpatient division, the antenatal examination division, and the mortuary, and for nursing education at the nursing school, which are the targets of the current equipment plan.

- ○ Equipment necessary for providing medical services required in this project
- Δ Equipment is necessary but use is not frequent; equipment has a substitute; equipment has some overlap; equipment that Tonga should procure of its own efforts.
- × Equipment with low priority in providing medical services required by this project

b) It should be an equipment conforming to the technical level of the hospital.

- ○ Equipment operable with the existing technical level of the medical staff
- Δ Equipment operable if the existing medical staff receives training upon its delivery
- × Equipment that is difficult to operate given the technical level of the hospital.

c) It should be an equipment whose management and maintenance are feasible.

- ○ Equipment manageable by the existing management and maintenance system and budget.
- Δ Equipment manageable if a maintenance contract is concluded with an agent or a medical equipment maintenance company.
- × Equipment which seems difficult to introduce because its expensive management and maintenance costs.

Overall evaluation

- ○ Equipment considered appropriate for the procure in the equipment plan
- × Equipment excluded from the equipment plan

The results of this review are shown in Table 2-22 below.

Table 2-22 Result after Examination of Requested Equipment

Req. No.	Name of Equipment	Priority	Req. Q'ty	Evaluation Items ①	②	③	Evaluation	Plan. Q'ty	Remarks
	1. Emergency and Outpatient Department								
1	Defibrillator	A	1	○	○	○	○	1	
2	Emergency Cart	A	1	○	○	○	○	1	
3	Electrocardiograph	A	2	○	○	○	○	2	
4	Patient Monitor	A	2	○	○	○	○	2	
5	Nebulizer	A	2	○	○	○	○	2	
6	Suction Unit	A	2	○	○	○	○	2	
7	Examination Light	A	5	○	○	○	○	5	
8	Patient Trolley	A	2	○	○	○	○	2	
9	Emergency Trolley	A	1	○	○	○	○	1	
10	Tabletop Autoclave	A	2	○	○	○	○	3	Planned Quantity is calculated from facility plan.
11	Weighing Scale, Adult	A	1	○	○	○	○	1	
12	Weighing Scale, Infant	A	1	○	○	○	○	1	
13	Height Scale	A	1	○	○	○	○	1	
14	Operating Light	A	1	○	○	○	○	1	Mobile Operating Light is taken.
15	Wheel Chair	A	1	○	○	○	○	1	

Req. No.	Name of Equipment	Priority	Req. Q'ty	Evaluation Items			Evaluation	Plan. Q'ty	Remarks
				①	②	③			
16	Digital Thermometer	A	1	△	○	○	×	0	The equipment should be procured through Tonga's own effort.
17	Pulse Oximeter	A	2	○	○	○	○	2	
18	Infusion Pump	A	1	○	○	○	○	1	
19	Portable Glucometer	A	1	○	○	○	○	1	
20	IV Stand	A	8	○	○	○	○	8	
21	Observation Bed	A	6	○	○	○	○	3	Planned Quantity is calculated from facility plan.
22	Triage Beds	A	2	○	○	○	○	2	Name this equipment examination table in Equipment List of Table2-36.
23	Diagnostic Set	A	3	○	○	○	○	4	Planned Quantity is calculated from facility plan.
24	Dressing Trolley	A	8	○	○	○	○	8	
25	Sphygmomanometer	A	6	○	○	○	○	4	Planned Quantity is calculated from facility plan.
26	IVF Warmer	A	1	○	○	○	○	1	
27	Ultrasound with Doppler	B	1	○	○	△	○	1	Necessary to contract with a agency or medical equipment company for the maintenance.
28	Treatment Instrument Set	B	2	○	○	○	○	2	
29	Laringoscope for Adult	B	1	○	○	○	○	1	
30	Laringoscope for Infant	B	1	○	○	○	○	1	
31	Tracheotomy Instrument Set	B	1	○	○	○	○	1	
32	Resuscitation Bag for Adult	B	1	○	○	○	○	1	
33	Resuscitation Bag for Infant	A	1	○	○	○	○	1	
34	Film Illuminator	B	6	○	○	○	○	6	
35	Oxygen Flowmeter	A	6	○	○	○	○	3	Caluculation of planned quantity refer to the foregoing examination of each division.
36	Surgical Scrub Station	B	2	○	○	○	○	2	
37	Instrument Cabinet	B	1	○	○	○	○	1	
38	Examination Table	A	7	○	○	○	○	9	Planned Quantity is calculated from facility plan.
39	Syringe Pump	A	1	○	○	○	○	1	
40	Portable Oximeter	B	1	○	○	○	○	1	
-	Gynecological Examination Table	-	-	○	○	○	○	1	Necessary to patients of emergency in ob-gyn.
	2. Special Clinic								
1	Weighing Scale, Adult	A	1	○	○	○	○	1	
2	Weighing Scale, Infant	A	1	○	○	○	○	1	
3	Diagnostic Set	A	2	○	○	○	○	2	
4	Sphygmomanometer	A	1	○	○	○	○	1	
5	Pulse Oximeter	A	1	○	○	○	○	1	
6	Height Scale	A	1	○	○	○	○	1	
	3. ENT								
1	Nasal Polypectomy Instrument Set	B	1	○	○	○	○	1	
2	Tonsillectomy Instrument Set	B	1	○	○	○	○	1	
3	Laryngectomy Instrument Set	B	1	○	○	○	○	1	
4	Suction Machine	B	1	○	○	○	○	1	
5	Pulse Oximeter	A	1	△	○	○	×	0	Necessity is low.

Req. No.	Name of Equipment	Priority	Req. Q'ty	Evaluation Items ①	②	③	Evaluation	Plan. Q'ty	Remarks
6	Bronchofiberscope	B	1	○	○	○	○	1	
7	Cleft Lip Plasty Instrument Set	B	1	○	○	○	○	1	
8	Mastoidectomy Instrument Set	B	1	○	○	○	○	1	
9	ENT Treatment Unit	B	1	○	○	○	○	1	
10	Examining Instrument Set	B	1	○	○	○	○	1	
11	Film Illuminator	B	1	○	○	○	○	1	
12	Audiometer	B	1	○	○	○	○	1	
13	Sound Proof Unit	B	1	○	○	○	○	1	
	4. Antenatal								
1	Fetal Doppler	A	2	○	○	○	○	2	
2	Examination Light	A	4	○	○	○	○	3	One existing equipment is still usable.
3	Fetoscope	A	1	○	○	○	○	7	Calculation of planned quantity refer to the foregoing examination of each division.
4	Sphygmomanometer	A	1	○	○	○	○	1	
5	Weighing Scale, Adult	A	1	○	○	○	○	1	
6	Weighing Scale, Infant	A	1	○	○	○	○	1	
7	Examination Table	A	2	○	○	○	○	2	
8	Gynecological Examination Table	A	2	○	○	○	○	2	
9	Portable Glucometer	A	1	○	○	○	○	1	
10	Instrument Trolley	A	1	○	○	○	○	2	One instrument trolley is necessary to each gynecological examination table.
11	Patient Trolley	A	1	○	○	○	○	1	
12	IV Stand	A	1	○	○	○	○	1	
13	Wheel Chair	A	1	△	○	○	×	0	The existing equipment is still usable.
14	Vaginal Instrument Set	A	6	○	○	○	○	6	
15	Height Scale	-	-	○	○	○	○	1	Necessary equipment for Antenatal examination.
	5. Physiotherapy								
1	Therapy Bed	B	1	○	○	○	○	1	
2	Ultrasound Therapy Apparatus	A	1	△	○	○	×	0	The existing equipment is still usable.
	6. Outpatient's Pharmacy								
1	Cupboard for Dangerous Drugs	B	1	○	○	○	○	1	
2	Medical Refrigerator	B	1	○	○	○	○	1	
3	Water Distiller	B	1	○	○	○	○	1	
4	Water Filter	B	1	△	○	×	×	0	Maintenance is difficult. Refer to the foregoing examination of each division.
5	Electronic Balance	B	1	○	○	○	○	1	
6	Medicine Trolley	B	1	○	○	○	○	2	Calculation of planned quantity refer to the foregoing examination of each division.
7	Small Instrument Set	B	1	○	○	○	○	1	
	7.1 Dental Clinic								
1	Dental Unit	A	11	○	○	○	○	11	11 dental units and a centralized compressor & vacuum devise are made 1 set in Equipment List of Table2-36.

Req. No.	Name of Equipment	Priority	Req. Q'ty	Evaluation Items			Evaluation	Plan. Q'ty	Remarks
				①	②	③			
2	Tabletop Autoclave	A	2	○	○	○	○	3	Calculation of planned quantity refer to the foregoing examination of each division.
3	Dental X-ray Unit	A	1	○	○	○	○	1	
4	Panoramic X-ray Unit	B	1	○	○	○	○	1	
5	X-ray Film Developer	A	1	○	○	○	○	1	
6	Ultrasonic Scaler	A	6	○	○	○	○	5	Calculation of planned quantity refer to the foregoing examination of each division.
7	Amalgamator	A	6	○	○	○	○	5	The same as the above.
8	Light Curing Unit	A	6	○	○	○	○	3	The same as the above.
9	Extraction Instrument Set	A	1	○	○	○	○	1	
10	Dental Instrument Set	A	4	○	○	○	○	3	Additional 3 set is sufficient.
11	Oral Surgery Equipment Set	B	2	○	○	○	○	1	1 set consists of maxillofacial surgery set, a high speed micro drill set, a wire loop set, an osteosynthesis set , and tooth extraction set
12	Surgical Micromotor	B	1	○	○	○	○	1	
13	Apex Locator	B	1	○	○	○	○	1	
14	Water Distiller	B	1	○	○	○	○	1	
-	Dressing Trolley	-	-	○	○	○	○	1	Necessary to carry dental instruments.
	7.2 Dental Tech. Room								
1	Model Trimmer	A	1	○	○	○	○	1	
2	Resin Curing Unit, Pressure Pot	A	1	○	○	○	○	1	
3	Vibrator	A	1	○	○	○	○	1	
4	Laboratory Lathe	A	1	○	○	○	○	1	
5	Resin Curing Unit	A	1	○	○	○	○	1	
6	Vacuum Mixer	A	1	○	○	○	○	1	
7	Pencil Sand Blaster	A	1	○	○	○	○	1	
8	Thermoplastic Pressure Former	A	1	○	○	○	○	1	
9	Laboratory Micrometer	A	1	○	○	○	○	2	Calculation of planned quantity refer to the foregoing examination of each division.
10	Centrifugal Casting Machine	A	1	○	○	○	○	1	
11	Burnout Furnace	A	1	○	○	○	○	1	
12	Hydraulic Flask Press	A	1	○	○	○	○	1	
13	Articulator	A	1	○	○	○	○	2	Two articular is necessary because the use is frequent and 2 or 3 technicians use them concurrently.
14	Impression Tray	A	1	○	○	○	○	10	Calculation of planned quantity refer to the foregoing examination of each division.
15	Flasks Set	A	20	○	○	○	○	13	The same as the above.
16	Hydro Flask	B	1	△	○	○	×	0	Foregoing Req. No. 2 Pressure Pot can be substituted.
17	Dental Bunsen Burner	B	2	○	○	○	○	2	
18	Hanging Motor	B	1	△	○	○	×	0	Foregoing Req. No. 9 Laboratory Micrometer can be substituted.
19	Thermo Forming Unit	B	1	△	○	○	×	0	Foregoing Req. No. 8 Thermoplastic Pressure Former can be substituted.
20	Electric Wax Knife	B	1	○	○	○	○	1	

Req. No.	Name of Equipment	Priority	Req. Q'ty	Evaluation Items			Evaluation	Plan. Q'ty	Remarks
				①	②	③			
21	Polishing Unit	B	1	△	○	○	×	0	Foregoing Req. No. 4 Laboratory Lathe can be substituted.
22	Dust Collector	B	1	○	○	○	○	1	
23	Dental Laboratory Instruments	B	1	○	○	○	○	1	
	8.1 School of Nursing - Model, Manequin, etc.								
1	Anatomical Human Body Male	B	1	○	○	○	○	1	
2	Anatomical Human Body Female	B	1	○	○	○	○	1	
3	Human Skelton	A	1	○	○	○	○	1	
4	Circulatory System Model	A	1	○	○	○	○	1	
5	Respiratory Organ Model	A	1	○	○	○	○	1	
6	Nasal/Throat/Pharynx Model	A	1	○	○	○	○	1	
7	Pregnant Uterus Model	A	1	○	○	○	○	1	
8	Training Dummy for Dressing	A	1	△	○	○	×	0	Following Req. No. 12 Nursing Care Manikins for Patient Care can be substituted.
9	Phantom for Delivery	A	1	○	○	○	○	1	
10	Injection Simulator	A	2	○	○	○	○	2	
11	Nursing Care Manikins for Dressing Techniques	A	1	△	○	○	×	0	Following Req. No. 13 Clinical Procedu Training Manikin can be substituted.
12	Nursing Care Manikins for Patient Care	A	1	○	○	○	○	1	
13	Clinical Procedure Training Manikin	A	1	○	○	○	○	1	
14	Resuscitation Simulator	A	1	○	○	○	○	1	
15	Child Care Simulator	A	1	○	○	○	○	1	
16	Pediatric Care Simulator	A	1	○	○	○	○	1	
17	Newborn Advance Care Simulator	A	1	○	○	○	○	1	
18	Torso Model	A	1	○	○	○	○	1	
19	Heart Disease 3D Display Model	B	1	○	○	○	○	1	
20	Death of an Artery Model	A	1	○	○	○	○	1	
21	Nasogastric Tube Feeding Model	B	1	○	○	○	○	1	
22	Heart Model	B	1	○	○	○	○	1	
23	Functional Larynx Model	B	1	○	○	○	○	1	
24	Mini Brain model	B	1	○	○	○	○	1	
25	Mini Kidney Model	B	1	○	○	○	○	1	
26	Skin Section Model	A	1	○	○	○	○	1	
27	Median Section of the Head Model	B	1	○	○	○	○	1	
28	Functional Heart System Model	B	1	○	○	○	○	1	
29	Functional Eye	B	1	○	○	○	○	1	
30	Placenta Model	B	1	△	○	○	×	0	Foregoing Req. No. 9 Phantom for Delivery can be substituted.
	8.2 School of Nursing - Education Charts, etc.								
1	Cholesterol Anatomy Poster	A	1	△	○	○	×	0	Following Req. No. 13 Cholesterol Chart is overlapped.

Req. No.	Name of Equipment	Priority	Req. Q'ty	Evaluation Items			Evaluation	Plan. Q'ty	Remarks
				①	②	③			
2	3-D Pyramid	B	1	○	○	○	○	1	Name this 3-D Pyramid 'Food Pyramid Kit' in Table2-36 Equipment List.
3	Diabetes Teaching Kit	A	1	○	○	○	○	1	Name these two items 'Diabetes Teaching Kit' in Table2-36 Equipment List.
4	Nutrition Diabetes Folding Display	A	1	○	○	○	○	1	
5	Understanding Diabetes Poster	A	1	○	○	○	○	1	Name these nine items 'Chart for Education' in Table2-36 Equipment List.
6	Chart Stand	A	1	○	○	○	○	1	
7	Arthritis Chart	A	1	○	○	○	○	1	
8	Human Ear Wall Chart	A	1	○	○	○	○	1	
9	Skin Cancer Chart	A	1	○	○	○	○	1	
10	Asthma Chart	A	1	○	○	○	○	1	
11	Hypertension Chart	A	1	○	○	○	○	1	
12	Hepatitis Chart	A	1	○	○	○	○	1	
13	Cholesterol Chart	A	1	○	○	○	○	1	
	8.3 School of Nursing - Medical Equipment for Education								
1	Neonatal Cot	A	1	○	○	○	○	1	
2	Wheel Chair	A	1	○	○	○	○	1	
3	Nursing Utensils Set	A	1	○	○	○	○	1	
4	Irrigator Stand	A	1	○	○	○	○	1	
5	Instrument Trolley	B	1	○	○	○	○	2	Each simulation space needs one instrument trolley
6	Binocular Microscope	A	1	○	○	○	○	1	
7	Nebulizer	A	1	○	○	○	○	1	
8	Walking aids-crutches, Walker and Tripod	B	1	○	○	○	○	1	
9	ECG Machine	A	1	○	○	○	○	1	
10	Sphygmomanometer	A	1	○	○	○	○	2	Each simulation space needs one sphygmomanometer.
11	Thermometer	A	1	△	○	○	×	0	The equipment should be procured through Tonga's own effort.
12	Patient Bed	B	2	○	○	○	○	2	
13	Stretcher	B	1	○	○	○	○	1	
14	Weighing Scale for Infant	B	1	○	○	○	○	1	
15	Examination Instrument Set	B	1	○	○	○	○	1	
16	Suction unit	B	1	○	○	○	○	1	
17	Oxygen Set	B	1	○	○	○	○	1	
18	Commode Chairs	B	1	○	○	○	○	1	
	8.4 School of Nursing - Equipment for Education								
1	TV System	B	1	○	○	○	○	1	
2	VTR	B	1	△	○	○	×	0	This is combined with foregoing Req. No. 1 TV System in Table2-36 Equipment List.
3	VCD	B	1	△	○	○	×	0	The same as the above.
4	Screen	B	1	△	○	○	×	0	This is complementary to following Req. No. 5 LCD Projector System and not selected in Equipment Plan.
5	LCD Projector System	B	1	△	○	○	×	0	This is not selected because another project may supply.
6	White Board	A	3	△	○	○	×	0	This is covered by Facility Plan.

Req. No.	Name of Equipment	Priority	Req. Q'ty	Evaluation Items			Evaluation	Plan. Q'ty	Remarks
				①	②	③			
7	Amplifier System	B	1	△	○	○	×	0	This is excluded from Equipment List and included in Electrical part of Facility Plan if necessity and appropriateness.
8	Copying Machine	B	1	△	○	○	×	0	This is not selected because another project may supply.
9	Small Printing Machine	B	1	△	○	○	×	0	Foregoing Req. No. 8 Copying Machine can be substituted.
10	Computer with Printer	B	1	△	○	○	×	0	This is not selected because another project may supply.
11	Printer for Computer (MP-3)	B	1	△	○	○	×	0	Foregoing Req. No. 10 Computer with Printer is substituted.
12	Cabinet	B	1	○	○	○	○	1	
13	Digital Recording Camera	B	1	△	○	○	×	0	The equipment should be procured through Tonga's own effort.
	9. Public Health								
1	Weighing Scale, up to 200kg	A	2	△	○	○	×	0	Public Health is not included in this facility plan.
2	Height Scale	A	2	△	○	○	×	0	Public Health is not included in this facility plan.
	10. Mortuary								
-	Mortuary Refrigerator	-	-	○	○	○	○	2	Two mortuary refrigerators for four deceased bodies are appropriate from the keep record of deceased bodies.

2-2-2-2 Site Plan

(1) Location of Hospital and Surrounding Environment

Vaiola Hospital is located at a site facing the arterial road to the airport, 3 km southwest from the central area of Nuku'alofa City. The site is nearly square having a quiet neighborhood with housing and schools and its total land area is approximately 6.5 ha. The other side across the road is a huge lagoon in Tongatapu Island, home to the National Cultural Center, which was constructed with Japanese grant aid.

(2) Site Configuration and Soil Properties

The project site is 280 m wide from east to west and 220 m from south to north and surrounded by Taufa'a Ahau Road (front road) on the southwest side and Hospital Road (side road) on the northeast side. Access to the front of the existing hospital, which currently houses an outpatient ward, is from the Hospital Road side. A bus stop and a taxi stand are located there. The project site is situated on a lawn-covered gentle hilltop approximately 4m from the front road. The ground of the main section of the hospital is mostly flat and the northwest part of the site slopes approximately 1m downward. The Soil layer consists of soil deposit on the surface and coral limestone below it.

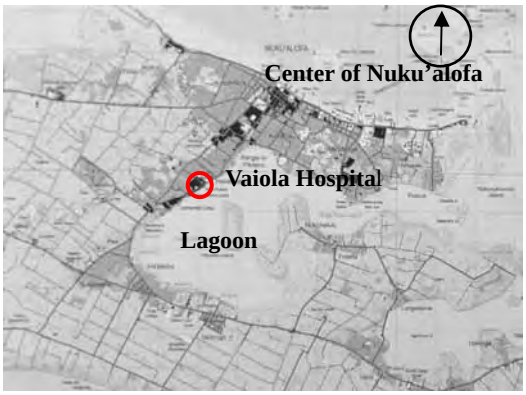


Figure 2-4 Surrounding Map

Figure 2-5 Project Site

(3) State of Infrastructure

1) Electricity

The 11 kV incoming power line to Vaiola Hospital comes from the North East corner on Hospital road. The line is connected to two transfomers of 300kVA and 500kVA both put in place by Tonga Power Limited. However, the 300kVA transformer dates from 1980 and is showing signs of deterioration such as melted cable connecting and rust. It is believed to be past its useful life. Since a ring main breaker to break connection to each transformer separately is not provided, the main breaker on the TPL side must be used in emergencies. This is not acceptable for operations at Vaiola Hospital. There is a scheduled power outage once a month for inspections. There is also one power outage per month on average due to deteriorated power main lines. The voltage fluctuation was observed to be very stable and good during the survey.

2) Water supply

Water supply was started in 1966 by the Tonga Water Board. However, as the water pressure is not sufficient due to leaks from deteriorated water distribution pipes, improvement work is now underway with technical assistance from Japan. Despite this effort, water supply is not sufficiently available at the hospital during the daytime. Therefore, rainwater is customarily stored for use as supplementary water.

3) Wastewater

There are no sewerage systems in place as urban infrastructure, so wastewater is being disposed of by self contained underground permeation system in the hospital grounds.

(4) Layout Plan of Facilities

The project facilities are grouped into three sections to realize a layout that does not cross access to each division: the accident and emergency, outpatient, and hospital administration (hereinafter the "O.P.D."); the special clinic and ophthalmology ward (hereinafter the "O.P.D. Annex"); and the nursing school.
The main access to the O.P.D. will be from the main Taufa'ahau road. Outpatients, attendants, ordinary vehicles and emergency vehicles will use this access. Public parking areas will be set up in front of the O.P.D.

Access to the O.P.D. Annex will be from the side road. Walkways, driveways, and public parking areas will be set up. To minimize crossing of movement lines of patients from reception to the final exit, a clear division will be introduced into the facility layout, including the pharmacy.
To maintain existing school functionality, the nursing school will be constructed on the empty space on the east side. The mortuary will be built on the east side of the existing building and right next to the mortuary for the royal family.

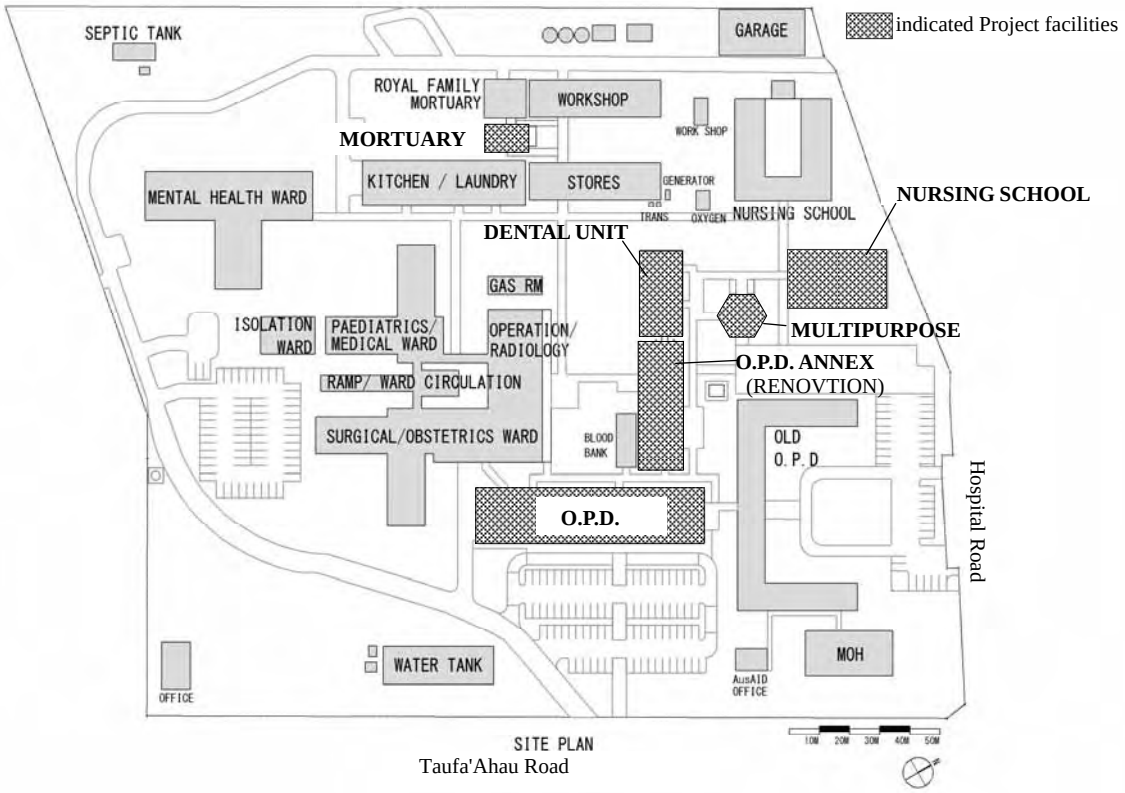


Figure 2-6 Site Plan

2-2-2-3 Architectural Plan

(1) Condition of Facility Scale

1) General Clinic Division

There are an estimated four consulting rooms required for the general clinic division, as shown below, based on the outpatient data at the hospital. However, because many child outpatients are communicable disease patients, one room will be allocated for children only and the remaining three rooms used as general consulting rooms. Those rooms can be shared when there is an extremely dense concentration of outpatients.

Table 2-23 Calculation for required Consulting room of Genaral Clinic

Average number of daily patients	Maximum number of daily patients	Consultation hours	Consultation minutes	Average consultation minutes	Average required number of consulting rooms	Maximum required number of consulting rooms
61	112	08:00-12:00	240	8	2.03	3.73

Quoted from Record of General Clinic of Vaiola Hospital in 2008

We have determined from the number of patients brought to the A & E that the two existing beds are sufficient for the resuscitation room. Additionally, the existing three beds in observation are believed to be adequate in view of the fact that the observation time per patient is less than 8 hours, even though the average number of patients is 5.4 per day.

2) Special Clinic Division

The single existing consulting room is insufficient in light of existing consulting data at the special clinical division; two rooms are necessary. Because outpatients visiting the special clinical division have a wide range of diseases and treatments, it is judged effective two rooms. The current single treatment room will be enough since treatment time is approximately half the consulting time.

Table 2-24 Calculation for required consulting room of Special Clinic

Average number of daily patients	Maximum number of daily patients	Consultation hours	Consultation minutes	Average consultation minutes	Average required number of consulting rooms	Maximum required number of consulting rooms
37.1	41.5	08:30-16:30	420	20	1.76	1.98

Quoted from Record of Special Clinic of Vaiola Hospital in 2008

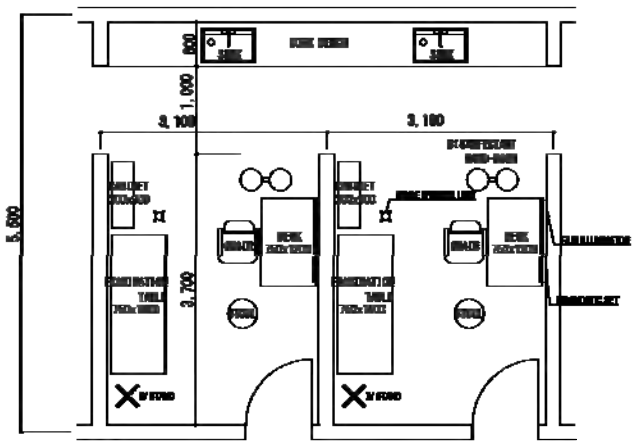


Figure 2-7 Typical Layout of consulting room of General and Special Clinic

3) ENT Clinic

The following rooms and equipment will be provided for the ENT clinic: a reception desk/ administrative area, a consulting room, a treatment room, an equipment room, and a space for sound proof unit. A total of 262 ENT surgeries, from major to minor, were performed last year, but Tonga believes that it is desirable to perform surgery in the existing medical examination division in terms of securement of staff, surgical equipment, and safety. Therefore, it is not necessary to set up a surgical room for minor surgeries in the clinic.

Table 2-25 Calculation for required consulting room of ENT

	Average number of daily patients	Consultation hours	Consultation minutes	Average consultation minutes	Calculated number of consulting rooms	Required number of consulting rooms
EAR	10.2	08:30-16:30	420	20	0.48	1
NOSE	0.8	08:30-16:30	420	20	0.04	1
THROAT	6.0	08:30-16:30	420	20	0.29	1

Quoted from Record of ENT of Vaiola Hospital in 2008

Since the patient numbers for each clinic is 10.2, 0.8 and 6.0 respectively, the required rooms are calculated to be 0.48, 0.04 and 0.29. In other words each clinic needs one room, but considering total patient and clinic numbers it is judged to be able operate with two rooms.

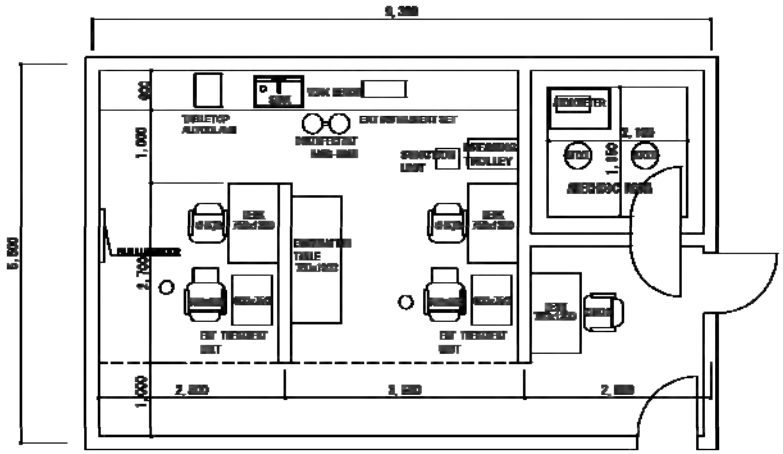


Figure 2-8 Typical Layout of ENT Clinic

4) Ophthalmology, Diabetes, and Physiotherapy

In the ophthalmology clinic, the consulting room and the treatment room will be separated, thereby improving the consultation efficiency and greatly reducing patient waiting time. From the existing data, two consulting rooms and two examination rooms are necessary because of equipment needs.

Table 2-26 Calculation for required consulting room of Ophthalmology

	Average number of daily patients	Maximum number of daily patients	Consultation hours	Consultation minutes	Average consultation minutes	Average required number of consulting rooms	Maximum required number of consulting rooms
COSULTING ROOM	20.9	42.9	08:30-12:00	210	10	1	2.04
EXAMINATION ROOM	20.9	42.9	08:30-12:00	210	8	0.8	1.63

Quoted from Record of Ophthalmology of Vaiola Hospital in 2008

Currently, the consulting efficiency in the diabetes clinic is not high, as shown below, because treatment is also given in the consulting room. If those rooms are separated, the waiting time of patients will be significantly reduced. In the calculation in Table 2-27, three consultation rooms and two treatment rooms are necessary. One doctor's room is used for one of three consultation rooms.

Table 2-27 Calculation for required consulting room of Diabetes

	Average number of daily patients	Maximum number of daily patients	Consultation minutes	Average consultation minutes	Average required number of consulting rooms	Maximum required number of consulting rooms
CONSULTING ROOM	32.1	39.3	210	15	2.29	2.81
TREATMENT ROOM	14.7	21.5	210	12	0.84	1.22

Quoted from Record of Diabetes of Vaiola Hospital in 2008

The physiotherapy clinic should be designed to have a width that can accommodate existing equipment and instruments in consideration of the existing service data. Because Tonga has future plans to construct a swimming pool for physical rehabilitation outside the building, they requested to arrange water pipes and other related utility pipes in the current project. Therefore, necessary arrangements will be made on the exterior walls of the building for future connection.

5) Dental Clinic

There are 241 consultation days yearly. Saturdays are consultation days, but no dentists are available and only minor treatment is provided. Although 15 dental treatment tables were requested in the preliminary survey, 11 tables would be appropriate from the calculation based on the average consulting time at the dental division of Vaiola Hospital.

Table 2-28 Calculation for required consulting room of Dental Clinic

Average number of daily patients	Consultation minutes	Average consultation minutes	Average required number of consulting rooms
155.2	420	30	11.1

Quoted from Record of Dental Clinic of Vaiola Hospital in 2008

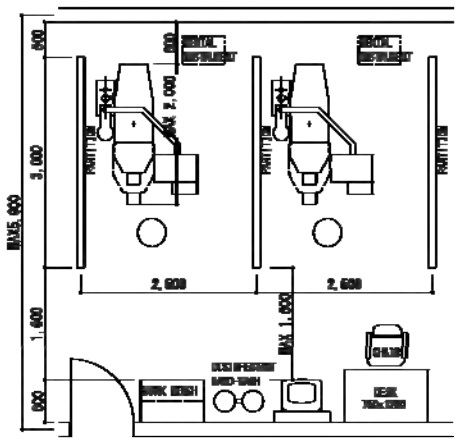


Figure 2-9 Typical Layout of Dental Unit

6) Obstetrics and gynecology clinic (Antenatal)

As every Monday afternoon is designated for gynecological examination only, antenatal examination is provided 189 days per year. Calculations based on this show that four consulting rooms are necessary. In addition, one pre-examination room and one doctor's room will be provided. The latter room is secured for doctors who are presently commuting from the medical ward because they do not currently have a room in the clinic.

Table 2-29 Calculation for required consulting room of Obstetrics and Gynecology clinic (Antenatal)

Average number of daily patients	Maximum number of daily patients	Consultation minutes	Average consultation minutes	Average required number of consulting rooms	Maximum required number of consulting rooms
48.7	54.4	420	25	2.9	3.24

Quoted from Record of Obstetrics and Gynecology clinic (Antenatal) of Vaiola Hospital in 2008

7) Hospital Administration

In the current plan, various rooms for hospital administration which are currently distributed throughout the hospital will be centralized on the second floor of the new O.P.D. Ward to improve efficiency of communication and circulation.

- Medical Superintendant's Room/General Administration Room (8 persons) + Maneger's Room, Accounting and Finance Room (4 persons), Matron Room/Office(5 persons)/In-house Infection Control Team Room (1 person)

- IT Server Room and System Engineer ' s Room + Equipment Storage

8) Education and Training Rooms

The following table shows education and training-related events such as seminars and lectures currently being held at the hospital, including the frequency and number of participants thereof. Among the four types of events described in the problem-finding section of this sector, the events excluding events of the Ministry of Health level and the public health division are shown in the table. These events can be held if two rooms are provided: one for about 15 persons and the other for about 30 persons.

Table 2-30 Contents of Education and Training Event

Contents	Frequency		Number of Attendant	Remarks
Health Personnel Review Council	As required		8	
Nurses Board Meeting	As required		7	
Medical/Dental Practice Board	As required		8	
National Pharmacy Board	As required		8	
Promotion Board	1	per 3 months	9	
Human Resource Development Committee	1	per month	14	
Administration Selection Committee	As required		4	
Training Development Committee	1	per month	11	
Training Selection Committee	As required		9	
HIS Steering Committee	1	per month	13	
HIS Selection Committee	As required		7	
Computer Lab Committee	1	per month	10	
Medical Services Committee	1	per month	17	
Drugs and Medical Supplies Committee	1	per month	16	

Contents	Frequency		Number of Attendant	Remarks
Medical Referral Committee	As required		4	
Mental Health Committee	1	per 3 months	10	
Medical Staff Selection Committee	As required		7	
Paramedical Selection Committee	As required		6	
Disaster Management Committee	1	per 3 months	17	
Dental Selection Committee	As required		4	
Nursing Selection Committee	As required		6	
Nursing Head of Sections Meeting	1	per week	16	
Laboratory Technician	3	per week	5	All through 12 months
X-Ray Technicians	2	per week	4	All through 12 months
Dental Technician	2-3	per week	6	All through 6 months
Pharmacy Refresher Courses	5	per week	6	All through 6 months
Ob/GYN -Antenatal Services	3	per year	25	Workshop
-Local Midwifery	1	per year	20	Workshop
-Planning of Immunization	5	per year	25	Workshop
Mental Health	2	per year	30	Workshop
Anesthesia	2	per year	15	Workshop
Emergency and OPD	2	per year	30	Workshop
Laboratory	3	per year	20	
Physiotherapy	1	per year	30	
Hospital Management	2	per year	20	
Health Information	1	per year	25	
Hospital Waste Management	1	per half year	25	

Quoted from Hospital Records

9) Mortuary

From the mortuary administration record in 2008 presented by Tonga, we find that about 70% of the deceased bodies are kept in mortuary refrigerator in the mortuary room for one to eight days. Although perfect records are not available on the full occupancy, at least one refrigerator for two deceased bodies is necessary. In addition, it would be possible to share the facilities in the royal family's mortuary, which is agreed with by Tonga side. The master plan included the room for gathering. However, we confirmed that a room with a permanent roof is not necessary, and instead a temporary tent will be set up in the lawn ground in front of the mortuary. As such, the construction of the room was removed from the project.

10) Pharmacy

Two outpatient pharmacies currently exist but they will be combined into one single pharmacy. In addition to the present function, the pharmacy will be provided with a reception counter, a prescription area, a drug storage, a pharmacist room, a staff room, a consulting corner and a small counter where patients are given advice on proper medicine use upon request. A 30-seat waiting area will be provided at a position that does not cross other circulation.

A dedicated room for the training of pharmacy staff is not necessary because training can be done in the rooms described in 8) above.

11) Nursing School

The rooms shown below will be included in the nursing school plan. The plan will focus mainly on providing sufficient spaces while retaining the present from composition to solve the existing lack of sufficient space. An auditorium where all students can gather for meetings of the entire school will be included in the plan. The inclusion of the space into the plan is considered appropriate, because it can also fulfill the function of canteen where hospital staff can gather, as requested by the hospital.

The nursing school will consist of the following rooms:

- 3 class rooms: Must be of sufficient size for 36 students.
- Simulation room: Must be of sufficient size to accommodate two demonstration beds and to allow a teacher to teach while students watch around the bed.
- Library: The present size is adequate.
- Computer room: The present size is adequate.
- Principal's room: The present size is adequate for each room.
- Staff room/secretary room: Must be sufficient size for respectively 8 staff, 2 secretary.

(2) Necessary Floor Area

The total floor area for architectural planning is estimated based on all relevant factors, including the number of necessary rooms calculated as above, the layout of medical equipment in each room, and the projected number of patients and medical staff. The floor area of each room of the project facility is estimated by referring to the Japanese Standard on the Floor Area of Medical Facilities (A design standards collection compiled by the Architectural Institute of Japan (AIJ) and by taking into account the current state of the existing facility, the average physical size of Tongan people, and the daily habits thereof.

Table 2-31 Floor Area of Each Room of the Subject Facility

Bldg	Floor	Dept	Room	Floor area	Dimension (m)	Remarks
O.P.D.	1	A&E	OBSERVATIN	42.84 ㎡	6.3×6.8	3 Observation Bed, Shower room, Toilet
			RESUSCITATION	37.05 ㎡	6.5×5.7	2 Patient Trolley、Each space can be used individually
			TREATMENT	28.60 ㎡	5.2×5.5	Space for one treatment table and one examination table
			EQ.-1	7.50 ㎡	2.5×3	Space for Equipment storage of A&E
			PLASTER	25.41 ㎡	7.7×3.3	Space for one treatment table and sink space
			HALL-1	56.67 ㎡	9.5×3.8+3×5.7+1.1×3.15	Space for switching a patient from one stretcher to another,, waiting space for family
			SUBTOTAL	198.07 ㎡		
		GENERAL CLINIC	MEDICAL RECORD-1	103.23 ㎡	17.1×5.7+1.6×3.6	Space for patient's record of two year, approx. 13,500 patients, manager room, reception, office(9persons)
			CON.-1	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			CON.-2	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			CON.-3	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			PEDIATRICS	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			M.O.-1	11.29 ㎡	3.05×3.7	Space for examination desk of one doctor, cabinet
			RECEPT.-2	8.71 ㎡	3.1×2.81	Space for reception of general clinic and cabinet
			EQ.-2	8.99 ㎡	3.1×2.9	
			TRIAGE-1	35.34 ㎡	6.2×5.7	Space for two examination table, reception
			SL.	4.59 ㎡	2.7×1.7	
			SISTER	7.14 ㎡	2.8×2.55	Space for desk and cabinet
			CHANGING-1	5.78 ㎡	3.4×1.7	
			ST.-1	2.38 ㎡	1.4×1.7	
			STAFF-1	17.70 ㎡	3.1×5.71	
			HALL-2	90.16 ㎡	18.4×4.9	Space for waiting space of 44 patients and circulation to A&E
			SUBTOTAL	366.11 ㎡		
		SPECIAL CLINIC	EQ.-3	9.28 ㎡	3.2×2.9	
			M.O.-2	8.96 ㎡	3.2×2.8	Space for examination desk of one doctor, cabinet
			TRIAGE-2	17.70 ㎡	3.1×5.71	Space for one examination table
			CON-4	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			CON-5	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			SL.-2	1.32 ㎡	1.2×1.1	
			CON. OTHERS	6.84 ㎡	3.8×1.8	
			HALL-3	83.22 ㎡	15.5×4.8+4.2×2.1	Space for waiting space of 32 patients
			SUBTOTAL	162.72 ㎡		

Bldg	Floor	Dept	Room	Floor area	Dimension (m)	Remarks
		OUTPATIENTS PHARMASY	PHARMACY	47.20 ㎡	4.1×5.7+1.9×3.4+2.6×4.4+1.5×1.7+1.34×2.6	Space for work of 13 staff
			PHAMACIST	12.58 ㎡	2.8×3+1.9×2.2	
			COUNSELING	3.42 ㎡	1.9×1.8	
			ST.-4	6.40 ㎡	3.2×2	
			DRUG INFORMATION	7.36 ㎡	3.2×2.3	
			STAFF-2	12.69 ㎡	4.7×2.7	
			REPACK	6.44 ㎡	2.3×2.8	
			EXTEM.	6.44 ㎡	2.3×2.8	
			SUBTOTAL	102.53 ㎡		
		ENT	CON.-6	52.44 ㎡	9.2×5.7	Space for one examination desk, examination table, sound proof unit
			RECEPT.-3	8.64 ㎡	3.2×2.7	Space for ENT reception(1 person) and cabinet
			ST.-3	9.28 ㎡	3.2×2.9	
			SUBTOTAL	70.36 ㎡		
		OHERS	ENTARANCE HALL	105.95 ㎡	6.5×16.3	Space for information counter and control of circulation of patients
			OP.	6.25 ㎡	2.5×2.5	For two telephone operator
			STAIR-1	18.60 ㎡	6.2×3	
			STAIR-2	9.69 ㎡	5.7×1.7	
			STAIR-3	4.34 ㎡	3.1×1.4	
			EV	9.00 ㎡	2.5×3.6	Acceptable to a stretcher
			ST.-2	6.12 ㎡	1.7×3.6	
			ST.-5	7.80 ㎡	1.5×3.8+1.5×1.4	
			CORRIDOR-1,2,3	53.84 ㎡	9.3×1.8+1.65×8.8+1.8×1.8+1.7×3.1+1.4×2.6+7.45×1.4	
			CORRIDOR-4,5	17.95 ㎡	4.4×1.8+5.7×1.76	
			CORRIDOR-6,7,8	21.81 ㎡	0.95×1.65+1.6×3.4+1.4×4.1+1.2×2.3+1.4×4.5	
			WC-2,3,4	14.31 ㎡	5.3×2.7	For staff
			WC-6,7	25.68 ㎡	5.8×3.9+1.1×1.7	For patients
			WC-8,9,10,11	14.15 ㎡	2.9×2.2+2.1×3.7	
			PS,EPS,etc	36.62 ㎡		
			SUBTOTAL	353.12 ㎡		
			TOTAL OF FIRST FLOOR	1251.90 ㎡		
O.P.D.	2	HOSPITAL ADMINISTRATION	MEDICAL S.I.	18.24 ㎡	3.2×5.7	Space for work desk, cabinet, sitting space for reception
			MATRON	18.24 ㎡	3.2×5.7	Space for work desk, cabinet, sitting space for reception
			OFFICE-1	18.24 ㎡	3.2×5.7	Space foe 5 staff and cabinet
			OFFICE-2	33.06 ㎡	5.8×5.7	Space for four staff, cabinet
			OFFICE-3＋MANAGER	53.58 ㎡	9.4×5.7	Space for 8 staff, manager room, cabinet
			INFECTIOUS CONTROL	11.52 ㎡	3.2×3.6	Space for one staff, cabinet
			ST.-6	11.52 ㎡	3.2×3.6	
			STAFF-3	16.64 ㎡	3.2×5.2	Space mainlyforhospital administration staff
			CONSULTANT ROOM-1	14.00 ㎡	4×3.5	
			CONSULTANT ROOM-2	16.45 ㎡	4.7×3.5	
			OFFICE	8.75 ㎡	2.5×3.5	
			ELECTRIC RM.	11.20 ㎡	3.2×3.5	
			SERVER	11.22 ㎡	3.3×3.4	
			IT OFFICE	10.88 ㎡	3.2×3.4	
			EQ.-4	13.26 ㎡	3.9×3.4	
			SUBTOTAL	272.41 ㎡		
			TRAINING	35.91 ㎡	6.3×5.7	Space for training up to 15 persons
			PREP.-1	16.53 ㎡	2.9×5.7	
			LECTURE	53.58 ㎡	9.4×5.7	Space for lecture up to 30 persons
			SUBTOTAL	106.02 ㎡		

Bldg	Floor	Dept	Room	Floor area	Dimension (m)	Remarks
		ANTENATAL(OB/GYN)	M.O.-3	11.16 ㎡	3.1×3.6	Space for examination desk of one doctor, cabinet
			OTHERS	6.54 ㎡	3.1×2.11	
			CON-7	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			CON-8	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			CON-9	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			CON-10	17.70 ㎡	3.1×5.71	Space for examination desk, examination table, work
			PRE-EXAM.	12.16 ㎡	3.2×3.8	
			MEDICAL RECORD-2	15.64 ㎡	4.6×3.4	Space for patient's record of two year, approx. 20,000 patients
			RECEPT-4	5.78 ㎡	1.7×3.4	Space for reception of antenatal
			STAFF-3	15.36 ㎡	4.8×3.2	Space for staff of antenatal
			ST.7-7	12.48 ㎡	4.8×2.6	
			LABORATORY	5.51 ㎡	2.9×1.9	
			WC-11	2.66 ㎡	1.4×1.9	Space for urine testing
			HALL-5+WAITING	103.24 ㎡	6.3×10.6+6.2×4.9+3.2×1.9	Space for waiting space of 50 patients
			SUBTOTAL	261.34 ㎡		
		OTHERS	STAIR-1	21.08 ㎡	6.2×3.4	
			STAIR-2	19.95 ㎡	3.5×5.7	
			STAIR-3	17.60 ㎡	4.8×3.1+1.7×1.6	
			EV	9.00 ㎡	2.5×3.6	Acceptable to a stretcher
			CORRIDOR-9	84.66 ㎡	6.5×1.7+18.6×1.8+1.9×5.3+16.7×1.8	
			CORRIDOR-10	41.48 ㎡	24.4×1.7	
			CORRIDOR-11,12	37.74 ㎡	1.7×1.9+1.7×7.5+1.7×12.8	
			WC-12	12.60 ㎡	3.6×3.5	
			WC-13	12.60 ㎡	3.6×3.5	
			WC-14,15	21.60 ㎡	3.1×3.6+2.9×3.6	
			PS,EPS,etc	42.02 ㎡		
			SUBTOTAL	320.33 ㎡		
			TOTAL OF SECOND FLOOR	960.10 ㎡		
O.P.D. ANNEX (RENOVATION)	1	OPHTHALMOLOGY	CON.-1	16.00 ㎡	5×3.2	Space for examination desk, examination table, work
			CON.-2	16.00 ㎡	5×3.2	Space for examination desk, examination table, work
			HALL-5	16.00 ㎡	5×3.2	
			M.O.-4	16.00 ㎡	5×3.2	Space for examination desk of one doctor, cabinet
			EYE CAMERA	16.00 ㎡	5×3.2	Space for eye camera, work
			STAFF-5	16.00 ㎡	5×3.2	
			EYESIGH TEST	23.04 ㎡	7.2×3.2	Space for eyesight test
			LASER-1	23.04 ㎡	7.2×3.2	Space for laser equipment, work
			LASER-2	16.00 ㎡	5×3.2	Space for laser equipment, work
			ST.8	23.04 ㎡	7.2×3.2	
			SUBTOTAL	181.12 ㎡		
		DIABETES	HALL-6	24.00 ㎡	5×4.8	
			M.O.-5	16.00 ㎡	5×3.2	Space for examination desk of one doctor, cabinet
			CON.-1	23.04 ㎡	7.2×3.2	Space for examination desk, examination table, work
			CON.-2	23.04 ㎡	7.2×3.2	Space for examination desk, examination table, work
			DRESSING-1	12.00 ㎡	5×2.4	Space for dressing
			DRESSING-2	12.00 ㎡	5×2.4	Space for dressing
			SUBTOTAL	110.08 ㎡		
		PHYSIOTHERAPY	PHUSIOTHERAPY	53.76 ㎡	7.2×9.6-3.2×4.8	Space for 3 Therapy Bed, equipment
			THERAPIST	15.36 ㎡	3.2×4.8	Space for work desk, cabinet
			ST.-9	23.04 ㎡	7.2×3.2	
			SUBTOTAL	92.16 ㎡		
		DENTAL CLINIC	STAFF 6	23.04 ㎡	7.2×3.2	Space for staff of dental
			ST.-10	16.00 ㎡	5×3.2	
			SUBTOTAL	39.04 ㎡		
		OTHERS	WC-16,17,18,19	48.00 ㎡	5×3.2×3	
			CORRIDOR-13	98.88 ㎡	1.8×41.6＋16×1.5	

Bldg	Floor	Dept	Room	Floor area	Dimension (m)	Remarks
			PS, EPS, etc	13.12 ㎡		
			SUBTOTAL	160.00 ㎡		
			O.P.D.ANNEX TOTAL	582.40 ㎡		
DENTAL UNIT	1		HALL-7, WAITING	15.30 ㎡	3×5.1	Space for waiting space of 24 patients
			RECEPT.-5	6.60 ㎡	3.3×2	Space for reception of Dental
			MEDICAL RECORD-3	22.77 ㎡	3.3×6.9	Space for patient's record of two year, approx. 75,000 patients)
			HALL-8	10.00 ㎡	4×2.5	Space for VIP patients
			DENTAL	133.31 ㎡	7×4.5+5.8 ×11.8+7.1 ×4.7	Space for 11 dental units
			VIP	26.50 ㎡	5×4.5+2 ×2	
			WC	5.00 ㎡	2×2.5	
			DENTAL PATHOLOGIST	14.79 ㎡	2.9×5.1	
			M.R.	15.00 ㎡	3×5	
			STETILI.-2	13.95 ㎡	3.1×4.5	
			X-RAY RM	7.68 ㎡	3.2×2.41	
			DENTAL TECH.	25.20 ㎡	7.2×3.5	
			WORKSHOP	25.20 ㎡	7.2×3.5	Space for maintenance and storage of equipment
			SUPERVISOR	16.50 ㎡	5×3.3	Space for two work desk of supervisors
			C.D.O.	15.00 ㎡	5×3	Space for work desk, cabinet, sitting space for reception
			CORRIDOR-18, 19	37.01 ㎡	1.9×11.9+ 1.6×9	
			PS, EPS, etc	7.89 ㎡		
			DENTAL UNIT TOTAL	396.10 ㎡		
NURSING SCHOOL	1		CLASS RM-1	75.44 ㎡	8.2×9.2	Space for 36 students
			CLASS RM-2	73.60 ㎡	8×9.2	Space for 36 students
			CLASS RM-3	73.60 ㎡	8×9.2	Space for 36 students
			SIMULATION-1,2 +PREP.2	75.44 ㎡	8.2×9.2	Space for beds, teacher and students(1 class) standing
			COMPUTER/PRINTER/COPY	20.46 ㎡	3.3×6.2	
			PRINCIPAL	31.00 ㎡	5×6.2	Same space of the existing including secretary room
			STAFF-5	28.52 ㎡	4.6×6.2	Space for 10 staff
			LIBRARY	50.84 ㎡	8.2×6.2	
			WC-20	10.80 ㎡	3×3.6	
			PANTRY	7.8 ㎡	3×2.6	
			WC-22,23	50.84 ㎡	8.2×6.2	
			CORRIDOR-20	97.20 ㎡	32.4×3	Space for student's circulation(2.5m)
			PS, EPS, etc	1.18 ㎡		
			NURSING SCHOOL TOTAL	596.10 ㎡		
MULTIPURPOSE				126.00 ㎡		
MORTUARY		HALL		55.00 ㎡		Include piloty and corridor
		MORGUE		43.40 ㎡	7×6.2	
PUMP ROOM FOR CITY WATER				25.00 ㎡	5×5	
MACHINE ROOM FOR SEWAGE TREATMENT				16.90 ㎡	3.8×4.5	
TOTAL FLOOR AREA				4120.90 ㎡		

(3) Composition of Facilities

Table 2-32 Composition of Facilities

Composition of Facilities	Story	Division	Contents of each Composition
O.P.D. New building, 2,280.0 ㎡	First Floor	A&E	Hall, Resuscitation, Treatment, Observation, etc
		General Clinic	Triage, Waiting Hall, Consulting room, Treatment room, Medical record, Staff, etc
		Special Clinic	Special Clinic, ENT
		Pharmacy	Pharmacy, Storage, Pharmacist room, Staff room
	Second Floor	Antenatal	Waiting Hall, Consulting room, Treatment room, Medical Record, Staff room, etc
		Education/ Training	Training room, Lecture room, Prep. room
		Hospital Administration	Medical Superintendent, Matron, Accounts, etc
O.P.D. ANNEX Renovated building, 582.4 ㎡	Single Story	Special Clinic	Ophthalmology, Diabetes, Physiotherapy
Dental Unit New building, 396.1 ㎡	Single Story	Dental	Dental Clinic, Dental Tech., X-ray, Machine room, Waiting Hall, etc
Multipurpose New building, 126.0 ㎡	Single Story		Waiting Space(Multipurpose use)), Storage for furniture
Nursing School New building, 596.1 ㎡	Single Story		Class room, Simulation room, Prep. Room, Principal room, Office, Computer
Mortuary New building, 98.4 ㎡	Single Story		Hall, Morgue
Outside waiting space, Passage New covered space, 987.7 ㎡	Single Story		Waiting space and Covered Passage
Ancillary Mechanical Facility New building, 41.9 ㎡	Single Story		City Water pump room、Sewage water pump room, City Water Reservoir Tank, Sewage treatment plant

(4) Floor Planning

1) O.P.D.

The O.P.D. will be constructed on the location of the former medical ward. The new building will be a two-story building with roughly the same floor area as the former medical ward. On the first floor, left from the main entrance will be the general clinic and emergency division, both with 24-hour service. The right side will be a special clinic and an ENT clinic. Behind them will be a pharmacy facing the exterior on the northeast side. Corridors will be provided between the O.P.D., the X-ray room in the main examination ward, and the pharmacy from the back door of the O.P.D. For the first floor, careful planning is made to eliminate crossing of patient and family circulation around the waiting room, the consulting room, and the treatment room in each division. A dedicated corridor for the hospital staff only will be installed where they can go to each division without crossing patient movement lines. The emergency division in the O.P.D. mainly provides wound treatment. For critically-ill patients who are carried into the existing operating theatre room or ICU, the shortest-distance route will be set by way of a dedicated accessway. The antenatal examination division will be placed on the second floor. Because many outpatients visit this division, this location is judged to be the best in terms of privacy and as the area does not cross the circulation of other divisions. However, as most outpatients in this division are pregnant women, the main stairway and an elevator will be provided adjacent to this division. The education and training division including a seminar room and an administrative division will be placed on the opposite side of the antenatal examination room on the second floor.

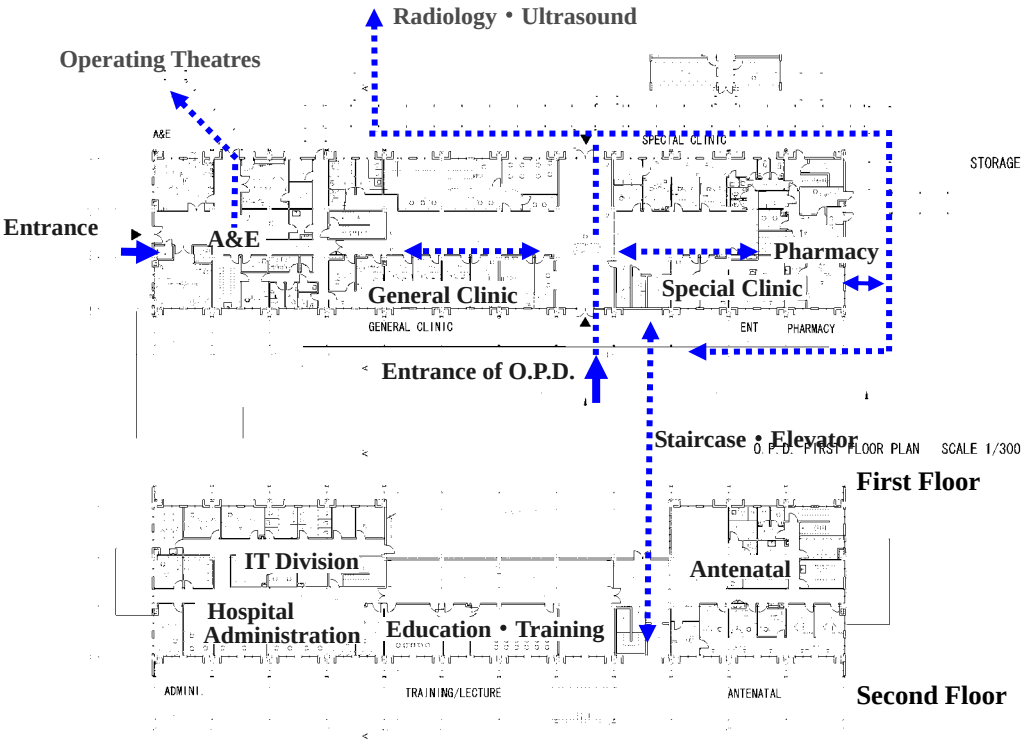


Figure 2-10 Floor Plan of O.P.D.

2) O.P.D Annex and Dental Clinic

A special clinic division consisting of ophthalmology, diabetes, and physiotherapy will be set in the completely renovated former laboratory building. In Tonga, one doctor examines both ophthalmology and diabetes, so these clinics will be placed adjacently, and physiotherapy, which is closely related to those clinics, will also be placed nearby. Because many outpatients visit these clinics and the waiting room is often overcrowded, we decided to move those clinics to the former laboratory building. Patient and family member circulation will be provided to the exterior side of the building, together with a waiting area. The corridor inside in the building provides access to all three clinics, enabling the smooth flow of both medical staff and equipment, which will improve the efficiency of service. The former laboratory building contains some space for use of dental clinic. The space will be utilized effectively by connecting the Dental Unit by way of a connecting corridor.

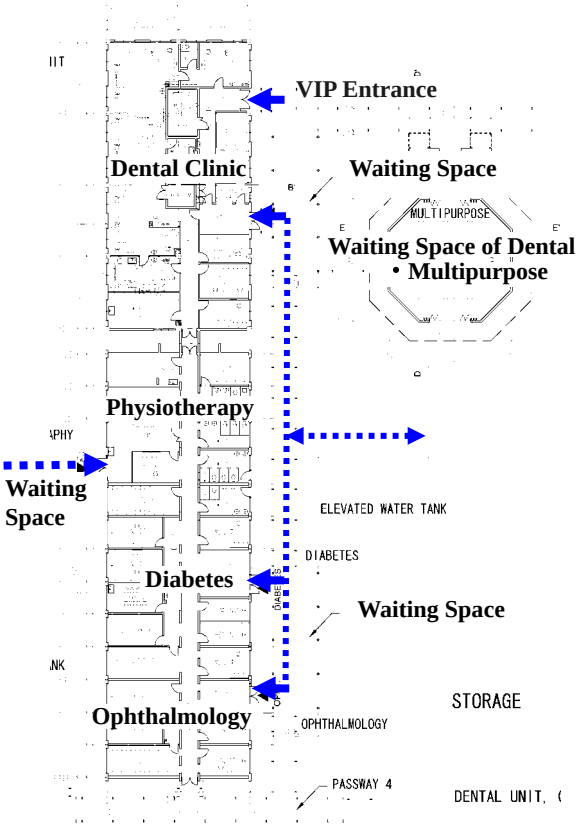


Figure 2-11 O.P.D. Annex・Dental Unit

3) Nursing School

The nursing school will be newly built in the empty space on the hospital side of the existing nursing school. It will be connected to the existing hospital with a covered passage. The nursing school will be a one story building consisting of three classrooms, two simulation rooms, a computer room, a library, an staff room, and a principal's room.

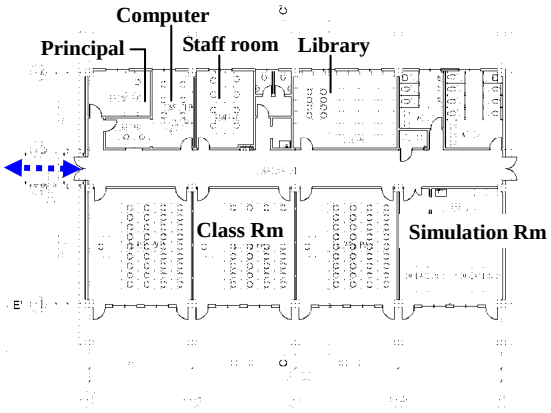


Figure 2-12 Nursing School

4) Mortuary

The mortuary will be constructed next to the existing royal family's mortuary. The deceased's body is carried from the main examination ward or the medical ward by way of a connecting outside passage, share the autopsy room and the embalmer's art room in the royal family's mortuary, and then kept in the mortuary refrigerator until the funeral is held. From existing records acquired during the basic survey, the refrigerator for four bodies is necessary.

The walls and ceiling of the mortuary will be constructed using heat-insulating panels to cool the heat emitted from the refrigerator, and an air conditioning unit will also be installed for cooling.

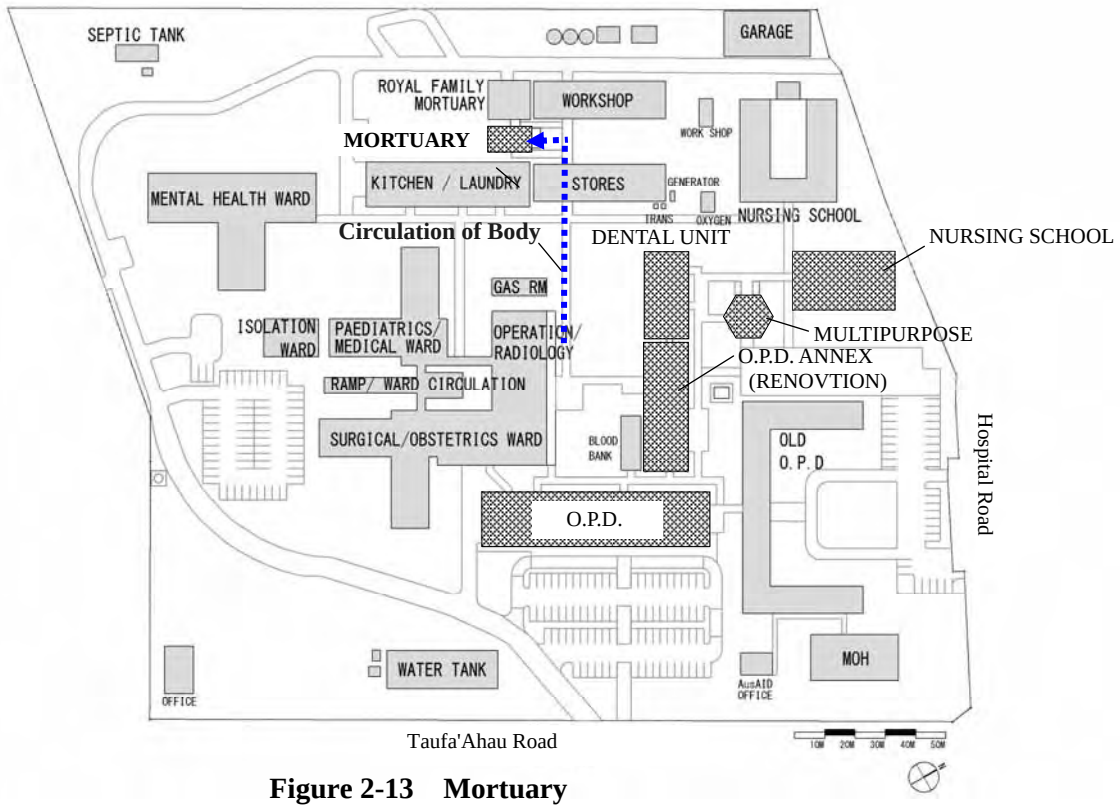


Figure 2-13 Mortuary

(5) Section Planning

As Tonga is located in a windy maritime climate zone, it is advisable to utilize natural draft. Also, some measures are necessary to block sunlight, which is quite strong due to Tonga's location around 20° south latitude. The building structure will be constructed of reinforced concrete and its sloped roofs built of steel frames. The exterior walls will be concrete block construction and primarily jalousie-type aluminum sash windows will be installed for natural ventilation. Fluorine resin paints should be applied to the exterior walls and the structural body to restrain carbonated deterioration caused by salt air permeation due to cyclones or other causes.

A large-scale solar panel system will be installed on the roof for the first time in Tonga. Pre-formed box section metal roofing are generally used as roofing materials in Tonga. However, in consideration of the proximity to the sea and possible salt damage, durable roofing materials should be used.

Raising the roof is an effective measure for preventing increases in hospital room temperature. In the O.P.D., an atrium will be provided on the second floor to allow the effective escape of hot air. An elevator will be installed adjacent to the stairway, because the antenatal examination division will be placed on the second floor of the O.P.D. due to planning constraints.

The floor height will be required to be 4 meters in height in order to reserve space for ventilation ducts under the structural girders above the 3 meter high ceiling.

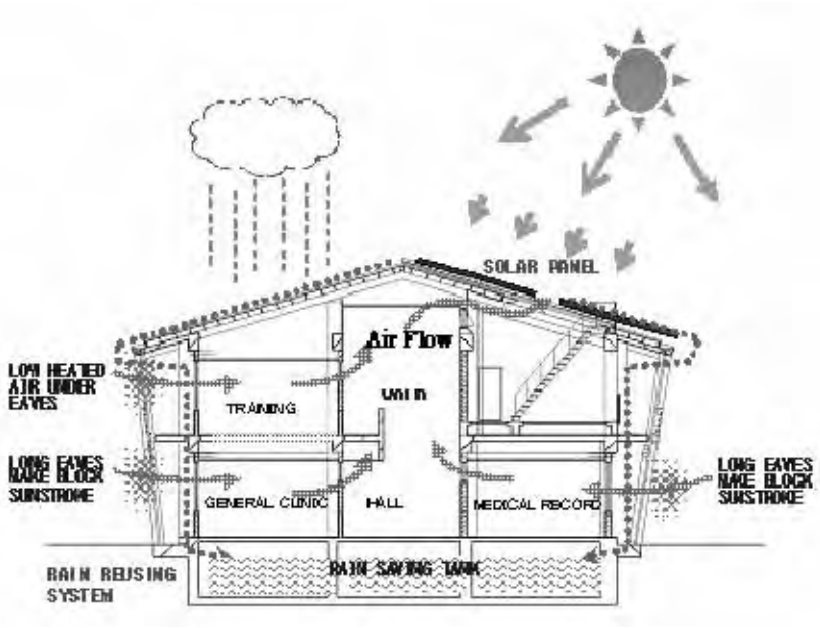


Figure 2-14 Section of O.P.D. Building

(6) Elevation Planning

The southeast side of the O.P.D. will become the main entrance to the hospital. The left side will be the entrance to the emergency division. Because both entrances will be given a canopy, approaching vehicles can easily find those entrances. The unique features of the building elevation include the roof with projected eaves and louvers used as sunshades and a row of galvanized steel beams extended from the roof. The elevation plan should create an open and clean hospital with comfortable breeze from Tonga's natural environment. It is also desirable to provide a distinctive design recognized as a hilltop landmark of this hospital, which serves as the top referral hospital in Tonga.

2-2-2-4 Structural Plan

(1) Geotechnical Conditions of the Project Site

The islands of Tonga are made up of uplifted coral limestone. A coral limestone layer also lies below the soil deposit on the ground surface in Tongatapu Island, where the project site is located.

According to the geotechnical investigation during the basic design survey, the ground of the project site consists of a topsoil layer at a depth of 0.3 to 1.5m, a volcanic ash layer at 1.5 to 3.5m, and a limestone layer at 1.5m to 3.7m and below. The building layout and geotechnical investigation positions are shown in the figure below. The geotechnical investigation results obtained in this investigation were roughly similar to those conducted for the first stage project, which was implemented with grant aid from Japan.

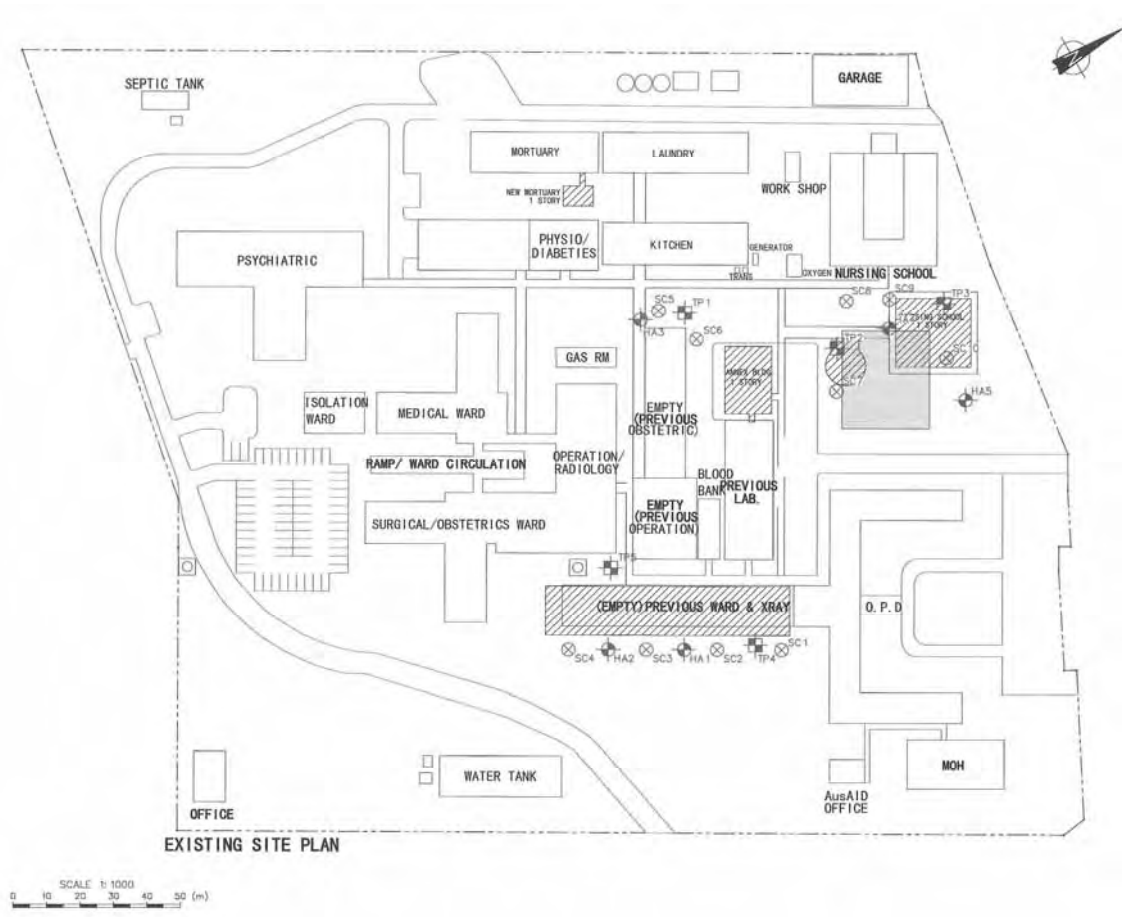


Figure 2-15 Location of Investigation

(2) Foundation Plan

From the analysis of the geotechnical survey results, we found that the foundation area of the planned buildings is made up of a limestone layer or a volcanic ash layer. Even the volcanic ash layer has an allowable bearing capacity of 150kPa (15 tons/m^2). Since the estimated load of the O.P.D. Ward is about 4 tons/m^2, the ground has sufficient strength as the load-bearing layer. Therefore, spread foundation is appropriate as the foundation type.

However, differential settlement can occur at positions such as: the position where the bearing ground of the foundation spans over multiple layers; the position where ground consolidation has already completed due to building weight (i.e. former medical ward) or due to embankment (i.e.

the planned site of the nursing school); and the position where multiple inclined layers exist. Therefore, prudent planning is important for those positions. From this standpoint, the ground of each ward in this project will be designed as follows.

O.P.D.
The foundation is supported by a limestone layer. However, limestone excavation is needed at the position where part of the foundation is made deeper to create a rainwater storage tank. The southwest area where the volcanic ash layer and the limestone layer meet should be replaced with rubble concrete to strengthen it.

Nursing School and Multi-purpose
The planned site is currently covered with embankment. Although the bearing layer is a volcanic ash layer, rubble concrete should be provided for the reason mentioned above.

Dental and Mortuary
The bearing layer consists of volcanic ash. If top soil remains below the foundation, rubble concrete should be replaced.

Before commencing construction work, the strength of the bearing layer should be reconfirmed by conducting a dynamic penetration test or other tests at the excavated bottom.

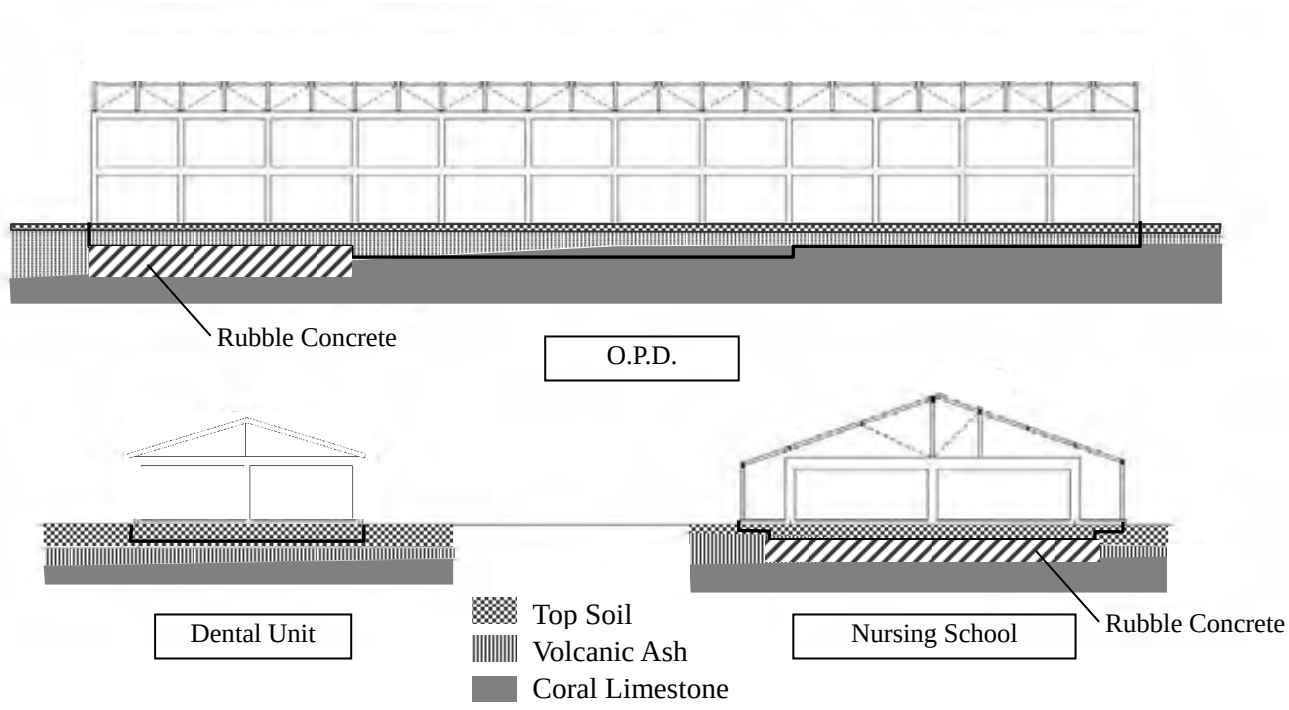


Figure 2-16 Section Diagram of each Building

(3) Structural Plan

The buildings in this project are basically designed as rigid frame reinforced concrete construction. The roofs are designed as part concrete slab and steel roofing on which metal roofing is placed. Salt damage prevention measures are indispensable because the project site is close to the sea and salt damage is frequent due to misty seawater blown to virtually all parts of the building. Rust prevention paint should be applied to structural steel and other metals to improve durability.

(4) Design Load

Various design loads used in this project should be determined based on the following standards:

National Building Code (2007)	Tongan standards
AS1170 (2007)	Australian standards
NZS4203 (1992)	New Zealand standards

1) Dead load

The dead load should conform to AS/NZS1170.1 and is estimated from the finishing materials and structural materials used in the project.

2) Live load

The live load should be determined by conforming to AS/NZS1170.1 and by adequately taking into account various factors.

3) Wind load

The wind load should conform to AS/NZS1170.2.
Based on Tongan standards, a wind velocity of 70m/s is used for critical state and 57m/s for the allowable stress design.

4) Seismic load

The seismic load should conform to AS1170.4 or the California Building Standards.

The results of calculations based on AS1170.4 are shown below.
The earthquake design category of the project site is II. The sub-soil class is C based on the geotechnical investigation results. 0.4 is used as the seismic zone factor based on the Tongan standards.

$$Fi = Ks[kp \cdot Z \cdot Sp / \mu]Wi$$

Ks: Story factor
3.6 for a one-story building and 2.5 for one story of a two-story building (Based on AS)
Kp: Probability factor P = 1/1000, Kp = 1.3 (Based on Tongan standards)
Z: Hazard factor: 0.4 (Based on Tongan standards)
Sp/μ: 0.22 (Based on AS)

Here, the seismic force for building design in Tonga is compared with that of Japan by presuming certain conditions. If the seismic force is estimated by Australian standards and converted into Japan's standard shear coefficient (C) under the ultimate bearing capacity, C is 0.41 for the one-story building and 0.29 for the two-story building. If the planned building types are evaluated by Japanese standards, the value is usually C=0.30 to 0.35. Therefore, the seismic load in Tonga will be this level or slightly greater.

(5) Structural Calculation

The Ministry of Public Works and Disaster Relief Activities was consulted regarding procedures to obtain permits and structural calculations. Approval to refer to various Japanese standards for structural calculations was obtained. Specifically, the Ministry gave permission to perform sectional design and stress analysis based on Japanese standards and using Japan's analysis programs. However, we must present the outline of structural calculations in English to obtain a permit through their review.

(6) Materials Used

The specifications of the materials used are prescribed in the Tongan standards. However, after consultation the Ministry of Public Works and Disaster Relief Activities allowed us to use the Japanese Industrial Standards (JIS) in addition to Tonga's standards.

1) Concrete: Conform to NZS3101, 3109

The field survey found that 20,25,30,40 N/mm^2 is used as the specified design strength. The slump is 8 cm, which is rather hard. As such, workability should be duly considered in design.
Sea sand is still used in Tonga, and therefore a salinity check is necessary when used.

2) Reinforcing bars: Conform to AS1720 and NZS3603.

In Tonga, reinforcing bars of NZS-based D20 or less are widely distributed. Import is required if other types are selected.

3) Structural steel: Conform to NZS3404.

All structural steel to be used in Tonga must be imported.

4) Concrete blocks: Conform to NZS4210.

Concrete blocks with a compressive strength of 12N/mm^2 are being produced in Tonga.

2-2-2-5 Mechanical and Electrical Plan

(1) Electrical System

1) Power supply system

The electrical system on the secondary side at Vaiola Hospital is connected to Tonga Power Ltd's two transformers, 300kVA and 500kVA, installed outside the electrical room. Connected to the 300 kVA transformer is the B1 system (The facilities constructed as the first stage project with grant aid from Japan, including the main examination room, laboratory, delivery room, obstetrics/gynecology clinic, surgery ward). Connected to the 500 kVA is the B2 system (All remaining facilities, including those constructed as the second stage project with assistance from the World Bank - Clinical, pediatrics/internal medicine, diabetes clinic, psychiatry medical ward, etc. – as well as the existing O.P.D., public health ward, laundry, and kitchen.)

However, the 300 kVA transformer is becoming seriously deteriorated due to its 30-year age. On the other hand, the design load of this project facility is about 155 kVA and the measured maximum consumption of secondary side electricity at the existing facilities is roughly 80 kVA. Therefore, it is possible to supply all the electricity needed at the entire hospital using only the 500 kVA transformer. Based on this result, the Consultant recommended that Tonga remove the 300 kVA transformer. The power distribution system will be three phase-four line system, 415V/240V, which is the standard type in Tonga. This project undertakes the secondary side of the transformer. The following figure shows the power supply plan on the secondary side.

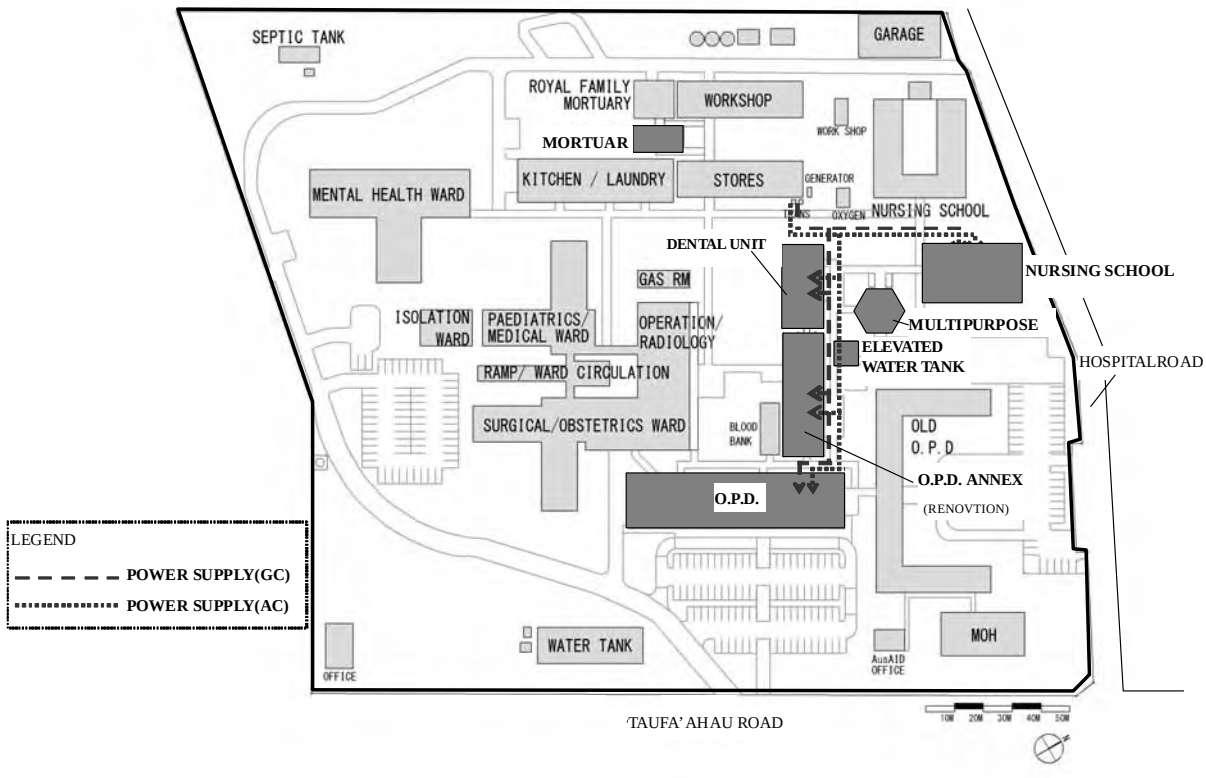


Figure 2-17 Electric Power Supply Route from low voltage switch

2) Lighting and receptacle systems

In Tonga, it is very dark in the public facilities, including Vaiola Hospital, because there are fewer than average electrical fixtures and half are not lighted. In line with this situation, the design illuminance is established as shown in the table. Movable task lights (medical equipment) and receptacles will be provided to allow concentrated use of lighting at needed positions. The primary light source will be fluorescent lamps, which are commonly used in Tonga and have excellent illumination efficiency. The zoning of light switches should be planned to reduce running costs by sectioning light into small zones utilizing a zigzag connection.
The general receptacle to be used is I type pin (3-pin) or O type pin with a grounded terminal, which is commonly used in Tonga. The position and specification of receptacles will be determined by taking into account the type of power source, capacity, and connection of the equipment used.

Table 2-33 Lighting Plan of Main Rooms

Room	Illuminance[Lx]	Fixture Type
CONSULTING・TREATMENT	200	Fluorescent
EXAMINATION ROOM	200	Fluorescent
OFFICE	200	Fluorescent
CORRIDOR	100	Fluorescent
WC	100	Fluorescent

3) Lightning arrester and grounding device

To protect facilities from lightning, lightning rods and electrical conductors should be provided above the roof.
Provide grounding to electrical equipment, communication equipment, etc. in accordance with their specifications. Also, provide grounding to medical equipment at necessary positions to ensure safety.

4) Telephone system

A Private Branch Exchange (PBX) is currently installed in the former laboratory building for use by Vaiola Hospital and the Ministry of Health (MOH). Caution is necessary when planning temporary work for the project, as a telephone line linking the existing PBX and the hospital/MOH lies in the work area and it must be transferred to the temporary path area.
The line capacity required by this project is about 10 outside lines and about 50 extension lines.
Japan will provide work for outlets, and conduits only.

5) Intercom system

Currently, medical staff in the emergency and outpatient divisions is stationed in the general clinical division 24 hours a day, but the door to the emergency division is closed. Therefore, install a call button on the wall beside the entrance to the emergency division so that the medical staff is immediately notified of the arrival of an emergency patient by ambulance or private car.

6) Fire alarm system

In this project, the fire alarm system will be installed based on Tongan fire prevention laws, regulations, and standards, and complemented by Japanese standards to enable early detection of fires and to prevent the spread of damage.

Evacuation lights and other devices for safe evacuation will be placed at necessary positions in accordance with Japanese standards if not clearly covered by the Tongan fire prevention equipment standards.

7) Piping for LAN

Currently, a LAN system networking Vaiola Hospital, MOH, and other facilities is in place. The server is located in the former laboratory together with PBX. In this project, a new IT office and server room will be installed in the O.P.D., and an in-hospital LAN system will be introduced in the new facilities. Conduits and boxes will be installed from the Electrical Pipe Shaft (EPS) to the necessary positions in each division to build the network. However, the supply of computer network equipment, cables, and modular jacks is the responsibility of Tonga.

8) Public address system

Provide handy amplifiers and microphones to the training facility in the O.P.D. and other meeting rooms to be used for meetings, seminars, and training sessions.

9) TV system

Install a TV antenna on the elevated tank to provide TV programs for the learning and enjoyment of patients and attending families. Outlets will be provided to the waiting areas in the general clinical division, the special clinical division, and the multi-purpose in the O.P.D. and other necessary rooms.

10) Solar photovoltaic system

This grant aid project will set up a solar photovoltaic system. To improve energy efficiency in the entire hospital, a solar photovoltaic system that can sufficiently complement the hospital's electrical supply but does not cause adverse flow. A 30KW capacity – about 20% of the electrical consumption at the hospital – is needed in consideration of the allowable range for Tonga Power Ltd. (TPL). This system will not have a battery because electrical consumption at night is very small. Solar panels will be placed on the northwest part of the O.P.D. roof, which was found to have the highest generation efficiency in the field survey. A meter indicating the generated electricity in real time will be set up at the easily visible front area of the O.P.D. to inform visitors of the importance of energy conservation.

(2) Mechanical building systems

1) Water supply

It will be difficult to secure the necessary water volume for the project facilities because the water pressure of the water main under the road that supplies water to the hospital is very low. Therefore, in this project a water pipe will be laid from the 200 mm water main at the Taufa'ahau Road up to the receiving tank constructed in this project. Tonga will undertake this connection work. Assuming a few days of water outage, the receiving tank size will be about 80 m^3, which is equivalent to two-day consumption at the project facilities. A fiber reinforced plastic (FRP) tank will be used to prevent contamination and development of algae due to sunlight. Water will be distributed by the gravity system from elevated water tanks. The tanks will be placed at a high enough position that can provide enough water pressure even to the shower rooms on the second floor. The water quality test found that the water hardness is high. Therefore, to prevent equipment blockage, a water treatment device and a water softening device will be provided in the equipment plan

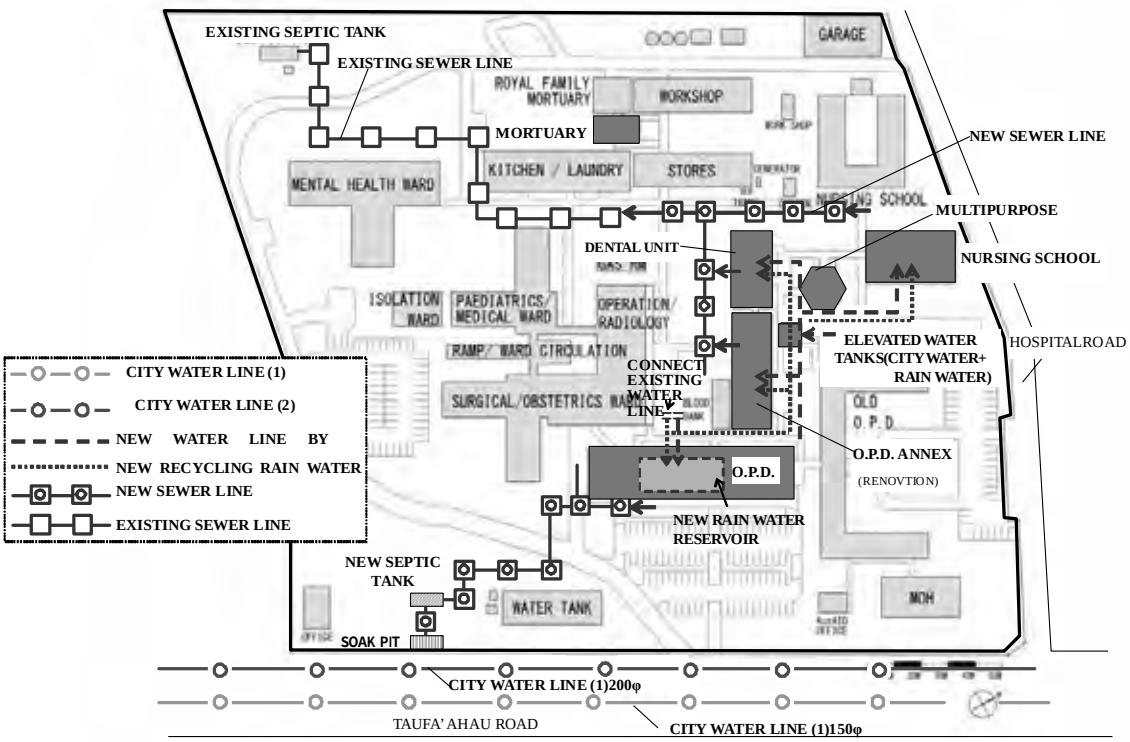


Figure 2-18 Water Supply and Drainage Piping Plan

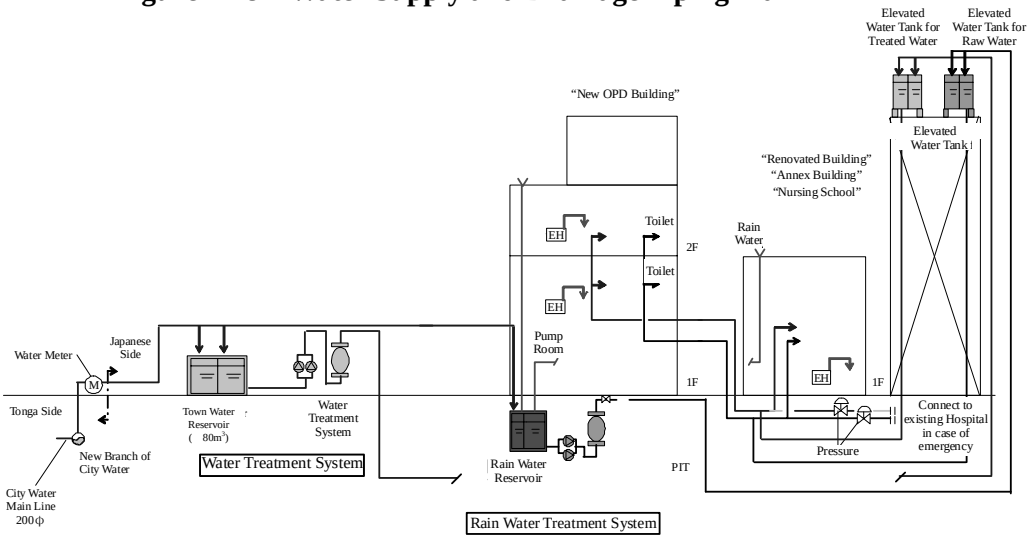


Figure 2-19 Diagram of Water Supply System

In Tonga, water supply is occasionally insufficient, so existing wards are also collecting rainwater in tanks to be used for various purposes.
As the water volume stored in those wards is wholly insufficient to supply to the project facilities, an independent rainwater tank will be built in the foundation area of the O.P.D. Ward. Rainwater will be collected on the roof and then directed via vertical gutters to the tank for various uses including fire water.

2) Drainage system

Out of the facilities planned in this project, the O.P.D. Annex and the nursing school will have wastewater drained into the existing sewerage system of the large-scale water treatment plant. However, wastewater from the O.P.D. is unable to be directed to that system due to insufficient gradient. Therefore, a new treatment facility will be constructed at the southeast part of the hospital premises. Sanitary wastewater and other miscellaneous wastewater from the O.P.D. are treated in the septic tank and then disposed of through the underground permeation device.

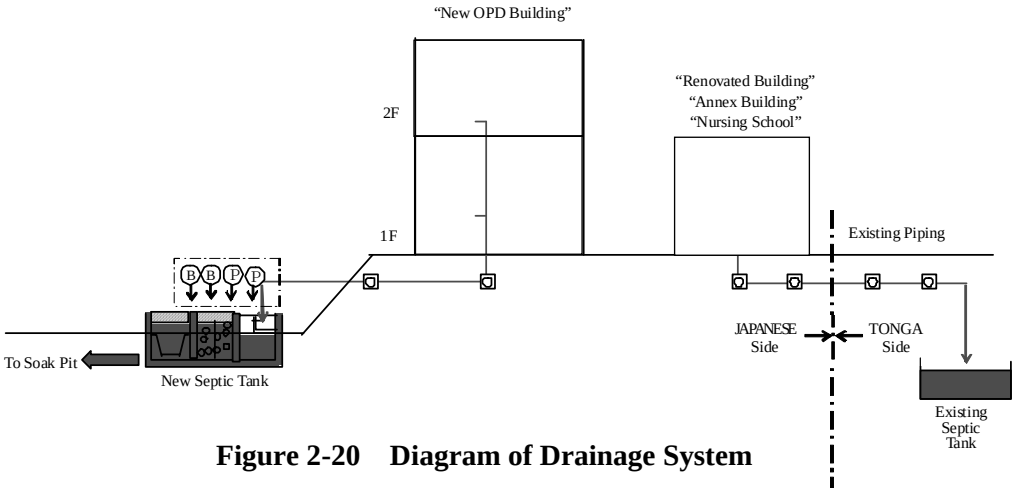


Figure 2-20 Diagram of Drainage System

3) Hot water supply system

Locations needing hot water supply include some parts in the O.P.D., the dental tech. room and sterilization room. Because the required hot water volume is low, units electric water heater will be installed.

4) Sanitary fixtures

The toilet basin will be a western type fitted with a low-tank type water flushing apparatus which is commonly used in Tonga. The urinal will be a floor stall type equipped with a flush valve, which can also be used easily by children. A toilet for the physically disabled will be provided in the general clinic division on the first floor of the O.P.D. The layout, apparatuses, and fixtures in the physically-disabled toilet should be the same specification as that of Japan.

5) Fire extinguishing system

A fire extinguishing system should be designed in accordance with fire prevention standards in Tonga. The details not covered by Tonga's standards should be complemented by New Zealand standards, Australian standards or Japanese standards. In this project, indoor fire hydrants (hose reels), outdoor fire hydrants, and fire extinguishers will be provided as a fire extinguishing system. Fire hydrant pumps and main distribution pipes are installed in the existing hospital and branch pipes will be extended from existing pipes.

6) Medical gas system

The medical gases needed in this project are oxygen and vacuum. In terms of safety, operability, and maintenance, a centralized system should be adopted. However, as the existing plant is available for oxygen and vacuum air, this existing plant and their main pipes are utilized. Therefore, in this project, branch pipes will be extended from the main pipes, and an emergency shut-off valve and an outlet will be provided to each system. The route of the branch pipes should be determined by taking into account the operation status in the hospital.

BS type medical gas outlets should be adopted. The number of oxygen humidifiers and absorption units fitted to outlets should be decided in view of the operating rate of outlets. Provide medical gases to the minimum necessary number of rooms.

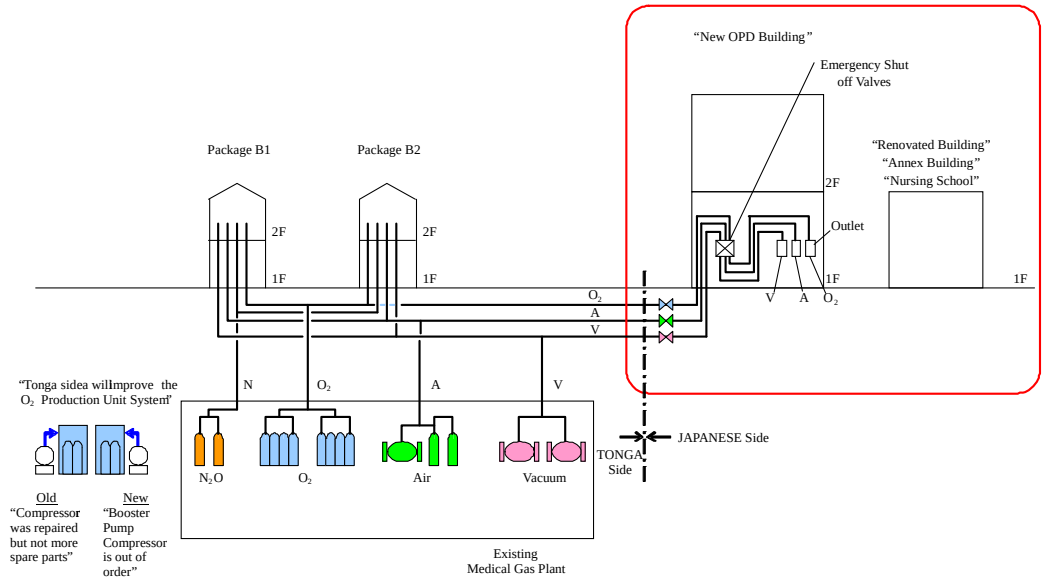


Figure 2-21 Diagram of Medical Gas Supply

7) Air conditioning and ventilation system

In general, a natural ventilation system utilizing windows will be adopted for such rooms as the consulting room, the staff room, and the waiting area. Windows or grilles will be provided at the upper part of the door. A ceiling fan will be installed in each room.

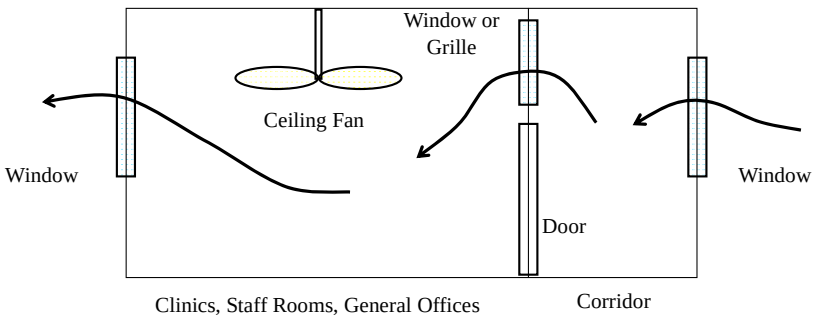


Figure 2-22 Ventilation System for Consulting Room, Staff Room, General Office

An air conditioning system will be provided to each room that needs air conditioning for medical service. In general, filters should be a standard renewable type.

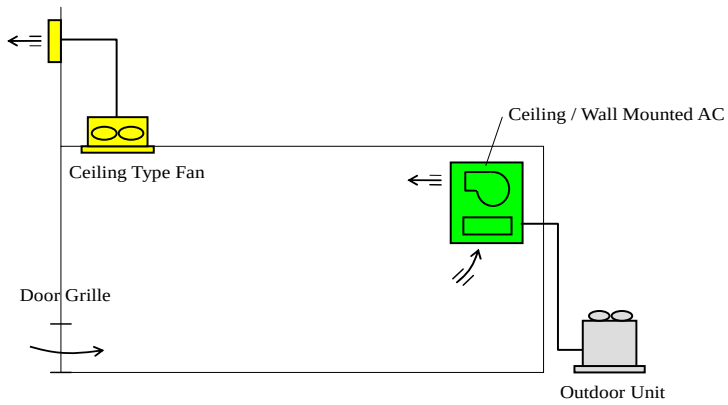


Figure 2-23 Typical Individual Air-Conditioning System

8) General and medical wastes

At Vaiola Hospital, general waste and medical waste are sorted into separate containers marked with different colors. General waste is collected by a private waste disposal company and carried to the waste treatment plant once per day. Medical waste is collected by a medical waste collection truck once per day after being disinfected in the high pressure sterilizer in the hospital and carried to the waste treatment plant. Although medical waste is currently disinfected in the sterilizer, the hospital is constructing another high pressure sterilizer and a building to house it. Both general and medical waste produced from the project facilities will be disposed of in the same manner.

2-2-2-6 Construction Materials Plan

In terms of construction materials, the Tonga side can easily perform maintenance if the construction materials and construction methods are widely used in Tonga, and if they mainly select fixtures and spare parts that are locally procurable as construction materials and construction methods. Principal construction materials and notes on their adoption are shown below.

(1) Exterior finishing materials

1) Roofs

Roofs will be designed to have a slope (approx. 17 degrees) that harmonizes with the roofs of existing buildings. Roofs are constructed of partial concrete slabs for porticos. Stop roofs will be insulated pre-formed box section metal roofing on steel trusses. This makes it possible to restrain temperature increases inside the building and to reduce the load on air conditioning systems.

2) Exterior walls and columns

Exterior walls and columns will be constructed of concrete blocks and concrete, respectively, and mortar finishing will then be applied. This is a typical construction style in Tonga. However, highly durable fluorine resin paints should be used for painting as measures against salt damage, which often occurs in Tonga due to the permeation of misty seawater. Among the planned buildings in the current project, the O.P.D., the O.P.D. Annex, and the nursing school are to be mostly ventilated by natural draft. Therefore, Jalousie windows should be installed in the openings facing the outside, as they have efficient ventilation and are resistant to wind pressure.

3) Walkways and driveways

Construct roof-covered passage located outside using slabs-on-grade, steel columns and beams, and folded roof plates that mesh with the construction in the second stage project. Construct outdoor walkways using highly durable interlocking blocks. Driveways and parking areas should be paved with concrete, as asphalt pavement is not common in Tonga.

Table 2-34 Exterior Finishing Material and Construction Method

Building Element		Existing Material and Local Construction Method	Adopted Construction Method	Rationale for Adoption
Exterior	Roof	Sloped roof (folded plate)	Sloped concrete slab roof with steel pre-formed roof sheets	Maintenance is relatively easy and relatively good performance against leakage.
			Sloped Steel framing (wood wool cement board insulation, with steel pre-formed roof sheets)	Maintenance is relatively easy and relatively good performance against leakage.
	Eternal Wall	Painting	Fluorine resin painting	Maintenance is relatively easy and good anti-salt corrosion performance
	Door and Window	Aluminium doors	Stainless steel doors (main entrance)	Rigid, durable, and good in water resistance.
			Aluminium doors	Good weather resistance performance. Easy to maintain
		Window	Aluminium jalousie window	Good ventilation, wind and rust resistance performance. Easy to clean

(2) Interior finishing materials

1) Floors

Use non-slip tiles for the halls and corridors near the entrance to make it easy to walk on even on rainy days. For rooms entering from these halls or corridors, use the following materials considering the use and the required performance of those rooms.

① Rooms that must be clean, such as the consultation rooms and emergency division: Homogeneous vinyl floor sheets that are easy to clean and remain clean for a long time to prevent in-hospital infection.

② Waiting halls, corridors: These are areas with heavy traffic of people and goods and will be finished with durable tile.

③ Administration officers: Homogeneous vinyl sheet will be selected for easy cleaning.

④ Toilets, showers, sanitary disposal rooms: Use tiles that are easy to clean, remain clean for a long time, and are highly durable.

2) Interior walls

Finish ordinary interior walls with an application of paint over the mortar base. Tiles that are easy to wipe should be used for toilet walls, sanitary disposal rooms, and shower rooms where contaminants may stick.
Apply a stretcher guard or a corner guard, either purpose-built or a handrail-combined types, to the corners of walls and columns in the corridors and rooms that stretchers and carts may bump into.
The X-ray room of the dental division should be constructed of reinforced concrete walls with sufficient radiation protection thickness and a lead-clad radiation protection door.

3) Ceilings

Install a canopy with enough size to cover arriving vehicles and people in the main entrance and the emergency entrance which are directly exposed to outside rains and winds. The canopy should be built of structural steel and covered with metal plates resistant to rust and weathering.
Silica calcium boards which are antibiotic, easy to clean, and remain clean for a long time should be used for the ceilings of the rooms that must be clean, such as the emergency division, and for ceilings in the water-using areas like toilets and showers.
Other rooms such as general rooms, lobbies, and halls need an acoustical absorption ceiling. Provide an integrated system ceiling built by applying rock wool acoustical boards over permanent plaster boards or over less expensive T-bar type lightweight steel frames.

4) Doors and windows

In consideration of weather resistance, adopt aluminum jalousies or sash windows for locations directly exposed to wind and rain. To prevent bumping damage, a stainless bumper plate to the bottom of doors will be provided at frequently-used entrances and in the emergency division likely to sustain stretcher bumping.
Light gauge steel doors will be used in other general interior locations. Steel doors should be used in locations that are important in terms of fire prevention.

Table 2-35 Interior Finishing Material and Construction Method

Building Element		Existing Material and Local Construction Method	Adopted Construction Method	Rationale for Adoption
Interior	Floor	Porcelain tile, Homogeneous vinyl sheet	Porcelain tile	Durable and easy to clean
			Homogeneous vinyl sheet	Easy to clean and maintain in resuscitation, treatment, consulting room which require high level of cleanliness.
	Interior wall	Painting Porcelain tile	Painting（general rooms）	Locally common method and easy to maintain.
			Porcelain tile (WC, Shower, etc)	Locally common method and easy to maintain in rooms which is exposed to water.
	Ceiling	Rockwool acoustic board, Plaster board	Rockwool acoustic board	Locally common method and easy to maintain.
			Calcium silicate board	It excels in antibacterial property and e Easy to clean and maintain in resuscitation, treatment which require high level of cleanliness.
	Fixture	Wooded door	Light steel door	It excels in operability and is easy to maintain in repainting.
			Steel door	It excels in sound proofing property and is adopted for machine room, etc.

(3) Building Systems equipment

The service life of most building systems equipment is usually 7 to 13 years, which is significantly shorter than building construction. Therefore, to enable smooth maintenance including renovation by the Tongan side after handing-over, types of building system equipment that have a history of being used in Tonga and meets a certain level of quality should be procured. In most cases, this will mean a Japanese or third country product.

2-2-2-7 Equipment Plan

A draft list of equipment to be procured in this project is shown in the table below together with their specifications and intended use.

Table 2-36 Equipment List

No.	Name of Equipment	Department										Planned Quantity
		Emergency/ Outpatient	Special Clinic	ENT	Ante-natal	Physiothe-rapy	Outpatient's Pharmacy	Dental Clinic	Dental Laboratory	School of Nursing	Mortuary	
1	Defibrillator	1										1
2	Emergency Cart	1										1
3	Electrocardiograph	2								1		3
4	Patient Monitor	2										2
5	Nebulizer	2								1		3
6	Suction Unit	2		1						1		4
7	Examination Light	4	1		3							8
8	Patient Trolley	2										2
9	Stretcher	1			1					1		3
10	Tabletop Autoclave	1		1	1			3				6
11	Weighing Scale, Adult	1	1		1							3
12	Weighing Scale, Infant	1	1		1					1		4
13	Height Scale	1	1		1							3
14	Mobile Operating Light	1										1
15	Wheel Chair	1								1		2
16	Pulse Oximeter	2	1									3
17	Portable Pulse Oximeter	1										1
18	Infusion Pump	1										1
19	Portable Glucometer	1			1							2
20	IV Stand	7	1		1					1		10
21	Observation Bed	3										3
22	Diagnostic Set	4	2									6
23	Dressing Trolley	6	1	1	2			1		2		13
24	Sphygomomanometer	4	1		1					2		8
25	IVF Warmer	1										1
26	Color Doppler Ultrasound		1									1
27	Treatment Instrument Set	2										2
28	Laryngoscope, Adult	1										1
29	Laryngoscope, Infant	1										1
30	Tracheotomy Instrument Set	1										1
31	Resuscitation Bag, Adult	1										1
32	Resuscitation Bag, Infant	1										1
33	Film Illuminator	4	2	1								7
34	Oxygen Flowmeter	3										3
35	Surgical Scrub Station	2										2
36	Instrument Cabinet	1										1
37	Examination Table	7	3	1	2							13
38	Syringe Pump	1										1
39	ENT Treatment Unit			1								1
40	ENT Instrument Set			1								1
41	Audiometer			1								1
42	Sound Proof Unit			1								1
43	Tracheal Intubation Fiberscope			1								1
44	Nasal Polypectomy Instrument Set			1								1
45	Tonsillectomy Instrument Set			1								1

No.	Name of Equipment	Department										Planned Quantity
		Emergency/ Outpatient	Special Clinic	ENT	Ante-natal	Physiothe-rapy	Outpatient's Pharmacy	Dental Clinic	Dental Laboratory	School of Nursing	Mortuary	
46	Laryngectomy Instrument Set			1								1
47	Cleft Lip Plasty Instrument Set			1								1
48	Mastoidectomy Instrument Set			1								1
49	Fetal Doppler				2							2
50	Fetoscope				7							7
51	Gynecological Examination Table	1			2							3
52	Vaginal Instrument Set				6							6
53	Therapy Bed					1						1
54	Cupboard for Dangerous Drugs						1					1
55	Medical Refrigerator						1					1
56	Water Distiller, Large						1					1
57	Water Distiller, Small							1				1
58	Electronic Balance						1					1
59	Medicine Trolley						2					2
60	Small Instrument Set						1					1
61	Dental Unit							1				1
62	Dental X-ray Unit							1				1
63	Panoramic X-ray Unit							1				1
64	X-ray Film Developer							1				1
65	Ultrasonic Scaler							5				5
66	Amalgamator							5				5
67	Light Curing Unit							3				3
68	Extraction Instrument Set							1				1
69	Dental Instrument Set							3				3
70	Apex Locator							1				1
71	OMFS Surgical Instrument Set							1				1
72	High Speed Micromotor Drill							1				1
73	OMFS Wiring Instrument Set							1				1
74	Osteosynthesis Instrument Set							1				1
75	Exodontias Instrument Set							1				1
76	Surgical Micromotor							1				1
77	Model Trimmer								1			1
78	Resin Curing Unit - Pressure Pot								1			1
79	Vibrator								1			1
80	Laboratory Lathe								1			1
81	Resin Curing Unit								1			1
82	Vacuum Mixer								1			1
83	Pencil Sand Blaster								1			1
84	Thermoplastic Pressure Former								1			1
85	Laboratory Micromotor								2			2
86	Centrifugal Casting Machine								1			1
87	Burnout Furnace								1			1
88	Hydraulic Flask Press								1			1
89	Articulator								2			2
90	Impression Tray								10			10
91	Flasks Set								13			13
92	Dental Bunsen Burner								2			2
93	Electric Wax Knife								1			1
94	Dust Collector								1			1
95	Dental Laboratory Instruments								1			1
96	Anatomical Human Body, Male									1		1
97	Anatomical Human Body, Female									1		1
98	Human Skelton									1		1

No.	Name of Equipment	Department										Planned Quantity
		Emergency/ Outpatient	Special Clinic	ENT	Ante-natal	Physiothe-rapy	Outpatient's Pharmacy	Dental Clinic	Dental Laboratory	School of Nursing	Mortuary	
99	Circulatory System Model									1		1
100	Respiratory Organ Model									1		1
101	Nasal/Throat/Pharynx Model									1		1
102	Pregnant Uterus Model									1		1
103	Phantom for Delivery									1		1
104	Injection Simulator									2		2
105	Nursing Care Mannequin for Patient Care									1		1
106	Clinical Procedure Training Mannequin									1		1
107	Resuscitation Simulator									1		1
108	Child Care Simulator									1		1
109	Pediatric Care Simulator									1		1
110	Newborn Advance Care Simulator									1		1
111	Torso Model									1		1
112	Heart Disease 3D Display Model									1		1
113	Death of an Artery Model									1		1
114	Nasogastric Tube Feeding Model									1		1
115	Heart Model									1		1
116	Functional Larynx Model									1		1
117	Brain Model									1		1
118	Kidney Model									1		1
119	Skin Section Model									1		1
120	Median Section of the Head Model									1		1
121	Functional Heart System Model									1		1
122	Functional Eye									1		1
123	Food Pyramid Kit									1		1
124	Diabetes Teaching Kit									1		1
125	Chart for Education									1		1
126	Neonatal Cot									1		1
127	Nursing Utensils Set									1		1
128	Binocular Microscope									1		1
129	Walking Aids									1		1
130	Bed									2		2
131	Examination Instrument Set									1		1
132	Oxygen Set									1		1
133	Commode Chair									1		1
134	TV System									1		1
135	Cabinet									1		1
136	Mortuary Refrigerator										2	2

Table 2-37 Specification of Major Equipment

No.	Name of Equipment	Plan. Q'ty	Specification	Purpose of Use
1	Defibrillator	1	Output energy: 2 to 360J or wider range for monophasic or, 2 to 270J or wider range for biphasic Heart range: 15 to 300bpm or wider range Monitor: LCD	To resuscitate patients in Ventricular fibrillation caused by external wounds.
4	Patient Monitor	2	Measurement parameters: ECG, resp, NIBP, temp., SpO2 Display: 8.4 inch or bigger Mobile cart: provided	To monitor a living body in serious case.
26	Color Doppler Ultrasound	1	Scanning method: electronic linear, electronic convex Image display modes: B, B/B, M, B/M, Doppler Probes: convex, transvaginal, linear and sector probe Printer: provided	To detect blood flow of Heart Disease and unusual blood flow.
35	Surgical Scrub Station	2	Type: single person use Accessories: mirror, soap container, brush container	To wash hands of doctors and nurses before treatment.
39	ENT Treatment Unit	1	Component: treatment unit, chair for patient, chair for doctor and head light with light source Number of sprays: 4 Vacuum: 700mmHg approx.	To examine and treat patients of ENT.
40	ENT Instrument Set	1	Composition: 83 items Material: mainly stainless steel	To examine and treat patients of ENT
42	Sound Proof Unit	1	Inner dimensions: 800(W) x 800(D) x 1800(H)mm or more Soundproof performance: 250Hz, 35dB or better Others: observation window and ventilation with sound-proof function	To use hearing test.
43	Tracheal Intubation Fiberscope	1	Composition: tracheal intubation fiberscope, light source, mobile cart Depth of field: 4 to 50mm or wider Working length: 550mm or more Light source: halogen bulb 150W or more	To examine a foreign substance in ENT.
44	Nasal Polypectomy Instrument Set	1	Composition: 68 items Material: mainly stainless steel	To remove polyps of nose.
46	Laryngectomy Instrument Set	1	Composition: 26 items Material: mainly stainless steel	To use for operation of throat and laryngeal diseases.
48	Mastoidectomy Instrument Set	1	Composition: bone drill, suction unit, forceps	To use for operation of mastoid process.
53	Therapy Bed	1	Type: manual/hydraulic Bed division: 3 sections or more Dimensions: 1900 (L) x 650 (W) or more Height: 500 to 900mm or wider	For treatment of physiotherapy
61	Dental Unit	1	Composition: dental chair 11 units, operating stool 11 units, central vacuum system 1 set, central compressor system 1 set, piping for compressed air and vacuum system 1 set Accessories for dental unit: hand piece, syringe, X-ray film viewer	For dental treatment

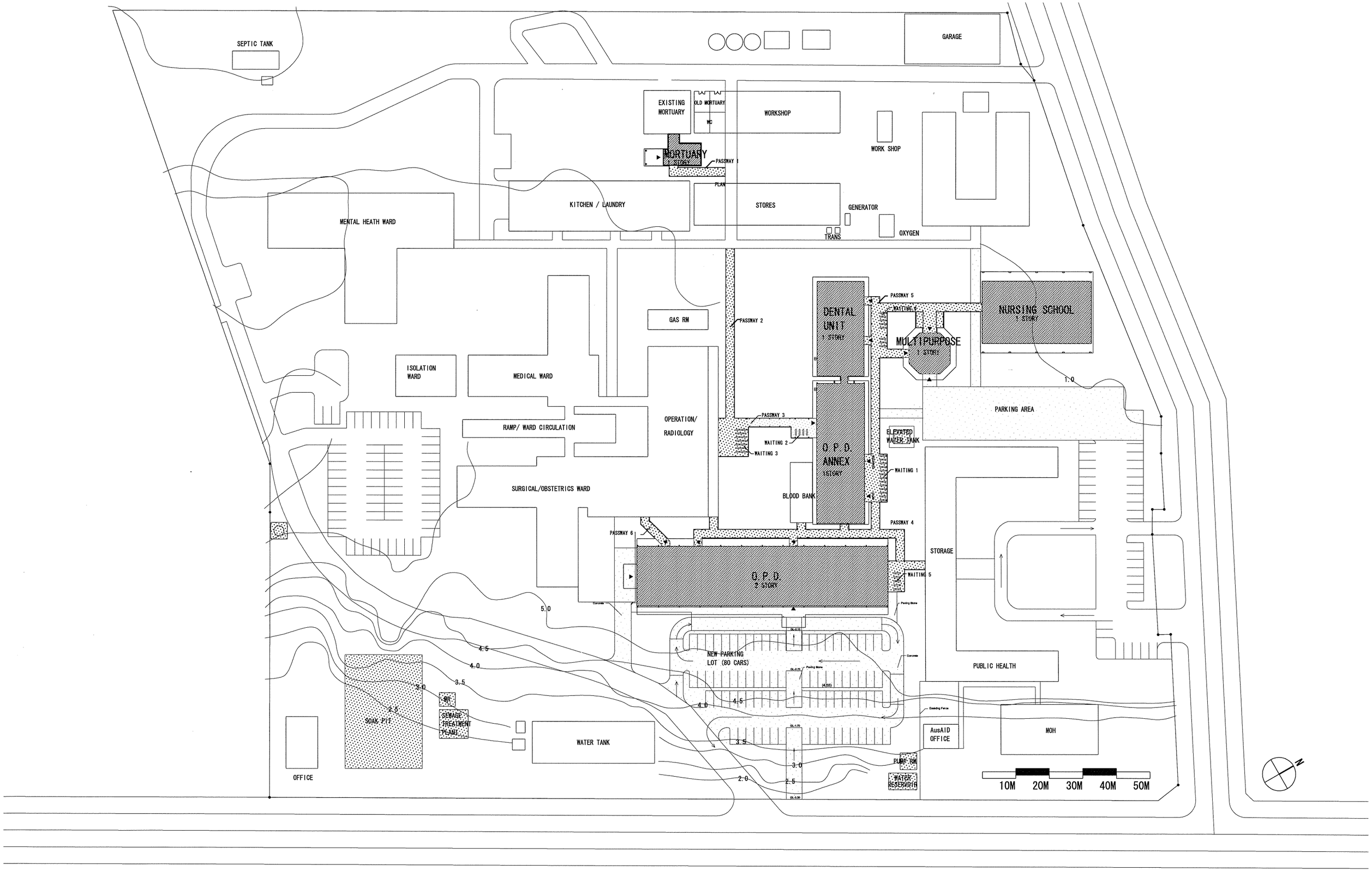
No.	Name of Equipment	Plan. Q'ty	Specification	Purpose of Use
63	Panoramic X-ray Unit	1	Type: conventional panoramic x-ray with cephalograph x-ray function Nominal tube voltage: 60 to 80kV approx. Exposure time: panorama 16 sec. or less	To X-ray teeth and maxillofacial part.
68	Extraction Instrument Set	1	Composition: 10 items Material: mainly stainless steel	For tooth extraction.
69	Dental Instrument Set	3	Composition: 24 items Material: mainly stainless steel	For dental treatment
72	High Speed Micromotor Drill	1	Composition: 14 items Material: mainly stainless steel	For operations of maxillofacial part.
74	Osteosynthesis Instrument Set	1	Composition: 12 items Material: mainly stainless steel	For operations of maxillofacial part.
94	Dust Collector	1	Box capacity: 9 liters approx. Air volume: 8 m^3/min Output power: 0.75 kW or less Collection box: drawer type	To grind molds of teeth and false teeth, etc.
136	Mortuary Refrigerator	2	Capacity: for 2 bodies Cadaver trays: rolling in/out possible Illumination inside: provided	To keep deceased bodies.

The equipment listed above includes the minimum necessary consumables used for test operations and operability confirmation after installation and for maintenance training before handing-over. Hence, other consumables necessary for use after handing-over, including gels and data sheets for the ultrasound, X-ray films for the x-ray equipment, and data sheets for the electrocardiograph, are not included in this project.

2-2-3 Basic Design Drawings

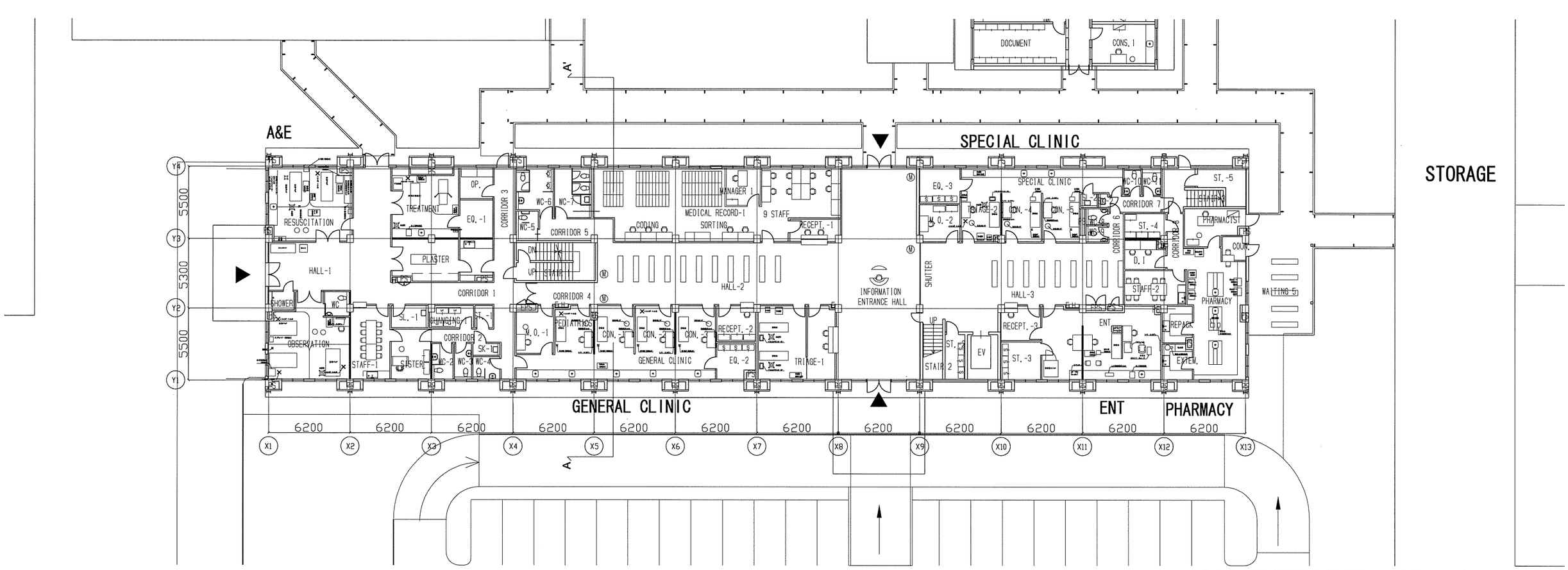
Table 2-38 List of Drawings

	Drawing	Scale	Page
1	Site Plan	1/1000	77
2	O.P.D: 1st Floor Plan/2nd floor Plan	1/300	79
3	O.P.D: Pit Plan/Roof Plan	1/300	81
4	O.P.D/O.P.D ANNEX: Elevation/Section	1/300	83
5	O.P.D ANNEX/Nursing School/Multipurpose: Plan	1/300	85
6	O.P.D ANNEX/Nursing School/Multipurpose/Mortuary: Elevation/Section/Plan	1/300	87
7	Covered Passage/Waiting/Pump Room/Machine Room/ Elevated Water Tank: Plan/Elevation/Section	1/300	89

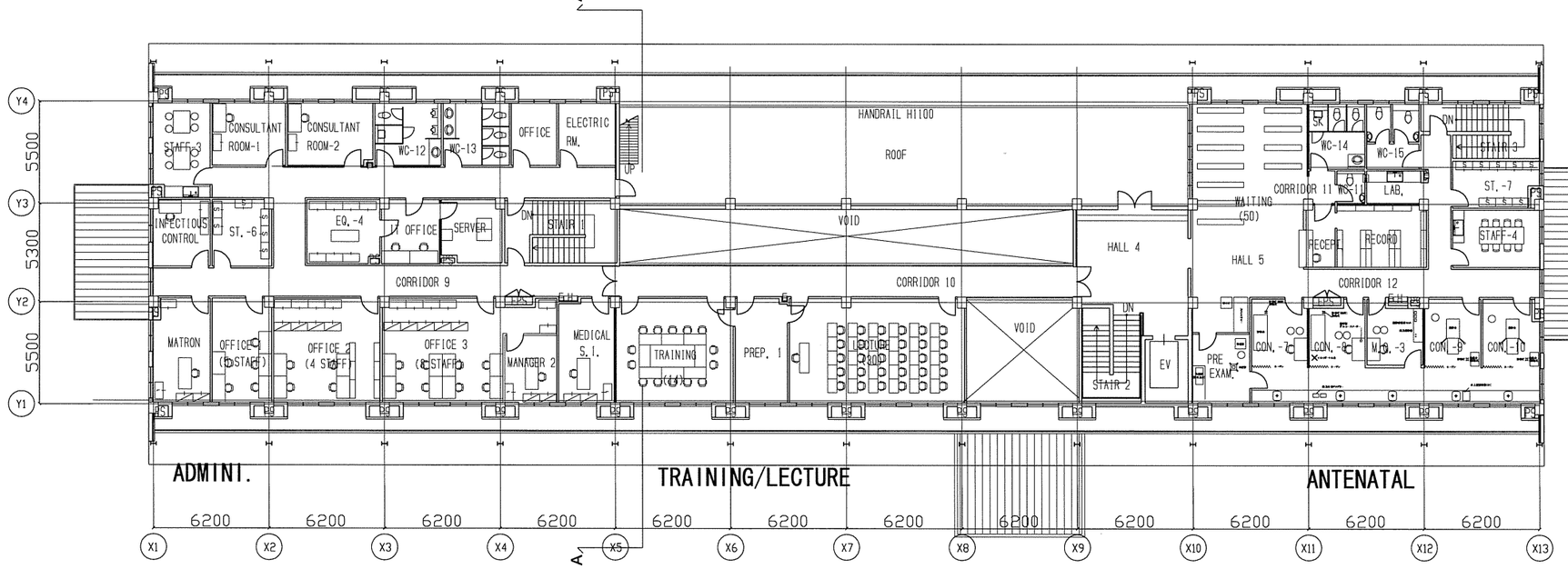


PROJECT BUILDING AND AREA | BUILDING | PASSWAY, WAITING & MECHANICAL PLANT | EXTERIOR WORK

SITE PLAN SCALE 1/1000



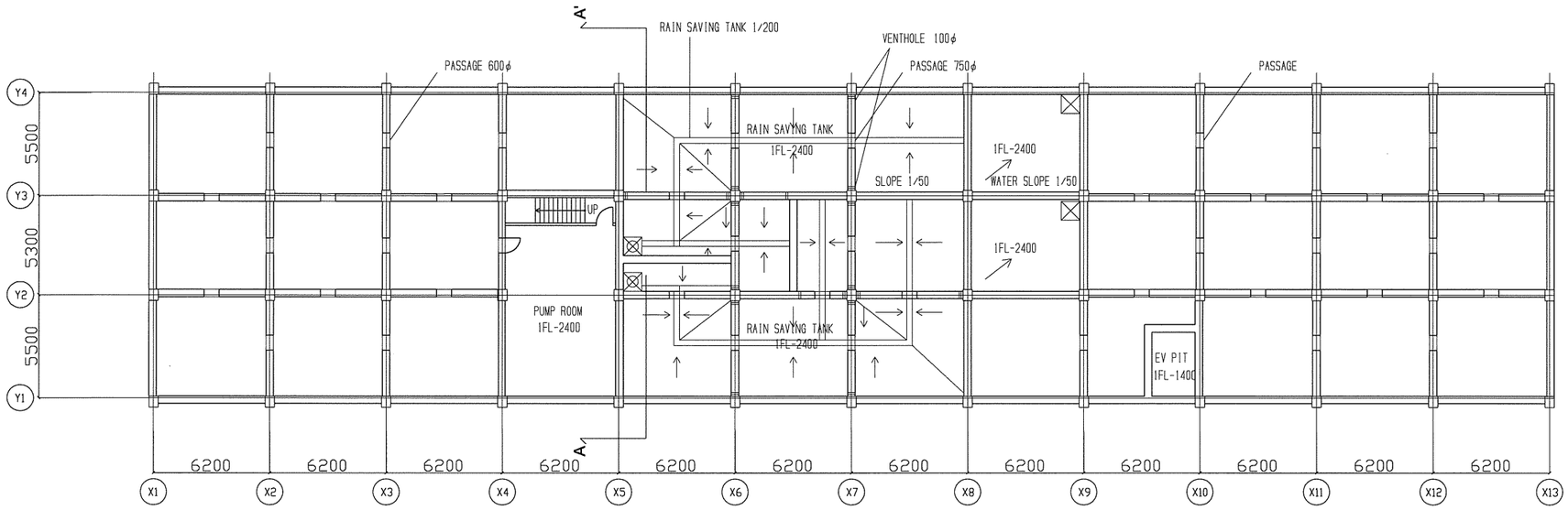
O.P.D. FIRST FLOOR PLAN SCALE 1/300



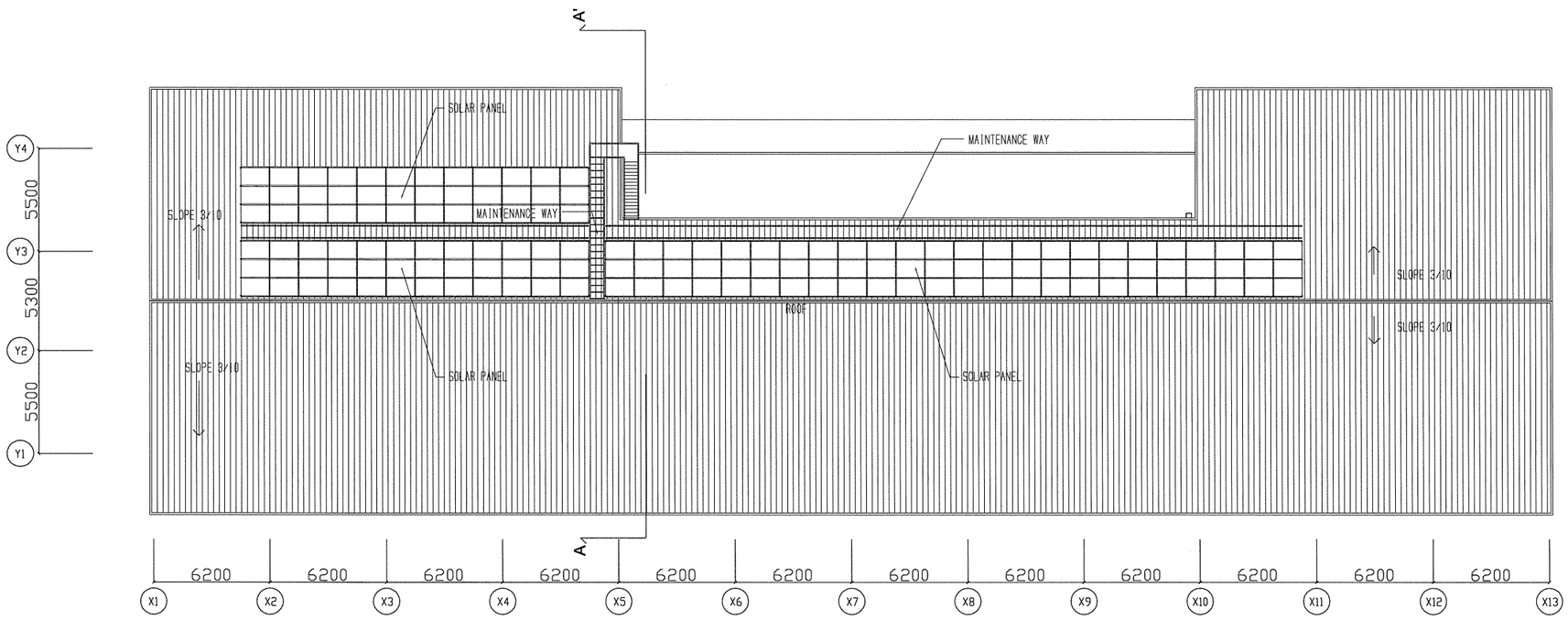
O.P.D. SECOND FLOOR PLAN SCALE 1/300

ABBREVIATION

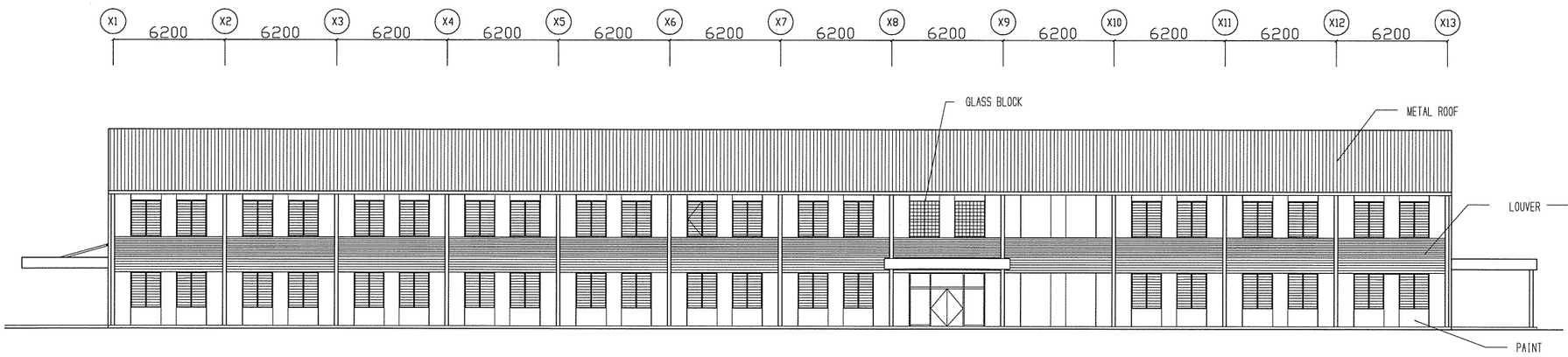
RECEPT.	:RECEPTION	STERILI.	:STERILIZATION	EQ.	:EQUIPMENT STORAGE	D. I.	:DRUG INFORMATION
ST.	:STORAGE	M. O.	:MEDICAL OFFICER	PREP.	:PREPARATION	WC	:TOILET
CON.	:CONSULTATION	RECEPT.	:RECEPTION	NS	:NURSE STATION	EXTEM	:EXTEMPORANEOUS PREPARATION ROOM
SL.	: SLUICE	COUN.	:COUNSELING	M. R.	:MACHINE ROOM		



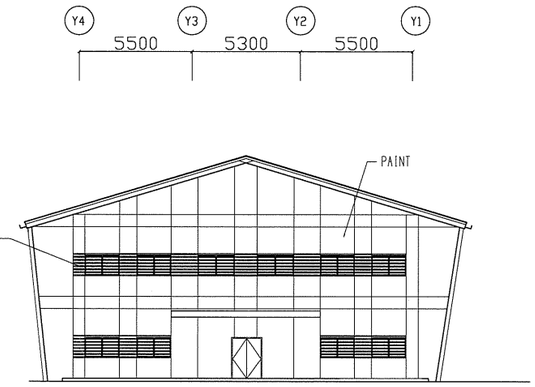
O.P.D. BASEMENT FLOOR PLAN SCALE 1/300



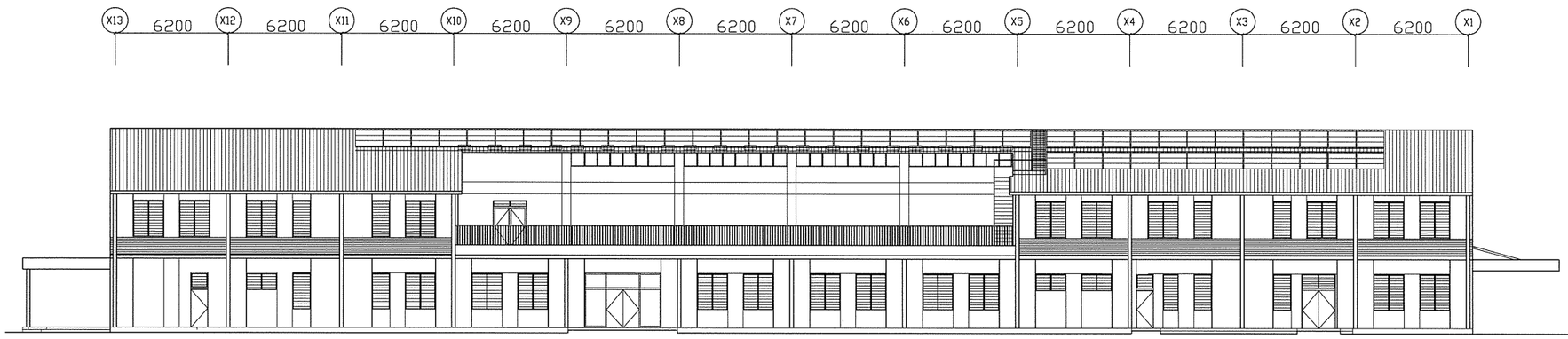
O.P.D. ROOF PLAN SCALE 1/300



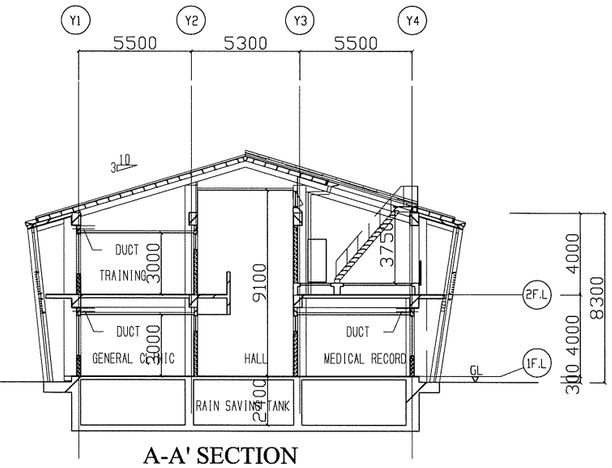
SOUTH-EAST ELEVATION



SOUTH-WEST ELEVATION

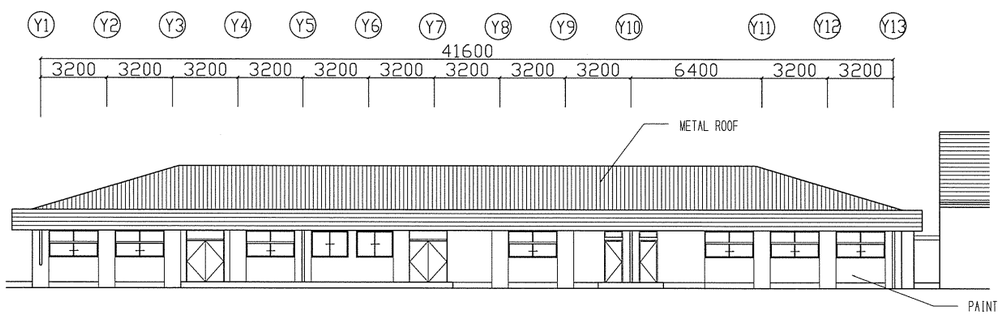


NORTH-WEST ELEVATION

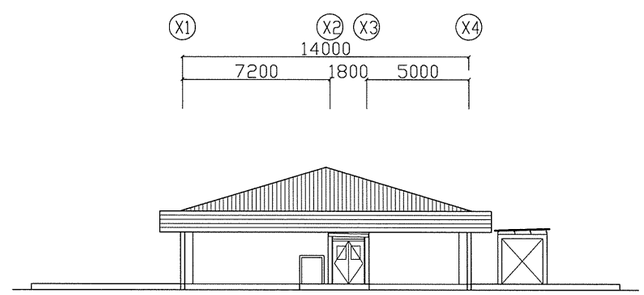


A-A' SECTION

O.P.D. SCALE 1/300

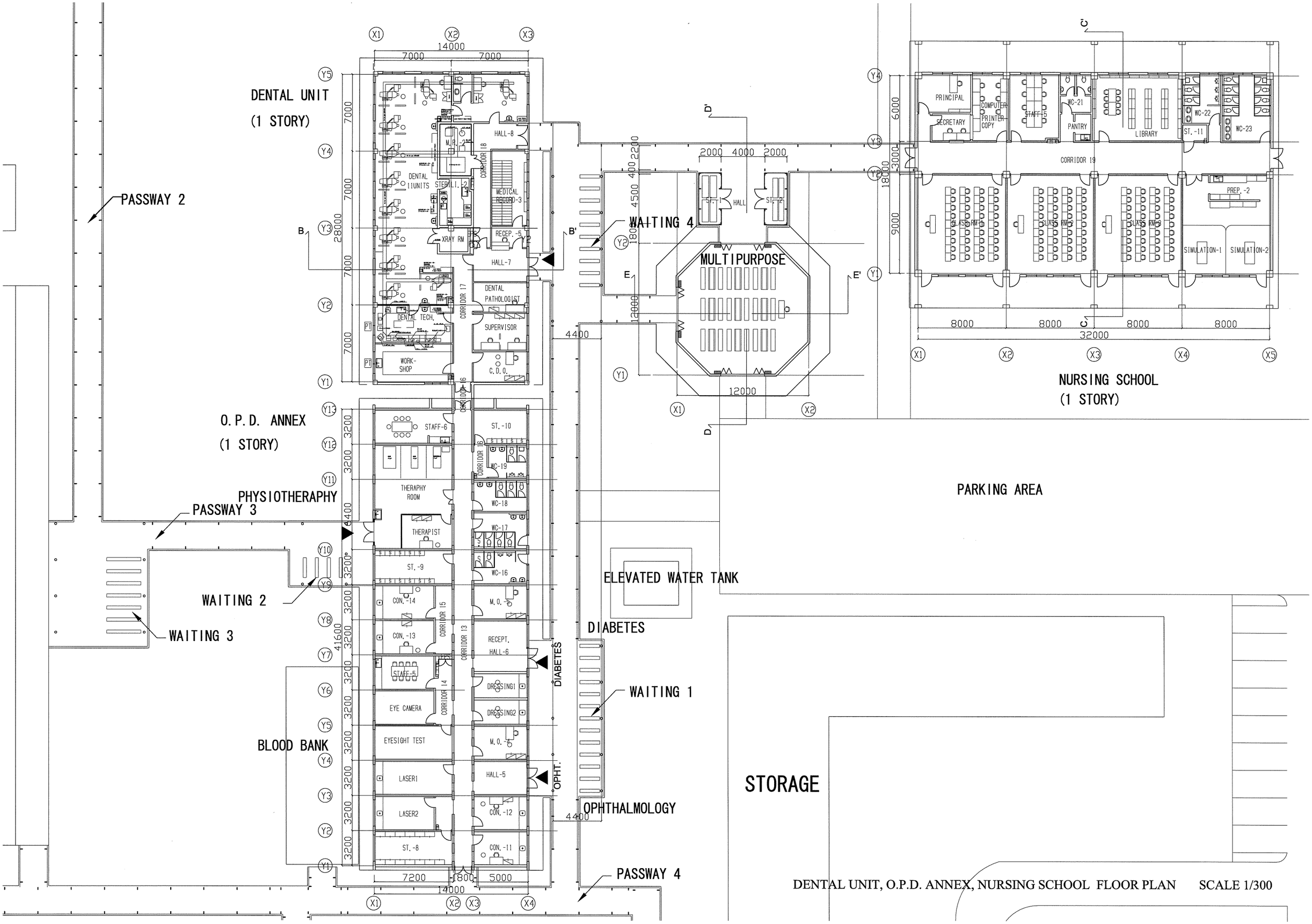


NORTH-EAST ELEVATION

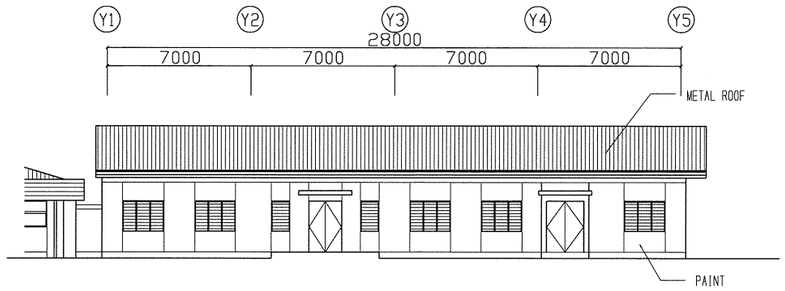


NORTH-WEST ELEVATION

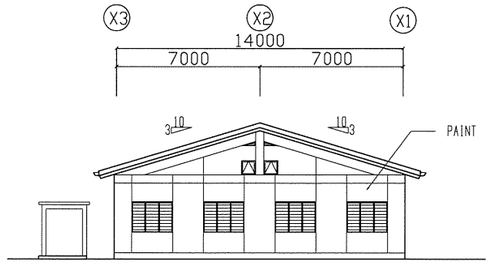
O.P.D. ANNEX SCALE 1/300



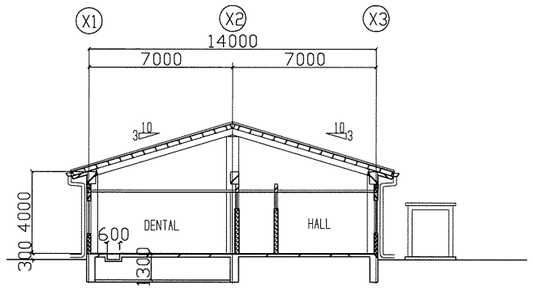
DENTAL UNIT, O.P.D. ANNEX, NURSING SCHOOL FLOOR PLAN SCALE 1/300



NORTH-EAST ELEVATION

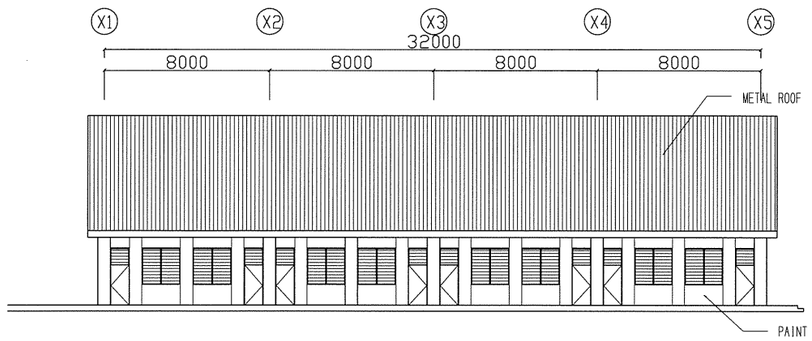


NORTH-WEST ELEVATION



B-B' SECTION

DENTAL UNIT SCALE 1/300



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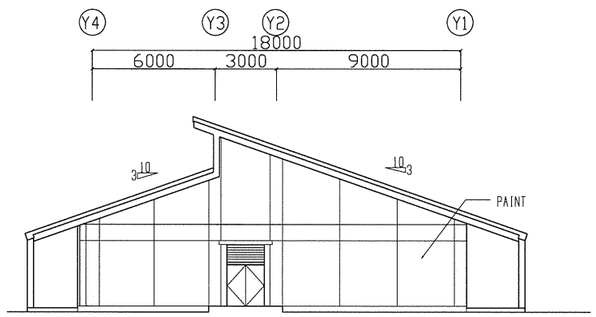
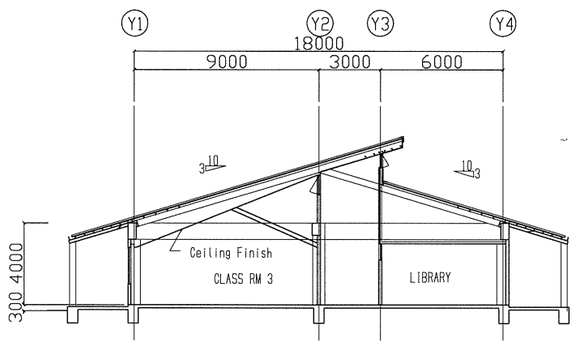
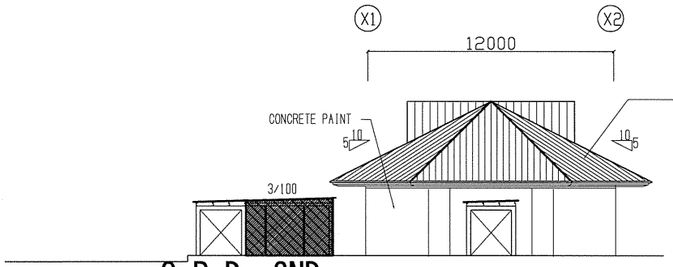


SOUTH-WEST ELEVATION

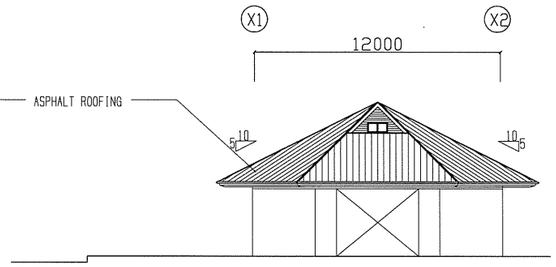


C-C' SECTION

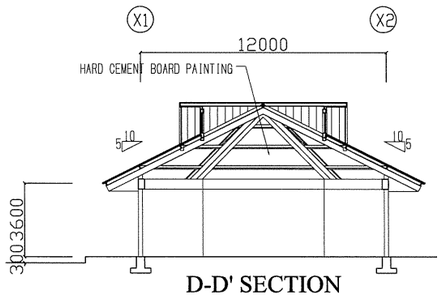
NURSING SCHOOL SCALE 1/300



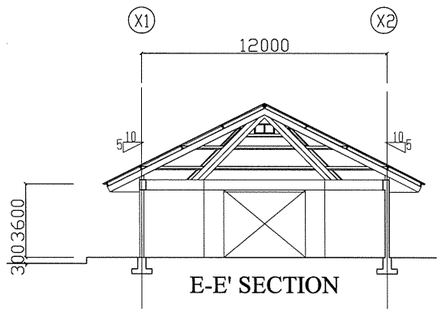
O. P. D. 2ND SOUTH-WEST ELEVATION



SOUTH-EAST ELEVATION

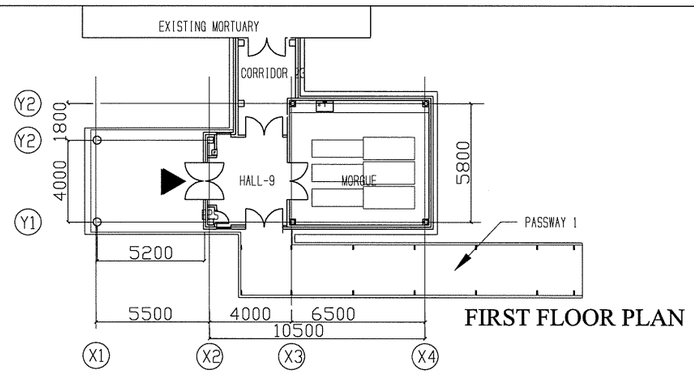


D-D' SECTION

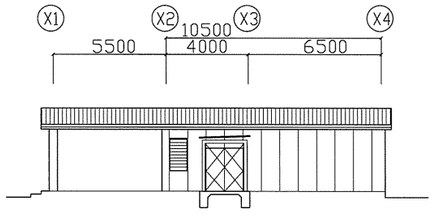


E-E' SECTION

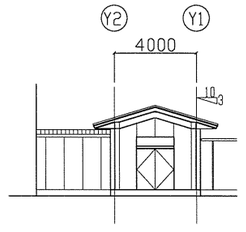
MULTI-PURPOSE SCALE 1/300



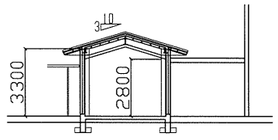
FIRST FLOOR PLAN



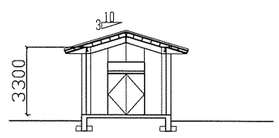
SOUTH-EAST ELEVATION



SOUTH-WEST ELEVATION

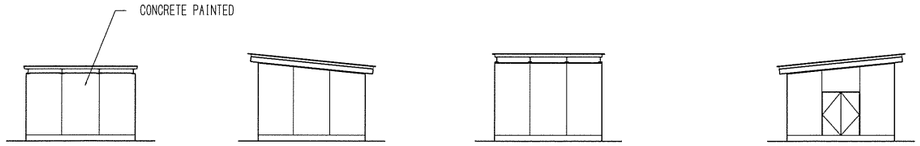


SECTION 1

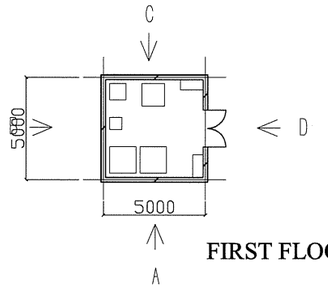


SECTION 2

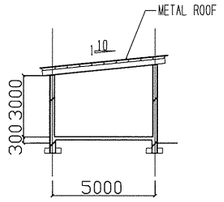
NEW MORTUARY SCALE 1/300



ELEVATION A ELEVATION A ELEVATION C ELEVATION D

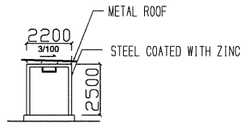


FIRST FLOOR PLAN

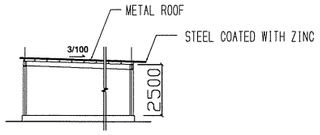


SECTION

PUMP RM (CITY WATER) SCALE 1/300

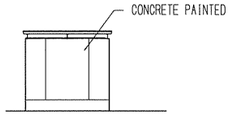


PASSWAY 1~5

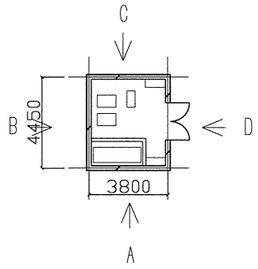


WAITING 1~3

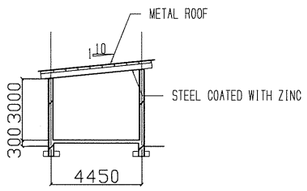
PASSWAY 1~6, WAITING 1~4 SCALE 1/300



ELEVATION A ELEVATION B ELEVATION C ELEVATION D

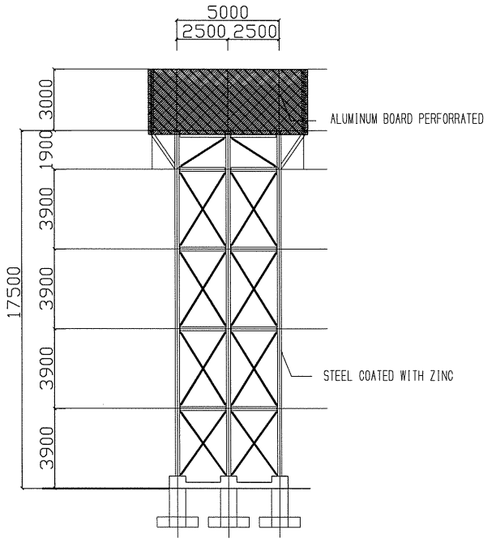


FIRST FLOOR PLAN

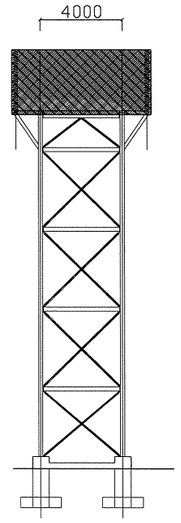


SECTION

MR(SEWAGE WATER PUMP ROOM) SCALE 1/300



ELEVATION 1



ELEVATION 2

ELEVATED WATER TANK SCALE 1/300

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Project Implementation System

This project will be implemented in accordance with the grant aid system of the Government of Japan after obtaining the approval of the Japanese Cabinet and after concluding the Exchange of Notes (E/N) and the signing of the grant agreement (G/A) on this project with the Government of Tonga.

The responsible agency and the implementation agency of this project on the Tongan side is the Ministry of Health (MOH) and the contracting person is the Director of Health. MOH executes the conclusion of a consultant contract and a construction/equipment contract and implements the Tongan works related to this project.

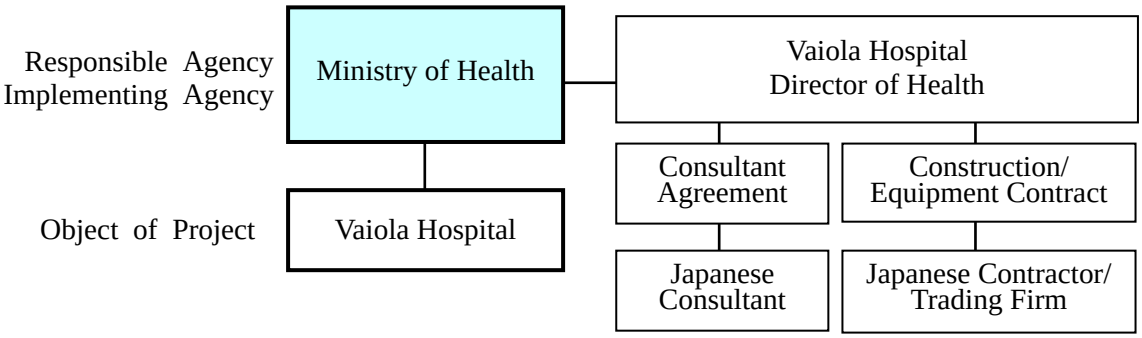


Figure 2-24 Relation among Project Executing Organization

Establishment of a committee for project promotion

The Project Steering Committee was established by MOH and Vaiola Hospital primarily for the smooth implementation of this project. The responsible administrator is the Director of Health and the committee is comprised of the officials from the Hospital and MOH.

(2) Tax Exemption

Tax exemption will be applied to this Japanese grant aid project in Tonga in accordance with the E/N to be concluded between the two countries.

Based on the designations in the E/N, the following will be the responsibilities of the Tonga.

1) Expeditions import procedures for facility and equipment related supplies from Japan or other third countries.
2) Exemption of customs duties, domestic taxes, and other fiscal levies imposed on Japan with respect to the construction materials and equipment used for the project.

Following the conclusion of a construction contract with Tonga, the contractor and the equipment provider involved in the work will promptly prepare a master list of import items and apply for tax exemption through MOH.

Taxes such as a value-added tax (VAT) levied on the items procured in Tonga in relation to the current work are not exempt in principle.

The responsible department for tax exemption in Tonga is the Revenue Service Department.

(3) Consultant

After the conclusion of the G/A, MOH will conclude a consultant contract on the detailed design and construction management with a Japanese consultant company. The consultant contract documents will come into force after obtaining authorization from JICA. To implement this project smoothly, it is important to promptly conclude a consultant contract following the conclusion of the G/A. The contracting consultant is required to prepare bid documents (detailed design drawings, specifications, etc.) based on this basic design survey report in consultation with MOH and obtain approval for the content thereof from Tonga in accordance with the aforementioned approval procedures. The bid work and construction management work will be executed in accordance with the content of the bid documents.

(4) Order of construction work/equipment procurement work

The work of this Japanese assistance shall consist of construction work to build facilities and procurement work to procure, install, and test medical equipment. The contractors are restricted to Japanese companies meeting certain qualification requirements. Successful contractors are selected by the open bid system with a restriction on bidder qualification.

MOH will conclude a construction contract and an equipment procurement contract with each successful contractor selected by the bid process and receive authorization of those contracts from the Japanese government. After authorization, those contractors will commence their work and execute it in accordance with the contract.

(5) Utilization of local consultants

With regard to construction management, engineers with experience in large-scale construction works are virtually not found in Tonga. Hence, it is required to utilize construction engineers from outside of Tonga other than Japanese resident representatives. Facilities engineers should be mobilized as well, as the hospital is a medical facility containing a higher ratio of mechanical and electrical works than with other general purpose buildings and for which cleanliness is required.

(6) Utilization of local construction engineers and dispatch of specialized Japanese engineers

The construction market in Tonga is small and large-scale construction companies do not exist. However, about ten small-scale construction companies with roughly five to six employees are available, including the overseas subsidiary of New Zealand’s Fletcher Construction Company. This Fletcher subsidiary has experience in Japanese ODA works. Chinese companies are also working in the private sector construction in addition to grant aid projects from China. Due to the lack of human resources, securing of motivated personnel is not easy. As such, other aid projects also utilize engineers from overseas.

The current project will be undertaken by a Japanese construction company. In the first stage project also undertaken by Japan, local engineers were hired under the oversight of Japanese engineers and Japanese engineers covered only the parts of the work not fully finished by the local engineers. This is important in order to check the work carefully in terms of the schedule, quality, and safety and to convey skills to local engineers.

For aspects in need of relatively high quality control, such as installation, trial testing, and adjustment of medical equipment, the introduction of construction management and technical guidance by Japanese specialty engineers with sufficient experience is indispensable. One example of this is the dispatch of New Zealand engineers for elevator work.

2-2-4-2 Implementation Conditions

(1) Temporary work plan not disruptive to hospital medical services

The planned construction site of this project will divide the existing O.P.D. Ward from the main examination/medical ward. Therefore, the temporary work plan should ensure the continuous operations of the Hospital as well as utmost safety by separating the circulation of patients, medical staff, and materials from work areas using temporary fences. A separate gate shall be provided to each work area and a guard assigned construction use. A dedicated gate and temporary driveway shall be set up to allow access of construction vehicles to each work area. Additionally, the setup of temporary buildings, including a consultant's office, a construction company's office, a material storage, shall be planned in accordance with the guidelines.
A leased generator shall be installed at the site for temporary offices because an electrical outage can occur several times a month. Municipal water is primarily used for construction. However, a rainwater tank shall be installed in preparation for the abrupt shortage in water supply, because water outages and drops in water pressure can occur occasionally. The wastewater from the work site will be drained to the temporary septic tank for purification, and then permeated into the ground through the soak pit. Necessary measures to reduce vibration and noise during ground work and building work will be enforced in cooperation with constructors.

(2) Improvement of technical ability of local workers

In Tongatapu Island, there are relatively many small to medium sized reinforced concrete buildings and steel frame buildings. Small-scale buildings are regularly under construction. Some of those buildings contracted by Chinese companies use mainly Chinese workers, but other buildings are being constructed by local workers. Buildings constructed by modern construction techniques are occasionally found, but most buildings are not very complex. The local construction industry does not have experience in medical facilities like this hospital that require high precision and high quality. This project includes relatively difficult work, such as the installation of solar panels on the metal roof, built-up asphalt waterproofing on the roof, special waterproofing for the underground water tank, and X-ray shielding. Therefore, it is necessary to send skilled technicians from Japan or other third party countries to advance the work while providing guidance to local workers.

(3) Procurement of construction materials

Many general construction materials, such as ready mixed concrete, crushed stones, gravel, metal roofing materials, sashes, doors, and windows, can be procured in Nuku'alofa City. However, other materials such as metal, waterproofing materials, and X ray-related materials should be procured from Japan or other third party countries. Because the materials for building equipment are mostly unobtainable in the local market, they need to be imported from Australia, Southeast Asian countries, or Japan. Therefore, careful planning of the procurement and delivery plans are necessary so that work progress and the construction period are not affected. There are two ready-mixed concrete plants in Tongatapu Island, one of which has testing equipment to check the concrete quality and also maintains data thereon; this plant would have no problem in terms of capability.

(4) Special construction techniques

In the design of this project, we strive to adopt construction techniques familiar to the local construction industry to the extent possible. However, techniques not familiar to the local industry will also be adopted in order to secure the quality and performance, including a water cut-off for placing a solar panel platform over the metal roof, waterproofing to create a durable underground pit, and the application of fluorine resin painting to mitigate carbonated deterioration of the building structure. Because periodic maintenance of roof seals and wall paintings are essential, it is important to provide necessary know-how to the maintenance staff of the hospital during the construction work. The constructors and the Resident Representative should provide necessary guidance.

(5) Procurement of equipment

The equipment procured in this project is not very complex, but some of it must be coordinated with the construction work in order to be installed. This includes the laying of a pipe between the dental units in the dental clinic and the centralized mechanical room for suction, compressed air, and dental dust collection; construction of an under floor wiring pit; and radiation shielding in the X-ray room in the dental clinic. The Consultant will provide necessary instructions and coordination among the constructors with regard to these processes.

The transfer of existing equipment is included in this project. Consult and coordinate the schedule and method of transfer with the hospital side over the schedule and method of transfer so that the transfer is smooth.

2-2-4-3 Scope of Works

The demarcation of the works between the Japan and Tonga sides is clearly defined in order to execute this cooperative project smoothly. Details thereof are shown below.

Table 2-39 Construction and Installation Responsibility Chart

To be covered by Japanese Side	To be covered by Tonga Side
	To secure and prepare land
	To get building permission
	To clear, level and reclaim the site when needed 1) Dismantle unnecessary structures and existing buildings within the site. 2) Dismantle and Relocate existing electrical power cable crossing the site 3) Dismantle and relocate existing telephone line crossing the site 4) Dismantle and relocate existing IT line crossing the site and servers 5) Dismantle and relocate existing water pipes crossing the site 6) Dismantle and relocate existing sewage catch basins and sewage pipes crossing the site
Exterior work within the site 1) Internal road, pavement for walk, Parking lot 2) Outdoor light, drainage of rain water	Exterior work 1) Road outside of the site 2) Gardening and trees 3) Gate and fence around the site
To construct buildings 1) Architectural Work Including fixed furniture, curtain for medical use 2) Electrical Work Power Supply, Lighting and Receptacle, Piping for Telephone, Piping for LAN, Public Address, Intercom, Fire Alarm System, Lighting Protection, Grounding 3) Mechanical Work Water Supply, Drainage, Hot Water Supply, Sanitary Fixture, Fire Fighting, Air Conditioning and ventilation, Rain Water Utilization 4) Other Work Piping for Medical Gas, Sewage Treatment System, Solar Panel System	
To provide facilities for the distribution of electrical power, water supply, drainage and others 1) Electrical a. Manhole, piping and cabling for electrical power incoming line within the site b. Substation including switchgear and main distribution board 2) Water Supply a. Water supply system within the site b. Rain water collection and supply system 3) Drainage a. Drainage system within the site b. Connecting drainage of O.P.D. Annex, Dental unit and Nursing School with existing drainage system	To provide facilities for the distribution of electrical power, water supply, drainage and others 1) Electrical a. Dismantle existing 300kVA transformer 2) Water Supply a. City water distribution main to the site 3) Drainage a. To accept drainage of O.P.D. Annex, Dental unit and Nursing School

To be covered by Japanese Side	To be covered by Tonga Side
4) Telephone system a. Telephone piping and outlets b. Manhole and piping for telephone incoming line in the site	4) Telephone system a. Telephone incoming line to the main distribution frame(MDF) in project facility and MDF, PBX, cabling and telephones
5) Other system	5) Other system a. TV set
6) Furniture and Equipment a. Curtain rail b. Pronect furniture c. Procurement and installation of medical equipment	6) Furniture and Equipment a. Curtain, Blind b. General furniture c. Removal and installation of existing equipment

The management of schedule associated with equipment installation and the building, electrical, and mechanical constructions are important in advancing the work smoothly. The related parties should adjust the schedule with a full understanding of the installation conditions and the intended use of the medical equipment to be installed.

2-2-4-4 Consultant Supervision

The Japanese consultant company (Consultant) will conclude a consultant contract with the Ministry of Health (MOH) and execute detailed design work (preparation of bid documents, etc.), bidding work, and construction management work for this assistance project.

The purpose of construction management is to ensure the proper execution of the contents of the construction contract, including checking the conformity of construction work to the design documents. The Consultant will strive to secure quality and manage the schedule while providing guidance, advice, and coordination during the construction period. This construction management consists of the following.

(1) Assistance with the bidding and contract processes

The work includes the preparation of bid documents, notice of bid solicitation, acceptance of an intention to bid, screening of qualifications, a briefing on the bid, distribution of bid documents, acceptance of bid documents, and evaluation of bids, all of which are necessary to determine the successful contractors who will undertake construction and equipment works. Also, advice and assistance regarding the conclusion of a construction contract between each successful bidder and the Ministry of Health (MOH) will be provided.

(2) Provision of guidance, advice, and coordination to the Contractor

The construction schedule, the construction plan, the construction equipment procurement plan, the equipment procurement and installation plan, shall be reviewed and necessary guidance, advice and coordination shall be provided to the Contractor.

(3) Checking and approval of construction drawings, installation drawings, etc.

The construction drawings, installation drawings, and other documents submitted by the Contractor shall be reviewed and approved after providing necessary instructions.

(4) Inspection and approval of construction materials and equipment

The conformity of construction materials and equipment to be procured by the Contractor shall be checked by comparing them with the construction contract documents prior to approval for procurement.

(5) Inspection of works

The quality and performance of the works shall be inspected by attending construction materials/equipment inspection tests conducted at the production plant and the tests conducted at the work site as appropriate.

(6) Reporting of progress of work

The construction schedule and the conditions at the site shall be fully understood and reported to the relevant agencies in both countries.

(7) Inspection of completed works and test operation

Inspection and test operation of completed buildings, systems, and equipment shall be performed. The intended performance specified in the construction contract documents shall be duly secured and an inspection report shall be submitted to the Ministry of Health (MOH).

(8) Construction supervising system

The Consultant shall assign one resident representative to the site to execute the abovementioned works. In addition, specialty engineers of each field shall be dispatched in view of the progress of work to perform necessary consultation, inspection, guidance, and coordination. At the same time, an engineer in Japan shall also be assigned to carry out technical reviews and communications with the site in Tonga. Additionally, necessary matters of the current project, including progress of work, application for payment, and final handing-over, shall be reported to the relevant governmental agencies in Japan.

The construction management system is shown in the figure below.

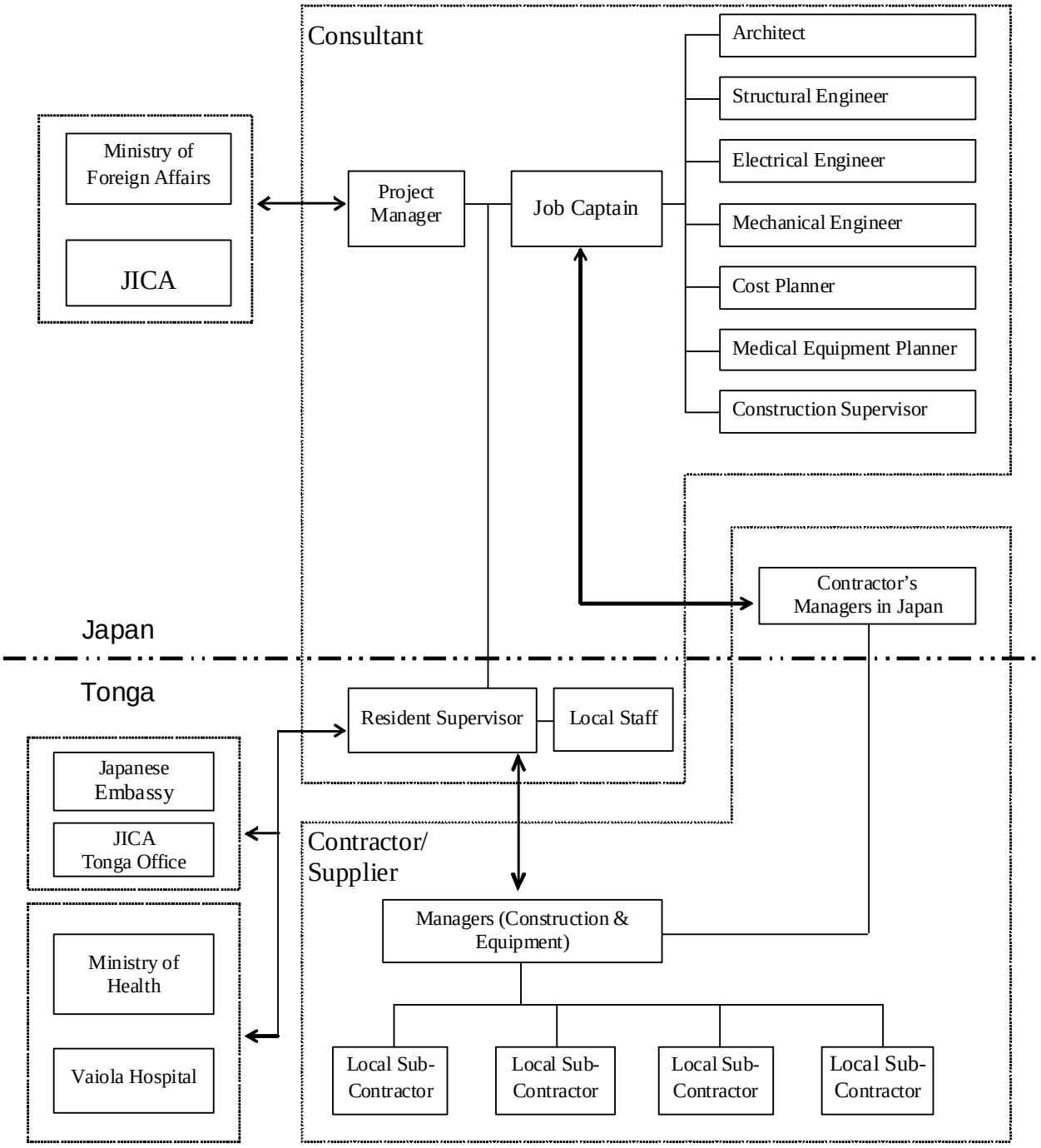


Figure 2-25 Consultant Supervision System

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

(1) Materials Used

- Cement
  Cement is not produced in Tonga, so it must be imported. Ordinary Portland cement or a similar product is commonly used.

- Aggregate
  Because gravel is not available in Tonga due to its geography, lifted coral is being used as the aggregate. It is cut out from the quarry in the inland area, crushed by a crushing machine, and graded according to size. Sand can be produced from crushed stones, but sea sand is commonly used these days. According to the plant, there is a possibility that the use of sea sand may be prohibited in the future. If sea sand is used for this work, it is necessary to check chloride content.

- Chemical admixtures
  Chemical admixtures are not used.

- Water
  The water quality should be equivalent to municipal water.

(2) Mix proportion plan

There is one ready mixed concrete plant near the project site in Tongatapu Island.
Prior to the casting of concrete, the constructor is required to prepare a mix proportion plan in accordance with the design documents and specifications of the work and submit it to the Resident Representative for approval. The plant will then produce a test mix in accordance with the plan and confirm the quality of the concrete.

(3) Casting of concrete

In construction works in Tonga, concrete is normally deposited using a cart or a bucket. The concrete slump is about 8 cm, but its workability is not good due to the influence of local climate. Therefore, sufficient care is needed for the infilling of concrete. A vibrator or similar means should be used to construct fully compacted concrete. Additionally, care must be taken in curing after the casting of concrete to prevent cracking due to drying shrinkage.

In Tonga, the normal procedure is to construct columns first, then place forms for beams and floors, arrange reinforcing bars, and cast the concrete.

(4) Strength

Values of 20, 25, 30, 40 N/mm^2 are used as the specified design strength. In view of the aggregate conditions and the building size, use 20 – 30 N/mm^2 as the specified design strength of concrete for the current structures.

(5) Quality control of concrete

Quality control is conducted at the aforementioned plants in accordance with Australian standards. The quality control method of the Japanese Architectural Standard Specification: Concrete Construction (JASS 5) shall be incorporated where appropriate.

Determine the strength for proportioning by trial mixing.

Conduct a compressive strength test using 28th day test pieces and confirm that the concrete exceeds the specified quality standard strength. For this test, install a water tank at the site that can cure test pieces in water. The compressive strength test should be conducted by a third party organization. The test shall be conducted every day of casting and once per 150 m^3.

Confirm that the chloride content in fresh concrete is 0.3 kg/m^3 or less using test methods commonly used in Japan.

2-2-4-6 Procurement Plan

(1) Construction materials and equipment

Since Vaiola Hospital is Tonga's top referral medical facility, it must be able to provide safe and stable medical service even during natural disasters and other emergencies. Therefore, construction materials that can create structurally strong bodies, external walls, sashes, and roofs should be selected. Finishing materials that are resistant to dirt, easy to clean, and not hard to maintain should be selected for interior surfaces. Finishing materials that are repairable and with repair materials procurable in Tonga should be selected to the extent possible in order to enable subsequent maintenance. The material specifications should conform to Tongan standards; however, if a relevant standard is not available, select materials utilizing Japanese Industrial Standards (JIS) or New Zealand standards.

1) Local procurement

In the case of grant aid projects, the procurement of construction materials and equipment in the local market is preferred. However, because most construction materials and equipment available in Tonga are imports, the materials and equipment used for the current project should be the same type as those commonly used in neighboring countries to make subsequent repair and maintenance easier. Check the quality level when selecting materials.

Because the project site is located in the capital city of Nuku'alofa (Tongatapu Island), imported materials can be procured locally, though they are limited to ordinary materials. However, care is necessary because it may be difficult to procure a large quantity of materials at once. It is important to check the quantity of existing stock since the delay in overseas or local procurement may a have serious effect on the construction schedule.

Asbestos-containing materials are not used at the work site because materials are to be imported from ISO member countries. It is possible to obtain the Materials Safety Data Sheet (MSDS).

2) Procurement by import

Some construction materials and equipment which are difficult to procure locally will be imported from Japan or third party countries. In that case, the Contractor is required to facilitate import and customs procedures in close concert with the Ministry of Health (MOH).

The main trade port in Tonga is Nuku'alofa Port, and there will be no issue with importing. Currently, there is one monthly container ship service between Japan and Nuku'alofa Port. It takes about a month to arrive at this port from Japan. Similar service between New Zealand and Nuku'alofa Port takes about one week.

3) Transportation plan

Transportation from Nuku'alofa Port to the construction site is not a problem because the road is paved and the distance is about 5 km.

It is necessary to adopt a packaging method that can withstand long-distance transportation to avoid material and equipment function degradation due to impact, humidity, and high temperature.

Sufficient care must be taken with overseas procurement as delivery time may be indefinite (i.e. one to two months) due to supplier status and similar reasons.

① Marine transportation

The use of a regular service from Yokohama Port is being considered for the marine transportation of procurements from Japan.

Number of days: embarkation procedures in Japan → departure from Nuku'alofa Port

Yokohama Port:	Export customs clearance	3 days
	Cargo loading	2 days
	Marine transportation	30 days
		(Yokohama Port→Nuku ' alofa Port)
	Import customs clearance/unloading	7 days
Total days of transportation		42 days

② Land transportation

Materials and equipment will be brought 5 km by truck to the construction site.

4) Procurement plan

Principal construction materials and equipment procured in consideration of the above are shown in the table below together with the categories thereof - a) procurement in Tonga, b) procurement in third party countries, and c) procurement in Japan - and the reasons why that category was chosen. Most of the materials and equipment are procurable via agents.

Table 2-40 Procurement Plan for Major Construction Materials and Equipment

Type of work	Material and equipment	Procurement			Remarks
		Local	Japan	Third country	
Architectural	Portland cement	○			Local products are satisfactory
	Fine aggregate	○			Crushed sand, pit sand is in general use
	Coarse aggregate	○			Crushed stone is in general use
	Deformed bar		○		Procured in Japan because of the assembly and zinc coating
	Form	○			Local products are satisfactory
	Steel		○		Procured in Japan because of the assembly and zinc coating
	Concrete block	○			Local products are satisfactory
	Paving brick	○			Local products are satisfactory
	Asphalt waterproofing		○		Procured in Japan because of quality
	Cement mortar	○			Local products are satisfactory
	Porcelain tile	○			Imported products on the market from neighbor countries
	Stone	○			Local products are satisfactory
	Wood for furniture	○			Local products are satisfactory
	Metal roof	○	○		Roof where solar panels are located is procured in Japan and the other roofs is satisfactory with local products
	Light gauge steel ceiling substrate		○		Procured in Japan because of no products locally
	Roof drain	○			Local products are satisfactory

Type of work	Material and equipment	Procurement			Remarks
		Local	Japan	Third country	
	Ordinary sheet glass	○			Local products are satisfactory
	Exterior Painting		○		Procured in Japan because of quality
	Aluminum window & door	○			Local products are satisfactory
	Steel door	○			Local products are satisfactory
	Steel door(fire door),X-ray shielding door		○		Procured in Japan because of quality
	Insulating cement board		○		Procured in Japan because of quality
	Plaster board	○			Local products are satisfactory
	Sink	○			Local products are satisfactory
	Wooden furniture	○			Local products are satisfactory
	Toilet partition		○		Procured in Japan because of quality and function
	Floor door for check	○			Local products are satisfactory
	Sign	○			Local products are satisfactory
	Curtain rail	○			Local products are satisfactory
Mechanical	Air conditioner		○	○	Procured in Japan or third country depending on specification
	Ventilation fan		○	○	Procured in Japan or third country depending on specification
	Air intake and outlet		○	○	Procured in Japan or third country depending on specification
	Duct material		○	○	Procured in Japan or third country depending on specification
	Refrigerant pipe, drain pipe		○	○	Procured in Japan or third country depending on specification
	Air filter		○	○	Procured in Japan or third country depending on specification
	Pump		○		Procured in Japan because of quality
	Sanitary ware		○	○	Procured in Japan or third country depending on specification
	FRP panel tank		○		Procured in Japan because of quality
	Hot water solar panel		○	○	No local products. Procured in Japan or third country depending on specification
	Electric water heater		○	○	No local products. Procured in Japan or third country depending on specification
	Piping material		○	○	Procured in Japan or third country depending on specification
	Thermal insulating material		○	○	Procured in Japan or third country depending on specification
	Fire protection equipment			○	No local products. Procured in third country because of cost
	Automatic control equipment		○	○	Procured in Japan or third country depending on specification
	Sewage treatment plant		○		Procured in Japan because of high quality

Type of work	Material and equipment	Procurement			Remarks
		Local	Japan	Third country	
	Medical gas		○		Procured in Japan because of high quality
	Filtration equipment		○		Procured in Japan because of high quality
Electrical	Substation		○	○	Procured in Japan or third country depending on specification
	Cable		○	○	Procured in Japan or third country depending on specification
	Public address system		○		Procured in Japan because of quality
	Fire alarm system		○	○	Procured in Japan because of quality
	Solar panel		○		Procured in Japan because of quality
	Lighting fixtures		○	○	No local products. Procured in Japan or third country depending on specification
	Wiring device		○	○	No local products. Procured in Japan or third country depending on specification
	Lightning protection		○		No local products. Procured in Japan because of cost and quality

(2) Procurement of medical equipment

1) Procurement plan

There are no medical equipment manufacturers or agents thereof in Tonga. Other than Japanese products, Tonga mainly uses U.S. and European products supplied by agents or sales companies stationed in New Zealand or Australia. Therefore, equipment that requires consumables should be selected from among those with agents or sales companies in the Oceanic region.

Procurement from third party countries should also be considered, because the availability of the manufacturer's agent is important for reliable after-sales service, and because fair bidding may not be secured due to the loss of competitiveness if procurement is restricted to Japanese products only.

Table 2-41 Origin of medical equipment procurement

No.	Name of Equipment	Procurement Countries		
		Local	Japan	Third Countries (Assumption)
1	Defibrillator		○	○ (New Zealand, Australia)
2	Emergency Cart		○	○ (New Zealand, Australia)
3	Electrocardiograph		○	○ (New Zealand, Australia)
4	Patient Monitor		○	○ (New Zealand, Australia)
5	Nebulizer		○	○ (New Zealand, Australia)
6	Suction Unit		○	○ (New Zealand, Australia)
7	Examination Light		○	○ (New Zealand, Australia)
8	Patient Trolley		○	○ (New Zealand, Australia, USA)
9	Stretcher		○	○ (New Zealand, Australia)
10	Tabletop Autoclave		○	○ (New Zealand, Australia, USA)
11	Weighing Scale, Adult		○	○ (New Zealand, Australia)
12	Weighing Scale, Infant		○	○ (New Zealand, Australia)

No.	Name of Equipment	Procurement Countries		
		Local	Japan	Third Countries (Assumption)
13	Height Scale		○	○ (New Zealand, Australia)
14	Mobile Operating Light		○	○ (New Zealand, Australia, USA, EU)
15	Wheel Chair		○	○ (New Zealand, Australia)
16	Pulse Oximeter		○	○ (New Zealand, Australia, USA)
17	Portable Pulse Oximeter		○	○ (New Zealand, Australia, USA)
18	Infusion Pump		○	○ (New Zealand, Australia)
19	Portable Glucometer		○	○ (New Zealand, Australia, USA, EU)
20	IV Stand		○	○ (New Zealand, Australia)
21	Observation Bed		○	○ (New Zealand, Australia, USA)
22	Diagnostic Set		○	○ (New Zealand, Australia)
23	Dressing Trolley		○	○ (New Zealand, Australia)
24	Sphygmomanometer		○	○ (New Zealand, Australia)
25	IVF Warmer		○	○ (New Zealand, Australia, USA)
26	Color Doppler Ultrasound		○	○ (New Zealand, Australia, USA, EU)
27	Treatment Instrument Set		○	○ (New Zealand, Australia)
28	Laryngoscope, Adult		○	○ (New Zealand, Australia)
29	Laryngoscope, Infant		○	○ (New Zealand, Australia)
30	Tracheotomy Instrument Set		○	○ (New Zealand, Australia)
31	Resuscitation Bag, Adult		○	○ (New Zealand, Australia)
32	Resuscitation Bag, Infant		○	○ (New Zealand, Australia)
33	Film Illuminator		○	○ (New Zealand, Australia)
34	Oxygen Flowmeter		○	○ (New Zealand, Australia)
35	Surgical Scrub Station		○	○ (New Zealand, Australia)
36	Instrument Cabinet		○	○ (New Zealand, Australia)
37	Examination Table		○	○ (New Zealand, Australia)
38	Syringe Pump		○	○ (New Zealand, Australia)
39	ENT Treatment Unit		○	○ (New Zealand, Australia)
40	ENT Instrument Set		○	○ (New Zealand, Australia, USA)
41	Audiometer		○	○ (New Zealand, Australia, USA, EU)
42	Sound Proof Unit		○	○ (New Zealand, Australia, USA, EU)
43	Tracheal Intubation Fiberscope		○	○ (New Zealand, Australia)
44	Nasal Polypectomy Instrument Set		○	○ (New Zealand, Australia, USA, EU)
45	Tonsillectomy Instrument Set		○	○ (New Zealand, Australia, USA, EU)
46	Laryngectomy Instrument Set		○	○ (New Zealand, Australia, USA, EU)
47	Cleft Lip Plasty Instrument Set		○	○ (New Zealand, Australia, USA, EU)
48	Mastoidectomy Instrument Set		○	○ (New Zealand, Australia, USA, EU)
49	Fetal Doppler		○	○ (New Zealand, Australia, USA, EU)
50	Fetoscope		○	○ (New Zealand, Australia)
51	Gynecological Examination Table		○	○ (New Zealand, Australia, USA, EU)
52	Vaginal Instrument Set		○	○ (New Zealand, Australia)
53	Therapy Bed		○	○ (New Zealand, Australia, USA, EU)
54	Cupboard for Dangerous Drugs		○	○ (New Zealand, Australia)
55	Medical Refrigerator		○	○ (New Zealand, Australia)
56	Water Distiller, Large		○	○ (New Zealand, Australia)
57	Water Distiller, Small		○	○ (New Zealand, Australia)
58	Electronic Balance		○	○ (New Zealand, Australia)

No.	Name of Equipment	Procurement Countries		
		Local	Japan	Third Countries (Assumption)
59	Medicine Trolley		○	○ (New Zealand, Australia)
60	Small Instrument Set		○	○ (New Zealand, Australia)
61	Dental Unit		○	
62	Dental X-ray Unit		○	○ (New Zealand, Australia, USA, EU)
63	Panoramic X-ray Unit		○	○ (New Zealand, Australia, USA, EU)
64	X-ray Film Developer		○	○ (New Zealand, Australia, USA, EU)
65	Ultrasonic Scaler		○	○ (New Zealand, Australia, USA, EU)
66	Amalgamator		○	○ (New Zealand, Australia, USA, EU)
67	Light Curing Unit		○	○ (New Zealand, Australia, USA, EU)
68	Extraction Instrument Set		○	○ (New Zealand, Australia)
69	Dental Instrument Set		○	○ (New Zealand, Australia)
70	Apex Locator		○	○ (New Zealand, Australia, USA, EU)
71	OMFS Surgical Instrument Set		○	○ (New Zealand, Australia, USA, EU)
72	High Speed Micromotor Drill		○	○ (New Zealand, Australia, USA, EU)
73	OMFS Wiring Instrument Set		○	○ (New Zealand, Australia, USA, EU)
74	Osteosynthesis Instrument Set		○	○ (New Zealand, Australia, USA, EU)
75	Exodontia Instrument Set		○	○ (New Zealand, Australia, USA, EU)
76	Surgical Micromotor		○	○ (New Zealand, Australia, USA, EU)
77	Model Trimmer		○	○ (New Zealand, Australia)
78	Resin Curing Unit – Pressure Pot		○	○ (New Zealand, Australia)
79	Vibrator		○	○ (New Zealand, Australia)
80	Laboratory Lathe		○	○ (New Zealand, Australia)
81	Resin Curing Unit		○	○ (New Zealand, Australia)
82	Vacuum Mixer		○	○ (New Zealand, Australia)
83	Pencil Sand Blaster		○	○ (New Zealand, Australia)
84	Thermoplastic Pressure Former		○	○ (New Zealand, Australia)
85	Laboratory Micromotor		○	○ (New Zealand, Australia)
86	Centrifugal Casting Machine		○	○ (New Zealand, Australia)
87	Burnout Furnace		○	○ (New Zealand, Australia)
88	Hydraulic Flask Press		○	○ (New Zealand, Australia)
89	Articulator		○	○ (New Zealand, Australia)
90	Impression Tray		○	○ (New Zealand, Australia)
91	Flasks Set		○	○ (New Zealand, Australia)
92	Dental Bunsen Burner		○	○ (New Zealand, Australia)
93	Electric Wax Knife		○	○ (New Zealand, Australia)
94	Dust Collector		○	
95	Dental Laboratory Instruments		○	○ (New Zealand, Australia)
96	Anatomical Human Body, Male		○	○ (Germany)
97	Anatomical Human Body, Female		○	○ (Germany)
98	Human Skelton		○	○ (Germany)
99	Circulatory System Model		○	○ (Germany)
100	Respiratory Organ Model		○	○ (Germany)
101	Nasal/Throat/Pharynx Model		○	○ (Germany)
102	Pregnant Uterus Model		○	○ (Germany)
103	Phantom for Delivery		○	○ (Germany)
104	Injection Simulator		○	○ (Germany)

No.	Name of Equipment	Procurement Countries		
		Local	Japan	Third Countries (Assumption)
105	Nursing Care Mannequin for Patient Care		○	○ (Germany)
106	Clinical Procedure Training Mannequin		○	○ (Germany)
107	Resuscitation Simulator		○	○ (Germany)
108	Child Care Simulator		○	○ (Germany)
109	Pediatric Care Simulator		○	○ (Germany)
110	Newborn Advance Care Simulator		○	○ (Germany)
111	Torso Model		○	○ (Germany)
112	Heart Disease 3D Display Model		○	○ (New Zealand, Australia, USA)
113	Death of an Artery Model		○	○ (New Zealand, Australia, USA)
114	Nasogastric Tube Feeding Model		○	○ (Germany)
115	Heart Model		○	○ (Germany)
116	Functional Larynx Model		○	○ (Germany)
117	Brain Model		○	○ (Germany)
118	Kidney Model		○	○ (Germany)
119	Skin Section Model		○	○ (Germany)
120	Median Section of the Head Model		○	○ (Germany)
121	Functional Heart System Model		○	○ (Germany)
122	Functional Eye		○	○ (Germany)
123	Food Pyramid Kit		○	○ (New Zealand, Australia, USA)
124	Diabetes Teaching Kit		○	○ (New Zealand, Australia, USA)
125	Chart for Education		○	○ (New Zealand, Australia, USA)
126	Neonatal Cot		○	○ (New Zealand, Australia)
127	Nursing Utensils Set		○	○ (New Zealand, Australia)
128	Binocular Microscope		○	○ (New Zealand, Australia, EU)
129	Walking Aids		○	○ (New Zealand, Australia)
130	Bed		○	○ (New Zealand, Australia)
131	Examination Instrument Set		○	○ (New Zealand, Australia)
132	Oxygen Set		○	○ (New Zealand, Australia)
133	Commode Chair		○	○ (New Zealand, Australia)
134	TV System	○		
135	Cabinet		○	○ (New Zealand, Australia)
136	Mortuary Refrigerator		○	○ (New Zealand, Australia)

2) Transportation plan

The transportation route is the same as that of construction materials and equipment. For equipment vulnerable to impact, humidity, and high temperature, a packaging method that can eliminate function degradation due to the above causes shall be selected.
Delivery of equipment procured from Japan and third party countries (U.S, Europe) takes about 1.5 months, including marine transportation, customs clearance, and inland transportation. Three or four days is necessary for tax exemption and customs clearance procedures at Nuku‘alofa Port.

2-2-4-7 Operational Guidance Plan

(1) Initial Operational Guidance

The initial guidance on equipment operation should be provided by technicians and/or engineers sent from the supplier at the time of delivery and installation, and medical service workers and equipment maintenance technicians of the eligible facilities shall be invited. In principle, the guidance should consist of the following explanations given to each group regarding all equipment: for medical service workers: operation method, precautions during handling, and daily inspection; for equipment maintenance technicians, troubleshooting and regular maintenance.

(2) Operational Guidance Plan

Equipment maintenance technicians at Vaiola Hospital have received operational guidance on equipment over several years, mainly from the Australian government. Therefore, a soft component will not be provided in this project. In addition, as most of the equipment to be procured will replace existing degraded equipment or add to insufficient equipment, we have determined that no particular operational guidance is required.

2-2-4-8 Implementation Schedule

The implementation schedule of this project after the conclusion of the Exchange of Notes (E/N) is shown in Fig. 2-26; it is comprised of detailed design work and bidding work by the Consultant, construction work by the Contractor, and construction management work by the Consultant.

(1) Detailed design work

A consultant contract shall be concluded between the Ministry of Health (MOH) and a Japanese consultant company (Consultant) regarding the detailed design of the current project (preparation of bid documents), and the consultant shall obtain authorization for the contract document from the Japanese government. Next, the Consultant shall prepare bid documents based on this basic design survey report in consultation with MOH and obtain approval of the ministry.
The period necessary for the detailed design (preparation of bid documents) is estimated to be four months.

(2) Bidding work

The period necessary for the bidding work is estimated to be four months in actuality.

(3) Construction work by the Contractor and construction management by the Consultant

After concluding the construction contract, the Contractor shall commence construction work. The Consultant starts the construction management work at the same time.

Table 2-42 Construction Detail of Vaiola Hospital

Composition of Facilities	Story	Division	Contents of each Composition
O.P.D. New building, 2,280.0 m^2	First Floor	A&E	Hall, Resuscitation, Treatment, Observation, etc
		General Clinic	Triage, Waiting Hall, Consulting room, Doctor's room, Medical record, Staff, etc
		Special Clinic	Special Clinic, ENT
		Pharmacy	Pharmacy, Storage, examination room, Pharmacist room, Staff room, etc
	Second Floor	Antenatal	Waiting Hall, Consulting room, Treatment room, Doctor's room, Pre-examination room, Medical Record, Staff room, etc
		Education/ Training	Training room, Lecture room, Prep. room
		Hospital Administration	Medical Superintendent, Matron, General Administration, Accounts, etc
O.P.D. ANNEX Renovated building, 582.4 m^2	Single Story	Special Clinic	Ophthalmology, Diabetes, Physiotherapy
Dental Unit New building, 396.1 m^2	Single Story	Dental	Dental Clinic, Dental Tech., X-ray, Medical Record, C.D.O., Supervisor, Waiting Hall, etc
Multipurpose New building, 126.0 m^2	Single Story		Waiting Space(Multipurpose use)), Storage for furniture
Nursing School New building, 596.1 m^2	Single Story		Class room Simulation room & Prep. Room, Principal room, Office, Computer, Library, etc
Mortuary New building, 98.4 m^2	Single Story		Hall, Morgue
Outside roof covered waiting space, Passage 987.7 m^2	Single Story		Waiting space and Covered Passage

Composition of Facilities	Story	Division	Contents of each Composition
Ancillary Mechanical Facility New building 41.9 m^2	Single Story		City water pump room、Sewage treatment plant room, City water reservoir tank, Sewage treatment tank

The period of construction is estimated to be 18 months; the contents of the work are shown in the figure below.

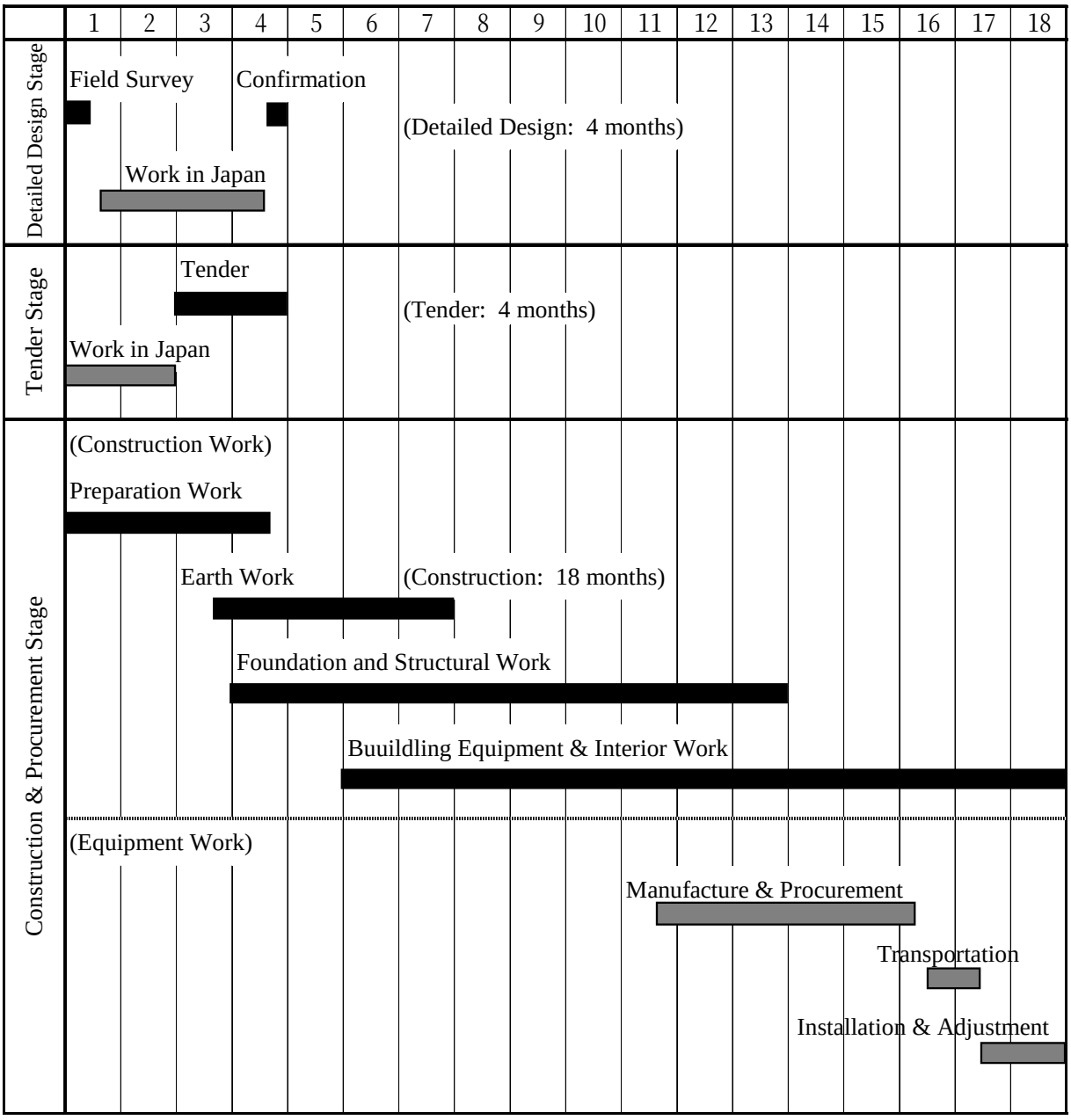


Figure 2-26 Project Schedule

(4) Procurement supervision

After concluding an equipment supply contract, the supplier begins procuring the equipment. The Consultant starts the procurement management and construction management works at the same time. The period of procurement and installation of equipment is estimated to be 8 months; the details of that period are shown in the figure above.

2-3 Obligations of Recipient Country

The principal measures and works to be undertaken by Tonga are described below.

(1) Measures and procedures

① Application and acquisition of necessary permits and authorization for obtaining a construction permit for the current project.

② Issuance of the Banker's Acceptance (B/A) and the Authority to Pay (A/P) and bearing of related charges.

③ Complete exemption of taxes related to the current assistance project.

④ Provision of conveniences for entry, work, and stay in Tonga, to Japanese and third party country citizens who supply materials/equipment and execute works in Tonga based on the authorized contract.

⑤ Complete exemption of customs duties and other internal taxes levied on Japanese and third country citizens who supply materials/equipment and execute works in Tonga based on the authorized contract.

⑥ Budgetary measures for the effective operation and maintenance of the facilities and equipment constructed or procured in this grant aid project.

⑦ Procedures, contracts, and bearing of charges regarding electricity, telephone, gas, water supply, and wastewater drainage related to this assistance project.

⑧ Securing of a surplus soil disposal area and a use permit thereof by constructors related to this assistance project

(2) Related works preceding the construction works

① Demolition of the existing medical wards and rough grading

② Transfer of existing electrical lines in the project areas

③ Temporary relocation of existing pharmacy

④ Dismantle deteriorating 300kva transformer

⑤ Temporary diversion of existing telephone lines including MDF and PBX in the project areas

⑥ Temporary diversion of existing IT lines and servers in the project areas

⑦ Temporary diversion of the existing water supply and fire protection system in the project areas

⑧ Temporary diversion of the existing water drainage system in the project areas

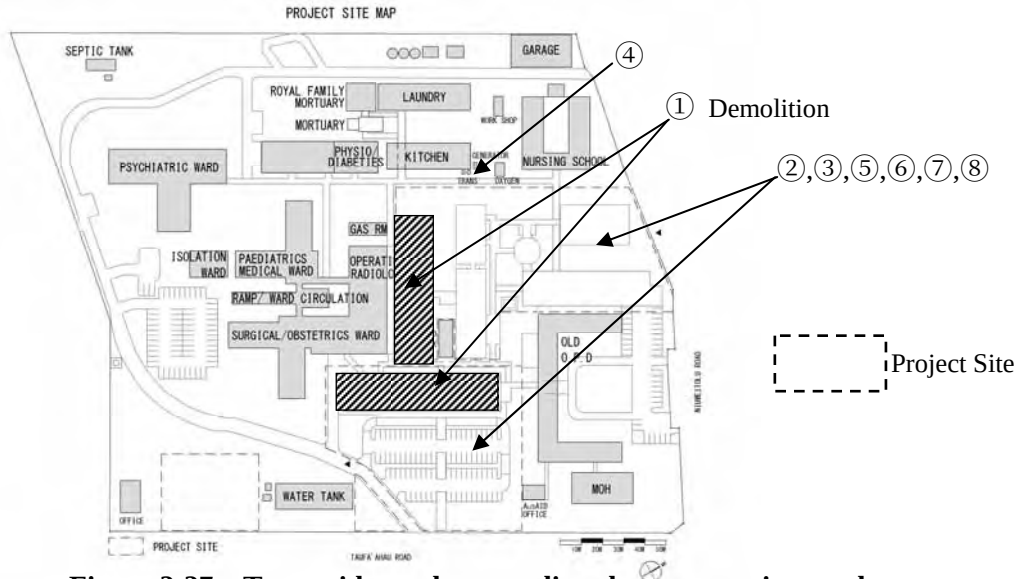


Figure 2-27 Tonga side works preceding the construction works

(3) Related works during and after facility construction

① Road works in areas other than the project site

② Gardening and planting in the project areas

③ Connection of water supply system to the project areas

④ MDF and PBX works for the project facilities and extension of telephone lines up to those facilities

⑤ Transfer of IT lines and servers to the IT rooms of the project facilities

⑥ Transfer of existing furniture and equipment to the project facilities

⑦ Installation of new curtain to the project facilities

⑧ Renovation of the existing O.P.D. after the completion of the current work

⑨ Demolition of the existing Nursing School after the completion of the current work

⑩ Transfer of the kitchen and laundry room to the existing diabetes/physiotherapy clinic after completion of the current work

⑪ Renovation of the existing kitchen and laundry areas and conversion into a workshop and storage after the completion of the current work

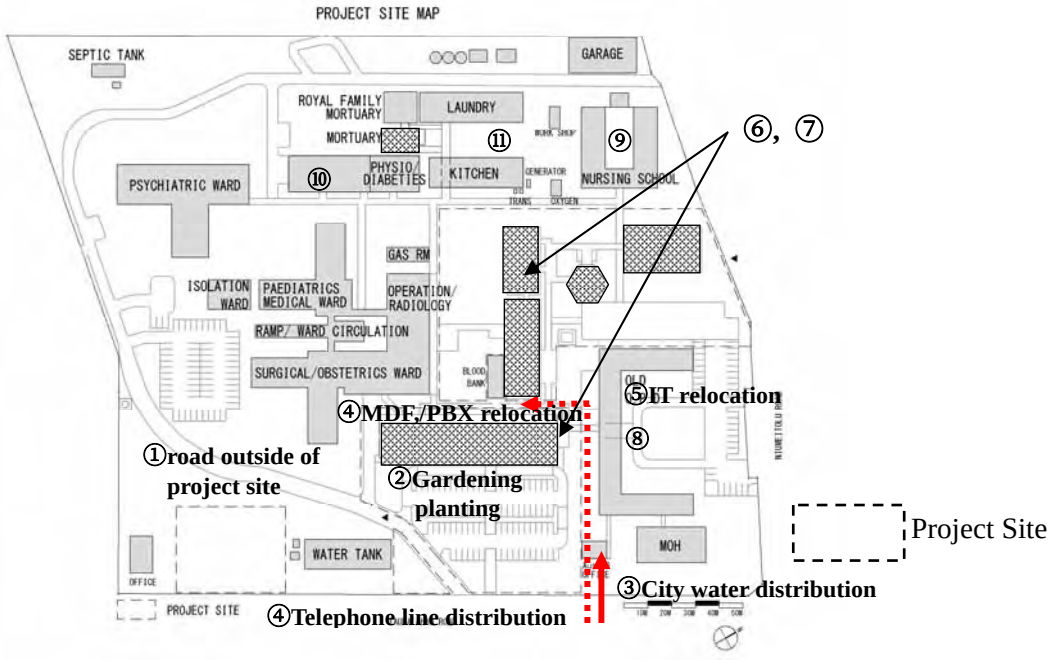


Figure 2-28 Tonga side works during and after facility construction

(4) Miscellaneous

Bearing of expenses spent on items not covered by the current grant aid project.

The implementation schedule of the work borne by Tonga is shown in Table 2-43.

Table 2-43 Schedule of Tonga Side Obligation Works

Item	Schedule
（1） Related works preceding the construction works	
①Demolition of the existing medical wards and rough grading	July 2010
②Transfer of existing electrical lines in the project areas	July 2010
③Temporary relocation of existing pharmacy	July 2010
④Dismantle deteriorating 300kva transformer	July 2010
⑤Temporary diversion of existing telephone lines including MDF and PBX in the project areas	July 2010
⑥Temporary diversion of existing IT lines and servers in the project areas	July 2010
⑦Temporary diversion of the existing water supply and fire protection system in the project areas	July 2010
⑧Temporary diversion of the existing water drainage system in the project areas	July 2010
⑨Banking Charges	July 2010
（2） Related works during and after facility construction	
①Road works in areas other than the project site	April 2012 or after
②Gardening and planting in the project areas	April 2012 or after
③Lead in the water supply system to the project areas	October 2011
④MDF and PBX works for the project facilities and extension of telephone lines up to those facilities	April 2012 or after
⑤Transfer of IT lines and servers to the IT rooms of the project facilities	April 2012 or after
⑥Transfer of existing furniture and equipment to the project facilities	April 2012 or after
⑦Installation of new curtain to the project facilities	April 2012 or after
⑧Renovation of the existing O.P.D. after the completion of the current work	April 2012 or after
⑨Demolition of the existing Nursing School after the completion of the current work	June 2012 or after
⑩Transfer of the kitchen and laundry room to the existing diabetes/physiotherapy clinic after completion of the current work	April 2012 or after
⑪Renovation of the existing kitchen and laundry areas and conversion into a workshop and storage after the completion of the current work	April 2012 or after

2-4 Project Operation Plan

(1) Personnel plan

Currently, maintenance at Vaiola Hospital is being performed by the Maintenance Division. Originally, the division consisted of 14 members, but presently the chief engineer, mechanical technician, and electrical technician posts are vacant. The Ministry of Health (MOH) is currently planning to increase the number of staff of this division, so a sufficient number of staff will be made available soon.

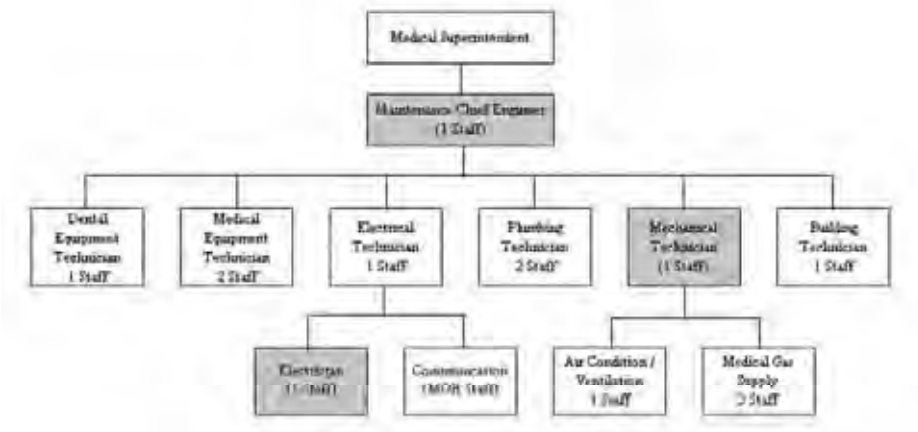


Figure 2-29 Maintenance Organization

(2) Maintenance Plan

1) Facilities (Buildings, mechanical system, and electrical system)

At Vaiola Hospital, both facility maintenance and equipment maintenance are being carried out by the maintenance division.
Although the hospital said that maintenance training was conducted by AusAID (Australia) in early 2009, but the MOH stated that the training mainly included explanations of current maintenance conditions in Australia, and thus has no direct influence on current maintenance practices. In 2007-2008, technicians in charge of piping, electrical systems, equipment, and facilities, as well as staff members in charge of mechanical systems, received about one or two years of specialty training in Fiji.

2) Medical equipment

The medical equipment to be provided in this project will be maintained by the two medical equipment technicians shown in the figure above. Their technical level is sufficiently high and they are doing maintenance and repair of all the equipment in Vaiola Hospital. They have the skill to repair almost all the medical equipment at the hospital if spare parts are made available. However, because the current maintenance staff is insufficient, one of them is also responsible for the maintenance of building and equipment. As such, he has to repair the building and equipment in addition to maintaining the medical equipment. Because of this, only one equipment technician can concentrate on the maintenance of medical equipment, and the maintenance of medical equipment is not sufficient at present. To solve this difficulty, the number of staff in charge of electrical equipment and systems will be increased. In doing so, the medical equipment technicians will be able to concentrate on the maintenance of medical equipment and proper maintenance of medical equipment will become possible, including the equipment procured in the current project.

・Color Doppler Ultrasound maintenance contract

It is necessary to conclude a maintenance contract with the agent of the manufacturer of the ultrasound procured in this project and to receive once-a-year periodic inspection from an agent technician in order to manage and maintain this equipment properly.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Expense of Tonga side Obligation Works

From the cost estimate, it was found that the following expenses would be required by the specified date to cover the works of the Tongan side: 435,500 Tonga Pa'anga (hereinafter referred to as "T$") by July 2010 before commencement of the current project; T$50,000 by October 2011, which is during the main work; and T$2,294,950 after April 2012, which is after the handover of the completed facility. (Tonga's fiscal year starts in July and ends at the end of the next June).

Those expenses will be appropriated from the budget of the Ministry of Health in FY2009, 2010, and 2011. If those amounts covering the Tongan work are compared with the maintenance budget of the Ministry of Health in FY2008 (Table 2-57), they account for 27.8%, 3.2%, and 146.3%, respectively. According to our confirmation, the Tongan side has already secured a budget for the expense paid out by July 2010 and is now preparing its execution. No problems should arise in terms of expenses for the works after FY2011, which will be executed over two fiscal years, as Tonga has issued assurance that it will secure a budget for those works.

Table 2-44 Expense of Tonga Side Obligation Work

Item	Expense (T$)
(1) Related works preceding the construction works	
①Demolition of the existing medical wards and rough grading	220,000
②Transfer of existing electrical lines in the project areas	20,000
③Temporary relocation of existing pharmacy	50,000
④Dismantle deteriorating 300kVA transformer	50,000
⑤Temporary diversion of existing telephone lines including MDF and PBX in the project areas	20,000
⑥Temporary diversion of existing IT lines and servers in the project areas	20,000
⑦Temporary diversion of the existing water supply and fire protection system in the project areas	30,000
⑧Temporary diversion of the existing water drainage system in the project areas	20,000
⑨Bank charge	5,500
Subtotal (1)	435,500
(2) Related works during and after facility construction	
①Road works in areas other than the project site	20,000
②Gardening and planting in the project areas	88,000
③Lead in the water supply system to the project areas	50,000
④MDF and PBX works for the project facilities and extension of telephone lines up to those facilities	220,000
⑤Transfer of IT lines and servers to the IT rooms of the project facilities	20,000
⑥Transfer of existing furniture and equipment to the project facilities	50,000
⑦Installation of new curtain to the project facilities	80,000

Item	Expense (T$)
⑧Renovation of the existing O.P.D. after the completion of the current work	1,400,000
⑨Demolition of the existing Nursing School after the completion of the current work	110,000
⑩Transfer of the kitchen and laundry room to the existing diabetes/physiotherapy clinic after completion of the current work	100,000
⑪Renovation of the existing kitchen and laundry areas and conversion into a workshop and storage after the completion of the current work	206,950
Subtotal (2)	2,344,950
Total	2,780,450

(2) Cost estimate conditions

1) Time of cost estimate: July 2009
2) Currency exchange rate: T$ 1 = JPY 47.56 (as of July 2009)
3) Project period: The periods for detailed design, bidding, and construction are as shown in the project schedule.
4) Miscellaneous: This project will be implemented in accordance with the grant aid system of the Government of Japan.

2-5-2 Operation and Maintenance Cost

(1) Maintenance Costs

This project is designed to reduce electricity and water costs by actively utilizing natural energy through the introduction of a solar photovoltaic system, a rainwater tank, and an architectural design fit for natural ventilation. Due to these efforts, the estimated maintenance cost of the project facilities is as shown in the table. The annual maintenance costs in the first year following completion of the facilities and that of the second year and later are shown in the table.

Table 2-45 Estimated Maintenance Costs

Unit：T$

Item	Initial fiscal year	Following fiscal years
① Electricity charge	119,955	119,955
② Telephone charge	3,240	3,240
③ Fuel cost of generator	0	0
④ Water charge	26,334	26,334
⑤ LPG gas charge	2,844	2,844
⑥ Oxygen charge	3,600	3,600
⑦ Major facilities and equipment maintenance cost	0	32,380
⑧ Building maintenance cost	0	20,434
⑨ Solar panel	0	0
⑩ Replacement parts	0	0
Subtotal ①～⑩ (facility maintenance cost)	155,973	208,787
⑪Cost of consumables	11,848	11,848
⑫Cost of spare parts	0	19,725
⑬Maintenance contract cost	10,513	10,513
Subtotal ⑪～⑬ (Equipment maintenance cost)	22,361	42,086
Total ①～⑬	178,334	250,873

① Electricity costs ..... 119,955 T$/yr

The contract demand for the project facilities is estimated 150kW from the scale and usage of the facilities. The actual electricity consumption is assumed to be, on average, 80% of the contract demand. In addition, approximately 10kW will be saved by the solar photovoltaic system.

Table 2-46 Presumed Electric Power Consumption

	Assumed Consumption (kW)
Object facility (150kW×0.8 – 10kW)	110

・Electricity rate system

Metered rate 0.727 T$/kWh

Table 2-47 Electricity charge

	Charge (T$)	Consumption (kW)	Used hour (h)	Day	Month	Load factor	Total (T$)
Object facility Meter rate	0.727	110	10	25	12	0.5	119,955

② Telephone costs .....3,240 T$/yr

The telephone costs depend on the frequency of use. Assuming the frequency of use shown in the table below, the telephone cost is estimated as follows:

・Telephone rate system

Domestic calls	Local calls	0.07 T$/3 min.
	Out-of-town calls	0.30 T$/min.
International calls		0.70 T$/min.

Table 2-48 Telephone charge

	Charge (T$)	Number of lines	Used hour (min/each)	Frequency (times/day)	Day	Month	Load factor	Total(T$)
City call	0.07	—	—	60	25	12	1.0	1,260
Long distance call	0.3	—	3	5	25	12	1.0	1,350
International	0.7	—	3	1	25	12	1.0	630
Total								3,240

③ Fuel cost of generator..... 0 T$/yr

There are no new generators in this project and there will be no increase in load after implementation of the project.

④ Water costs .....26,334 T$/yr

The estimated water consumption at the project facilities is as follows.

Table 2-49 Presumed water Consumption

	Water supply per day (m^3/day)
Object facility	60

・Water rate system

Metered rate (average) 1.9 T$/$m^3$

Table 2-50 Water charge

	Charge (T$)	Water supply	Day	Month	Rate of city water consumption	Load factor	Total(T$)
Object facility Meter rate	1.9	60	25	12	0.77*	1.0	26,334

*: The project plans for the use of rainwater. The rainwater will displace 23% of city water and city water usage is 100% - 23% = 77%.

⑤ LPG gas costs ..... 2,844 T$/yr

LPG gas is used in examination rooms. Gas consumption is estimated as follows.

Table 2-51 LPG Consumption

Facility	Use	Consumption per day (kg/day)
Dental clinic	Dental tech.	3

・LPG gas rate system

LPG gas rate 3.95 T$/kg

Table 2-52 LPG Charge

	Price (T$)	Consumption (kg)	Day	Month	Annual consumption (kg)	Load factor	Total(T$)
LPG price	3.95	3	25	12	900	0.8	2,844

⑥ Oxygen gas costs ..... 3,600 T$/yr

Oxygen gas is used in the resuscitation room, recovery room, and other facilities. Its consumption at the project facilities is estimated as follows.

Table 2-53 Oxygen Consumption

Facility	Consumption per day (liter/day)
Object facility	500

・O_2 gas rate system

O_2 gas rate 0.04 T$/Liter

Table 2-54 Oxygen Charge

	Charge (T$)	Consumption (liter)	Day	Month	Annual Consumption (liter)	Load factor	Total(T$)
O_2 charge	0.04	500	25	12	150,000	0.6	3,600

⑦ Major facilities and equipment maintenance cost ..... 32,380 T$/yr

At the project facilities, it is necessary to entrust the maintenance of principal building equipment to an outside maintenance company. The costs thereof are estimated as follows by referring to the results of consultation with a local maintenance company.

Table 2-55 Preliminary Calculation Result

Facility system	Maintenance cost (T$)	Times of periodic inspection
Air conditioning system	6,380	One time/year
Drainage system, Sewage treatment system	26,000	One time/year
Total	32,380	

⑧ Building maintenance costs .....20,434 T$/yr

Relatively easy maintenance materials will be adopted for both the exterior and interior of the project facilities. Therefore, the building maintenance costs spent on the maintenance of the interior/exterior of the buildings, purchase of repair and replacement parts of electrical, water supply, water drainage, and air-conditioning equipment are estimated to be 1/2 - 1/3 of that of similar buildings in Japan. Building maintenance costs are necessary in the second year and later.

・Rate system 4 T$/㎡/yr

Table 2-56 Building Maintenance Cost

	Cost (T$)	Area (㎡)	Day	Month	Total (T$)
Building Maintenance Cost	4	5,108.6	—	—	20,434

⑨ Solar Panel ..... 0 T$/yr

There is no annual maintenance.

⑩ Cost of replacement parts ..... 0 T$/yr

Pre-filters are attached. The frequency of filter replacement is assumed as follows. Pre-filters can be reused, so there is no exchange cost.

・Rate system

Pre-filter cleaning approx. 2 times/month

⑪ Cost of equipment consumables .....11,848 T$/yr

〔Initial Fiscal Year and Following Fiscal Years〕

(1) Defibrillator	(gel)	1 unit	×	@	5,000	=	5,000
(2) Electrocardiograph	(paste, recording paper)	2,500 cases	×	@	15	=	37,500
(3) Patient Monitor	(electrode)	200 cases	×	@	380	=	76,000
(4) Nebulizer	(mask, etc.)	3 units	×	@	5,000	=	15,000
(5) Infusion Pump	(tube, etc.)	100 cases	×	@	520	=	52,000
(6) Portable Glucometer	(kit, lancet)	400 units	×	@	290	=	116,000
(7) Color Doppler Ultrasound	(gel, recording paper)	400 cases	×	@	50	=	20,000
(8) Syringe Pump	(syringe, etc.)	100 units	×	@	460	=	46,000
(9) Tracheal Intubation Fiberscope	(biopsy, bulb)	100 units	×	@	175	=	17,500
(10) Fetal Doppler	(gel)	2 units	×	@	12,000	=	24,000
(11) Water Distiller	(salt)	2 units	×	@	1,000	=	2,000
(12) Dental X-ray Unit	(x-ray film)	500 cases	×	@	50	=	25,000
(13) Panoramic X-ray Unit	(cefalo x-ray film)	250 cases	×	@	155	=	38,750
(14) X-ray Film Developer	(developer, etc.)	750 cases	×	@	50	=	37,500
(15) Others (10% of the total amount above)		1 set	×	@	51,225	=	51,225
					Sub-total		¥563,475
							T$11,848

⑫ Cost of equipment spare parts ..... 19,725 T$/yr

〔Second Fiscal Year and Following Fiscal Years〕

(1) Electrocardiograph	(patient cable)	1 unit	× @	13,000	=	13,000
(2) Patient Monitor	(lead, SpO2 probe)	3 units	× @	49,000	=	147,000
(3) Nebulizer	(tube, etc.)	3 units	× @	8,000	=	24,000
(4) Suction Unit	(bottle, cap)	4 units	× @	6,000	=	24,000
(5) Examination Light	(bulb)	8 units	× @	3,500	=	28,000
(6) Tabletop Autoclave	(heater, packing)	6 units	× @	18,000	=	108,000
(7) Mobile Operating Light	(bulb)	1 unit	× @	14,400	=	14,400
(8) Pulse Oximeter	(probe)	3 units	× @	30,000	=	90,000
(9) Diagnostic Set	(bulb)	6 units	× @	9,200	=	55,200
(10) Film Illuminator	(lamp)	7 units	× @	3,000	=	21,000
(11) Tracheal Intubation Fiberscope	(lamp, valve)	1 unit	× @	16,750	=	16,750
(12) Fetal Doppler	(probe)	2 units	× @	60,000	=	120,000
(13) Water Distiller	(heater, filter)	2 units	× @	12,000	=	24,000
(14) Dental X-ray Unit	(bulb, etc.)	11 units	× @	15,000	=	165,000
(15) Binocular Microscope	(oil, bulb)	500 cases	× @	5	=	2,500
(16) Others (10% of the total amount above)		1 set	× @	85,285	=	85,285
				小計		¥938,135
						T$ 19,725

⑬ Maintenance contract cost ..... 10,513 T$/yr

〔Intitial Fiscal Year and Following Fiscal Years〕

(1) Color Doppler Ultrasound	(1time/year)	1 year	× @	500,000	=	500,000
				Sub-total		¥500,000
						T$ 10,513

(2) Financial situation and maintenance costs

Below we compare the maintenance budget of Vaiola Hospital with the total hospital budget and the total maintenance budget (including Vaiola Hospital's maintenance budget) of the Ministry of Health (MOH). The maintenance budget of Vaiola Hospital accounts for 70 to 85% of the total maintenance budget of MOH, indicating how important this hospital is in Tonga.

In the meantime, the maintenance budget of Vaiola Hospital is included in the budget of the Ministry of Health. It is estimated that the maintenance budget of the hospital will increase to T$178,334 (ca. JPY8.50 million) in FY2011 when this grant aid project is completed, and increase to T$250,873 (ca. JPY12.00 million) in FY2012 and beyond. This accounts for about 13.5% and 19.0%, respectively, of the maintenance budget of Vaiola Hospital in FY 2008, which is a significant increase. The total maintenance budget of the Ministry of Health, including the above increases at Vaiola Hospital, respectively accounts for 7.3% and 7.7% of the total budget of the Ministry in FY 2008. Recognizing the importance of facility and equipment maintenance, Tonga explained to the Japanese side that it would secure 7% of the Ministry's budget for the maintenance of hospitals. However, the Japanese side conveyed that the maintenance budget should be further increased, and the Ministry of Health promised that they would take responsibility for securing the necessary amounts.

Table 2-57 Budget for MOH and Maintenance expense

(Unit: T$1,000)

	Budget of MOH A	Budget for Maintenance of MOH B	Ratio B/A	Budget for Maintenance of Vaiola Hospital C	Ratio C/A	Ratio C/B
2008	24,392	1,569	6.4%	1,320	5.4%	84.1%
2007	17,760	855	4.8%	632	3.5%	73.9%
2006	20,170	N/A	-	N/A	-	-

Note：Budget of 2008 year is before negotiation with Department of the Treasury

2-6 Other Relevant Issues

(1) The current grant aid project will be promoted by the Project Steering Committee, which consists of members primarily from the Ministry of Health and Vaiola Hospital. To smoothly promote the current project, it is important that the Ministry of Health cooperates with relevant agencies to go through legal procedures, secures the necessary budget, and executes it to enable implementation of Tongan side works, which are an indispensable part of the current grant aid project.

(2) It is important that the Tongan side works are executed at an appropriate time considering the schedule of the main work.

1) We should check the details and progress of Tongan side works periodically, including the demolition of existing structures located in the construction site, grading work, and transfer of active rooms and equipment existing in the buildings to be rehabilitated.

2) We should also check the schedule and progress of utility works periodically, including the detour and transfer of all utility lines that run through the construction site up to other non-project facilities, such as electric lines, and leading-in of utilities to the project facilities.

3) The construction site of the current project consists of an open space and some of the existing buildings on the Vaiola Hospital premises. Therefore, it is important to conduct safety confirmation and traffic control during construction work to ensure that construction vehicles and construction materials delivery vehicles accessing the site from the front road and side road will not cause danger to the ongoing medical service at the hospital, including the movement of patients, their families, medical staff, the delivery of medical materials, and general traffic in the hospital premises.

Chapter 3 Project Evaluation and Recommendations

CHAPTER 3. PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effect

The following effects are expected to be achieved by the implementation of the current project.

Table 3-1 Project Effects

Current status/problems	Countermeasures by the project	Direct effects/ improvement levels	Indirect effects/ Improvement levels
Due to aging and shortage of facilities and equipment, the hospital is currently unable to provide sufficient medical services as a tertiary-level hospital either quantitatively or qualitatively.	・ Improvement of the facilities and equipment of the general and special clinic divisions ・ Improvement of the facilities and equipment of the emergency division ・ Improvement of the facilities and equipment of the dental clinic division ・ Improvement of the facilities and equipment of the nursing school ・ Improvement of the facilities and equipment of the education/training division.	・ Improvement as a secondary-level hospital will improve the content and quality of medical service. It will increase the annual number of outpatients in general (66,625 patient/year), special (7,173 patient/ year), and dental clinics (26,321 patient/ year). ・ The number of nursing school students (92 students in present) will increase. ・ The number of foreign exchange programs (three present) will increase. ・ Improvement of education/training facilities will enable efficient operation of various programs.	・ Improvement of the hospital as Tonga's top referral hospital will improve the health of all Tongan people ・ Improvement as Tonga's key disaster rescue base ・ Reduction in maintenance costs by the active utilization of natural energy

The details of the expected effects are as follows:

(1) Expected direct effects

1) Recovery of functions and improvement of medical services as a clinical and emergency medical facility

The functions of the clinical and emergency divisions will be restored by the improvement of the hospital's facilities and medical equipment. This will improve hospital indices shown by the number of outpatients, which is currently 66,625 (Vaiola Hospital, 2008) in the general clinic; 7,173 in the special clinic; 5,581 in wound and minor treatments; 26,321 in the dental clinic; and 9,204 in prenatal examination. In addition, the content and quality of services as a medical service facility will be improved.

2) Improvement of the secondary-level medical facility serving for Tongatapu Island, where the nation's capital is located

If this hospital, which serves as the secondary-level medical facility for about 70,000 people on Tongatapu Island, is improved, the content and quality of medical services provided will improve as well.

3) Enhanced functionality through the improvement of the nursing school building

Improvement of the school facility and educational equipment will help increase the number of nursing students (92 in 2008) and exchange programs with other countries (three programs in 2008).

4) Efficient administration by improving educat1ional and training facilities

Currently, education and training-related efficiency at the hospital is poor. For example, gatherings of many people, such as graduation ceremonies and a PTA assemblies, which take place about 10 times a year, are held at external rental facilities because the hospital has no such space. Also, all-school meetings, which take place 24 times a year, are held in a very crowded room. If a multipurpose hall that can accommodate a large number of people is constructed, it is possible to hold education/training programs and workshops at the hospital in addition to the above gatherings and meetings.

(2) Indirect effects

1) Health improvement of all Tongan people

If the nation's top referral medical facility is improved, it can provide improved medical services to Tonga's population of about 100,000 people, contributing to the overall improvement of their health.

2) Improvement of Tonga's emergency rescue base

The hospital will be able to engage in rescue/relief activities and receive victims in case of major disasters such as cyclones, earthquakes, and plane crashes (a rescue scheme during these kinds of accidents is being promoted by the WHO and other organizations) through working as the key rescue base by mobilizing the general clinic and emergency wards, which have earthquake-resistant structures.

3) Reduction in maintenance costs by the active utilization of natural energy

A range of improvements including renewable energy-based power generation with the introduction of a solar panel system and the installation of a rainwater tank to cover the chronic shortage of municipal water will contribute to the improvement in the chronic insufficiency of utilities commonly seen in island countries.

(3) Achievement indices of the project

Increases in the following numbers at the hospital are used as the achievement indices of the current project.

1) Increase of outpatients in the general and special clinic divisions

The increased number of consultation rooms and treatment rooms in each division will improve consultation efficiency and shorten the waiting time appropriately, which will increase the number of outpatients.

2) Increase of treatment in the dental clinic division

Restoration of treatment tables and upgrade of the shared-use X-ray room will greatly improve efficiency and shorten waiting time, which will increase the number of outpatients.

3) Increase of nursing school students

Currently, three narrow classrooms are used by the first to third year students. If those rooms are expanded to an appropriate size, it is possible to increase the number of nursing students

from the current number of 92. The number of applicants to the nursing school is expected to increase as the demand for nursing staff is rising.

4) Increase of exchange programs with other countries

Currently, there are three exchange programs per year (Vaiola Hospital, 2008) and meeting rooms are tentatively used for that purpose, because the hospital has no facility to accommodate these people. The number of such programs is expected to increase.

3-2 Recommendations

3-2-1 Issues and recommendations that should be addressed by the Tonga side

The following improvements should be made to operate Vaiola Hospital smoothly and effectively and to produce the aforementioned direct and indirect effects after this project's improvement.

(1) To improve referral functions in Tonga, establish a cooperative and coordinative system with lower level medical institutions and utilize it for the overall improvement of regional medical services such as preventive healthcare.

(2) To facilitate future equipment restoration, draw up a financial plan including a reserve fund for the purchase thereof by considering the service life and long-term deterioration of principal equipment.

(3) Secure the required number of personnel in charge of maintenance to ensure that the completed medical facility and the procured equipment are continuously used in good condition.

(4) When installing equipment, make arrangements to give technical guidance on the actual operation in addition to the explanations of their respective maintenance manuals, operation manuals, and circuit diagrams received from suppliers. Additionally, give instructions on the effective use of these manuals to enable effective maintenance of the equipment.

(5) For each equipment procured in this project, keep a record of the delivery date, frequency of use, and repair history in the ledger (log). Also, prepare a spare parts purchase plan and an equipment restoration plan, and develop an equipment maintenance budget plan on a medium- to long-term basis based on these plans.

(6) After completion of the current project, prepare an annual report on the administration of the project facility and equipment. Utilize the report to keep track of the operational performance and as reference material to seek further improvement in hospital administration.

(7) It will be recommended that care be taken in the handling of asbestos when demolishing existing buildings.

3-2-2 Technical cooperation and collaboration with other donors

Various countries and international organizations are continuously extending aid to Tonga, including neighboring countries such as Australia and New Zealand, Asian countries such as Japan and China, and multinational organizations including the Asian Development Bank, the British Commonwealth of Nations, EU, UNFPA, WHO, and the World Bank. The content of aid to Vaiola Hospital extended as part of these schemes are widely varied, ranging from improvement of hospital operation, improvement of preventive healthcare, and improvement of healthcare technologies to improvement of facilities and equipment.

The aid for the overall improvement of Vaiola Hospital was extended in three stages: in the first stage, the mental health ward and the pathology/diabetes ward were completed with aid from the World Bank; in the second stage, the main examination ward and the obstetrics/surgery ward were completed with aid from Japan; in the third stage, the isolation ward, the pediatrics/internal medicine ward, staircases, and slope ways were completed with aid from the World Bank. Although it is necessary to consider coordination with those already-completed facilities, the current project does not overlap.

China is now constructing a healthcare center in the Mua, Vaini, and Niue areas as aid to healthcare centers that come below Vaiola Hospital in the medical service structure. However, the current project does not overlap with those constructions.

Accordingly, there is no need for technical cooperation or collaboration with other donors during the execution of the current project, although some of those completed facilities may have some influence on the effects of the current project.

Appendices

1. Member List of the Study Team

Basic Design Survey (March 9 to April 3, 2009)

No.	Name	Assignment title	Organization
1	Mr. Hitoshi ARA	Leader	Assistant Director for Urban and Regional Development Division 3, Urban and Regional Development Group, Economic Infrastructure Department, Japan International Cooperation Agency
2	Dr.Rie OGIWARA	Technical Advisor	Medical Officer, International Medical Center of Japan, Ministry of Health, Labor & Welfare
3	Ms. Ryoko KATO	Project Coordinator	Reproductive Health Division, Health Systems and Reproductive Health Group, Human Development Department, Japan International Cooperation Agency
4	Mr. Takeshi ENDO	Project Manager/ Architectural Planner	Nihon Sekkei International Inc.
5	Mr. Shin HINOMIZU	Architectural Designer	Nihon Sekkei International Inc.
6	Mr. Takahisa ISOBE	Facility Planner	Nihon Sekkei International Inc.
7	Mr. Makoto SUZUKI	Equipment Planner	Nihon Sekkei International Inc.
8	Mr. Akira WATANABE	Health care / Nursing Education	Nihon Sekkei International Inc.
9	Mr. Hideo NAKASHIMA	Cost and Procurement Planner	Nihon Sekkei, Inc.
10	Mr. Shingo NOKOSHIMATSU	Architectural Designer (Assistant)	Nihon Sekkei International Inc.
11	Mr. Seiichi NAKAMURA	Facility Planner (Assistant)	Nihon Sekkei, Inc.
12	Mr. Kenichi SHIMIZU	Structural Engineer (Assistant)	Nihon Sekkei, Inc.

Additional Survey (June 27 to July 2, 2009)

No.	Name	Assignment title	Organization
1	Mr. Takeshi ENDO	Project Manager/ Architectural Planner	Nihon Sekkei International Inc.
2	Mr. Katsuo URANO	Solar Panel System Specialist	Nihon Sekkei International Inc.
3	Mr. Seiichi NAKAMURA	Facility Planner (Assistant)	Nihon Sekkei, Inc.

Explanation on Draft Report (August 22 to August 30, 2009)

No.	Name	Assignment title	Organization
1	Mr. Juichiro SASAKI	Leader	Chief Representative, Fiji Office, Japan International Cooperation Agency
2	Ms. Sonoko TAKAHASHI	Project Coordinator	Reproductive Health Division, Health Systems and Reproductive Health Group, Human Development Department, Japan International Cooperation Agency
3	Mr. Takeshi ENDO	Project Manager/ Architectural Planner	Nihon Sekkei International Inc.
4	Mr. Hideo NAKASHIMA	Cost and Procurement Planner	Nihon Sekkei, Inc.
5	Mr. Makoto SUZUKI	Equipment Planner	Nihon Sekkei International Inc.

2. Study Schedule

Basic Design Survey (March 9 to April 3, 2009)

Member / Date			JICA			Consultant					
			Leader	Project Coordinator	Technical Adviser	Project Manager/ Architectural Planner	Health Care/Nurcing Education	Equipment Planner/ Procurement	Architectural Designer	Facility Planner	Cost and Procurement Planner
1	March 9	Mon			Dep. Narita→						
2	10	Tue			Ar. Auckland Dep. Auckland →Ar. Nuku'alofa						
3	11	Wen			Visit JICA Office, MOH･Vaiola Hospital, Explain Inception Report, confirm Schedule, Hospital Tour						
4	12	Tha			Site survay for Hospital, Construction site, Present condition of Infrastructure						
5	13	Fri			Ditto						Dep. Narita →
6	14	Sat			Study for Basic Design						Ar. Auckland → Ar. Nuku'alofa
7	15	Sun			Team Meeting and Reviewing						Team Meeting and Reviewing
8	16	Mon	Dep. Narita →		Meeting with MOH Re. Nursing education etc.					Dep. Narita →	Local building marcket
9	17	Tue	Ar. Auckland Dep. Auckland →Ar. Nuku'alofa		Detail survey at Hospital					Ar. Auckland → Ar. Nuku'alofa	Local building marcket
10	18	Wen	Team Meeting, JICA, MOH, Hospital, Project site						Detail survey at Hospital		
11	19	Tha	Meeting with MOH Re. Project component, Minites of discussion						Detail survey at Hospital		
12	20	Fri	Meeting with MOH Re. Minites of discussion						Detail survey at Hospital		Local building marcket
13	21	Sat	Provisional						Detail survey at Hospital		ditto
14	22	Sun	Team Meeting and Reviewing								
15	23	Mon	Meeting with MOH Re. Minites of discussion								Local building marcket
16	24	Tue	Sign for M/M, JICA Office, EOJ						Design for M/E system, Equipment Plan		
17	25	Wen	Dep. Nuku'alofa→Ar. Auckland			Base line survey	Nuku'alofa→ Auckland	Base line survey	Meeting with Hospital Re. Project detail		Nuku'alofa→ Auckland
18	26	Tha	Dep. Auckland → Ar. Narita			Other donner	→ Ar. Narita	Other donner			Local building marcket
19	27	Fri				Meeting with Hospital Re. Project detail		Meeting with Hospital Re. Project detail			Local building marcket
20	28	Sat				Meeting with MOH Re. Project detail		Meeting with MOH Re. Project detail			Local building marcket
21	29	Sun				Team Meeting and Reviewing		Team Meeting and Reviewing			Local building marcket
22	30	Mon				Meeting with MOH Re. Technical memo		Dep. Nuku'alofa →Ar. Auckland	Meeting with MOH Re. Technical memo		Dep. Auckland → Ar. Narita
23	31	Tue				Sign for Technical memo		Local building marcket	Sign for Technical memo		
	April										
24	1	Wen				Dep. Nuku'alofa→Ar. Auckland		Dep. Auckland → Ar. Sydney	Dep. Nuku'alofa→Ar. Auckland		
25	2	Tha				Local building marcket		Local building marcket	Local building marcket		
26	3	Fri				Dep. Auckland → Ar. Narita		Dep. Sydney → Ar. Narita	Dep. Auckland → Ar. Narita		

Additional Survey (June 27 to July 5, 2009)

			Project Manager/ Architectural Planner	Solar Panel System Specialist	Facility Planner (Assistant)
1	June 27	Sat	Depart Narita -		
2	June 28	Sun	Arrival at Auckland Stay at Auckland		
3	June 29	Mon	Depart Auckland Arrival at Nuku Alofa Visit JICA Office		
4	June 30	Tue	Visit MOH (Purpose of visit, Confirm schedule for the meetings and site investigation etc.) Site survay and set up record devise、Meeting with Hospital maintenance staff		
5	July 1	Wed	Meeting with MOH、Meeting with Tonga Power Check power consummption record on site, Meeting with MOH regarding Solar system		
6	July 2	Thu	Meeting with MOH regarding Maintenace budget and Staff allocation, Market survay at Nuku Alofa1, Finish of recording, Collect material of data, Checking the data		
7	July 3	Fri	Reporting of survay, Reporting to MOH and Hospital Report to JICA Office		
8	July 4	Sat	Check record, Depart Nuku Alofa - Arrival at Auckland Stay at Auckland		
9	July 5	Sun	Depart Auckland- Arrival at Narita		

Explanation on Draft Report (August 22 to August 30, 2009)

Member / Date			JICA		Consultant		
			Leader	Project Coordinator	Project Manager/ Architectural Planner	Cost and Procurement Planner	Equipment Planner
1	August 22	Sat		Narita→			
2	August 23	Sun		Auckland			
3	August 24	Mon	Suva→Nuku'alofa Visit JICA Office	Auckland → Nuku'alofa Visit JICA Office			
4	August 25	Tue	Discussion at MOH (Explanation of Preparatory Survey (Basic Design) Report)				
5	August 26	Wed	Discussion at MOH on Minutes of Discussions				
6	August 27	Thu	Discussion at MOH on Minutes of Discussions				
7	August 28	Fri	Discussion at MOH on Minutes of Discussions, Signing of Minutes of Discussions Report to JICA Office & Embassy of Japan				
			Nuku'alofa → Suva				
8	August 29	Sat		Nuku'alofa → Auckland			
9	August 30	Sun		Auckland → Narita			

3. List of Parties Concerned in the Recipient Countries

Tonga Side

Ministry of Health

Dr. Viliami T. Tangi	Minster of Health
Dr. Litili ‘Ofanoa	Director of Health
Mr. Tuakoi Ahio	Principal Health Administrator
Dr. Malakai ‘Ake	Chief Medical Officer, Public Health
Mr. Viliami Ika	Project Coordinator
Mr. Sione Hufanga	Principal Health Planning Officer

Vaiola Hospital

Dr. Siale Akauola	Medical Superintendent of Vaiola Hospital
Dr. Silio Tomiki	Chief Dental Officer of Vaiola Hospital
Dr. Ana Aicauola	Senior Medical Officer, Radiology
Dr. Paula S. Vivili	Senior Medical Officer, Opthalmology, Diabetes, Health Promotion
Dr. Veisinia Matoto	Medical Officer Incharge, Medical Ward
Dr. Moana Tupou	Medical Officer Incharge, Outpatient/A&E
Dr. Toakase Fakakovikaetau	Medical Officer In-charge, Pediatric Ward
Dr. 'Sione Talanoa Latu	Medical Officer In-charge, Orthopedics
Dr. Lisiate 'Ulufonua	Registrar
Dr. Lei Schaaf	Surgeon In-charge, ENT
Dr. Semisi Latu	Senior Medical Officer, Obstetrics
Ms. Ana Navaefiafi	Chief Nursing Officer
Sr. ‘Ofa Takulua	Matron
Sr. Pinomi Latu	Sister Incharge, Outpatient/A&E
Mr. Sione Po'uliva'ati	Physiotherapist
Mr. Siutaka Siua	Seinior Pharmacist
Mr. Sione Veilofia	Senior Medical Record Officer
Ms. Leva'ita ‘Asaeli	Pharmacist
Ms. Ana Navaefiafi	Chief Nursing Officer
Mr. 'Feleti Eke	Mechanical Supervisor
Mr. Tu'Amelie Paea	Computer Programmer
Mr. Clifton Latu	Computer Operator

School of Nursing

Sr. Tilema Cama	Principal

Ministry of Foreign Affairs

Mr.Vainga Tone	Secretary

Ministry of Finance

Mr. Aisake Eke	Secretary of Finance
Ms. Natalia V. Palu	Principal Economist, Aid Management Division

Revenue Service Department

Ms. Lepaola Vaes	Dupty Commissioner of Revenue

Ministry of Works

Mr. Leveni ‘Aho	Deputy Director of Works

AusAID

Ms. Telusa Hepisipa Fotu	Senior Policy Manager
Ms. Barbara Tu'ipulotu	Program Manager

The Embassy of the People's Republic of China

Mr. Huang Yue Guo	First Secretary(Economic & Commercial)

Tonga Power Limited

Mr. Murray David	Superintendant/outer Islands Manager-Power Station

Tonga Water Board

Mr. Pita Moala	Project Manager
Mr. Mafua	Chief Enfineer

Fire Department

Mr. Lofla Heimuli	Chief Fire Officer

BOC TONGA LTD(Gas Provider)

Mr. Arvind Kumar

OSCOM Ltd.(Telecommunication Company)

Mr. Timote Tuitavuki

Japan Side

Embassy of Japan

Mr. Yasuo Takase	Ambassador Extraordinary and Plenipotentiary
Mr. Akira Ouchi	Counsellor
Ms Naoko Masuhara	Researcher

JICA Tonga Office

Mr. Nobuaki Matsui	Resident Representative
Ms Takako Fujise	Coordinator
Mr. Masafumi Inoue	Coordinator

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR UPGRADING AND REFURBISHMENT
OF VAIOLA HOSPITAL (PHASE II)
IN THE KINGDOM OF TONGA

In response to a request from the Government of the Kingdom of Tonga (hereinafter referred to as "Tonga"), the Government of Japan decided to conduct a Preparatory Survey on the Project for upgrading and refurbishment of Vaiola Hospital (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Kingdom of Tonga the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Hitoshi Ara, Assistant Director, Urban and Regional Development Group, Economic Infrastructure Department, JICA, and is scheduled to stay in the country from March 10th to March 31st, 2009.

The Team held discussions with the officials concerned of the Government of the Kingdom of Tonga and conducted a field survey at the study area.

In the course of discussions and field survey, both sides have confirmed the main items described on the ATTACHMENT. The Team will proceed to further works and prepare the Preparatory Survey Report.

Nuku'alofa, March 24th, 2009

Mr. Hitoshi ARA
Leader
Preparatory Survey Team
Japan International Cooperation Agency

Dr. Litili OFANOA
Director of Health
Ministry of Health
Kingdom of Tonga

ATTACHMENT

1 Objective of the Project

The objective of the Project is to improve the medical service function of Vaiola Hospital in Nuku'alofa in the Kingdom of Tonga through the improvement and upgrading of the medical facilities and equipment.

2 Project site

The site of the Project is Vaiola Hospital in Nuku'alofa, Tongatapu Island. The location is shown in Annex-1.

3 Responsible and Implementing Agency

3-1 The Responsible Agency and the Implementing Agency are the Ministry of Health of Tonga.

3-2 Organization chart including above Agencies is shown in Annex-2.

3-3 Both sides agreed to set up the Steering Committee and the Project Task Force to implement the Project smoothly. The Tonga side also agreed to inform the members of the above committees when the Team returns to explain the draft basic design.

4 Items requested by the Tonga side

After discussions with the Team, the items described in Annex-3 (facilities) and Annex-4 (equipment) were finally requested by the Tonga side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

5 Japan's Grant Aid Scheme

5-1 The Tonga side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-5.

5-2 Both sides will take necessary measures described in Annex-6, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6 Schedule of the Study

6-1 The consultants will proceed to further studies in Tonga until March 31st, 2009.

6-2 JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around August 2009.

6-3 In case that the contents of the report is accepted in principle by the Government of Tonga, JICA will complete the final report and send it to the Government of Tonga by October 2009.

7 Other relevant issues

7-1 Sustainability of the Project

(1) The Tonga side agreed to allocate sufficient budgets to manage Vaiola Hospital, to operate the equipment supplied by the Project, and to cover the provision of spare parts, consumables, reagents, and periodical maintenance contracts.

(2) The Tonga side ensured to assign sufficient number of the following qualified staff for operation and maintenance of building and equipment.

- Maintenance Engineer(s)
- Mechanical Technician(s)
- Electrician(s)

7-2 Confidentiality of the Project

Both sides confirmed that the detailed specification of the drawings, equipment and other technical information shall not be released before the tender to be held in the implementation stage of the Project.

7-3 Undertakings by the Tonga side

In addition to the major undertakings described in the Annex-6, the Tonga side confirmed;

(1) to conduct necessary demolition and leveling works for the new facilities constructed by the Project and relocate function of the facility,

(2) to complete necessary clearance or diversion works of existing infrastructure located in or around the Project site including underground works,

(3) to transfer the existing equipment and furniture to be placed in the new building(s) after the completion of the Project.

7-4 Criteria of Equipment Selection

Both sides agreed to the following selection criteria of equipment.

(1) Concordance with the functions and activities of the Project facilities

(2) Current condition and insufficient numbers of the existing equipment

(3) Available technical staff to operate and maintain the equipment

(4) Accessibility of procurement of spare parts and consumables for the equipment

(5) Technical and financial feasibility of operation and maintenance of the equipment

7-5 Criteria of Architectural Planning

Both sides agreed to review the Master Plan based on the following criteria.

(1) Current usage of the functions (number of patients, consultation time per patient, consultation hours. etc...)

(2) The number of medical staff

(3) Characteristic of the functions

7-6 Renovation of the Existing OPD Building

The Team explained its findings on the durability of the existing OPD building and the nursing school building. However, the Tonga side expressed the possibility of continuing to use a part of the OPD building as the public health facility for the time being. The Team will conduct further survey for the durability of the building and will make technical advice on the renovations to be conducted by the Tonga side.

7-7 Request for the Location of Facilities in Buildings

The Tonga side requested to locate the facilities in buildings as follows. The Team agreed to consider the requests in the architectural planning.

(1) The dental clinic, the outpatient clinic, the ante-natal clinic and the diabetes clinic should be arranged to avoid congestion of waiting space and mixing of circulation, due to the large number of patients for the facilities.

(2) The ophthalmology clinic and the diabetes clinic should be located in close proximity as they share patients in common.

7-8 Medical Solid Waste

The Team explained the importance of the adequate management of medical solid waste. The Tonga side ensured to install autoclave sterilization facilities in the rear side of the hospital.

7-9 Operational Cost

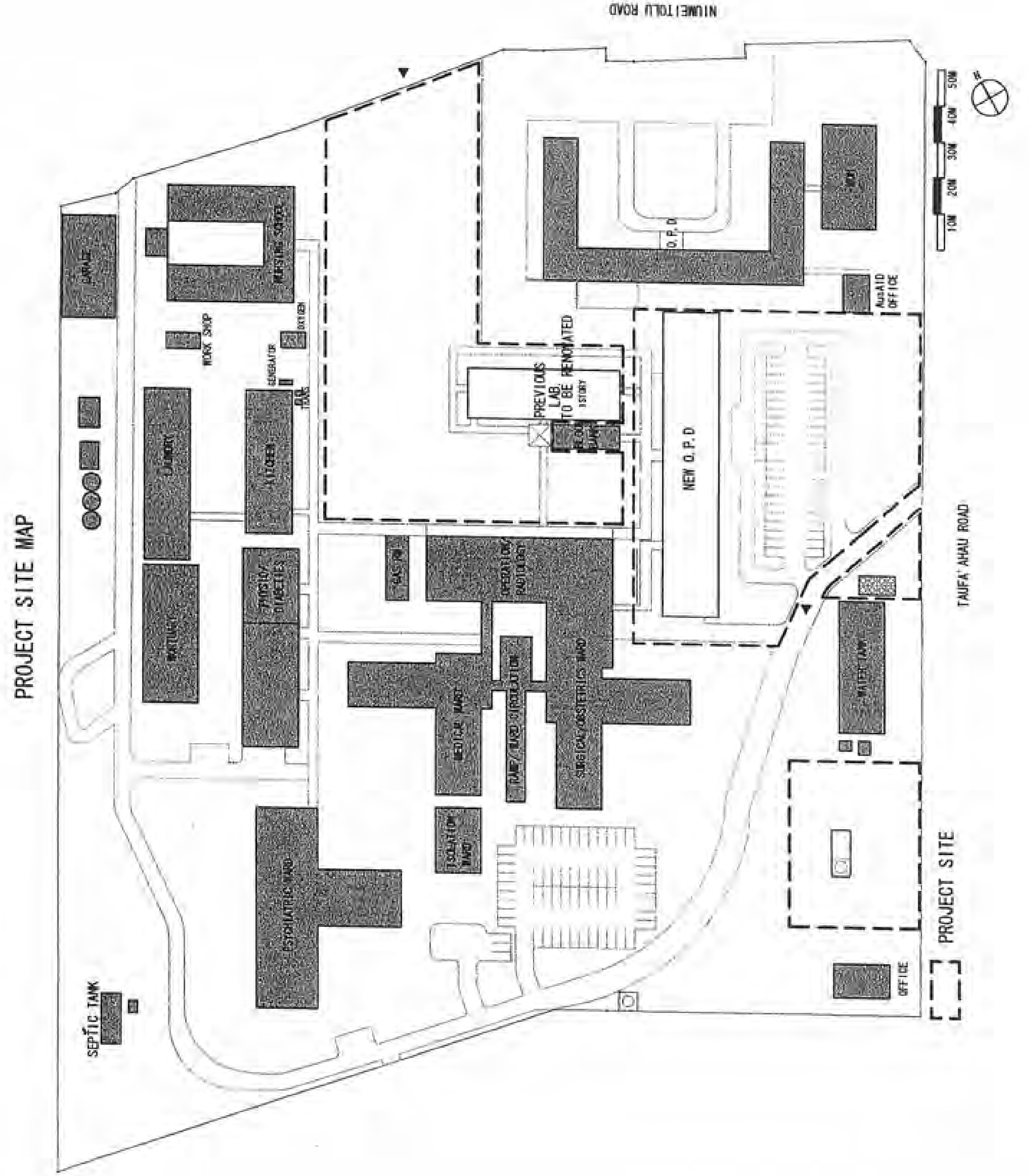
The Tonga side requested measures to reduce operational cost including rain water reservoirs and other systems. The Tonga side also emphasized the importance of introduction of a solar panel system as it is in line with the policy of the Government of Tonga on utilization of renewable energy sources. The Team explained the need for further study on their feasibility and appropriateness.

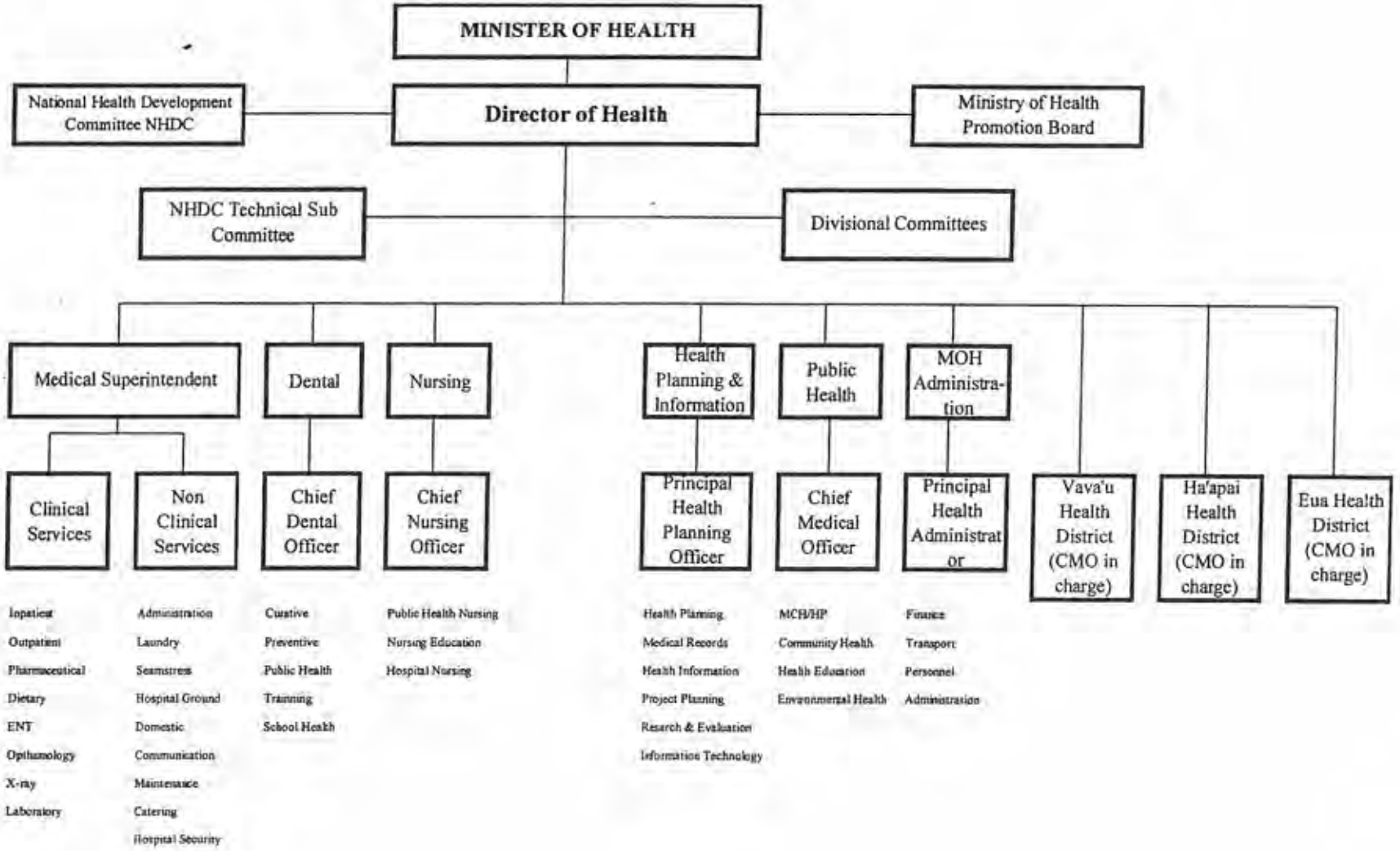
7-10 Training for Building Facilities and Equipment

The Tonga side requested technical support for facility (buildings, electrical, mechanical, and so on) and equipment maintenance. The Team explained the need for further study.

Annex-1:	Project Sites Map
Annex-2:	Organization Chart
Annex-3:	Requested Items (Facilities)
Annex-4:	Requested Items (Equipment)
Annex-5:	Japan's Grant Aid Scheme
Annex-6:	Major Undertakings to be taken by Each Government

Annex-1


PROJECT SITE MAP
NIUMEITOLU ROAD
TAUFA'AHAU ROAD
10M
20M
30M
40M
50M
O.P.D
AusAID OFFICE
PREVIOUS LAB TO BE RENOVATED
1STORY
NEW O.P.D
NURSING SCHOOL
GARAGE
WORK SHOP
OXYGEN
GENERATOR
LAUNDRY
KITCHEN
MORTUARY
PHYSIO/DIABETES
OPERATION/RADIOLOGY
SURGICAL/OBSTETRICS WARD
MEDICAL WARD
ISOLATION WARD
PSYCHIATRIC WARD
WATER TANK
SEPTIC TANK
OFFICE
PROJECT SITE


MINISTER OF HEALTH
National Health Development Committee NHDC
Director of Health
Ministry of Health Promotion Board
NHDC Technical Sub Committee
Divisional Committees
Medical Superintendent
Dental
Nursing
Health Planning & Information
Public Health
MOH Administra-tion
Clinical Services
Non Clinical Services
Chief Dental Officer
Chief Nursing Officer
Principal Health Planning Officer
Chief Medical Officer
Principal Health Administrat or
Vava'u Health District (CMO in charge)
Ha'apai Health District (CMO in charge)
Eua Health District (CMO in charge)
Inpatient
Outpatient
Pharmaceutical
Dietary
ENT
Opthamology
X-ray
Laboratory
Administration
Laundry
Seamstress
Hospital Ground
Domestic
Communication
Maintenance
Catering
Hospital Security
Curative
Preventive
Public Health
Trainning
School Health
Public Health Nursing
Nursing Education
Hospital Nursing
Health Planning
Medical Records
Health Information
Project Planning
Research & Evaluation
Information Technology
MCH/HP
Community Health
Health Education
Environmental Health
Finance
Transport
Personnel
Administrasion

Annex -2

Annex-3

Requested Items (Facilities)

Priority	Main function	Contents of function
1st	Hospital	Outpatients department Accident & Emergency Special clinics Ophthalmology & ENT Antenatal clinic Physiotherapy Dental health clinic Outpatient pharmacy Main entry/ Reception/ Admission Accounts Hospital administration Medical records
2nd	Hospital Training Others Others	2-1 Diabetes clinic 2-2 Nursing school/ Training 2-3 Mortuary 2-4 Public Health

Annex-4

Requested Items (Equipment)

Name of Equipment	Priority	Requested Quantity
1. Emergency and Outpatient Department		
1 Defibrillator	A	1
2 Emergency Cart	A	1
3 Electrocardiograph	A	2
4 Patient Monitor	A	2
5 Nebulizer	A	2
6 Suction Unit	A	2
7 Examination Light	A	5
8 Patient Trolley	A	2
9 Emergency Trolley	A	1
10 Tabletop Autoclave	A	2
11 Weighing Scale, Adult	A	1
12 Weighing Scale, Infant	A	1
13 Height Scale	A	1
14 Operating Light	A	1
15 Wheel Chair	A	1
16 Digital Thermometer	A	1
17 Pulse Oximeter	A	2
18 Infusion Pump	A	1
19 Portable Glucometer	A	1
20 IV Stand	A	8
21 Observation Bed	A	6
22 Triage Beds	A	2
23 Diagnostic Set	A	3
24 Dressing Trolley	A	8
25 Sphygmomanometer	A	6
26 IVF Warmer	A	1
27 Ultrasound with Color Doppler	B	1
28.Treatment Instrument Set	B	2
29 Laringoscope for Adult	B	1
30 Laringoscope for Infant	B	1
31 Tracheotomy Instrument Set	B	1
32 Resuscitation Bag for Adult	B	1
33 Resuscitation Bag for Infant	A	1
34 Film Illuminator	B	6
35 Oxygen Flowmeter	A	6
36 Surgical Scrub Station	B	2
37 Instrument Cabinet	B	1
38 Examination Table	A	7
39 Syringe Pump	A	1
40 Portable Oximeter	B	1
2. Special Clinic		
1 Weighing Scale, Adult	A	1
2 Weighing Scale, Infant	A	1
3 Diagnostic Set	A	2
4 Sphygmomanometer	A	1
5 Pulse Oximeter	A	1
6 Height Scale	A	1
3. ENT		
1 Nasal Polypectomy Instrument Set	B	1
2 Tonsillectomy Instrument Set	B	1
3 Laryngectomy Instrument Set	B	1
4 Suction Machine	B	1
5 Pulse Oximeter	A	1
6 Bronchofiberscope	B	1
7 Cleft Lip Plasty Instrument Set	B	1
8 Mastoidectomy Instrument Set	B	1
9 ENT Treatment Unit	B	1
10 Examining Instrument Set	B	1
11 Film Illuminator	B	1
12 Audiometer	B	1

Name of Equipment	Priority	Requested Quantity
13 Sound Proof Unit	B	1
4. Ante-natal		
1 Fetal Doppler	A	2
2 Examination Light	A	4
3 Fetoscope	A	1
4 Sphygmomanometer	A	1
5 Weighing Scale, Adult	A	1
6 Weighing Scale, Infant	A	1
7 Examination Table	A	1
8 Gynecological Examination Table	A	2
9 Portable Glucometer	A	2
10 Instrument Trolley	A	1
11 Patient Trolley	A	1
12 IV Stand	A	1
13 Wheel Chair	A	1
14 Vaginal Instrument Set	A	1
5. Physiotherapy	A	6
1 Therapy Bed		
2 Ultrasound Therapy Apparatus	B	1
6. Outpatient's Pharmacy	A	1
1 Cupboard for Dangerous Drugs		
2 Medical Refrigerator	B	1
3 Water Distiller	B	1
4 Water Filter	B	1
5 Electronic Balance	B	1
6 Medicine Trolley	B	1
7 Small Instrument Set	B	1
7. Dental Health	B	1
7.1 Detal Clinic		
1 Dental Unit	A	11
2 Tabletop Autoclave	A	2
3 Dental X-ray Unit	A	1
4 Panoramic X-ray Unit	B	1
5 X-ray Film Developer	A	1
6 Ultrasonic Scaler	A	6
7 Amalgamator	A	6
8 Light Curing Unit	A	6
9 Extraction Instrument Set	A	1
10 Dental Instrument Set	A	4
11 Oral Surgery Equipment Set	B	2
12 Surgical Micromotor	B	1
13 Apex Locator	B	1
14 Water Distiller	B	1
7.2 Dental Laboratory		
1 Model Trimmer	A	1
2 Resin Curing Unit, Pressure Pot	A	1
3 Vibrator	A	1
4 Laboratory Lathe	A	1
5 Resin Curing Unit	A	1
6 Vacuum Mixer	A	1
7 Pencil Stand Blaster	A	1
8 Thermoplastic Pressure Former	A	1
9 Laboratory Micrometer	A	1
10 Centrifugal Casting Machine	A	1
11 Burnout Furnace	A	1
12 Hydraulic Flask Press	A	1
13 Articulator	A	1
14 Impression Tray	A	1
15 Flasks Set	A	20
16 Hydro Flask	B	1
17 Dental Bunsen Burner	B	2
18 Hanging Motor	B	1
19 Thermo Forming Unit	B	1
20 Electric Wax Knife	B	1

Name of Equipment	Priority	Requested Quantity
21 Polishing Unit	B	1
22 Dust Collector	B	1
23 Dental Laboratory Instruments	B	1
8. School of Nursing		
8.1 Model, Manequin, etc.		
1 Anatomical Human Body Male	B	1
2 Anatomical Human Body Female	B	1
3 Human Skelton	A	1
4 Circulatory System Model	A	1
5 Respiratory Organ Model	A	1
6 Nasal/Throat/Pharynx Model	A	1
7 Pregnant Uterus Model	A	1
8 Training Dummy for Dressing	A	1
9 Phantom for Delivery	A	1
10 Injection Simulator	A	2
11 Nursing Care Manikins for Dressing Techniques	A	1
12 Nursing Care Manikins for Patient Care	A	1
13 Clinical Procedure Training Manikin	A	1
14 Resuscitation Simulator	A	1
15 Child Care Simulator	A	1
16 Pediatric Care Simulator	A	1
17 Newborn Advance Care Simulator	A	1
18 Torso Model	A	1
19 Heart Disease 3D Display Model	B	1
20 Death of an Artery Model	A	1
21 Nasogastric Tube Feeding Model	B	1
22 Heart Model	B	1
23 Functional Larynx Model	B	1
24 Mini Brain model	B	1
25 Mini Kidney Model	B	1
26 Skin Section Model	A	1
27 Median Section of the Head Model	B	1
28 Functional Heart System model	B	1
29 Functional Eye	B	1
30 Placenta Model	B	1
8.2 Education Charts, etc.		
1 Cholesterol Anatomy Poster	A	1
2 3-D Pyramid	B	1
3 Diabetes Teaching Kit	A	1
4 Nutrition Diabetes Folding Display	A	1
5 Understanding Diabetes Poster	A	1
6 Chart Stand	A	1
7 Arthritis Chart	A	1
8 Human Ear Wall Chart	A	1
9 Skin Cancer Chart	A	1
10 Asthma Chart	A	1
11 Hypertension Chart	A	1
12 Hepatitis Chart	A	1
13 Cholesterol Chart	A	1
8.3 Medical Equipment for Education		
1 Neonatal Cot	A	1
2 Wheel Chair	A	1
3 Nursing Utensils Set	A	1
4 Irrigator Stand	A	1
5 Instrument Trolley	B	1
6 Binocular Microscope	A	1
7 Nebulizer	A	1
8 Walking aids-crutches, walter and tripod	B	1
9 ECG Machine	A	1
10 Sphygmomanometer	A	1
11 Thermometer	A	1
12 Patient Bed	B	2
13 Stretcher	B	1
14 Weighning Scale for Infant	B	1

Name of Equipment	Priority	Requested Quantity
15 Examination instrument Set	B	1
16 Suction unit	B	1
17 Oxygen Set	B	1
18 Commode Chairs	B	1
8.4 Equipment for Education		
1 TV System	B	1
2 VTR	B	1
3 VCD	B	1
4 Screen	B	1
5 LCD Projector System	B	1
6 White Board	A	3
7 Amplifier System	B	1
8 Copying Machine	B	1
9 Small Printing Machine	B	1
10 Computer with Printer	B	1
11 Printer for Computer (MP-3)	B	1
12 Cabinet	B	1
13 Digital Recording Camera	B	1
9. Public Health		
1 Weighing Scale, up to 200kg	A	2
2 Height Scale	A	2

Legend:

Priority A: Equipment necessary to carry out the Vaiola Hospital's function

Priority B: Equipment necessary to carry out the Vaiola Hospital's function but further study is required.

Note: Quantities are subject to change due to coordination with the facility

JAPAN'S GRANT AID SCHEME

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as part of this realignment, JICA was reborn on October 1, 2008. After the reborn of JICA, following the decision of the Government of Japan (hereinafter referred to as "the GOJ"), Grant Aid for General Project is extended by JICA.

Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

Japanese Grant Aid is conducted as follows-

・Preparatory Survey (hereinafter referred to as "the Survey")
- the Survey conducted by JICA

・Appraisal &Approval
-Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet

・Determination of Implementation
-The Notes exchanged between the GOJ and a recipient country (E/N)

・Grant Agreement (hereinafter referred to as "the G/A")
-Agreement concluded between JICA and a recipient country

・Implementation -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the E/N will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey Will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-6.

(6) "Proper Use"

The Government of recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making

payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

Annex-6

Major Undertakings to be taken by Each Government

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land		•
2	To clear, level and reclaim the site when needed		•
3	To construct gates and fences in and around the site		•
4	To construct the parking lot	•	
5	To construct roads		
	1) Within the site	•	
	2) Outside the site		•
6	To construct the building	•	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1)Electricity		
	a.The distributing line to the site		•
	b.The drop wiring and internal wiring within the site	•	
	c.The main circuit breaker and transformer		•*1
	2)Water Supply		
	a.The city water distribution main to the site		•*2
	b.The supply system within the site (receiving and/or elevated	•	
	3)Drainage		
	a.The city drainage main (for storm, sewer and others) to the site		(•)
	b.The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	•	
	4)Gas Supply		
	a.The city gas main to the site		(•)
	b.The gas supply system within the site	•	
	5)Telephone System		
	a.The telephone trunk line to the main distribution frame / panel (MDF) of the building		•
	b.The MDF and the extension after the frame / panel	•	
	6)Furniture and Equipment		
	a.General furniture		•
	b.Project equipment	•	
8	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
9	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	

10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		•
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		•
13	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		•

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)
*1 Existing 300kva transformer to be replaced by new 500kva transformer.
*2 New city water inlet from Taufaáhau road to new receiving tank is to be provided.

MINUTES OF DISCUSSIONS
ON PRELIMINARY STUDY
ON THE PROJECT FOR UPGRADING AND REFURBISHMENT
OF VAIOLA HOSPITAL (PHASE II)
IN THE KINGDOM OF TONGA
(EXPLANATION ON DRAFT REPORT)

In March 2009, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Preliminary Study Team on the Project for Upgrading and Refurbishment of Vaiola Hospital (Phase II) (hereinafter referred to as "the Project") to the Kingdom of Tonga (hereinafter referred to as "Tonga"), and through discussion, field survey, and technical examination of the study results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult the Tonga side on the components of the draft report, JICA sent to Tonga the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Juichiro Sasaki, Chief Representative, JICA Fiji Office, and is scheduled to stay in the country from August 24 to August 29, 2009.

In the course of discussions, both sides have confirmed the main items described in the ATTACHMENT. The Team will proceed to further works and prepare the Basic Design Study Report.

Nuku'alofa, August 28, 2009

Mr. Juichiro SASAKI
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
Japan

Dr. Siale 'Akau'ola
Director of Health
Ministry of Health
Kingdom of Tonga

ATTACHMENT

1. Components of the Draft Report

The Tonga side agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid Scheme

The Tonga side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Tonga as explained by the Team and described in Annex-5 and Annex-6 of the Minutes of Discussions signed by both sides on March 24, 2009.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to Tonga by October 2009.

4. Confidentiality of the Project

Both sides confirmed that all information related to the Project including detailed specifications of equipment and other technical information shall not be released to any outside parties before the signing of all the Contract(s) for the Project.

5. Other Relevant Issues

5-1 Confidentiality of the Project Cost Estimation

The Team explained the cost estimation of the Project as described in Annex-1. Both sides agreed that the Project Cost Estimation should never be duplicated or released to any outside parties before the signing of all the Contract(s) for the Project. Tonga side understands that the Project Cost Estimation described in Annex-1 is not final and is subject to change.

5-2 Scope of Works

The issues discussed between the Team and the Tonga side are as follows:

(1) The Tonga side requested that the number of a mortuary refrigerator should be increased, based on the necessary number of deceased bodies to be kept in refrigerator, which ranged from 0 to 7 during last 9 months. The Team understood the necessity to increase the number of a mortuary refrigerator from 1 to 2 to keep 4 deceased bodies, while the space for 3 refrigerators for the mortuary would be included in the design, so that the Tonga side could procure another mortuary refrigerator to keep 6 deceased bodies at most.

(2) Regarding the issue mentioned above (1), the area for the mortuary which is designed as 81.7 m^2 should be expanded to keep the space for 3 mortuary refrigerators. The Team understood the necessity for such change, as

reflected in the design drawings attached hereto as Annex-3-1.

(3) The Tonga side requested that the space for VIP patients of the dental unit should be a separate room with a toilet because of the Tongan dignified cultural tradition, while it is suggested as a section of the dental room. The Team understood the necessity for such change, as reflected in the design drawings attached hereto as Annex-3-2.

(4) The Tonga side requested that the waiting space of the dental unit should be converted into a room for dental pathologist, while the waiting space should be secured in the other area. The Team understood the necessity of such change, as reflected in the design drawings attached hereto as Annex-3-2.

(5) Regarding the issue mentioned above (4), the Tonga side requested that the waiting space for 30 people of the dental unit should be prepared as the outside covered waiting space along with the corridor near to the dental unit. The Team understood the necessity of such change, as reflected in the design drawings attached hereto as Annex-3-2.

(6) The Tonga side requested that 3 doors should be included for the multipurpose for the security and management purpose. The Team understood the necessity of such change, as reflected in the design drawings attached hereto as Annex-3-3.

(7) The Tonga side requested that the plaster space of the accident and emergency (A&E) in the first floor of the outpatient department (O.P.D) should be separated from the treatment room for operational reason. The Team accepted such change, as reflected in the design drawings attached hereto as Annex-3-4. The both sides confirmed that the estimated cost increase would be predicted as minimum.

(8) The Tonga side requested that 2 simulations rooms of the nursing school should be 1 room with the wider preparation space. The Team accepted such change, as reflected in the design drawings attached hereto as Annex-3-5. The both sides confirmed that the estimated cost increase would not be predicted.

(9) The Tonga side requested that 2 changing rooms in the second floor of the O.P.D. should be converted to the consultant rooms and the security room should be converted to the office based on the needs of the rooms in this section. The Team accepted such change, as reflected in the design drawings attached hereto as Annex-3-6. The both sides confirmed that the estimated cost increase would not be predicted.

(10) Both side agreed that a solar power system with a 30 KW capacity, which is approximately 20% of the total electrical consumption of the hospital, should be included in the scope of works of the Project.

Based on the above, both sides agreed, as the scope of works of the Project, the outline of the project described in Annex-2, design drawings described in Annex-3 with

several changes as reflected in Annex-3-1 to Annex-3-6 based the discussion between the Team and the Tonga side, and equipment list described in Annex-4.

Both sides also noted that the changes indicated in above (1), (2), (3), (4), (5) and (6) would cause the increase of the project cost estimation. Although further cost estimation is necessary, the Team pointed out that the predicted cost increase could be covered under the total project cost estimation indicated in above 5-1, by decreasing the number of air conditioners for the facilities of the Project. In reply, the Tonga side explained that all of the changes indicated in above (1) to (6) are necessary, and it would rather decrease the number of air conditioners to accommodate the necessary changes. Both sides agreed on these changes, and confirmed that such changes will be subject to approval of the Government of Japan.

5-3 Operation and Maintenance Cost

The Tonga side agreed to secure and allocate necessary budget and a staff for the proper and sustainable operation and maintenance of the facilities and the equipment to be provided under the Project as described in Annex-5.

The Tonga side also confirmed that it should allocate a maintenance staff for building and medical equipment including solar power system. Maintenance organization is described in Annex-6; however, currently the chief engineer, mechanical technician, and electrical technician posts are vacant. To address this issue, the Tonga side explained that it has already secured budget for hiring a chief engineer under the fiscal year (FY) 2009 budget (from July 2009 to June 2010) and it is currently looking for an appropriate personnel, while it has not secured any budget for hiring a mechanical technician and an electrical technician. The Team requested that the Tonga side should secure the budget for hiring a mechanical technician and an electrical technician under FY 2010 budget. The Tonga side agreed to it.

5-4 Obligation Works by the Tonga side

The Tonga side agreed to implement necessary infrastructure works and construction works related to the Project, such as demolition of existing two buildings, temporary relocation of pharmacy, PBX and IT server and these lines, by appropriate time with securing necessary budget allocation for expenses for such works as described in Annex-7. The Team explained that the timely completion of the obligation works by the Tonga side based on the schedule in Annex-7 is crucial for Japanese side to implement its works as scheduled, and in case that works by the Tonga side would be behind the schedule for certain period of time, Japanese side might have to re-schedule its implementation schedule accordingly.

5-5 Building Permission and Other Necessary Approval

The Tonga side confirmed that it should assign local architect and engineers.

The Tonga side explained the procedure for the design approval and building

permission, which the Ministry of Health would endorse drawings for submission and receive approval from the Ministry of Public Works. The Tonga side further described that it could proceed with the both process simultaneously, and necessary duration would be 3 months at most. The Tonga side confirmed that such process would be completed before tender notice for the Project.

5-6 Tentative Schedule of the Project

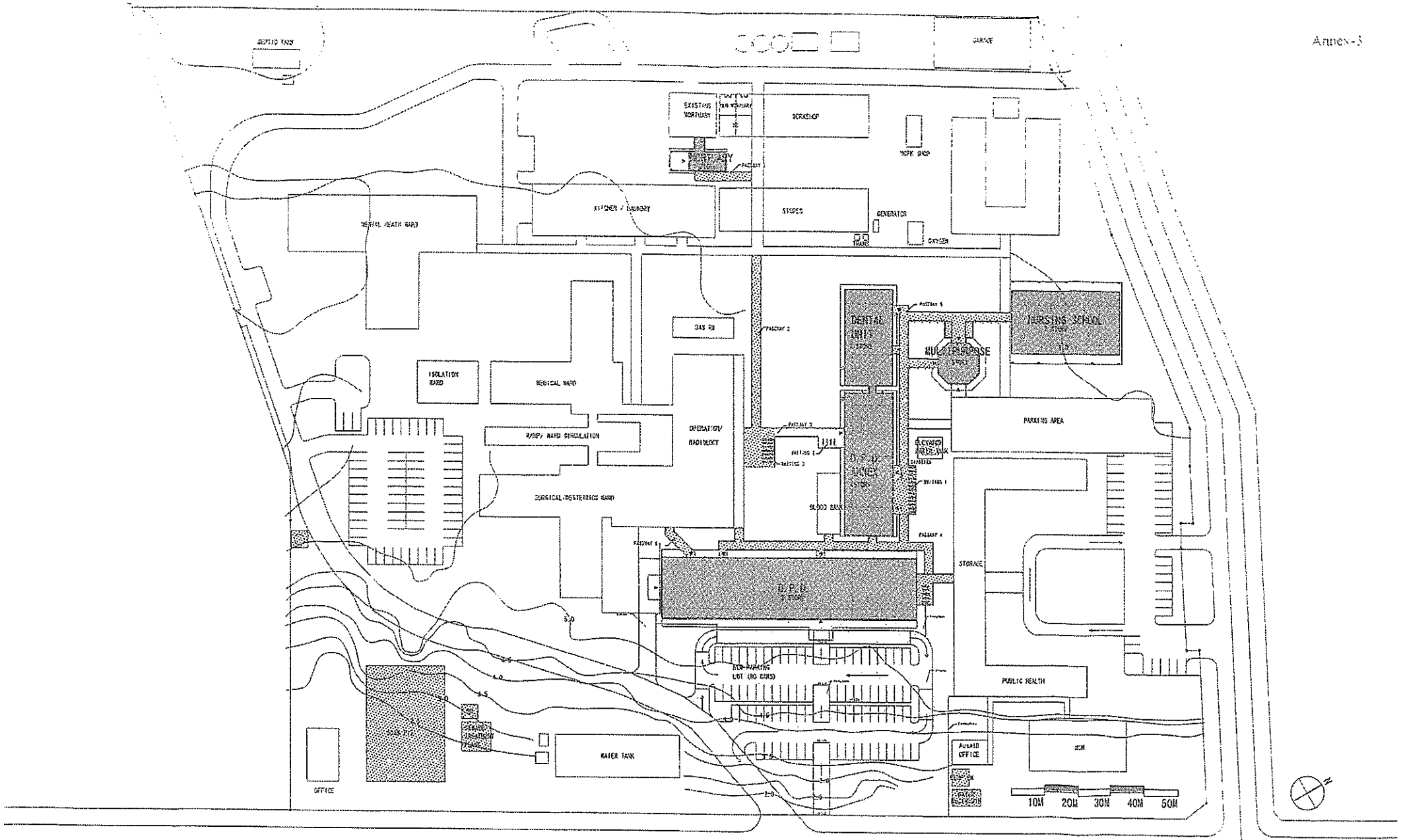
The tentative schedule of the Project is described in Annex-8.

Annex-1 Project Cost Estimation
Annex-2 Outline of the Project
Annex-3 Design Drawings
Annex-4 Equipment List
Annex-5 Operation and Maintenance Cost for Facilities and Equipment
Annex-6 Maintenance Organization
Annex-7 Undertakings by the Tonga side
Annex-8 Tentative Schedule of the Project

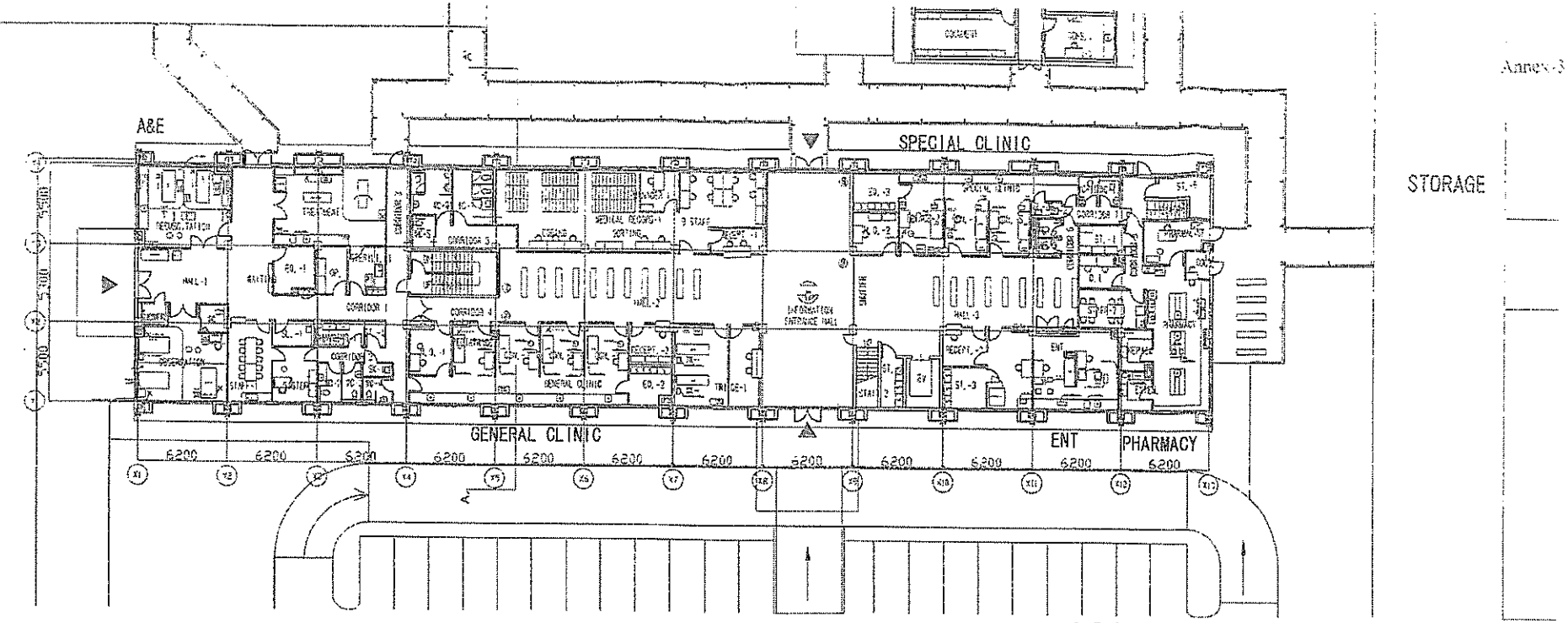
Outline of the Project

Major project breakdown (total floor area)	Composition of Facilities	Contents of each Composition	
Facility (5,108.6 ㎡)	O.P.D. New two storied building, 2,280.0 ㎡	Basement floor: First floor O.P.D.: Second floor Antenatal: Administration: Training: IT Service:	Pit for Rainwater Reservoir Waiting Hall, General Clinic, Accident and Emergency, Special Clinic(Internal Medicine, Surgical, ENT), Pharmacy of Outpatients Waiting Hall, Consulting rooms Medical Office, Accounts Training room, Lecture room IT office, Server room
	O.P.D. ANNEX Renovated single storied building, 582.4 ㎡	O.P.D.:	Ophthalmology, Diabetes, Physiotherapy
	Dental Unit New single storied building 396.1 ㎡		Dental room, Dental tech. room, X-ray room, Machine room, Waiting Space
	Multipurpose New single storied building 126.0 ㎡		Waiting Space(Multipurpose use)), Storage for furniture
	Nursing School New single storied building 596.1 ㎡		Class room, Simulation room, Library, Computer room, Office
	Mortuary New single storied building 98.4 ㎡		Morgue, Hall
	Outside waiting space, Passage with covered Roof 987.7 ㎡		Waiting space for Pharmacy of Outpatients, Ophthalmology, Diabetes, Physiotherapy Covered Passage connecting the project facilities and existing facilities
	Ancillary Mechanical Facility New single storied Building 41.9 ㎡		City Water pump room, Sewage water pump room, City Water Reservoir Tank, Elevated water reservoir tank, Sewage treatment plant
Medical Equipment	The equipment necessary for the project facilities(Accident and Emergency, General Clinic, Special Clinic, Antenatal, Physiotherapy, Pharmacy of Outpatients, Dental, Nursing School, Mortuary, etc)		

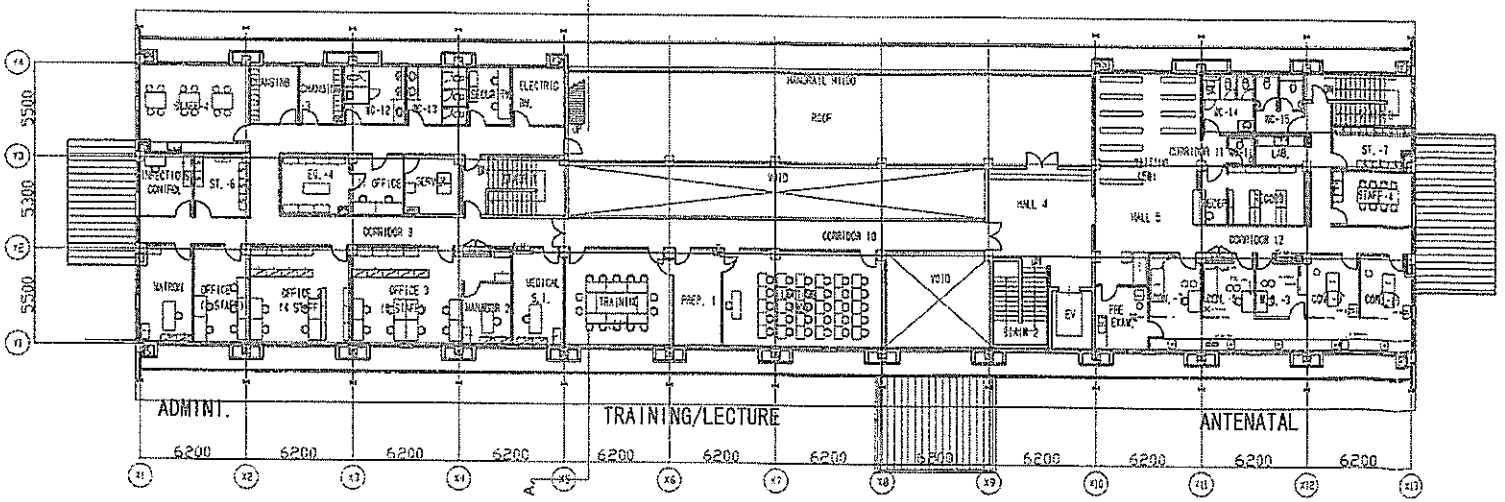
Annex-3



PROJECT BUILDING AND AREA | BUILDING | PASSWAY, WAITING & MECHANICAL PLANT | EXTERIOR WORK

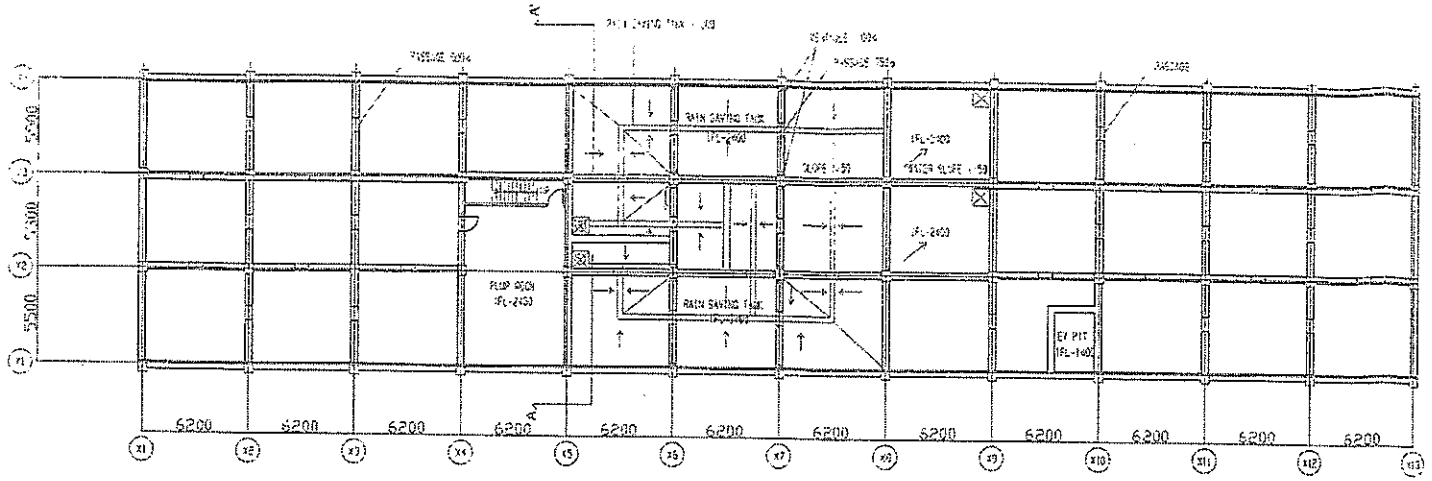


O.P.D. FIRST FLOOR PLAN SCALE 1/300

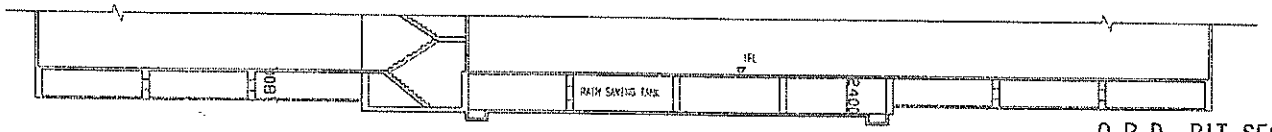


ABBREVIATION							
	RECEPT. RECEPTION	STERIL. STERILIZATION	EQ. EQUIPMENT STORAGE	D.I. DRUG INFORMATION
	ST. STORAGE	M.O. MEDICAL OFFICER	PREP. PREPARATION	WC TOILET
	EXAM. EXAMINATION	RECEPT. RECEPTION	NS NURSE STATION	EXPEP EXPERIMENTAL PREPARATION ROOM
	SL. SLUICE	COUNS. COUNSELLING	M.R. MACHINE ROOM	

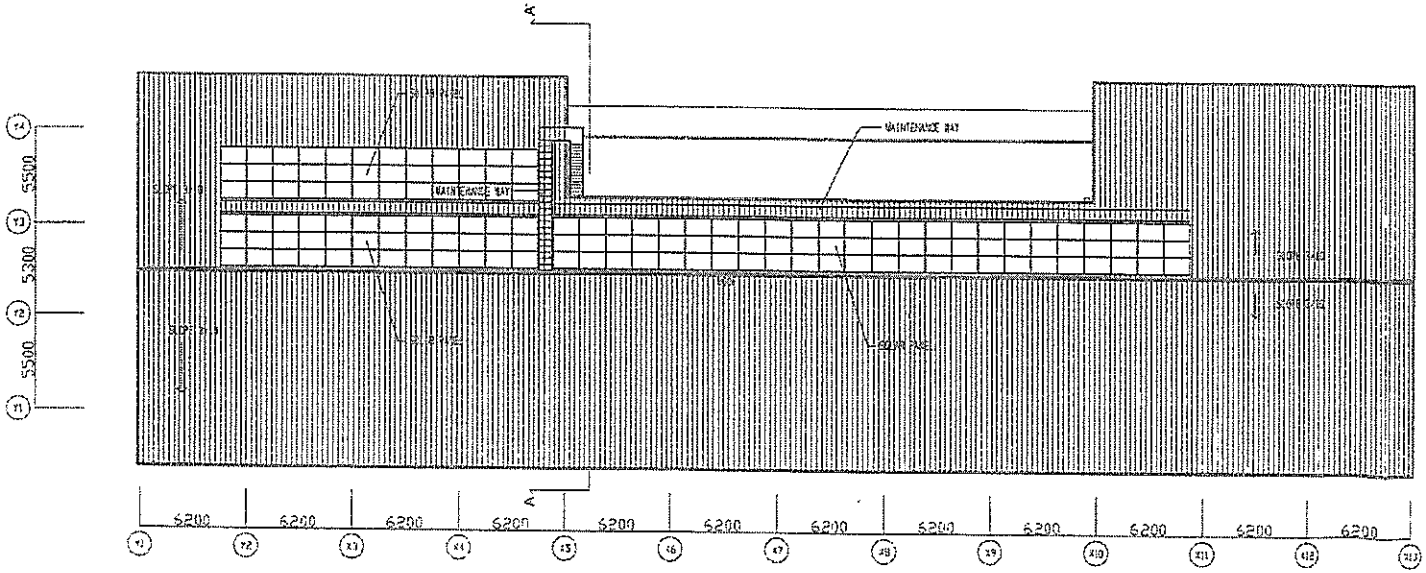
O.P.D. SECOND FLOOR PLAN SCALE 1/300



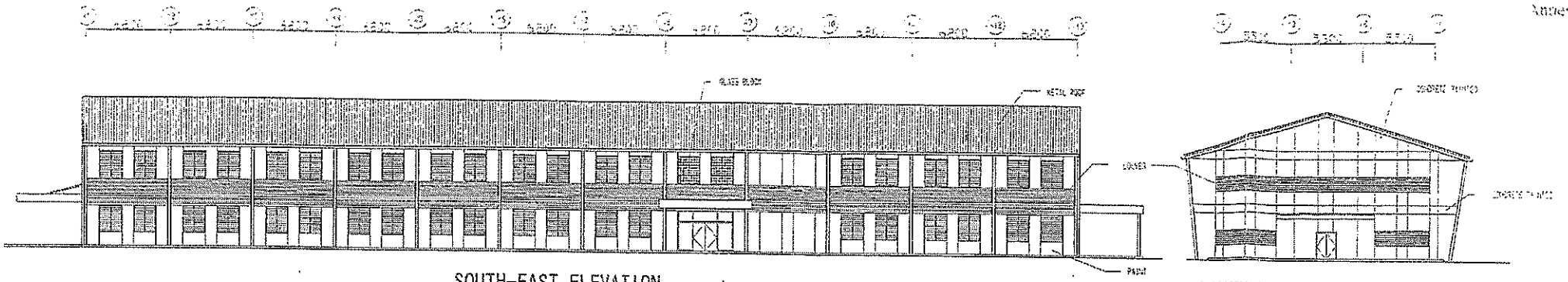
O.P.D. BASEMENT FLOOR PLAN SCALE 1/300



O.P.D. PIT SECTION SCALE 1/300

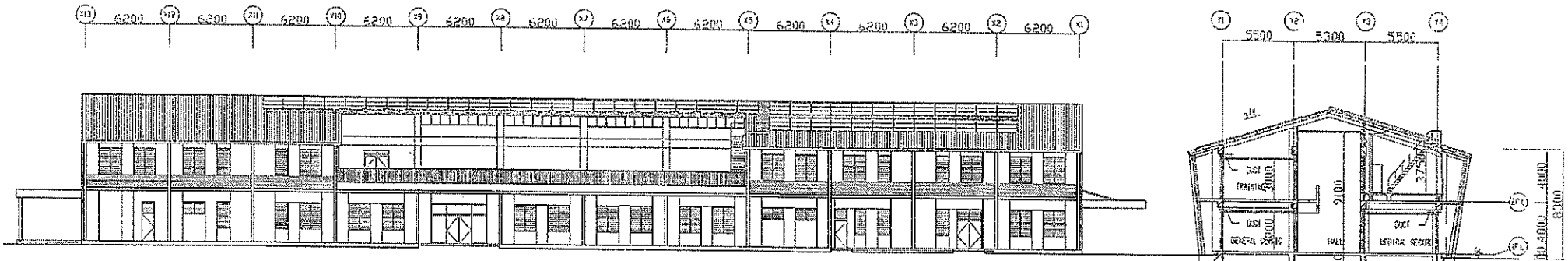


O.P.D. ROOF PLAN SCALE 1/300

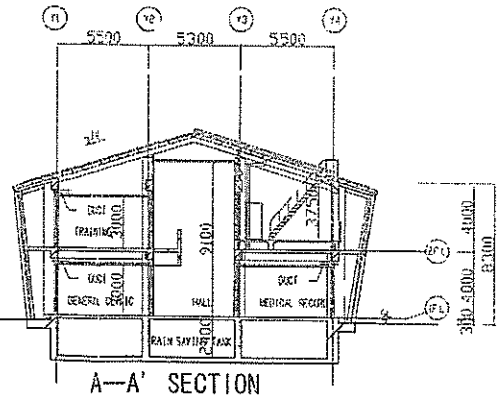


SOUTH-EAST ELEVATION

SOUTH-WEST ELEVATION

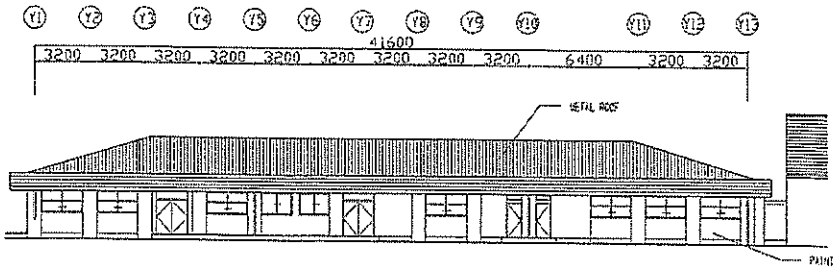


NORTH-WEST ELEVATION

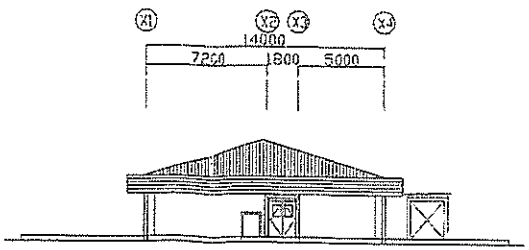


A—A' SECTION

O.P.D. SCALE 1/300

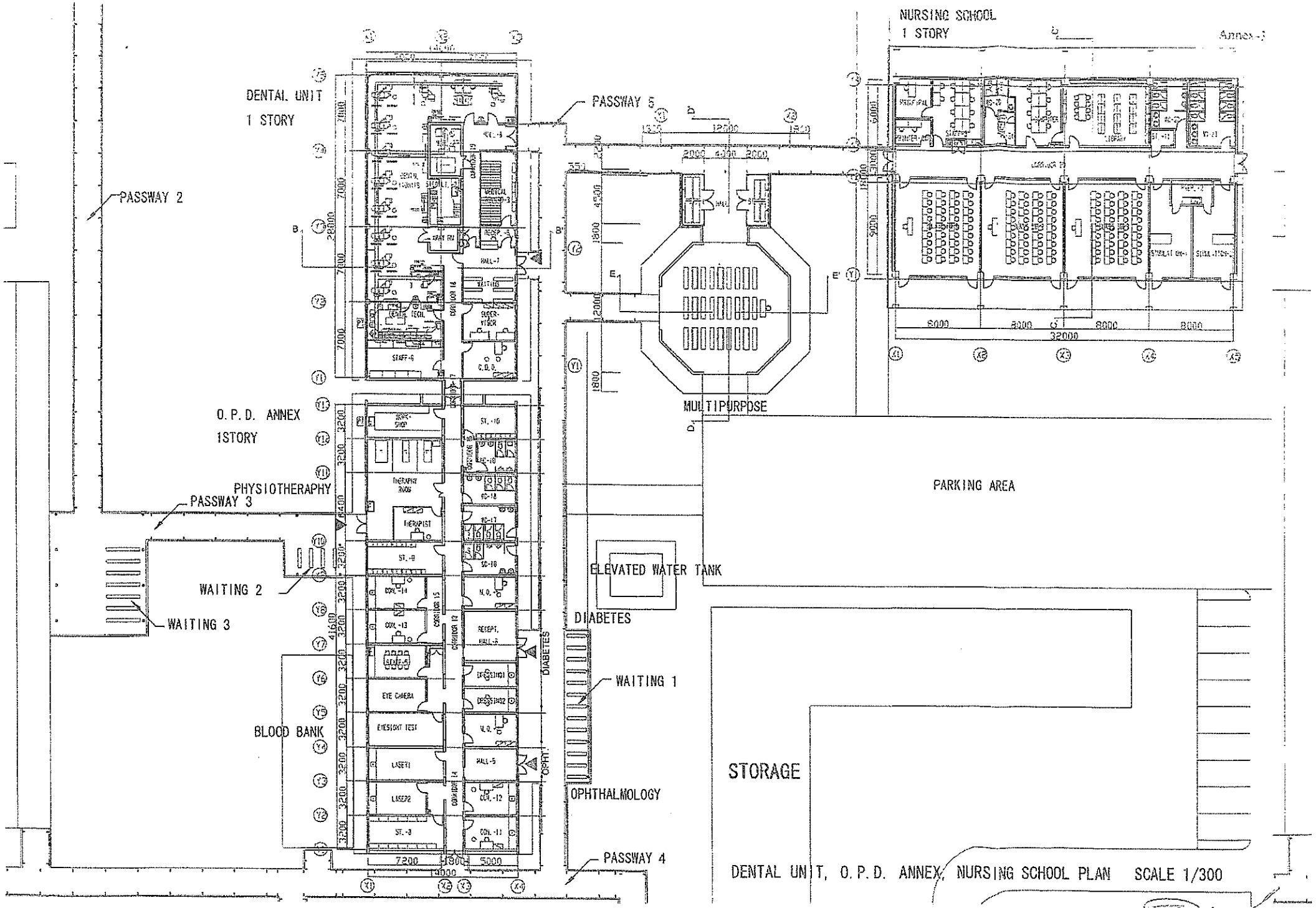


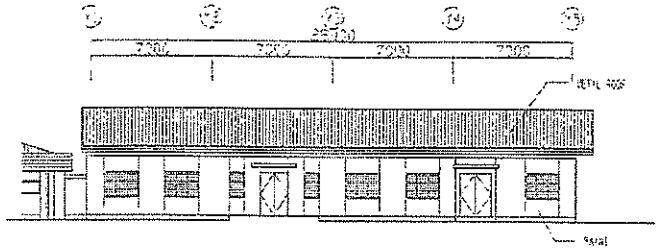
NORTH-EAST ELEVATION



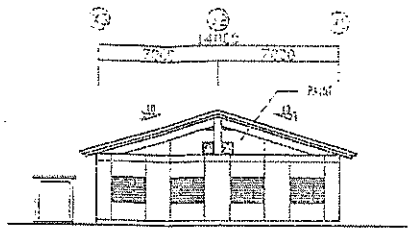
NORTH-WEST ELEVATION

O.P.D. ANNEX SCALE 1/300

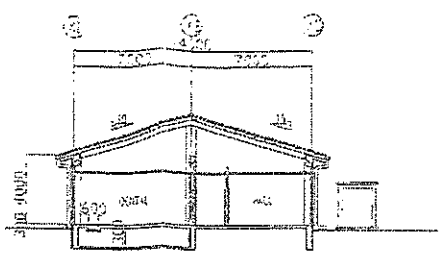

DENTAL UNIT
1 STORY
PASSWAY 5
NURSING SCHOOL
1 STORY
Annex-3
PASSWAY 2
O.P.D. ANNEX
1STORY
MULTIPURPOSE
PHYSIOTHERAPHY
PASSWAY 3
PARKING AREA
WAITING 2
WAITING 3
ELEVATED WATER TANK
DIABETES
WAITING 1
BLOOD BANK
OPHTHALMOLOGY
STORAGE
PASSWAY 4
DENTAL UNIT, O.P.D. ANNEX, NURSING SCHOOL PLAN SCALE 1/300



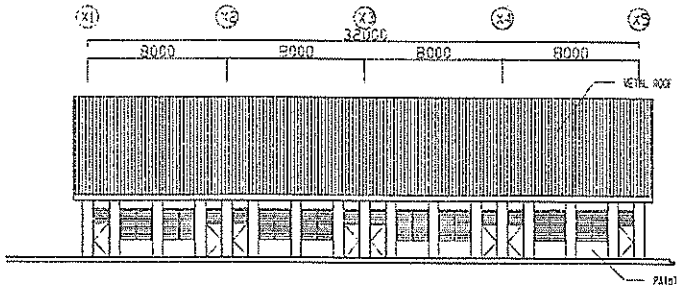
NORTH-EAST ELEVATION



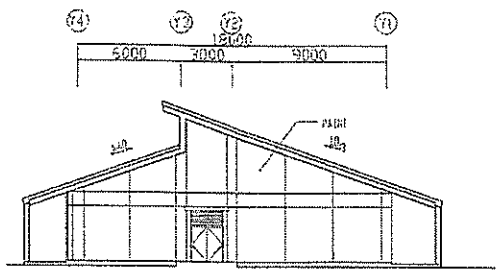
NORTH-WEST ELEVATION



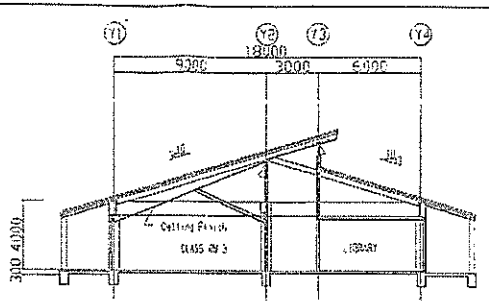
B-B' SECTION
DENTAL UNIT S=1/300



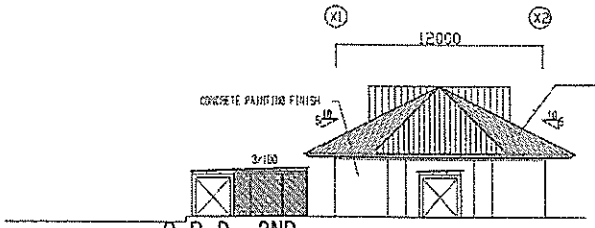
SOUTH-EAST ELEVATION



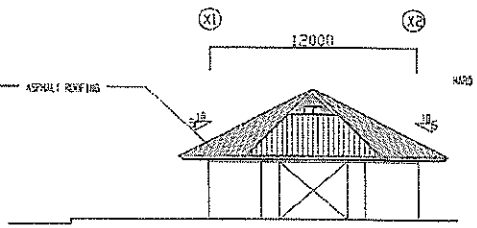
SOUTH-WEST ELEVATION



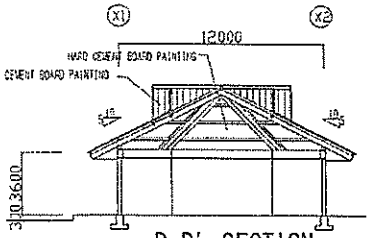
C-C' SECTION
NURSING SCHOOL S=1/300



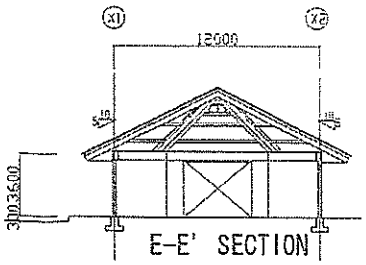
O.P.D. 2ND SOUTH-WEST ELEVATION



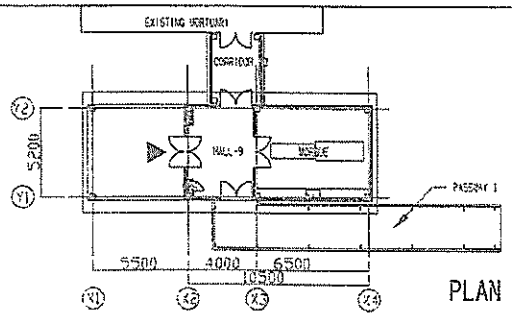
SOUTH-EAST ELEVATION



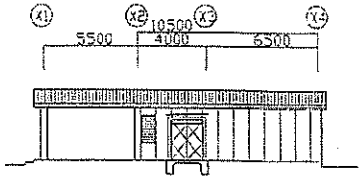
D-D' SECTION



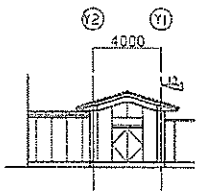
E-E' SECTION
MULTI-PURPOSE S=1/300



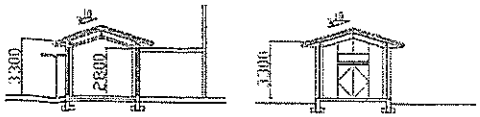
PLAN



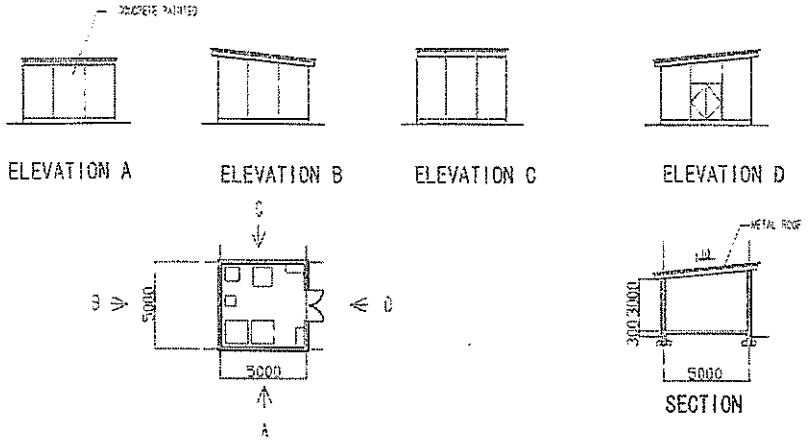
SOUTH-EAST ELEVATION



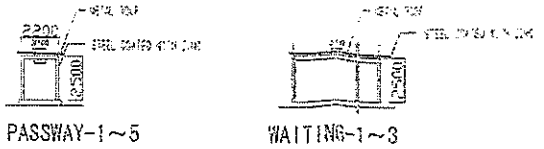
SOUTH-WEST ELEVATION



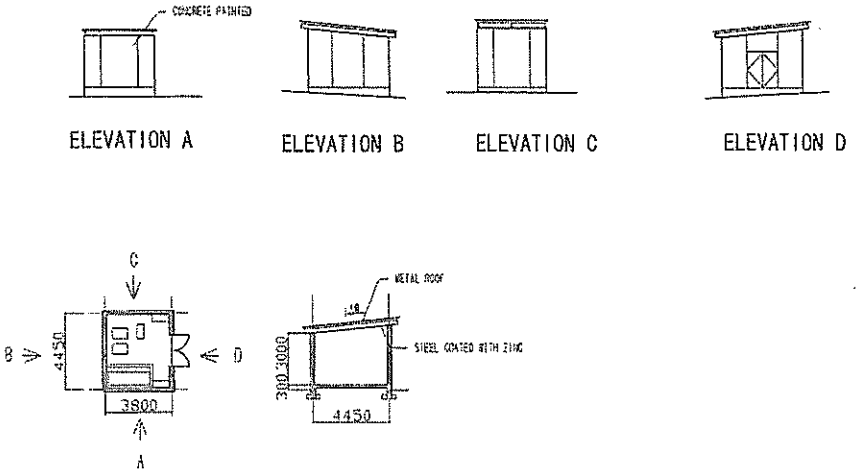
SECTION
NEW MORTUARY S=1/300



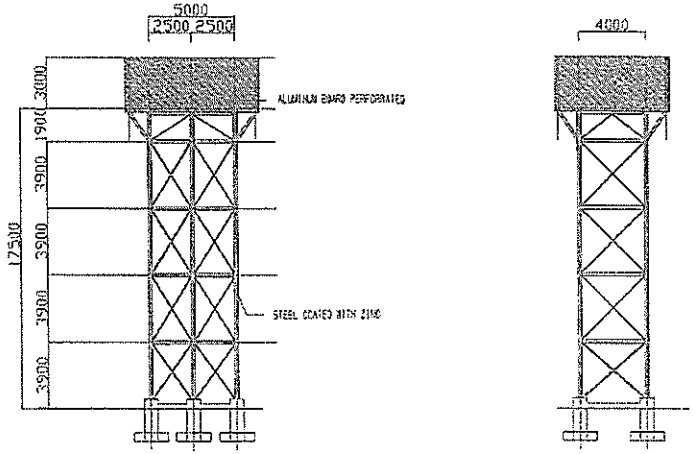
PUMP RM (CITY WATER) S=1/300



PASSWAY-1～5, WAITING-1～3 S=1/300



MR(SEWAGE WATER PUMP ROOM) S=1/300

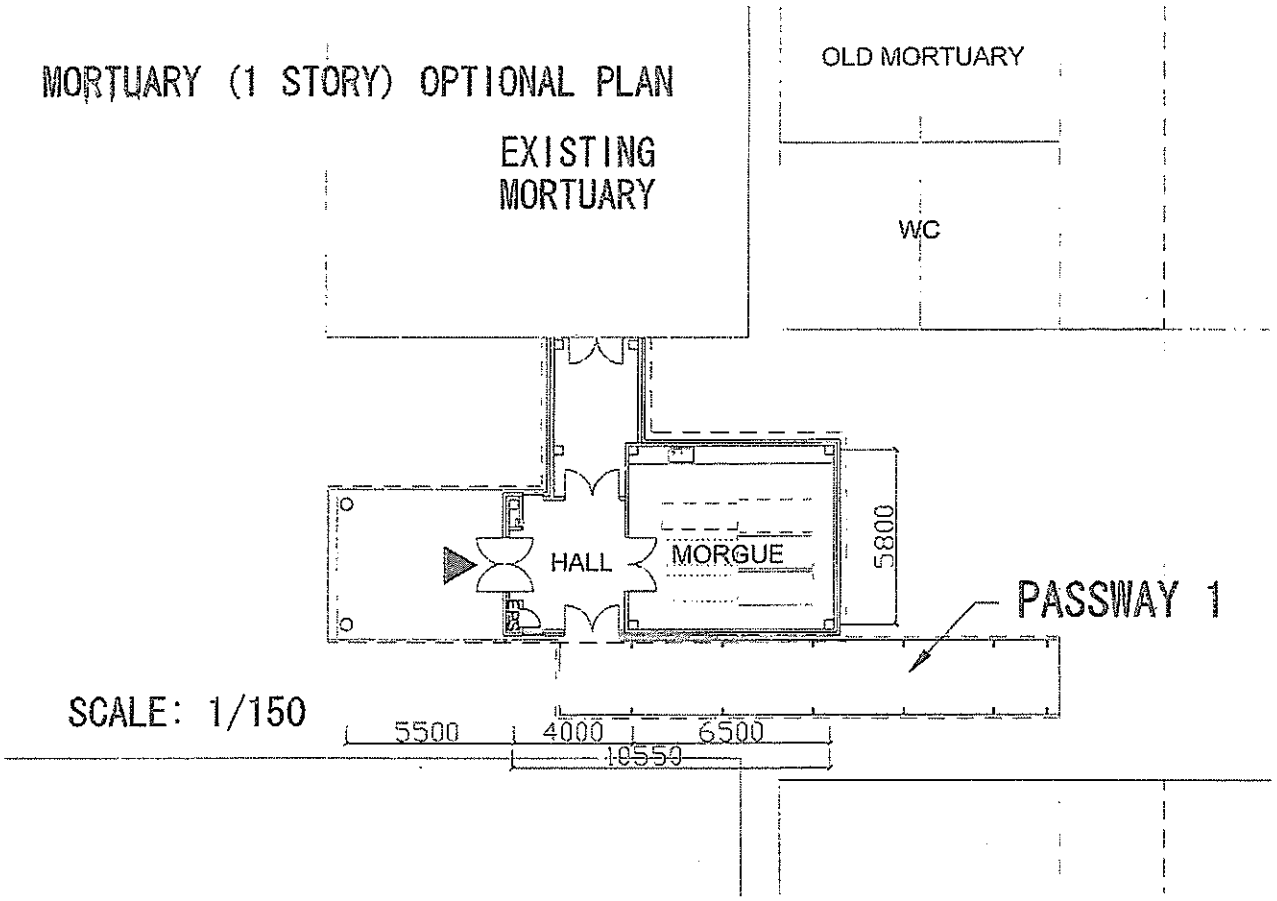


ELEVATED WATER TANK S=1/300

Mortuary layout change: Expand the area of Morgue

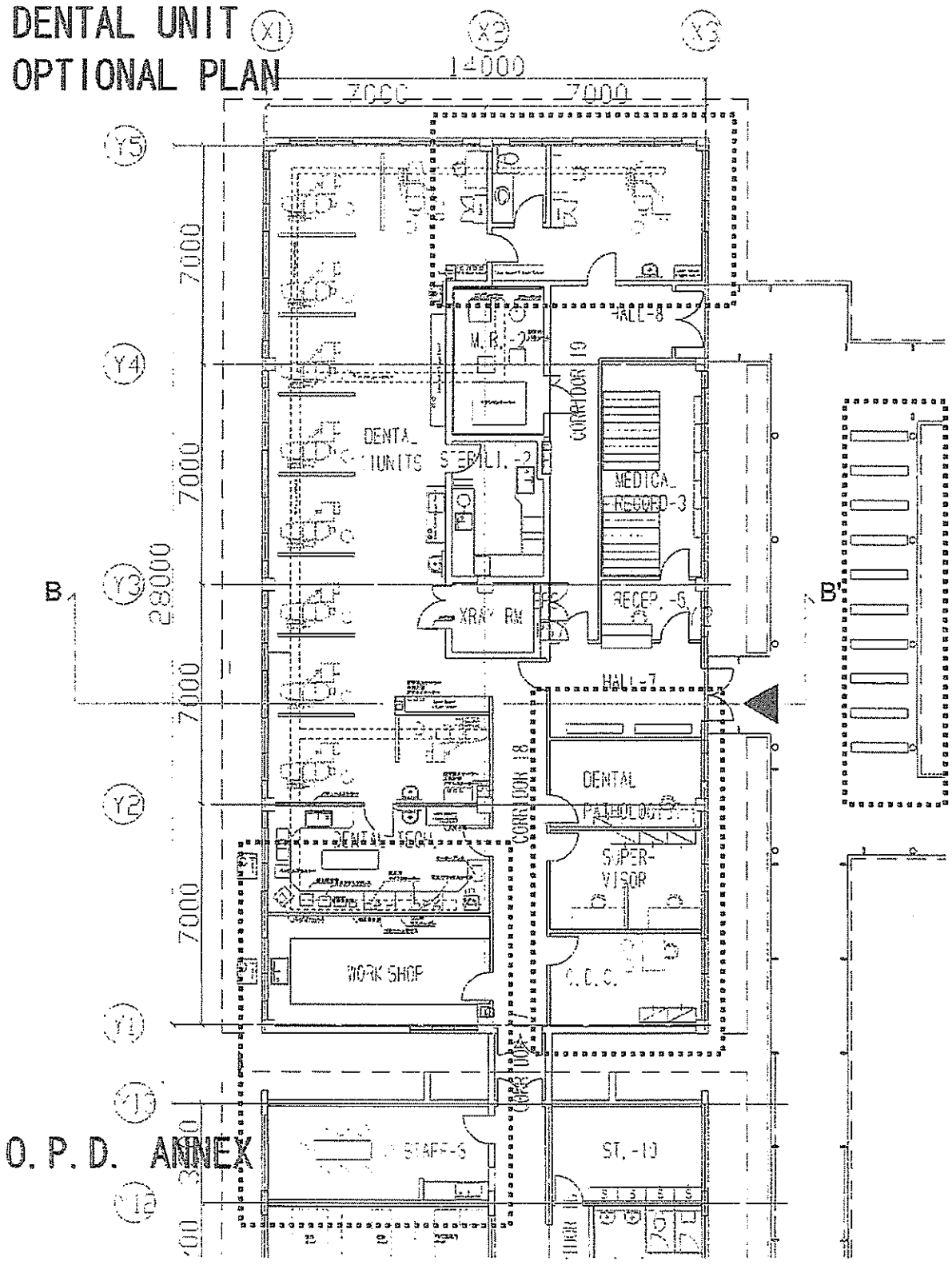
Morgue space will include the capacity of 3 No. of mortuary refrigerator

(2 No. of mortuary refrigerator will be included in the Project)



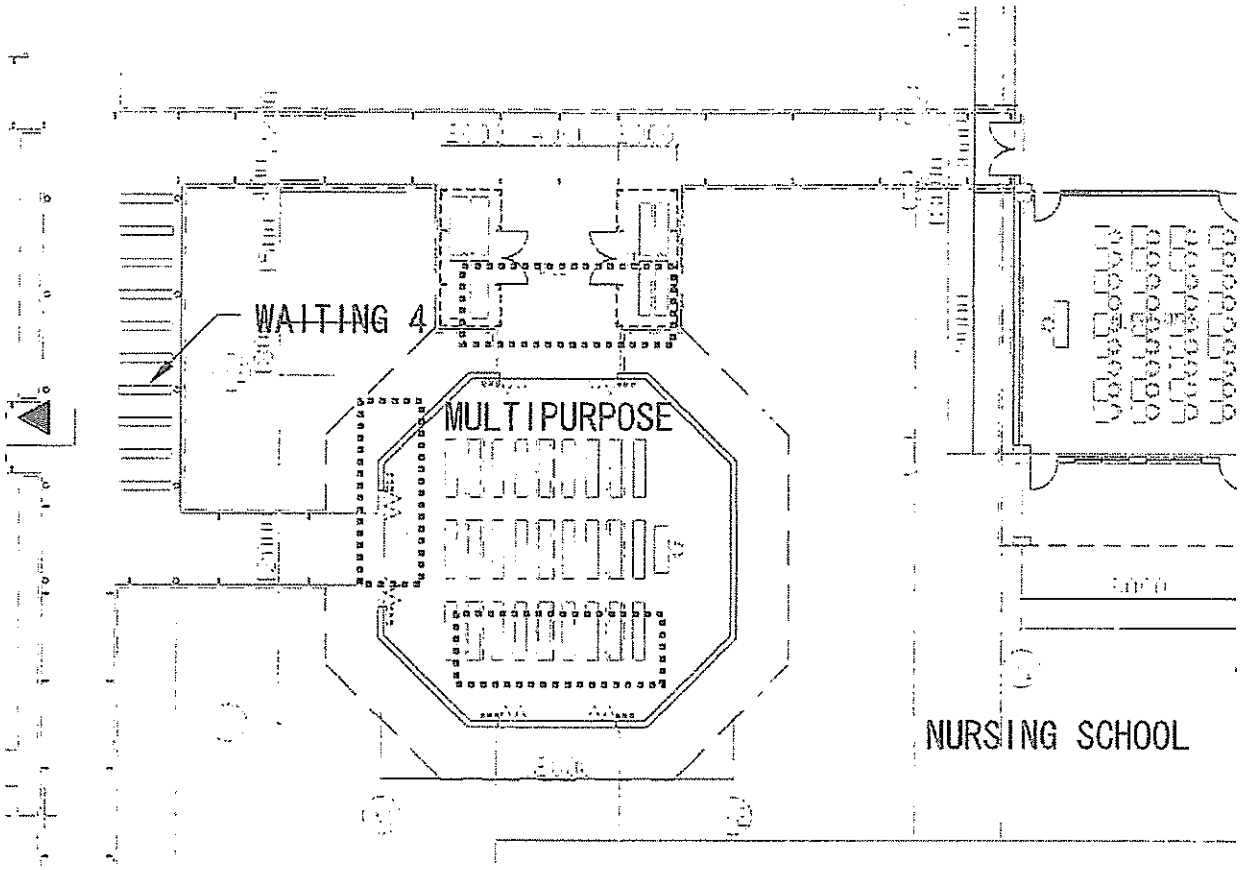
Dental Unit

- Additional partition and Toilet for VIP dental clinic
- Additional room for Dental Pathologist
- Change location of Work shop and Staff room
- Outside waiting space for 30 patients



Multipurpose Room

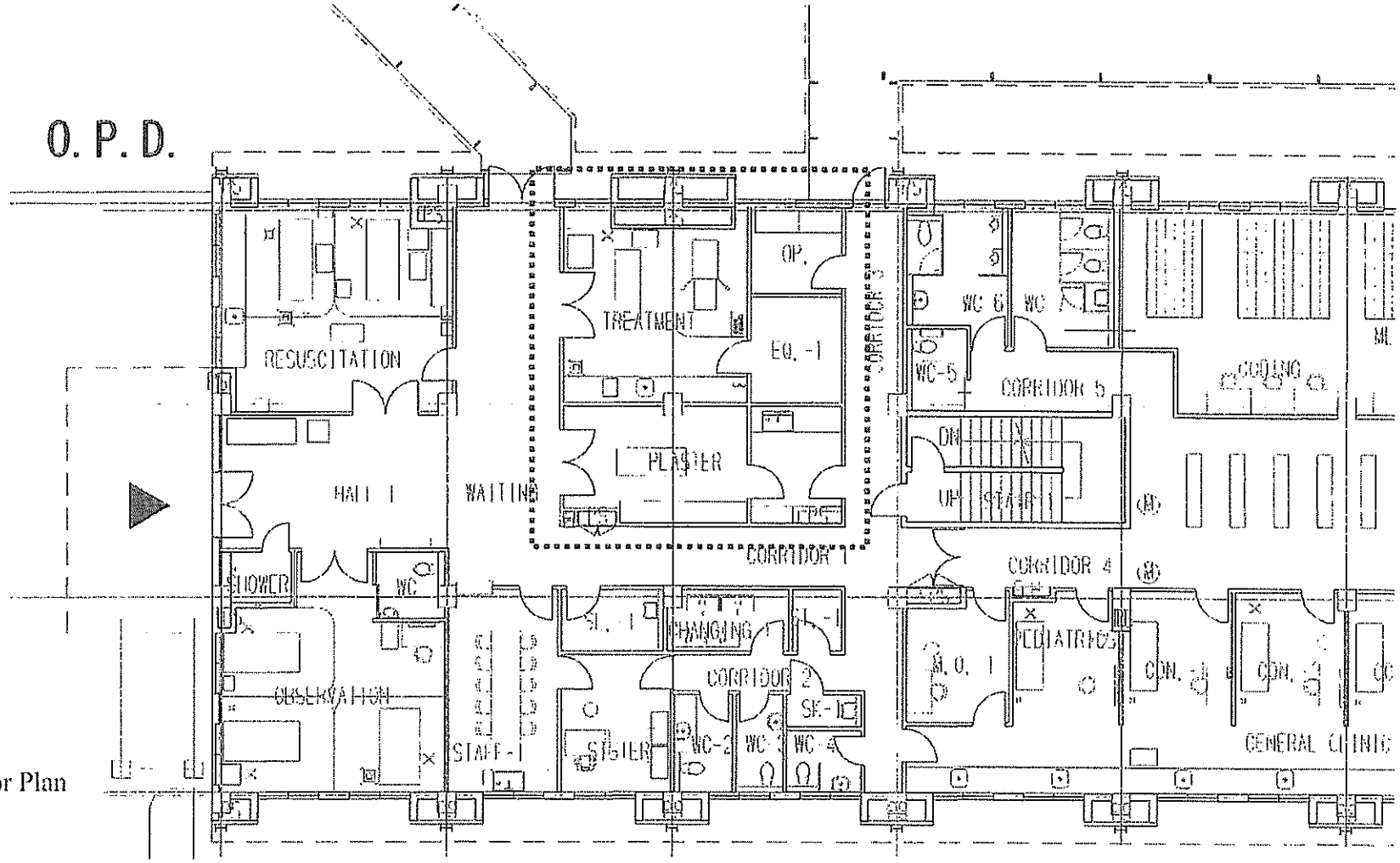
- Additional doors



Multipurpose 1st Floor Plan

1. Layout change for Plaster Room

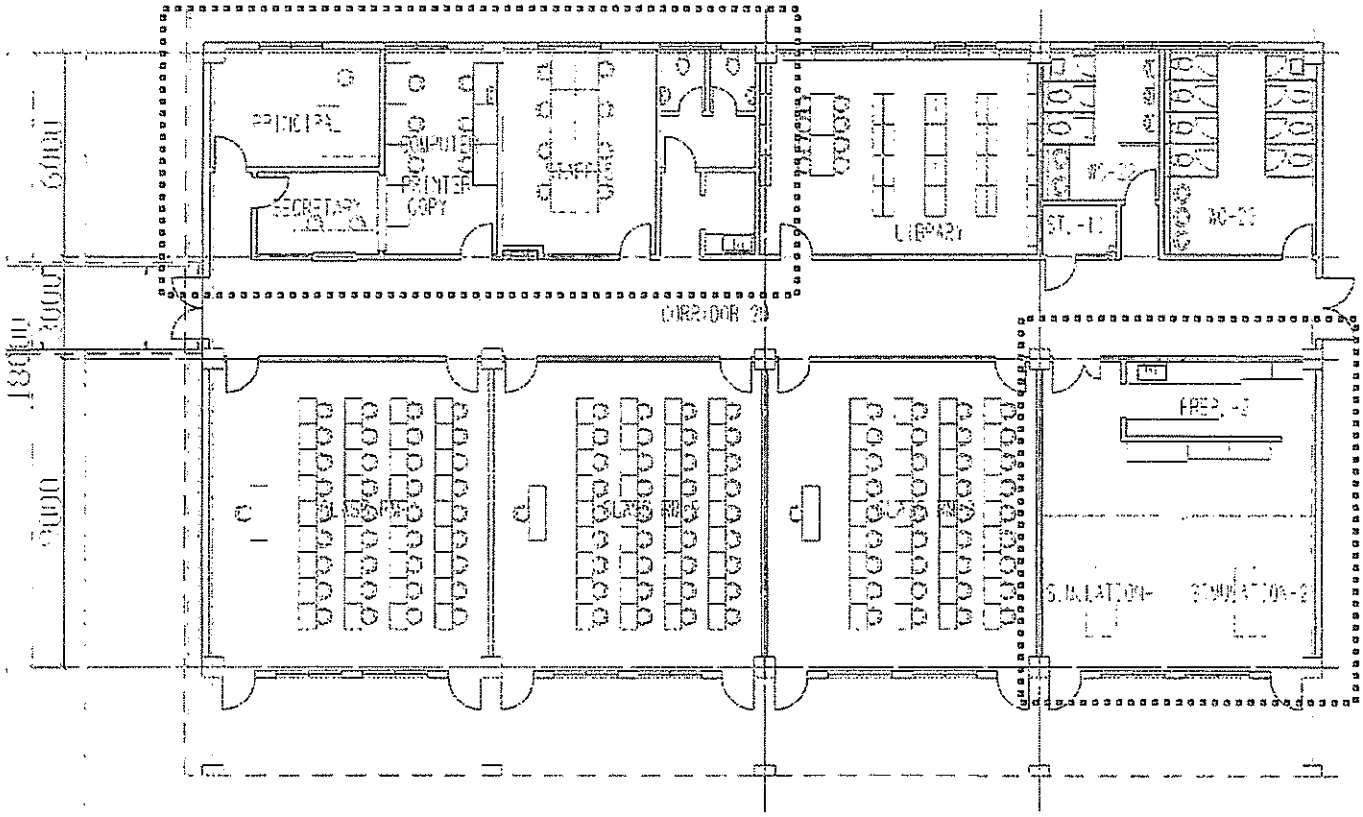
- Treatment and Plaster room layout has changed without any increment of floor area and buildings quantities.



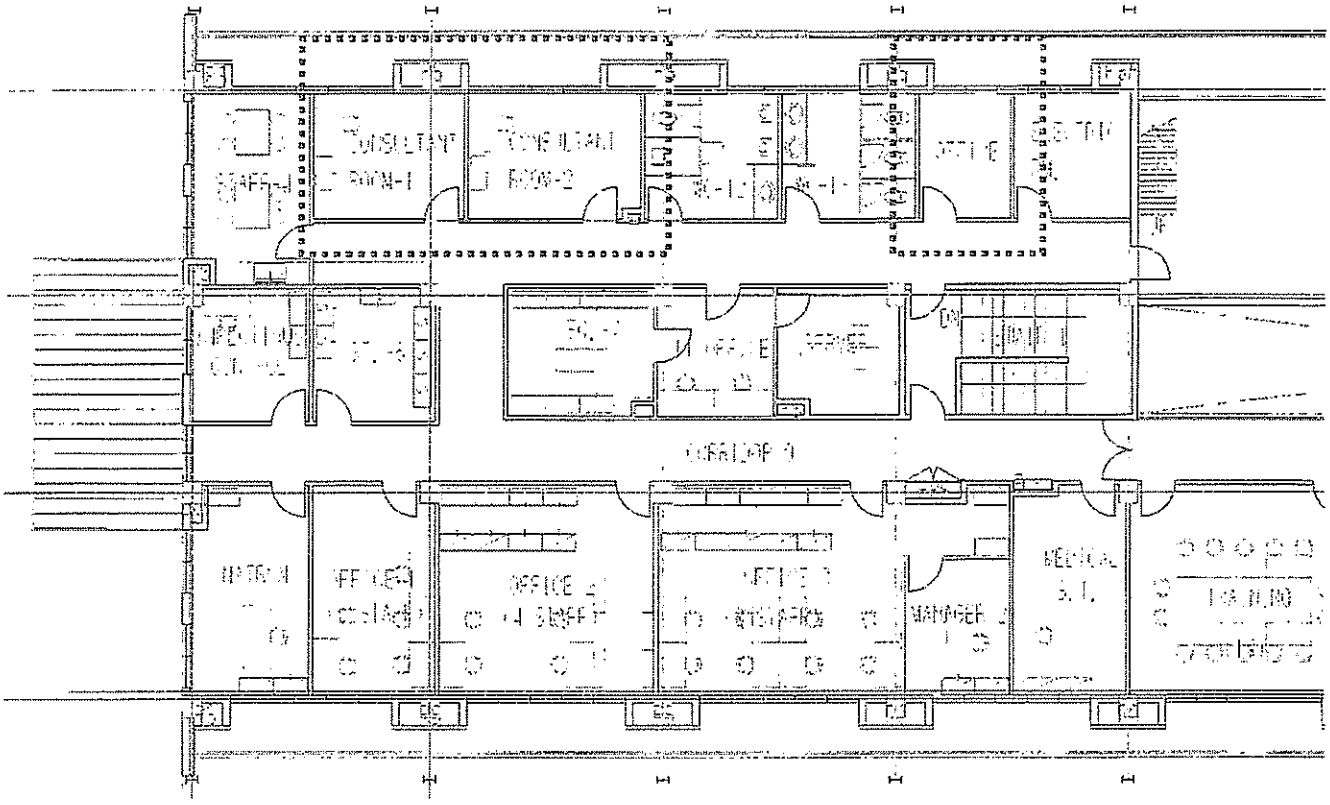
OPD 1st Floor Plan

5. Nursing School

- Layout change for Principal room, Secretary room, Computer room, Staff room and Staff toilet.
- Partition wall of Simulation -1 and 2 shall be changed to Curtain
- Expand room area for Preparation at Simulation



6. Room name change for Consultant room and Office



OPD 2nd Floor Plan

Annex-4

Equipment List

No.	Name of Equipment	Requested Quantity
1	Defibrillator	1
2	Emergency Cart	1
3	Electrocardiographa	3
4	Patient Monitor	2
5	Nebulizer	3
6	Suction Unit	4
7	Examination Light	8
8	Patient Trolley	2
9	Stretcher	3
10	Tabletop Autoclave	6
11	Weighing Scale, Adult	3
12	Weighing Scale, Infant	4
13	Height Scale	3
14	Mobile Operating Light	1
15	Wheel Chair	2
16	Pulse Oximeter	3
17	Portable Pulse Oximeter	1
18	Infusion Pump	1
19	Portable Glucometer	2
20	IV Stand	10
21	Observation Bed	3
22	Diagnostic Set	6
23	Dressing Trolley	13
24	Sphygomomanometer	8
25	IVF Warmer	1
26	Color Doppler Ultrasound	1
27	Treatment Instrument Set	2
28	Laryngoscope, Adult	1
29	Laryngoscope, Infant	1
30	Tracheotomy Instrument Set	1
31	Resuscitation Bag, Adult	1
32	Resuscitation Bag, Infant	1
33	Film Illuminator	7
34	Oxygen Flowmeter	3
35	Surgical Scrub Station	2
36	Instrument Cabinet	1
37	Examination Table	13
38	Syringe Pump	1
39	ENT Treatment Unit	1
40	ENT Instrument Set	1
41	Audiometer	1
42	Sound Proof Unit	1
43	Tracheal Intubation Fiberscope	1
44	Nasal Polypectomy Instrument Set	1
45	Tonsillectomy Instrument Set	1
46	Laryngectomy Instrument Set	1
47	Cleft Lip Plasty Instrument Set	1
48	Mastoidectomy Instrument Set	1
49	Fetal Doppler	2
50	Fetoscope	7
51	Gynecological Examination Table	3
52	Vaginal Instrument Set	6
53	Therapy Bed	1
54	Cupboard for Dangerous Drugs	1
55	Medical Refrigerator	1
56	Water Distiller, Large	1
57	Water Distiller, Small	1
58	Electronic Balance	1
59	Medicine Trolley	2
60	Small Instrument Set	1
61	Dental Unit	1
62	Dental X-ray Unit	1
63	Panoramic X-ray Unit	1
64	X-ray Film Developer	1

No.	Name of Equipment	Requested Quantity
65	Ultrasonic Scaler	5
66	Amalgamator	5
67	Light Curing Unit	3
68	Extraction Instrument Set	1
69	Dental Instrument Set	3
70	Apex Locator	1
71	OMFS Surgical Instrument Set	1
72	High Speed Micromotor Drill	1
73	OMFS Wiring Instrument Set	1
74	Osteosynthesis Instrument Set	1
75	Exodontia Instrument Set	1
76	Surgical Micromotor	1
77	Model Trimmer	1
78	Resing Curing Unit - Pressure Pot	1
79	Vibrator	1
80	Laboratory Lathe	1
81	Resing Curing Unit	1
82	Vacuum Mixer	1
83	Pensil Sand Blaster	1
84	Themoplastic Pressure Former	1
85	Laboratory Micromotor	2
86	Centrifugal Casting Machine	1
87	Burnout Furnace	1
88	Hydraulic Flask Press	1
89	Articulator	2
90	Impression Tray	10
91	Flasks Set	13
92	Dental Bunsen Burner	2
93	Electric Wax Knife	1
94	Dust Collector	1
95	Dental Laboratory Instruments	1
96	Anatomical Human Body, Male	1
97	Anatomical Human Body, Female	1
98	Human Skelton	1
99	Circulatory System Model	1
100	Respitatory Organ Model	1
101	Nasal/Throat/Pharynx Model	1
102	Pregnant Uterus Model	1
103	Phantom for Delivery	1
104	Injection Simulator	2
105	Nursing Care Manekin for Patient Care	1
106	Clinical Procedure Training Manekin	1
107	Resuscitation Simulator	1
108	Child Care Simulator	1
109	Pediatric Care Simulator	1
110	Newborn Advance Care Simulator	1
111	Torso Model	1
112	Heart Disease 3D Display Model	1
113	Death of an Artery Model	1
114	Nasogastric Tube Feeding Model	1
115	Heart Model	1
116	Functional Larynx Model	1
117	Brain Model	1
118	Kidey Model	1
119	Skin Section Model	1
120	Median Section of the Head Model	1
121	Functional Heart System Model	1
122	Functional Eye	1
123	Food Piramid Kit	1
124	Diabetes Teaching Kit	1
125	Chart for Education	1
126	Neonatal Cot	1
127	Nursing Utensils Set	1
128	Binocular Microscope	1
129	Walking Aids	1
130	Bed	2

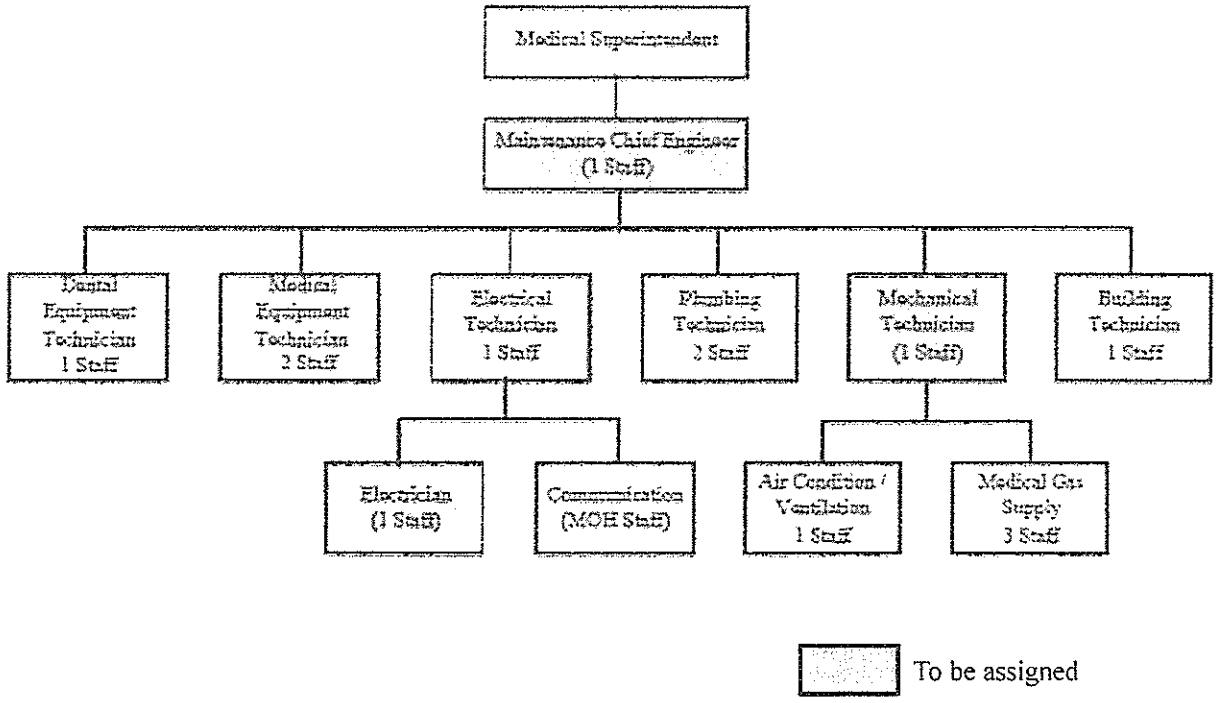
No.	Name of Equipment	Requested Quantity
131	Examination Instrument Set	1
132	Oxygen Set	1
133	Commode Chair	1
134	TV System	1
135	Cabinet	1
136	Mortuary Refrigerator	2

Operation and Maintenance Cost for Facilities and Equipment

(T$)

Item	Initial fiscal year	Following fiscal years
① Electricity charge	119,955	119,955
② Telephone charge	3,240	3,240
③ Fuel cost of generator	22,680	22,680
④ Water charge	25,650	25,650
⑤ LPG gas charge	2,844	2,844
⑥ Oxygen charge	3,600	3,600
⑦ Major facilities and equipment maintenance cost	0	32,380
⑧ Building maintenance cost	0	20,000
⑨ Solar panel	0	0
⑩ Replacement parts	0	3,200
Subtotal ①～⑩(facility maintenance cost)	177,969	233,549
⑪Cost of consumables	11,848	11,848
⑫Cost of spare parts	0	147,971
⑬Maintenance contract cost	10,511	10,511
小計 ⑪～⑬(Equipment maintenance cost)	22,359	170,330
Total ①～⑬	200,328	403,879

Maintenance Organization



Undertakings by the Tonga side

Item	To be completed	Expense (T$)
(1) Related works preceding the construction works		
①Demolition of the existing medical wards and Rough grading	July 2010	220,000
②Transfer of existing electrical lines in the project areas	July 2010	20,000
③Temporary relocation of Pharmacy	July 2010	50,000
④Dismantle deteriorate 300kva transformer	July 2010	50,000
⑤Temporary Diversion of existing telephone lines including MDF and PBX in the project areas	July 2010	20,000
⑥Temporary Diversion of existing IT lines and servers in the project areas	July 2010	20,000
⑦Temporary Diversion of the existing water supply & fire protection system in the project areas	July 2010	30,000
⑧Temporary Diversion of the existing water drainage system in the project areas	July 2010	20,000
(2) Related works during and after facility construction		
①Road works in areas other than the project site	April 2012 or after	20,000
②Landscaping and planting in the project areas	April 2012 or after	88,000
③Lead in of the water supply system to the project areas	October 2011	50,000
④MDF and PBX works for the project facilities and extension of telephone lines up to those facilities	April 2012 or after	220,000
⑤Transfer of IT lines and servers to the IT rooms of the project facilities	April 2012 or after	20,000
⑥Transfer of existing furniture equipment to the project facilities	April 2012 or after	50,000
⑦Install new curtain	April 2012 or after	80,000
⑧Renovation of the existing O.P.D. after the completion of the current work	April 2012 or after	1,400,000
⑨Demolition of the existing Nursing School after the completion of the current work	June 2012 or after	110,000
⑩Transfer of the kitchen and laundry room to the existing diabetes/physiotherapy clinic after completion of the current work	April 2012 or after	100,000
⑪Renovation of the existing kitchen and laundry areas and conversion into a workshop and storage after the completion of the current work	April 2012 or after	206,950

Tentative Schedule of the Project

The Project for Upgrading and Refurbishment of Vaiola Hospital (Phase Ⅱ)

Annex-8