

Ministry of Infrastructure and Public Utilities  
Republic of Vanuatu

BASIC DESIGN STUDY REPORT  
ON  
THE PROJECT FOR IMPROVEMENT  
OF PORT VILA MAIN WHARF  
IN  
REPUBLIC OF VANUATU

December 2007

JAPAN INTERNATIONAL COOPERATION AGENCY

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ECOH CORPORATION  
JAPAN MARINE SCIENCE INC.

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## PREFACE

In response to a request from the Government of Republic of Vanuatu, the Government of Japan decided to conduct a basic design study on the Project for Improvement of Port Vila Main Wharf and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Vanuatu a study team from June 3 to July 6, 2007 and from September 16 to September 20, 2007.

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

December, 2007

Masafumi Kuroki  
Vice-President  
Japan International Cooperation Agency

December, 2007

### **Letter of Transmittal**

We are pleased to submit to you the basic design study report on the Project for Improvement of Port Vila Main Wharf in Republic of Vanuatu.

This study was conducted by the consortium of ECOH CORPORATION and Japan Marine Science Inc., under a contract to JICA, during the period from May, 2007 to December 2007. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Vanuatu 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,

Norio Tanaka  
Project Manager,  
Basic design study team on the Project for  
Improvement of Port Vila Main Wharf  
The consortium of ECOH CORPORATION  
and Japan Marine Science Inc.

## **Summary**

# Summary

## 1. Overview of the Country

### 1.1 Land and Nature

The Republic of Vanuatu (hereinafter referred to as Vanuatu) is an archipelago of 82 islands that spreads like a chain across the western part of the South Atlantic Ocean (at latitude 13 – 23 south and longitude 166 – 172 east). The north-south length of Vanuatu is 1,300km and the exclusive economic zone is as large as 680,000km<sup>2</sup>. The total land area is 12,189km<sup>2</sup>. The total population as of 2006 was approx. 221,500 (according to the National Statistical Office of the Republic of Vanuatu); approx. 20% of the population live on Efate Island where the capital city of Port Vila is located, approx. 15% on Espiritu Santo Island and approx. 14% on Tanna Island.

The annual average rainfall is 2,200mm (1997 – 2006) in the capital, Port Vila, and the average temperature is 24.6°C. In the whole country of Vanuatu, the period from November to April is the rainy season with high temperatures and rainfall, and the period from May to October is the dry season with strong southeasterly trade winds. While there are strong winds from the west in the rainy season from November to April, there may be a long spell of no wind or rainstorms could be caused by winds from the north and tropical cyclones during this rainy season.

### 1.2 Socioeconomic Situation

According to the National Statistical Office of the Republic of Vanuatu, Vanuatu's GDP in 2006 was 43.066 billion vatu (hereinafter referred to as "VT") and the real GDP was 18.789 billion VT (1VT=1.21 yen in July 2007), while the percentages of the primary, secondary and tertiary industries were 14%, 9% and 77% respectively. It is evident that tertiary industry accounts for a large percentage. When you look at the real GNP growth rate, the annual average rate for the last five years is 2.56%, but the real GNP growth rate was as high as 5.5% in 2004, 6.8% in 2005 and 4.7% in 2006, indicating rapid growth in recent years. According to the export and import statistics in 2005, the export value was 4 billion VT and the import value was 16 billion VT, showing a large excess of imports. The majority of exports and imports are handled at the ports of Luganville on Santo Island and Port Vila on Efate Island. 45% of the total export value is handled through Luganville and 25% through Port Vila, while 13% of the total import value is handled through Luganville and 86% through Port Vila. The main exports (based on weight and volume) are coconut oil, coconut food products, copra, cocoa, beef, etc., while the main imports are fuel, rice, wheat, cement, etc. The tourist industry is a major industry in Vanuatu, which attracts 50,000 – 60,000 tourists a year. 60% of tourists come from Australia. These figures have been stable for the last several years. In recent years, twice as many tourists as mentioned above come in cruise ships. It has become standard practice for the cruise ships to come into the port in the morning and leave the port in the evening so

that the passengers can go sightseeing during the daytime.

## **2. Background of the Project**

### **2.1 Overall Plan, Present Situation and Issues of the Sector Concerned**

#### **(1) Overall Plan (Positioning of the Port and Harbor Sector in National Policies)**

As Vanuatu is an island country, the ports play an important role as gateways for domestic and international marine transportation and as ports of call for cruise ships. Against such a background, the government of Vanuatu has stated the need for improvement of domestic marine transportation, and the importance and need for safety and security measures at the two ports of Luganville and Port Vila, in the Priorities & Action Agenda (PAA) 2006-2015, which is the mid- and long-term plan of the country. The mid-term plan (2007 – 2011) in the above-mentioned Agenda proposes more specific port facility improvement, implementation of the International Ship and Facility Security Code (ISPS) for ships and port facilities, improvement of sites including the container area, replacement of the tug boat, etc.

#### **(2) Present Situation and Issues**

##### **1) Issues Related to Port Functions**

Port Vila Main Wharf was brought into service in 1972. As they were designed for bulk and pallet cargoes, the current port facilities cannot respond to containerization of cargoes. The most serious issue is that the shed for loose cargoes which occupies 25% of the limited port area is located in the center of the port area, so a sufficient container area cannot be secured and this has become a major obstacle for cargo handling. Therefore, containers are transferred to and stored at the Star Wharf located approx. 1km east of the Main Wharf and on the road shoulders outside of the port area. In addition, due to the structure of the port facilities, it takes time to carry the containers from the pier and thus generates waiting time for landing of cargoes from container ships, resulting in inefficient cargo handling operations. As a result, at present, the standard mooring time is 11.3 hours per container ship.

The cargo handling hours at the Main Wharf are 7:00 – 22:00 every day except Sunday and the workers work in two shifts. Under such conditions, if a freighter arrives outside these hours, it is put on demurrage, waiting for the starting time, because no cargo handling operations are performed. In addition, the customs work is done at the container storage areas on the public road, approx. 200m – 1km away from the port area. This is not only very inefficient, but has become a serious security issue.

##### **2) Present Situation and Issues for Securing Safe Navigation of Ships Calling at the Port**

The laws of the Republic of Vanuatu (Chapter 26 “PORTS”) make it compulsory for ships to use pilot

and tugboats when they enter and leave Port Vila. The 24-year-old pilot boat was banned from operating due to its age and unsafe condition and it is still moored up. Thus, at present, a flat-bottomed wooden boat with an outboard motor is used as a substitute for the pilot boat. However, it is not suitable for pilot service because of its poor seaworthiness and stability, and thus it is very difficult and dangerous to conduct work. At present, three pilots conduct pilot services.

Since the 34-year-old tugboat deployed at Port Vila was taken out of service in 2005 because of aging, support by a tugboat is not currently provided. Controlling a ship at low-speed navigation during approach is limited and the turnaround radius of the ships calling at the port is 3 – 4 times the length of the ship. Thus, ship handling without a tug boat is dangerous even at ordinary times, i.e. even when no restrictions are imposed on entering and leaving the port and mooring at and leaving the pier in strong winds, from the viewpoint of marine navigation and pier protection.

### **3) Response to Marine Accidents**

100 – 120 large vessels (cruise ships and tankers) come into Port Vila each year and there are about 10 marine accidents a year, including stranding and capsizing of vessels. In the past, when marine accidents happened, lifesaving, etc. was performed by the out-of-service tug boat, but there is no means available to respond to marine accidents at present, because there is no search and rescue equipment.

## **2.2 Requests and Results of Preliminary Study**

### **(1) Requests from the Government of Vanuatu**

The requests from the government of Vanuatu are wharf extension, concrete decks, pavement for cargo handling area, shed for loose cargo, administration office, and etc.

### **(2) Narrowing-down of Requests from Preliminary Study**

#### **1) Results of Preliminary Study**

During the preliminary study from January to February 2007, the requests from the government of Vanuatu were carefully evaluated and the following items were studied by conducting an analysis in Japan.

- The situation of vessels entering and leaving Port Vila and the cargo handling conditions were confirmed, various kinds of data were collected and discussions with the government of Vanuatu were conducted to confirm the priority of the requests.
- While the wharf extension was one of the first priorities in the Minutes of Meeting, it was confirmed that its reasonableness would be evaluated from the viewpoint of the usage frequency of the port and the scale of vessels calling at the port, and the government of Vanuatu agreed to this.
- Because the reasonableness of the wharf extension was not accepted from the viewpoint of the



usage frequency of the port and the scale of vessels calling at the port as a result of study after coming back to Japan, it was decided to exclude it from the components.

### **3. Summary of Results of Studies and Contents of the Project**

#### **3.1 Dispatching of Basic Design Study Teams and Draft Basic Design Explanation Team**

Responding to the request from the government of Vanuatu, the government of Japan decided to conduct basic design studies and the Japan International Cooperation Agency (JICA) dispatched study teams to Vanuatu as mentioned below. Planning and review of the basic design study were conducted, based on the results of the below-mentioned field studies.

- (1) Field Study : June 3 – July 6, 2007
- (2) Second Field Study : September 16 – September 20, 2007
- (3) Draft Basic Design Explanation : November 4 – November 8, 2007

#### **3.2 Summary of Results of Studies**

In planning the facilities and equipment for this project, importance was given to the role of Port Vila as the main port and the physical distribution base of Vanuatu by improving the facilities to meet the needs of container cargoes which are the current main form of cargoes, by reducing the mooring time and cargo handling time by the appropriate use of functions, and by improving the efficiency of vessels coming alongside and leaving the wharf and the safety of marine navigation in the port.

##### **(1) Basic Policy**

###### **1) Port Structures**

- i) The government of Vanuatu strongly requested the wharf extension because the extension area is necessary as an area to handle heavy cargoes. However, it was found as a result of the study that heavy cargoes such as heavy equipment could be handled by taking the heavy equipment apart and dividing it into sections of an appropriate weight and using trailer trucks, and that it would be possible to handle all the heavy cargoes by extending the current cargo handling hours if cargo handling efficiency was improved by this project, even if the volume of cargoes increased in the future. Thus, it was excluded from this project following further discussion with the government of Vanuatu.
- ii) The four openings between the five access bridges connecting the pier and the land will be closed by concrete decks in order to improve access between the pier and the cargo handling area and expand the workspace on the pier. The concrete decks are of a vertical-pile structure in consideration of the initial design conditions of the existing pier and the current usage conditions, and the design load is 22kN/m<sup>2</sup>.

- iii) Regarding the container area, in consideration of the volume of cargoes which are currently handled, the number of days that the containers are kept for storage, the number of empty containers and the kinematic performance of cargo handling machinery, it has been decided that the area will be 8,620m<sup>2</sup>; the gradient of the ground will be less than 1% so that there will be no hindrance to cargo handling operations; and the pavement will be concrete pavement strong enough for heavy equipment movement. In addition, drainage ditches will be installed in consideration of rainwater in the port area.
- iv) As the shore protection has been badly damaged by natural disasters, it will be rehabilitated for maintenance of the port functions (117m in total). The eastern shore protection will be provided partially by block masonry and partially by riprap revetment. The western shore protection will be provided by riprap revetment.

The port facilities have been planned and designed in accordance with the technical criteria for port facilities in Japan (the Ministry of Land, Infrastructure and Transport).

## **2) Onshore Facilities**

- i) The western part of the shed for loose cargoes will be demolished and reduced to the necessary area because bulk cargoes have been greatly reduced. The area where the shed will be demolished, the surrounding roads and the empty space will be improved and developed as a container area, making it possible to accommodate both containers with goods and empty containers, with the aim of reduction of cargo handling time, more efficient customs work and improvement of security.
- ii) The portion which will be kept as the shed will be improved by replacing the side walls and the roof, except for the reinforced frames and the foundation, and by making a necessary room there.
- iii) The administration office will be relocated and newly built near the east gate from the viewpoint of securing of the container site and security. The administration office will be built with pile foundation.

The buildings have been planned and designed in accordance with Japan's building code, etc.

## **3) Supporting Vessels**

The improvement of the efficiency of vessels entering and leaving the port and the safety of vessels coming alongside and leaving the pier is expected to be achieved through procurement of a tug boat and a pilot boat. Both boats have been planned and designed in accordance with the vessel criteria of the Japanese Association of Classification Societies.

- i) The tug boat will be a similar vessel type to that which is deployed at ports and harbors in Japan, taking into consideration the work-critical steady wind velocity at Port Vila (10m/s) and the towing power to support standard container ships (18,400GRT), and it will be equipped with functions for rescue service and disaster prevention.

- ii) The pilot boat will have adequate seaworthiness and maneuverability to ensure that a pilot can board and leave ships and do lashing in a safe and reliable manner. The main engine will be a type which can be technically supported in Vanuatu.

## (2) Contents of the Project

In consideration of the background of the project, natural conditions, maintenance and management system and construction conditions as a result of the preliminary studies, the facilities to be built under this project should be of the appropriate scale and content as a grant aid cooperation. The facilities concerned are planned as follows:

Facilities	Detailed Structure	Quantity
[Civil Engineering Facilities] Concrete decks	Steel pipe pile-type pier	To close the three openings and one western edge Area=1,013 m <sup>2</sup> Pile length=20-30m Thickness of floor deck: 40cm
Pavement of cargo handling area	Floor deck concrete Concrete pavement	Thickness of floor deck: 40cm Pavement area=8,620 m <sup>2</sup>
Drainage facility	Concrete U-shaped side ditches and Hume pipes	1 set
Westside shore protection	Mildly sloped riprap revetment	Extension=50m
Eastside shore protection	Upright block masonry seawall	Extension=66.6m
Lighting facilities in the port area	High pole type, high-pressure sodium lamps	4
Lighting buoys	LED lamps, solar energy	2
[Buildings] Rehabilitation of the shed for loose cargoes	Utilization of the existing steel frames; new construction of the side walls and the roof	One-story building Total floor area=1,045 m <sup>2</sup>
Administration office	Concrete block building (Administration office, conference room, book storeroom, toilet)	Two-story building Total floor area=560 m <sup>2</sup>
[Equipment to be Procured] Tug boat	Total length: approx. 31m Total tonnage: approx. 250 tons Main engine: 1,600hp × 2	1
Pilot boat	Total length: approx. 12m Total tonnage: approx. 11 tons Main engine: 180hp × 2	1

## 4. Construction Period and Project Cost Estimation

If this project is implemented as a grant aid cooperation of Japan, assuming a construction period for an A-type government bond project to implement implementation design, tender-related works, facility construction and equipment procurement, the period from implementation design to tender-related works will be 9 months; the period for construction of the facilities will be 18 months; and the period

for procurement of the equipment (shipbuilding) will be 26 months.

## **5 Project Evaluation and Recommendations**

### **5.1 Project Effect**

The smooth cargo handling environment in Port Vila harbor will be secured and the berthing environment for the ships calling this harbor will be improved.

#### **(1) Direct Effects**

- 1) The distance of 100m to 1km for container transportation can be shortened to 100m to 200m by constructing a container storage yard within the port district.
- 2) The cycle time per cargo container (the time required for unloading of the container from the ship, transportation on land and return of transportation machinery to the ship) can be reduced from 13 to 9.6 minutes by shortening the container transportation distance.
- 3) The mooring time per ship can be reduced from 11.3 hours to 7 hours by shortening the cycle time, contributing to higher efficiency of cargo handling and improved port services.
- 4) The procurement of a tugboat will reduce the water area for turning ships calling at the port from 3 to 4 times the ship's length to 1 to 1.5 times, ensuring safety of navigation. In addition, the support provided for ships to berth at and depart from the wharf will improve the safety of berthing and departure and shorten the berthing and departure time.
- 5) Berthing can be conducted in a wind velocity of 10m/s to 15m/s which was not possible before.

#### **(2) Indirect Effects**

- 1) The restart of the tugboat service will provide safe and steady support for ships entering and leaving the port, shorten their berthing and departure time, reduce accidental damage to the wharf and provide an appropriate means of dealing with sea accidents and firefighting at coastal facilities, contributing to improved port services.
- 2) Customs clearance can be executed within the port district and lighting facilities within the port premises will be improved, ensuring greater security within the port premises.
- 3) The cargo handling machinery will not run on general public roads, thereby easing the congested traffic situation with general vehicles on public roads.
- 4) The safety of ships calling at the port and the shorter cargo handling time will stabilize marine transportation and goods distribution in Vanuatu.

### **5.2 Operation, Maintenance and Management System of the Recipient Country**

The organization which will receive this project including the container area (a place to keep reefer

containers, etc.) which will newly come under its control is the Ministry of Infrastructure and Public Utilities (MIPU) of Vanuatu. Regarding the operation, maintenance and management system, the Ports and Harbor Department (PHD) of MIPU will be in charge of operation and management of the port and the Public Works Department (PWD) of MIPU will be in charge of maintenance and management of the facilities (large-scale maintenance and management works, etc.).

In addition to the conventional maintenance and management costs of the entire port, the main maintenance and management items which will occur for the port area of Port Vila which will be improved under this project are routine inspection and maintenance/repair works. PWD has the technical capabilities to handle these items. Although maintenance and management of the tug boat and the pilot boat require some annual expenses, new revenue is expected to be generated by improvement of the tug boat and the pilot boat. In addition, as it has been confirmed that PHD will prepare a budget for any shortfall in the maintenance and management costs of these boats, there should be no problem regarding maintenance and management.

### **5.3 Project Appropriateness**

This Project is intended to construct a work area for container cargo handling within the bonded area of the PHD and procure craft (a tugboat and pilot boat) in order to improve the Port Vila Wharf in Vanuatu. If this Project is implemented, efficient cargo handling work and the safe and steady arrival and departure of ships calling at the port will be made possible by realizing the improvement of port functionality. The procurement of craft equipped with search and rescue and firefighting functions will allow measures to be taken against sea accidents and fires on ships and at shore facilities as well as against marine pollution, contributing to the safety of marine transportation and the stability of society and the economy in Vanuatu. Therefore, it is deemed as appropriate and meaningful to implement this Project under Japan's grant aid cooperation.

### **5.4 Recommendations**

The considerations and recommendations for more effective and efficient implementation of this Project are summarized below.

For effective use of the port facilities after completion of the construction of the facilities and the procurement of equipment and materials for ships, it is recommended that the MIPU of Vanuatu, which is the maintenance and operation agency for this Project.

The considerations and recommendations for more effective and efficient implementation of this Project are summarized below.

For effective use of the port facilities after completion of the construction of the facilities and the procurement of equipment and materials for ships, it is recommended that the MIPU of Vanuatu, which is the maintenance and operation agency for this Project, take the following points into full

consideration to maintain and operate the facilities and equipment:

**(1) Appropriate Operation Management**

For smooth operation of the facilities and greater efficiency of cargo handling work, MIPU will be required to provide appropriate guidance and regulations to parties concerned with the port and port users.

**(2) Appropriate Maintenance Management**

After completion of the facilities, MIPU should manage the appropriate and necessary maintenance of the facilities and procured equipment and materials.

**1) Maintenance/Management of Facilities**

The facilities constructed in this Project (including shore protection, concrete decks, cargo handling yard pavement, drainage facilities, lighting facilities, lighting buoys, administration office and storehouses for bulk goods and cargoes) are not maintenance-free. Therefore, MIPU is required to undertake appropriate operation, maintenance and management to demonstrate the effective functions of these facilities. It is also important for MIPU to improve the consciousness of managers by training them as trustworthy managers through proper and regular inspection work.

**2) Maintenance/Management of Equipment and Materials**

The PHD has experience in operation and maintenance of tugboats and pilot boats. However, the planned tugboat will have a higher output than the tugboat which has been in operation so far because the ships calling at the port have increased and are larger. Accordingly, it is anticipated that the operation and maintenance costs will be need to be increased. Therefore, it is desired to secure the sufficient budget to be appropriated to these costs. The services of the tugboat and pilot boat are necessary to provide safe and steady support to ships calling at the port. For these boats, it is necessary to formulate and execute daily inspection and maintenance programs and to make continuous efforts to maintain the performance of the boats.

**3) Proper Use of Existing Piers and Connection Bridges at the Wharf (Access Restrictions for Cargo Handling Machinery)**

In this Basic Design Study, it has been made clear that the use of forklifts in cargo handling work on the existing piers at the wharf should be prohibited and that SISU container movers can be used as an alternative means if the existing piers and connection bridges are in a sound condition and have adequate durability as initially designed. However, it is expected that higher loads than the initial design conditions will be applied to the piers even in cargo handling work with the SISU machines that are used at present. If damage to the piers and connection bridges is likely to expand in the course of continuous monitoring, the use of such piers should be prohibited immediately in order to conduct a durability evaluation by the consultant and to carry out appropriate repair of the damage.

《Monitoring of the deterioration of existing piers and connection bridges at the wharf and future repair work》

After completion of the facilities in this Project, an investigation into deterioration of the concrete deck bottom will be made (through fixed-point observation of crack widths every 4 months and overall investigation every year) and temporary measures will be taken if necessary. If the advance of deterioration is confirmed, the necessity of future repair work will be examined.

**【Temporary Measures (Simple Repairs)】**

Temporary measures will be taken for maintenance of the port facilities if any cracks or fractures are found in the concrete of the facilities in the monitoring survey. Concrete cracks will be cut in the form of a V and filled with filling material such as concrete adhesive or waterproof mortar to prevent the inflow of water and salt. Fractures will be cut out and filled with mortar mixed with an adhesive and finished. (This work can be executed by any local constructor in Vanuatu.)

**【Repair Work (Repair Level by ADB)】**

Repair work will be carried out on a large scale prior to 2016 when the life-prolonging period of 15 years as targeted by the ADB repair works expires. The steel piles and steel planks will be coated with a corrosion-resistant paint and provided with reinforcing steel plates and electric anticorrosive plates (anodes). Reinforcing bars at the concrete cracks and fracture points will be exposed to check the corrosion of the bars. Depending upon the corrosive condition of the bars, the bars will be replaced or coated with antirust paint and concrete will be placed so that it adheres to the existing concrete using adhesive. Fenders will be replaced depending upon their deterioration. (Such repair work cannot be done by any local constructor in Vanuatu.)

**4) Necessary Protection of Pavement of Cargo Handling Yard**

The pavement design for the cargo handling yard in this Project is based on the standard for work using a 40-ton class top-lifter. In work involving handling of heavy cargoes with cargo handling machinery such as a side lifter or crane, MIPU is required to direct cargo handling companies to protect the pavement of the yard by covering the spaces in the outrigger installations with lining plates in order to prevent the pavement from fracture.

**5) Improvement of Container Storage Method in Cargo Handling Yard**

MIPU is required to direct cargo handling companies to store each lot of containers effectively in the very limited space in the cargo handling yard.

**6) Improvement of Container Storage Method in Cargo Handling Yard s**

The Port Vila Harbor Authority has experience in operation and maintenance of tugboats and pilot boats. However, the planned tugboats will have higher outputs than those which have been operated

so far because the ships calling the port have been decreasing and larger. Accordingly, it is anticipated that the costs of operation and maintenance will be required to be increased. Therefore, it is desired to secure the sufficient budget to be appropriated to those costs. The services of tugboats and pilot boats are to provide safe and steady supports to the ships calling the port. For these boats, it is necessary to formulate and execute the daily inspection and maintenance programs and to make continuous efforts to maintain the performance of those boats.



# CONTENTS

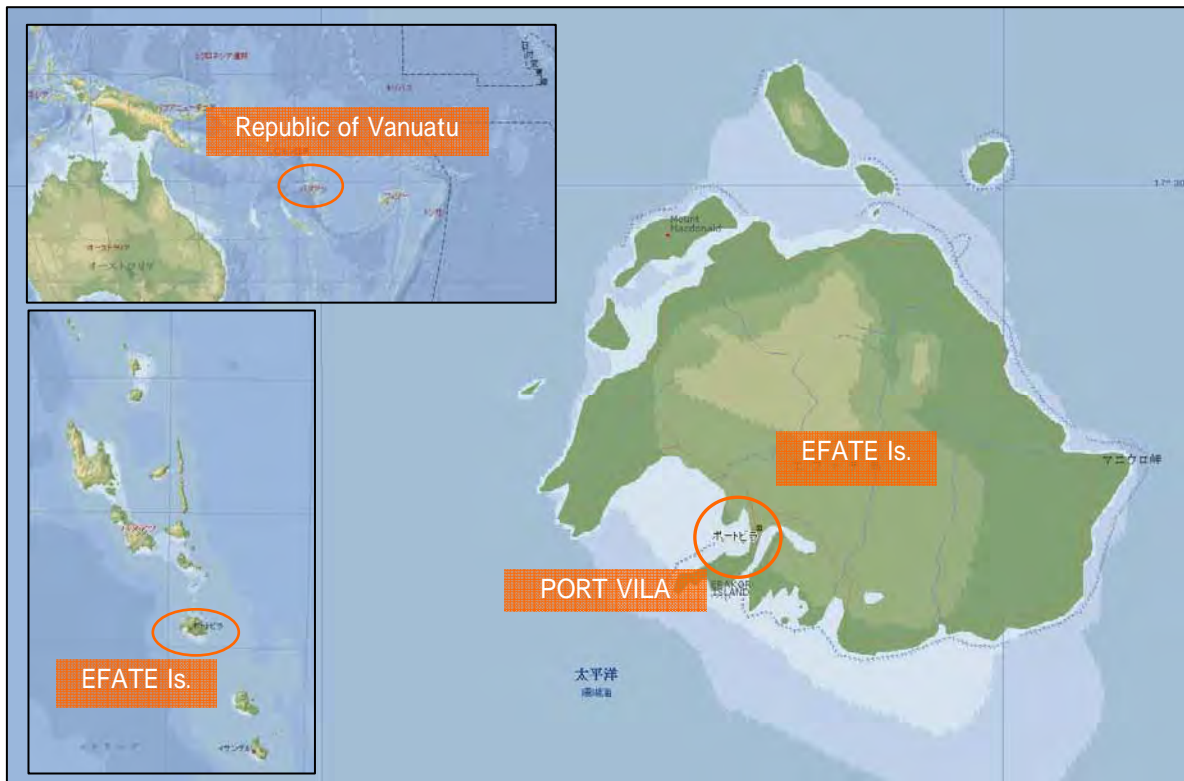
Preface	
Letter of Transmittal	
Summary	
Contents	
Location Map / Perspective Plan	
List of Figures & Tables	
Abbreviations	

	Page
<b>CHAPTER 1 BACKGROUND OF THE PROJECT -----</b>	<b>1-1</b>
1-1 Present Situation and Issues -----	1-1
1-2 Project Purpose -----	1-4
1-3 Contents of Project -----	1-4
1-4 Relationship between this Project and Higher Level Programs-----	1-5
1-5 Background of the Request -----	1-6
1-6 Requested Component -----	1-7
<b>CHAPTER 2 CONTENTS OF THE PROJECT -----</b>	<b>2-1</b>
2-1 Basic Concept of the Project -----	2-1
2-2 Basic Design of the Requested Japanese Assistance-----	2-2
2-2-1 Design Policy -----	2-2
2-2-2 Basic Plan-----	2-6
2-2-3 Basic Design Drawings -----	2-13
2-2-4 Implementation Plan -----	2-25
2-2-4-1 Implementation Policy -----	2-25
2-2-4-2 Implementation Conditions -----	2-27
2-2-4-3 Scope of Works -----	2-28
2-2-4-4 Consultant Supervision -----	2-29
2-2-4-5 Quality Control Plan -----	2-31
2-2-4-6 Procurement Plan -----	2-31
2-2-4-7 Initial Operation Training and Operation Training Plan-----	2-32
2-2-4-8 Implementation Schedule-----	2-33
2-3 Obligations of the Recipient Country-----	2-35
2-4 Project Operation Plan-----	2-36
2-5 Project Cost Estimation-----	2-38
2-6 Other Relevant Issues-----	2-39
<b>Chapter 3 Project Evaluation and Recommendations -----</b>	<b>3-1</b>
3-1 Project Effect-----	3-1
3-2 Recommendations-----	3-1

**[ Appendices ]**

Appendix-1 Member List of the Survey Team-----	A-1
Appendix-2 Survey Schedule -----	A-3
Appendix-3 List of Parties Concerned in the Recipient Country-----	A- 5
Appendix-4 Minutes of Discussions -----	A- 7
Appendix-5 Reference -----	A-25
Appendix-5-1 Cargos handled at the port -----	A-25
Appendix-5-2 Detailed Building Crireria -----	A-39
Appendix-5-3 Examination of Equipment Performance -----	A-45
Appendix-5-4 Basic data for wind and wave analyses -----	A-53
Appendix-5-5 Result of soil investigation and topographic & bathymetric surevey -----	A-64

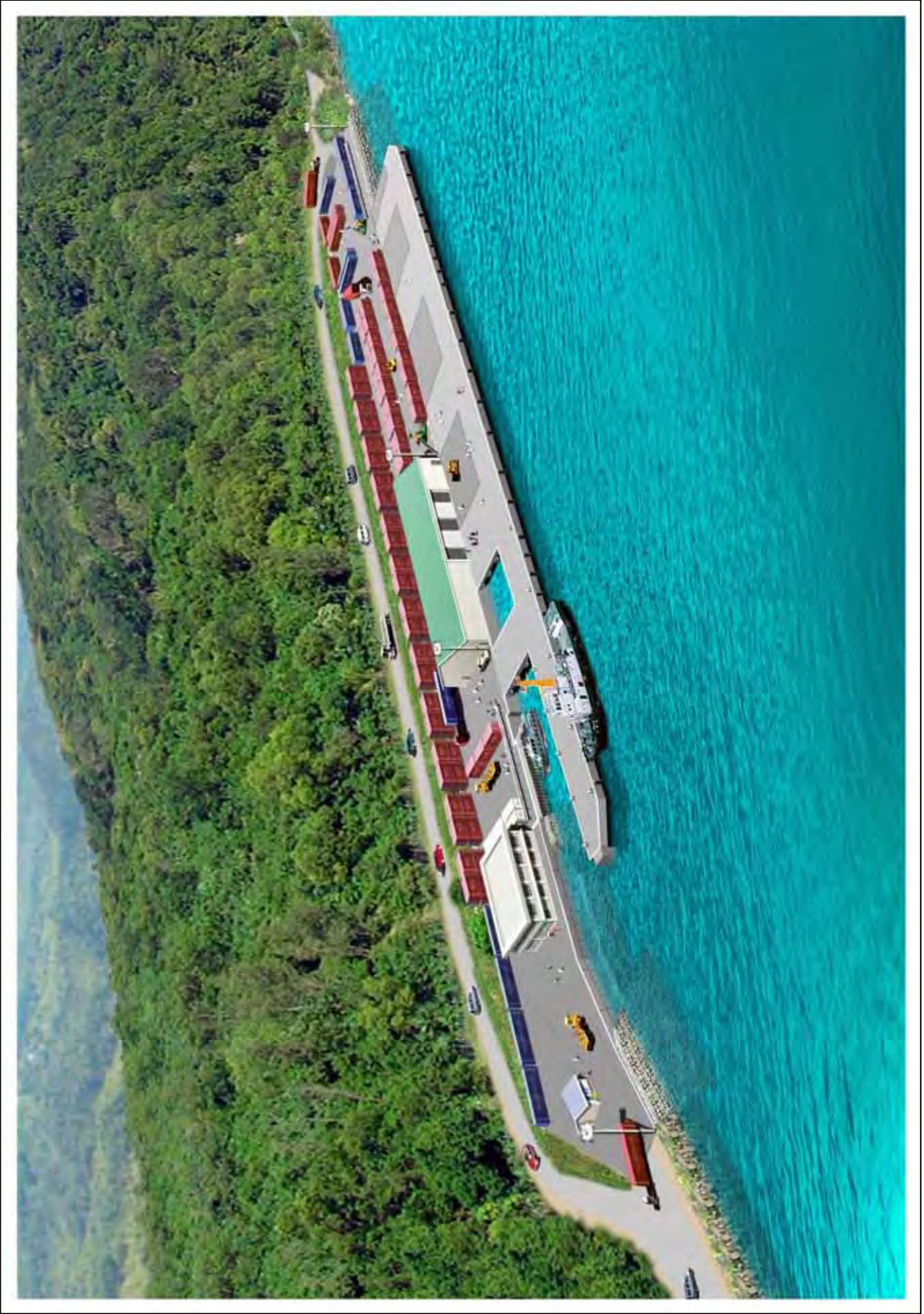
## Location Map



Location of the Republic of Vanuatu



Project Site (Port Vila Main Wharf)



Perspective

## **List of Figures**

Figure -2.2.3-1 Design floor plan -----	2-15
Figure -2.2.3-2 Standard section plan of the concrete deck -----	2-16
Figure -2.2.3-3 Section plan of the concrete deck (in the westernmost part) -----	2-17
Figure -2.2.3-4 Section plan of the westside shore protection -----	2-18
Figure -2.2.3-5 Section plan of the eastside shore protection -----	2-19
Figure -2.2.3-6 Floor plan of the pavement of the Cargo-Handling Area -----	2-20
Figure -2.2.3-7 Floor and elevation plans of the Shed for Loose Cargoes -----	2-21
Figure -2.2.3-8 Design floor plan of the Administration Office -----	2-22
Figure -2.2.3-9 General arrangement of the tugboat -----	2-23
Figure -2.2.3-10 General arrangement of the pilot boat-----	2-24

## Abbreviations

ADB	Asisan Development Bank
AIS	Automatic Identification System
AS	Australian Standard
BOD	Biochemical Oxygen Demand
DWT	Dead Weight Tonnage
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
EPIRB	Emergency Position Indicate Radio Beacon
GDP	Gross Domestic Product
GMDSS	Global Maritime Distress and Safety System
GRT	Gross Tonnage
ISPS	International Ship & Facility Security Code
JICA	Japan International Cooperation Agency
LED	Light Emitting Diode
LPG	Liquefied petroleum gas
MARPOL	International Convention for the Prevention of Pollution from Ships
MIPU	Ministry of Infrastructure & Public Utilites
MSL	Mean Sea Level
NZS	New Zealand Standard
ODA	Official Development Assistance
PAA	Priorities & Action Agenda 2005-2015
PHD	Ports and Harbor Department
PWD	Public Works Department
pH	Potential of Hydrogen
ps	Metric Horse Power
SART	Search and Rescue Radar Transponder
SS	Suspended Solids
VHF	Very High Frequency
VT	Vatu

## **CHAPTER 1**

### **BACKGROUND OF THE PROJECT**

# CHAPTER 1 BACKGROUND OF THE PROJECT

## 1-1 Present Situation and Issues

### 1-1-1 Present Situation and Issues of Port Facilities

#### Present Situation of Main Wharf

Port Vila Main Wharf was brought into service in 1972. The system of transferring cargos directly to warehouses located on the land area close to the wharf, via access bridges, was adopted to suit cargo handling operations using forklifts, because at that time bulk and palletized cargos constituted the main port cargoes. However, the containerization of port cargos has made rapid progress all over the world and 90% of import cargos at Port Vila come in containers. Thus, the current port facilities cannot adequately respond to containerization, and various issues regarding cargo handling have been exposed. The most critical issue is that there is no container yard suitable for efficient container handling. The cargo shed is located in the center of the port area and occupies 25% of the limited port area, creating a major obstacle to container handling. Since only a very small portion of the port area can be used to store containers, containers are carried to Star Wharf located 1km east of the Main Wharf and to the road shoulders outside of the port area for storage, unpacking, customs inspection, etc.

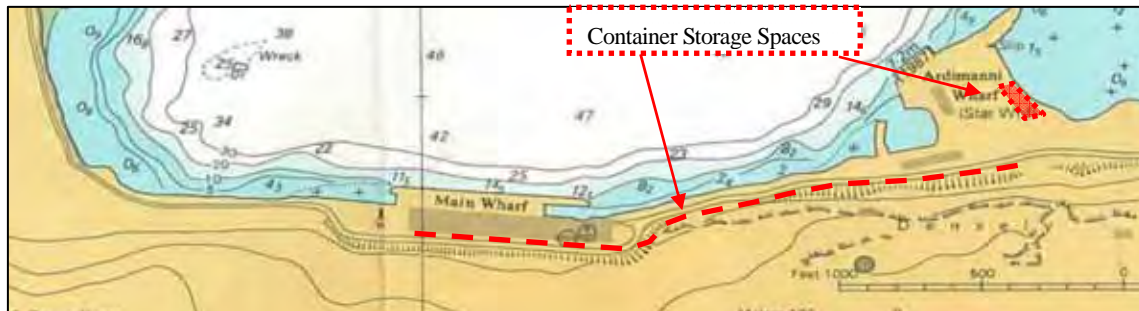
In addition, the wharf where the containers are landed is only 9.1m wide and only two of the access bridges between the wharf and the land, the easternmost and westernmost, can be used due to the presence of the cargo shed, generating waiting time for cargo handling operations with cranes because it takes time to carry the containers from the wharf, thus resulting in inefficient cargo handling operations. Furthermore, since side lifters and SISU container movers come and go on the narrow access bridges during cargo handling operations, safe cargo handling operations cannot be ensured in the present situation.

#### Bottleneck of Port Cargo Handling at Main Wharf

As discussed above, the most fundamental bottleneck at the port facilities of Port Vila Main Wharf is that, while there is no container yard suitable for container handling operations, a container yard cannot be allocated at an appropriate location because of the existence of the cargo shed where utilization rate has decreased. Containers which have been landed using the ship's gear are temporarily placed on the access bridges and then carried by cargo handling equipment (SISU, side lifters, etc.). Sufficient working space cannot be ensured on the 9.1m-wide access bridges and the containers are carried to the land area as one-way traffic by the said cargo handling equipment using the access bridges located at each end of the wharf. The containers which have been carried onto the land are kept mainly in an empty lot on the Main Wharf (behind the cargo shed), in empty spaces on the road to the Star Wharf and in the open space on the Star Wharf, because there is no dedicated container yard at the Main Wharf. Except for the open space at the Star Wharf, the areas are just



empty spaces along the coast road which expand linearly, resulting in very inefficient cargo handling operations.



Location of Container Storage Yards



Container Storage along the Road

The cargo handling hours at the Main Wharf are 7:00 – 22:00 every day except Sunday and the workers work in two shifts. Under such conditions, if a cargo ship arrives outside these hours, it is put on demurrage, waiting for the starting time, because no cargo handling operations are performed. One of the reasons why 24-hour cargo handling operations cannot be performed is that, since lighting facilities in the port area are insufficient, safe cargo handling operations cannot be ensured because the storage yard extends linearly as mentioned above.

As stated in the preliminary study report, it takes five days to clear customs. Apart from the problem of customs management, customs work is conducted at the container storage areas. It is recognized that this is very inefficient and it is a major issue from the viewpoint of security, because the work is actually done outside the bonded area.

### **1-1-2 Present Situation and Issues for Ensuring Safe Navigation of Ships Calling at the Port**

The laws of the Republic of Vanuatu (Chapter 26 “PORTS”) make it compulsory for ships to use pilot and tugboats when they enter and leave Port Vila.

The pilot service is currently conducted by two pilots and one pilot trainee at Port Vila.

Since the 34-year-old tugboat deployed at Port Vila was taken out of service in 2005 because of aging, support by a tugboat is not currently provided. Before that, escort support at the narrow entrance approach course and support for berthing at and leaving the wharf were provided. At present, calling ship is approaching and berthing by herself.

Control of ship operation performance at low-speed navigation during approach operations is limited and entering and leaving the port and berthing at and leaving the wharf are limited when there is a strong wind. The approach to the Main Wharf is navigated at 2 knots or slower, and when there is a strong wind at right angles to the ship, the deflection increases and it is difficult for the ship to maintain course to dock at the wharf and to control the approach angle. Drag anchors are used during departure and berthing of the ship. Since the drag anchors may become unstable, even if slow and careful operation of the ship is conducted, it is still difficult to control the approach angle and the speed of the ship. Thus, some ships, the wharf and the fenders have been damaged because of ships crashing into the wharf.

The 24-year-old pilot boat was banned from operating by the Maritime Affairs Agency, which is the ship inspection organization in the Republic of Vanuatu, because it was considered unsafe. Thus, it cannot be operated even after the dock is repaired and it is still moored there. As the main engine of the present pilot boat is very old and the vessel speed is around 5 knots, the pilot boat cannot keep up with the vessel speed of the ships calling at the port. The vessel speed of the ships calling at the port was lowered to enable the pilot boat to come alongside so that the pilot could board and leave the ships. At present, a flat-bottomed wooden boat with an outboard engine is used as a substitute for the pilot boat. However, it is not suitable for pilot work because of its poor seaworthiness and stability as the pilot meeting point is located on the off shore with ocean swell. It is very difficult and dangerous for the pilot to board and leave the ships calling at the port.



Pilot Boat  
(Banned)



Substitute Pilot Boat  
(Flat-bottomed boat)

### 1-1-3 Present Situation and Issues of Maritime Safety

While 60 to 70 large cruise ships (approx. 2,000 passengers per ship) per year use the Port Vila Main Wharf and 40 to 50 oil tankers enter Port Vila including the Main Wharf, there is no ship

equipped with disaster prevention equipment (fire-extinguishing systems and seawater surface treatment equipment) for fires on or oil spillage from the ships calling at the port or for fires at the facilities on land.

There are about 10 marine accidents every year in the Republic of Vanuatu and a majority of the accidents involve stranding and capsizing of ships. When such accidents happen, lifesaving, etc. is performed by the disused tugboat, but there are no means available to respond to marine accidents at present because there is no search or rescue equipment.

## **1-2 Project Purpose**

Project Purpose

Overall goal: Balanced economic revitalization of the Republic of Vanuatu

- 1) Project purpose: To enable safe and efficient operation of Port Vila.
- 2) Expected output: Port Villa will be rehabilitated and improved.
- 3) Project output indicator: Reduction of cargo handling hours, etc.
- 4) Site: Port Villa City, Efate Island, Republic of Vanuatu
- 5) Beneficiaries
  - Direct beneficiaries: Approx. 40,000 residents of Efate Island
  - Indirect beneficiaries: Overall population of the Republic of Vanuatu, i.e. approx. 200,000 people
- 6) Government agencies
  - Main agency: Ministry of Infrastructure and Public Utilities
  - Implementation agency: Public Works Department, Ministry of Infrastructure and Public Utilities
- 7) Recipient's input plan: Securing of the project site
- 8) Recipient's activity plan: Operation and maintenance of facilities and equipment provided by the project

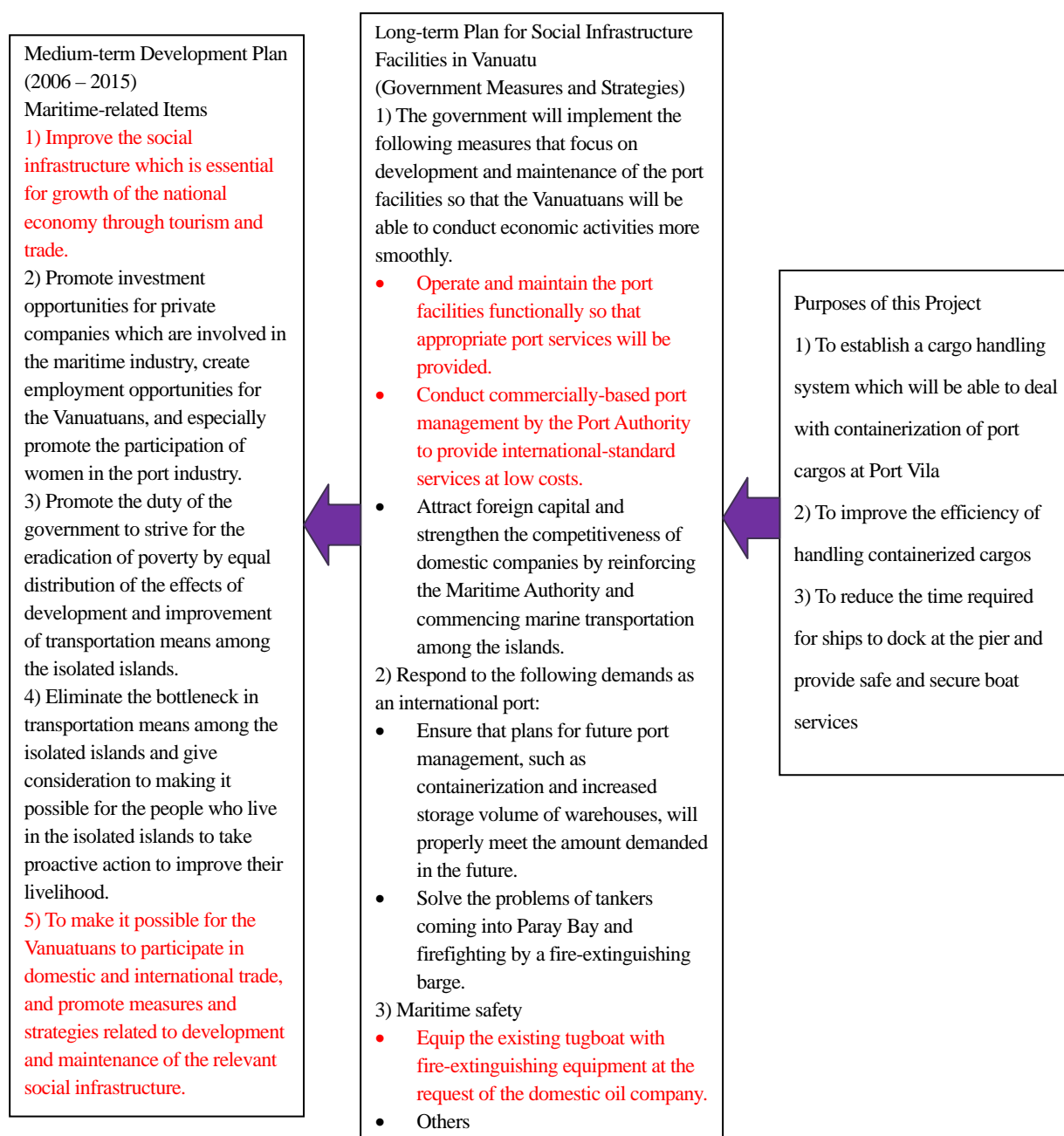
## **1-3 Contents of Project**

- Concrete deck (gapped space between access bridges, and space between westernmost access bridge and extension of westernmost point of existing wharf)
- Shed for loose cargo (demolition of existing cargo shed by Vanuatu side and construction of new shed of approximately 1,045m<sup>2</sup>)
- Pavement of cargo handling areas
- Drainage for whole port area
- Tugboat
- Pilot boat
- Shore protection
- Administration office (for PHD, customs, quarantine and immigration)

- Lighting facilities in the port area
- Toilets (including the new shed and administration office)
- Firefighting equipment
- Lighting buoys

#### 1-4 Relationship between this Project and Higher Level Programs

The relationship between the measures and strategies of the marine transportation sector in the national development program and social infrastructure improvement program (marine transportation sector) and the purposes of this project is as shown in the chart below:



Relationship between this Project and Higher Level Programs

## **1-5 Background of the Request**

### **1-5-1 Overall Plan, Present Situation and Issues of the Sector Concerned**

#### **(1) Overall Plan (Positioning of the Port and Harbor Sector in National Policies)**

As Vanuatu is an island country, the ports play an important role as gateways for domestic and international marine transportation and as ports of call for cruise ships. Against such a background, the government of Vanuatu has stated the need for improvement of domestic marine transportation, and the importance and need for safety and security measures at the two ports of Luganville and Port Vila, in the Priorities & Action Agenda (PAA) 2006-2015, which is the mid- and long-term plan of the country. The mid-term plan (2007 – 2011) in the above-mentioned Agenda proposes more specific port facility improvement, implementation of the International Ship and Facility Security Code (ISPS) for ships and port facilities, improvement of sites including the container area, replacement of the tug boat, etc.

#### **(2) Present Situation and Issues**

##### **1) Issues Related to Port Functions**

Port Vila Main Wharf was brought into service in 1972. As they were designed for bulk and pallet cargoes, the current port facilities cannot respond to containerization of cargoes. The most serious issue is that the shed for loose cargoes which occupies 25% of the limited port area is located in the center of the port area, so a sufficient container area cannot be secured and this has become a major obstacle for cargo handling. Therefore, containers are transferred to and stored at the Star Wharf located approx. 1km east of the Main Wharf and on the road shoulders outside of the port area. In addition, due to the structure of the port facilities, it takes time to carry the containers from the pier and thus generates waiting time for landing of cargoes from container ships, resulting in inefficient cargo handling operations. As a result, at present, the standard mooring time is 11.3 hours per container ship.

The cargo handling hours at the Main Wharf are 7:00 – 22:00 every day except Sunday and the workers work in two shifts. Under such conditions, if a freighter arrives outside these hours, it is put on demurrage, waiting for the starting time, because no cargo handling operations are performed. In addition, the customs work is done at the container storage areas on the public road, approx. 200m – 1km away from the port area. This is not only very inefficient, but has become a serious security issue.

##### **2) Present Situation and Issues for Securing Safe Navigation of Ships Calling at the Port**

The laws of the Republic of Vanuatu (Chapter 26 “PORTS”) make it compulsory for ships to use pilot and tugboats when they enter and leave Port Vila. The 24-year-old pilot boat was banned from operating due to its age and unsafe condition and it is still moored up. Thus, at present, a flat-bottomed wooden boat with an outboard motor is used as a substitute for the pilot boat. However, it is not suitable for pilot service because of its poor seaworthiness and stability, and thus it is very difficult and dangerous to conduct work. At present, three pilots conduct pilot services.

Since the 34-year-old tugboat deployed at Port Vila was taken out of service in 2005 because of aging, support by a tugboat is not currently provided. Controlling a ship at low-speed navigation during approach is limited and the turnaround radius of the ships calling at the port is 3 – 4 times the length of the ship. Thus, ship handling without a tug boat is dangerous even at ordinary times, i.e. even when no restrictions are imposed on entering and leaving the port and mooring at and leaving the pier in strong winds, from the viewpoint of marine navigation and pier protection.

### **3) Response to Marine Accidents**

100 – 120 large vessels (cruise ships and tankers) come into Port Vila each year and there are about 10 marine accidents a year, including stranding and capsizing of vessels. In the past, when marine accidents happened, lifesaving, etc. was performed by the out-of-service tug boat, but there is no means available to respond to marine accidents at present, because there is no search and rescue equipment.

## **1-6 Requested Component**

### **1-6-1 Requests and Results of Preliminary Study**

#### **(1) Requests from the Government of Vanuatu**

The requests from the government of Vanuatu are wharf extension, concrete decks, pavement for cargo handling area, shed for loose cargo, administration office, and etc.

#### **(2) Narrowing-down of Requests from Preliminary Study**

##### **1) Results of Preliminary Study**

During the preliminary study from January to February 2007, the requests from the government of Vanuatu were carefully evaluated and the following items were studied by conducting an analysis in Japan.

- The situation of vessels entering and leaving Port Vila and the cargo handling conditions were confirmed, various kinds of data were collected and discussions with the government of Vanuatu were conducted to confirm the priority of the requests.
- While the wharf extension was one of the first priorities in the Minutes of Meeting, it was confirmed that its reasonableness would be evaluated from the viewpoint of the usage frequency of the port and the scale of vessels calling at the port, and the government of Vanuatu agreed to this.
- Because the reasonableness of the wharf extension was not accepted from the viewpoint of the usage frequency of the port and the scale of vessels calling at the port as a result of study after coming back to Japan, it was decided to exclude it from the components.

## **CHAPTER 2**

### **CONTENTS OF THE PROJECT**

## CHAPTER 2 CONTENTS OF THE PROJECT

### 2-1 Basic Concept of the Project

#### 2-1-1 Project Purpose

Overall goal: Balanced economic revitalization of the Republic of Vanuatu

- 1) Project purpose: To enable safe and efficient operation of Port Vila.
- 2) Expected output: Port Villa will be rehabilitated and improved.
- 3) Project output indicator: Reduction of cargo handling hours, etc.
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- 5) Beneficiaries
  - Direct beneficiaries: Approx. 40,000 residents of Efate Island
  - Indirect beneficiaries: Overall population of the Republic of Vanuatu, i.e. approx. 200,000 people
- 6) Government agencies
  - Main ministry: Ministry of Infrastructure and Public Utilities
  - Implementation agency: Public Works Department, Ministry of Infrastructure and Public Utilities
- 7) Recipient's input plan: Securing of the project site
- 8) Recipient's activity plan: Operation and maintenance of facilities and equipment provided by the cooperation project

#### 2-1-2 Contents of the Project

Contents and scale of the project

Facility	Details of structure	Quantity
[Civil engineering facilities]		
1. Concrete decks (at the openings and the western end)	Steel-pipe pile piers	Four piers (Total area: 1,013 m <sup>2</sup> )
2. Pavement of the Cargo-Handling Area	Concrete pavement	Area of pavement: approx. 8,620 m <sup>2</sup>
3. Drainage	Concrete U-shaped side ditches and corrugated pipes	1 set
4. Westside shore protection	Mildly sloped riprap revetment	Extension: 50m
5. Eastside shore protection	Upright block masonry seawall	Extension: 66.64m
6. Lighting facilities	High pole type with high-pressure-sodium lamps	4
7. Lighting buoys	LED lamps powered by solar cells	2
[Construction facilities]		
1. Shed for Loose Cargoes	Steel frame construction, single-storied (warehouse, two offices and toilets)	Total floor area: 1,045 m <sup>2</sup>
2. Administration Office	Concrete block building, two-storied (administration offices, conference rooms, library and toilets)	Total floor area: 560 m <sup>2</sup>



[Equipment to be procured] 1. Tugboat  2. Pilot boat	Total length: approx. 31m Total tonnage: approx. 250t Main engine: 1.600hp x 2 engines Total length: approx. 12m Total tonnage: approx. 11t Main engine: 180hp x 2 engines	1 boat  1 boat
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## 2-2 Basic Design of the Requested Japanese Assistance

### 2-2-1 Design Policy

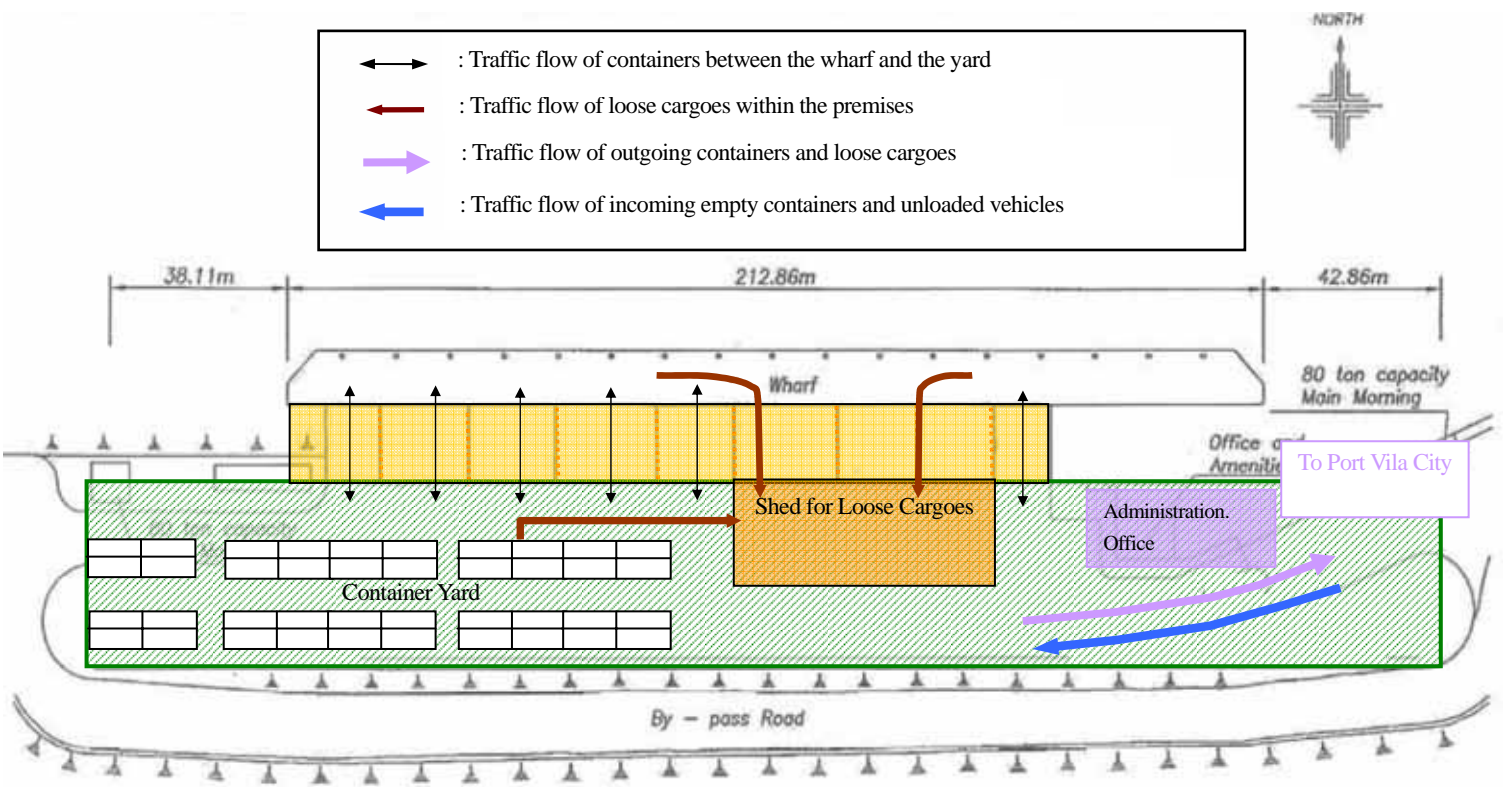
#### 2-2-1-1 Design policy for the port facilities

The most significant goal of this project is to modernize the existing port facilities which were constructed more than 35 years ago, as they do not meet the standards of current marine transport which uses more containers and larger ships than 35 years ago.

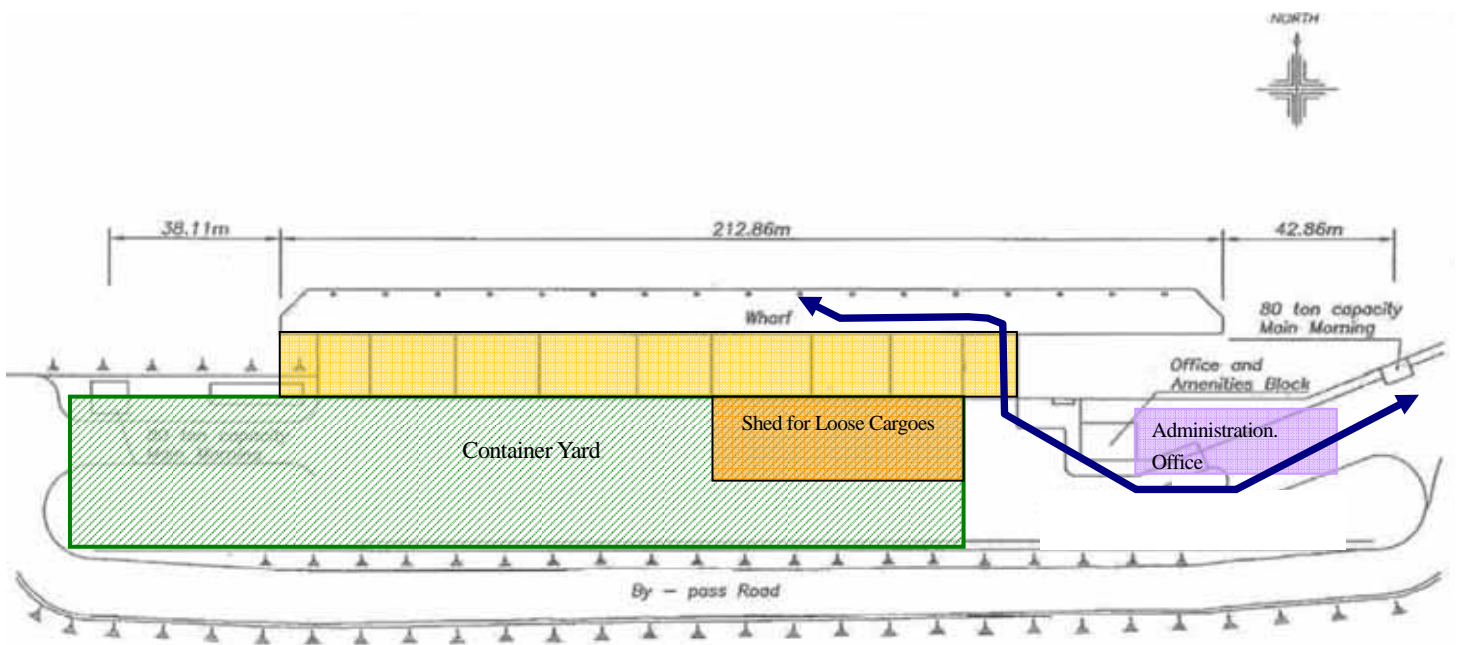
To achieve this goal, the following basic policies have been established.

##### (1) Policy concerning the facility plan

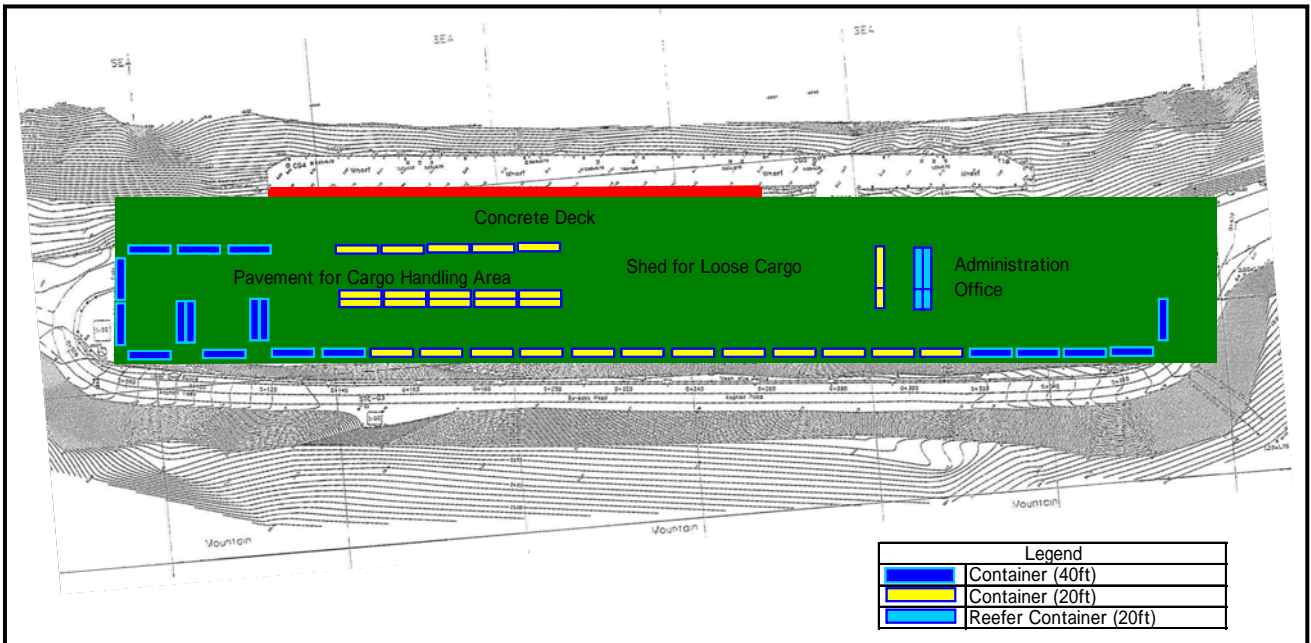
- \* An area as large as possible shall be reserved for the Cargo-Handling Area.
- \* Efficient work within the site shall be guaranteed, taking into consideration the traffic flows of cargoes and passengers in the port area.
- \* An effort shall be made to make the site as flat as possible.
- \* Security within the site shall be enhanced.
- \* Structures shall be designed so as to minimize maintenance costs.



Traffic flow of cargoes



Traffic flow of cruise ship passengers



Facility site plan (assuming container storage)

(2) Policy concerning natural conditions

- \* Waves generated in the port will be included in consideration of the design waves.
- \* Uniformity of structural behavior with the existing structures in the vicinity will be considered when establishing the seismic coefficient.
- \* The ground condition will be considered when decisions are made on facility structures. In particular, the shore protection will be designed so as not to be affected by container and other loads and, if necessary, the ground at the shore protection will be reinforced.

(3) Policy concerning social conditions

- \* The construction methods and schedule will be determined, with suspension of work while a cruise ship is at anchor in the port a basic rule.
- \* Utmost attention will be paid to the safety of ordinary tourists while a cruise ship is at anchor in the port.
- \* Every effort will be made to ensure the creation of as many employment opportunities as possible for local residents.

(4) Policy concerning the condition of the local construction business

- \* The basic rule is local procurement of equipment and materials to the greatest extent possible, as long as locally available goods meet the standards of this project in terms of performance, availability both in quantity and in the time required for delivery, and costs. Otherwise, equipment and materials will be procured from Japan or a third country.

- (5) Policy concerning the employment of local construction firms
- \* Every effort will be made to employ as many local construction firms and laborers as possible in the project. When an appropriate firm or laborer cannot be hired locally, employment from Japan or a third country will be considered for smooth progress of the project.
- (6) Policy concerning the operational and maintenance/management capacities of the implementing agency
- \* PWD, the organization responsible for operation of the port, has not accumulated data on the flow of individual cargoes. We will stress that such data are essential for the formulation of a future port plan and recommend PWD to start accumulating data.
- (7) Policy concerning establishment of the scale and contents of the facilities to be constructed in the requested Japanese assistance
- \* An effort will be made to secure as large an area as possible for the Cargo-Handling Area including the area required for operation of container handlers, large-scale forklift trucks and side lifters. A storage area for reefer containers will be secured.
  - \* The Shed for Loose Cargoes will be designed mainly for cement, construction materials and small-lot cargoes from the containers of loose cargoes.
  - \* The Administration Office and the Shed for Loose Cargoes will be designed to contain staff rooms and offices for all the port workers. The toilets in these buildings will be designed in such a way as to allow their use on weekends and holidays by tourists and the general public.
  - \* The drainage ditches will be designed for draining rainwater in the port area.
- (8) Policy concerning construction methods and processes
- \* All the construction works will be conducted on land.
  - \* Utmost attention will be paid during the works so as not to damage existing structures.
  - \* The work schedule in this project will be well coordinated with the schedule for demolition and removal of the existing facilities by the Vanuatu side, so that lack of coordination will not cause any delay in the works.
  - \* Those people working in the existing Administration Office will be relocated to the new office after its construction has been completed.
  - \* Sufficient time will be reserved for equipment procurement in consideration of the state of the shipbuilding business in Japan.

#### **2-2-1-2 Design policy for port equipment**

- (1) Tugboat
- \* The basic design of the tugboat will be prepared on the following bases: 1) A tugboat has to have the

maneuverability to perform the required supportive work promptly, including assistance to arriving and departing large ships and safe performance in ship handling including steering and turning. 2) The basic concept of the design is to equip the tugboat with not only the equipment required for tugging work, but also search and rescue and disaster prevention functions. 3) Reference is to be made to the design of tugboats of similar specifications which have been deployed and successfully used in ports and harbors in Japan.

- \* Wind velocity of 10m/s (fluctuating wind velocity of 13m/s) will be used as the design wind velocity for navigational support and docking/undocking support by the tugboat. The design ambient temperature conditions for the equipment will be set at air temperature 45°C and seawater temperature 32°C, taking into consideration their use in a tropical zone.
- \* The tugboat is to have sufficient cruising range to provide support to various islands in Vanuatu in the event of disaster and to navigate to Australia, approximately 1,800 km from Port Vila.
- \* When selecting the equipment to be loaded on the tugboat, availability of after-sales service and spare parts and maintenance/management costs are to be considered.

## (2) Pilot boat

- \* The basic policy for the design of the pilot boat is to have good wave-resistance, good maneuverability and sufficient stability to enable safe, quick and trouble-free embarkation and disembarkation of pilots and line handling.
- \* The pilot boat will be made of steel, because steel boats can be maintained and repaired locally and in consideration of the environment.

## 2-2-2 Basic Plan

### 2-2-2-1 Basic plan for the port facilities

#### (1) Concrete decks

- \* For more efficient cargo handling on the wharf, the openings between the access bridges and between the westernmost access bridge and the line connecting the western end of the existing pier and the land are to be closed with concrete decks. However, the opening west of the easternmost access bridge will not be closed for reasons of safety of the construction and cargo-handling works, because oil and gas pipelines are installed in the opening.
- \* The concrete decks are to have a vertical-pile-pier structure for uniformity of the dynamic behavior of the structures and ease of construction.
- \* The elevation of the surface of the concrete decks is to be made identical to that of the existing access bridges adjacent to them so that they make a continuous apron deck. The westernmost and easternmost access bridges have 1% declivity toward the land, while the remaining bridges in the middle have 1% acclivity toward the land. Therefore, a step will be installed between the

westernmost access bridge and Deck C. Because of the step, Deck C and the westernmost access bridge will be separate in terms of usage. Car stops will be installed at the boundary between Deck C and the westernmost access bridge.

- \* Use of SISU container handlers, which are used in the existing facilities, is to be assumed in the design of the strength of the new concrete decks. Therefore, the following restrictions will apply to cargo handling on the new decks.
  - Handling of loaded containers with forklift trucks will be prohibited.
  - Loaded containers will be handled only with the SISU container handlers which are used at the existing pier to transport containers.
  - Forklift trucks with a cargo-handling capacity of 20t or less will be used for the handling of empty containers. Entry of forklift trucks with a capacity greater than 20t onto the decks will be prohibited, even if they are unloaded.
  - Only one piece of container-handling machinery will be allowed to operate on each of the existing access bridges and new concrete decks and entry of a second cargo-handling machine onto the bridge or deck will be prohibited.
  - Stacking of loaded containers will be prohibited.
  - As the new decks will be used as a unit with the existing structures, the former are to have the same anti-seismic strength as the latter. By reference to the collected material, "PORT DEVELOPMENT STUDY REPORT BY WILTON & BELL PTY.LTD 1978 OCT," the horizontal design seismic coefficient used in the original design is to be assumed at  $k_h=0.1$ .

## (2) Cargo-Handling Area

- \* The Cargo-Handling Area is to have an area capable of accommodating 96 containers, including 20t, 40t and reefer containers.
- \* Asphalt pavement requires frequent maintenance. As there is no large-scale paving machine in Vanuatu, concrete pavement, which requires less maintenance and management work, will be used in this project. The load of the largest vehicle currently in use in the existing facilities (40t top-lifters) is to be considered when designing the pavement. For efficient cargo handling, the inclination of the ground surface in the premises is to be 1% or less. For drainage of rainwater, the ground surface will be sloped at approximately 1 % from the mountain side to the sea.

## (3) Shore protection

- \* Loosening of the stone masonry due to the fragile foundations is considered to be the cause of the collapse of the shore protection on the western side. The structure of the shore protection to be adopted in this project will be sloping riprap masonry revetment and stone materials available in Vanuatu will be used for the structure. The bottom end of the masonry will be made deeper than at present. To prevent storage of containers and operation of cargo-handling machinery behind the shore protection from causing sliding failure, a platform with pile foundations will be installed behind

the stone masonry.

- \* The load of double-stacked loaded containers and the wheel loads of the 40t top-lifters and SISU container handlers will be taken into consideration when deciding the design load of the platform.
- \* The reason for the collapse of the shore protection on the eastern side is assumed to be similar to that on the western side. As the water area in front of this shore protection is used for docking and undocking by small tourist boats and other ships, concrete block masonry will be adopted as the basic design of the shore protection to minimize any adverse effect on the use of the front water area. As the area behind the protection will be used as a passageway for tourists, surcharge storage of containers and other cargoes will not be considered in the design. Therefore, guard rails will be installed behind the shore protection to prohibit storage of containers and traffic of heavy vehicles near the shore protection.
- \* The design surcharge on the area behind the shore protection will be assumed at  $1\text{ton/m}^2$  and  $0.5\text{ton/m}^2$  at ordinary times and in the event of an earthquake, respectively.

#### (4) Rainwater drainage facilities

- \* As the existing facilities do not function adequately, new drainage ditches, catch basins and drainage pipes capable of handling the amount of rainwater expected from precipitation in the port area will be installed.

#### (5) Shed for Loose Cargoes

- \* Part of the existing Shed for Loose Cargoes will be dismantled and removed. The remaining  $1,045\text{m}^2$  part with its steel frames will be reused, with replacement of the steel sheet roof and metal walls and openings (shutters). It is impossible to dismantle and remove the foundation of the existing shed because the bracing structure, such as the tie rods supporting the steel sheet piles for earth retention on the seaward side, is installed inside the foundation.
- \* The frame which is to support a new large-section opening (large-scale shutter) planned in the western gable wall will be installed independently from the existing steel frames. Reuse of the existing structure will impose restrictions on the size of the openings in the ridge direction. However, as no problem is expected from the use of shutters of the size of the existing ones, shutters with a size of  $4,000\text{W}\times 4,500\text{H}$  will be installed.
- \* The Customs and IFIRA Offices will be accommodated in the shed. The toilets for tourists and sales clerks in the souvenir shop and a water tank room will be installed in the shed.
- \* The floor area surrounded by the exterior walls will be  $55.0\text{m}\times 19.0\text{m}=1,045\text{ m}^2$ . However, the existence of an area under a lean-to roof on the south of the shed will increase the total floor area in terms of the Building Standard Law by approximately  $140\text{ m}^2$ .

#### (6) Lighting Facilities

- \* Four large lighting facilities of sufficient height will be installed in the port (at sites near either end of

the wharf). They will enable cargo handling during the night and guarantee security in the port.

(7) Administration Office

- \* To ensure a sufficient area for the Cargo-Handling Area and security in the port, the location of the Administration Office will be moved eastward.
- \* The Customs Office and rooms associated with the work of the Customs will be located on the first floor. Rooms for immigration services will be also included in the design of the first floor. In consideration of ease of access for the general public to the Customs Office, the public entrance will be designed on the north (seaward side) of the checkpoint on the eastern side. The entrance for workers will be designed on the southern side of the building. This design will enable separation of the traffic flows. On the second floor, the PHD will have their offices as is the case in the existing facility. In consideration of the distance to the escape route from each room, the building will be designed as a center-core building with a staircase in the center, instead of a center hallway building elongated in the east-west direction. The total floor area will be  $2 \times 20.0\text{m} \times 14.0\text{m} = 560.0 \text{ m}^2$ . In other words, an area almost twice as large as at present will be required. The table below shows the numbers and capacities of the required rooms obtained from interviews with Customs and PHD personnel.

Floor	Personnel / Room name	Capacity	Floor	Personnel / Room name	Capacity
1	Border Customs Manager	1	2	Director	1
	Principal Compliance Officer	1		Clerical Support Officer	1
	Senior Compliance Officer	13		Harbor Master	1
	Examine Border Officer			Assistant Harbor Master	1
	Examine Officer			Operations Manager	1
	Immigration Office	2		Senior Finance Officer	1
	Library & Store			Finance Officer	1
	Storage for Dangerous Materials			Captain & Boson	2
	Small Kitchen			Conference Room	
	Conference Room			Small Kitchen	
	Toilets			Library	
				Storage	
		Toilets			

- \* Because of the pavement plan in the premises, the elevation of the ground around the planned site of the Administration Office is not level. The elevation is highest at the southeastern corner of the building. The plane at the elevation at this point will be set as GL. The floor height will be GL+100mm and the story height will be set at 3.2m for both the first and second floors.
- \* The design of the eave extension of the existing facility will be partially followed as a measure against rainwater. The design will include 90cm-wide eaves in the north-south direction above the windows



on the first floor and all around the building above the windows on the second floor. In principle, the interior ceiling height will be 2.6m.

- \* To ensure the lighting in each office, the main structures will be made of RC construction and the walls, including the exterior walls, will have concrete blocks as substrate and a mortar finish.
- \* Vanuatu has its own Building Code. The code was last revised in 2000. As is the case with previous versions, the details are provided by reference to Australian Standards (AS) or New Zealand Standards (NZS) in the 2007 edition. Because the code of Vanuatu is extremely complicated and integration with AS and NZS has made it unclear how to process the zoning coefficients described in the Standards of Vanuatu, Japanese structural standards will be used in this project.

The details of the power supply, water supply and drainage plans are shown in the attached materials.

#### (8) Lighting Buoys

- \* In order to ensure safe navigation and mooring of large ships, two lighting buoys will be installed near the border of the shoal area south of the entry route.

### **2-2-2-2 Basic plan for the port equipment**

#### (1) Applicable rules and regulations

The following are the maritime rules and regulations applicable to ships of Vanuatu nationality.

- 1) Laws and ordinances of Vanuatu (on maritime affairs, marine transportation, sailors, ports and harbors, etc)
- 2) Rules and regulations of ship classification societies
- 3) Maritime rules and regulations of Japan

Although Vanuatu has established laws and ordinances on maritime affairs and marine transportation, it does not have any regulations on the structure of ships or safety regulations. In addition, Vanuatu has not incorporated the South Pacific Maritime Code or Pacific Regulations into its domestic legal system. Tugboats and pilot boats deployed in ports and harbors in Japan are built in accordance with the maritime rules and regulations of Japan and are not classified in accordance with rules and regulations for the classification of ships.

In this project, a tugboat and a pilot boat will be built in accordance with the maritime rules and regulations of Japan and a ship classification society will conduct in-production inspection.

#### (2) Inspection by the supervising agency and classification of ships

The Vanuatu Maritime Authority controls inspections of ships in Vanuatu. The tugboat owned in the past and the pilot boat currently in use were built and inspected by a ship classification society (LRS – Lloyd's Register of Ships). Later, Vanuatu withdrew from the society and the Maritime Authority now conducts

regular and unscheduled inspections of ships after building. The Authority does not commission a ship classification society to conduct in-production inspection on its behalf. We have confirmed that the tugboat and the pilot boat to be provided in this project will be subjected to inspection by the Maritime Authority when they are delivered to Vanuatu. The Vanuatu Maritime Authority commissioned in-production inspection to a ship classification society in the past. LRS, which offers inspection services in Australia, will be commissioned to conduct in-production inspection, for ease of access.

### (3) Basic performance of the tugboat

#### 1) Type of boat

The tugboat to be designed will have a single steel deck and optimal performance in terms, in particular, of towing power, stability and maneuverability. A deckhouse will be built on the deck and a wheelhouse and a mast will be installed on the top of the deckhouse. The tugboat is to have a hull shape and equipment arrangement which will enable quick and safe pushing and towing. Tugging work will be performed mainly at the bow, using the rubber fender attached to the bow for pushing large ships and a winch installed at the bow for towing them in reverse motion.

#### 2) Performance of propeller

When a propeller is designed on a velocity basis, the main engine will become torque-rich during operation at maximum towing power (or bollard pull) and bollard-pull performance will decline. As the tugboat is to be used mainly for docking and towing support, the propeller will be designed for maximum towing power (bollard pull).

#### 3) Capacity of tanks

Although cruising distance does not affect ordinary operation of the boat in the port, it is preferable for it to have as long a supply interval as possible because of the capacity of the supply facilities on land. As it is expected to be used for search and rescue operations at various islands in Vanuatu, it is to have fuel and fresh water tanks large enough to guarantee the cruising distance required for such operations.

#### 4) Equipment for towing

- A windlass/line hauler with hawser drum will be installed in the center of the upper deck at the bow. The chain gypsy and hawser drum will be able to be operated independently by shifting the clutch. The hawser drum will have the capacity to wind  $\phi 90$  mm x 100m of fiber hawser and have a breaking force of 1.5 times the towing power.
- A towing hook will be installed on the upper deck behind the deckhouse. The hook will have a capacity of 1.5 times the towing power.
- A steel-pipe towing beam will be installed in front of the top of the propeller room. Both wings of the beam will be sloped in order for the rope to slide smoothly.

#### 5) Crew

In accordance with the maritime rules and regulations of Vanuatu, the crew of the tugboat will consist of the following.

• Captain	1
• Chief engineer	1
• Other crew members	4
Total	6

The tugboat will always be equipped with lifesaving equipment (lifesaving raft and life jackets) and accommodation for six persons.

#### 6) Radio equipment

As there is no ground station of the Global Maritime Distress and Safety System (GMDSS) in Vanuatu, there is no need to equip the boat fully with a GMDSS-compatible radio communication system. Nevertheless, the boat will be equipped with VHF international wireless telephone, Emergency Position Indicating Radio Beacon (EPIRB), two-way VHF wireless telephone and a Search and Rescue Radar Transponder (SART), all compatible with GMDSS.

#### \* Marine pollution prevention measures

The tugboat will be equipped with an oil separator in accordance with the oil discharge standards of the International Convention for the Prevention of Pollution from Ships (MARPOL). A sanitation system compliant with MARPOL IV will be installed and the boat will be equipped with a system that enables discharge of treated wastewater from the side of the boat into the sea or to a land facility. The main engines will be certified in accordance with MARPOL Annex VI.

#### 7) Search and rescue operations

The tugboat will be equipped with a 2kW and a 1kW searchlight on top of the wheelhouse and on top of the mast, respectively, to enable search and rescue operations day and night. It will also be equipped with international and two-way VHF wireless telephones, Automatic Identification System (AIS), EPIRB and SART. It will carry a tender boat.

#### 8) Fire-extinguishing equipment

Notice No. 29 of the Japan Coast Guard based on the provisions of Clause 2, Article 15 of the Enforcement Regulations of the Maritime Traffic Safety Law of Japan obliges very large vessels with a length of 250m or more or carrying hazardous materials and vessels carrying 50,000t or more of hazardous materials to be provided with an escort boat and a fireboat, respectively. Although oil tankers, LPG tankers and large cruise ships enter the harbor at Port Vila, there is no ship with firefighting equipment in or around the port. Therefore, the tugboat will be equipped with fire-extinguishing equipment for other ships in accordance with the above-mentioned notice of the Japan Coast Guard in order to handle fire at sea or at land facilities.

#### 9) Measures against oil spills

Alternative measures against oil spills are collection (with oil skimmers, oil fences and absorbents) and dispersion by spraying neutralizers (oil dispersants). As Port Vila does not have any equipment to handle oil spills, the tugboat will be equipped with an oil dispersant system with a portable nozzle.

#### (5) Pilot boat

##### 1) Type of boat

The pilot boat will have a flush deck with a deckhouse and a mono-hull deep-V bottom. It will have the appropriate velocity, good wave-resistance, good maneuverability and sufficient stability for pilotage.

##### 2) Arrangement

Pilots will embark and disembark from the upper deck at the bow. Maximum visibility including at the rear will be guaranteed for the steersman to enable maneuvering for safe and fail-free embarkation and disembarkation and escort operations.

##### 3) Main engines

The criteria for selection of the type of main engine are reliability, availability of technical support, including supply of spare parts in Vanuatu, and ease of servicing in the boat. The engines will be installed in such a way that the structures above them do not make servicing difficult, when they are serviced on land.

##### 4) Stability

The pilot boat is to have sufficient stability with no load, ordinary load and full load.

### **2-2-3 Basic Design Drawings**

#### **2-2-3-1 Basic design drawings of the port facilities**

The following basic design drawings are shown below.

- Figure -2.2.3-1 Design floor plan
- Figure -2.2.3-2 Standard section plan of the concrete deck
- Figure -2.2.3-3 Section plan of the concrete deck (in the westernmost part)
- Figure -2.2.3-4 Section plan of the westside shore protection
- Figure -2.2.3-5 Section plan of the eastside shore protection
- Figure -2.2.3-6 Floor plan of the pavement of the Cargo-Handling Area
- Figure -2.2.3-7 Floor and elevation plans of the Shed for Loose Cargoes

Figure -2.2.3-8 Design floor plan of the Administration Office

### **2-2-3-2 Basic design drawings of the equipment to be procured**

The following basic design drawings are shown below.

Figure -2.2.3-9 General arrangement of the tugboat

Figure -2.2.3-10 General arrangement of the pilot boat

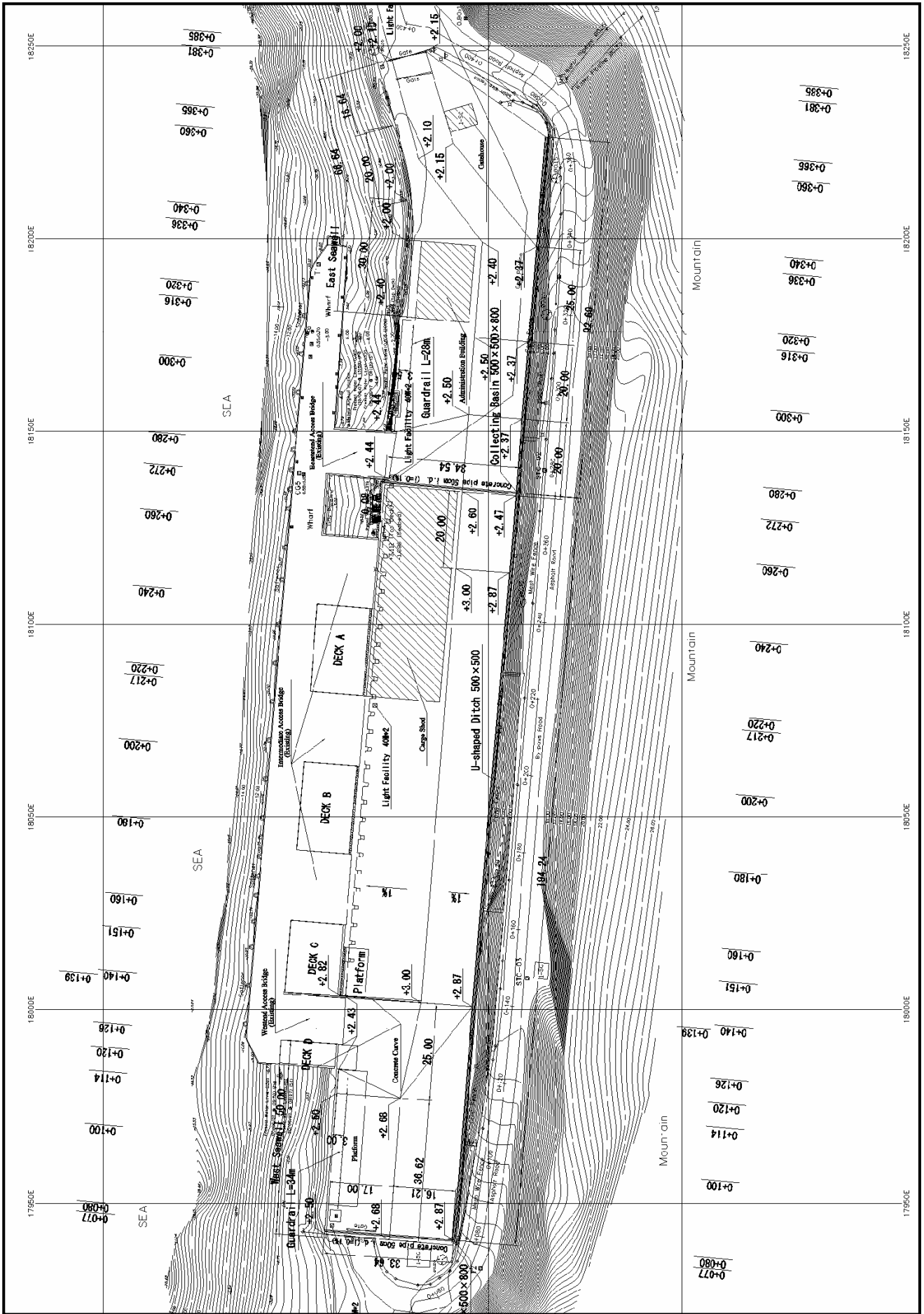


Figure-2.2.3-1 Design floor plan

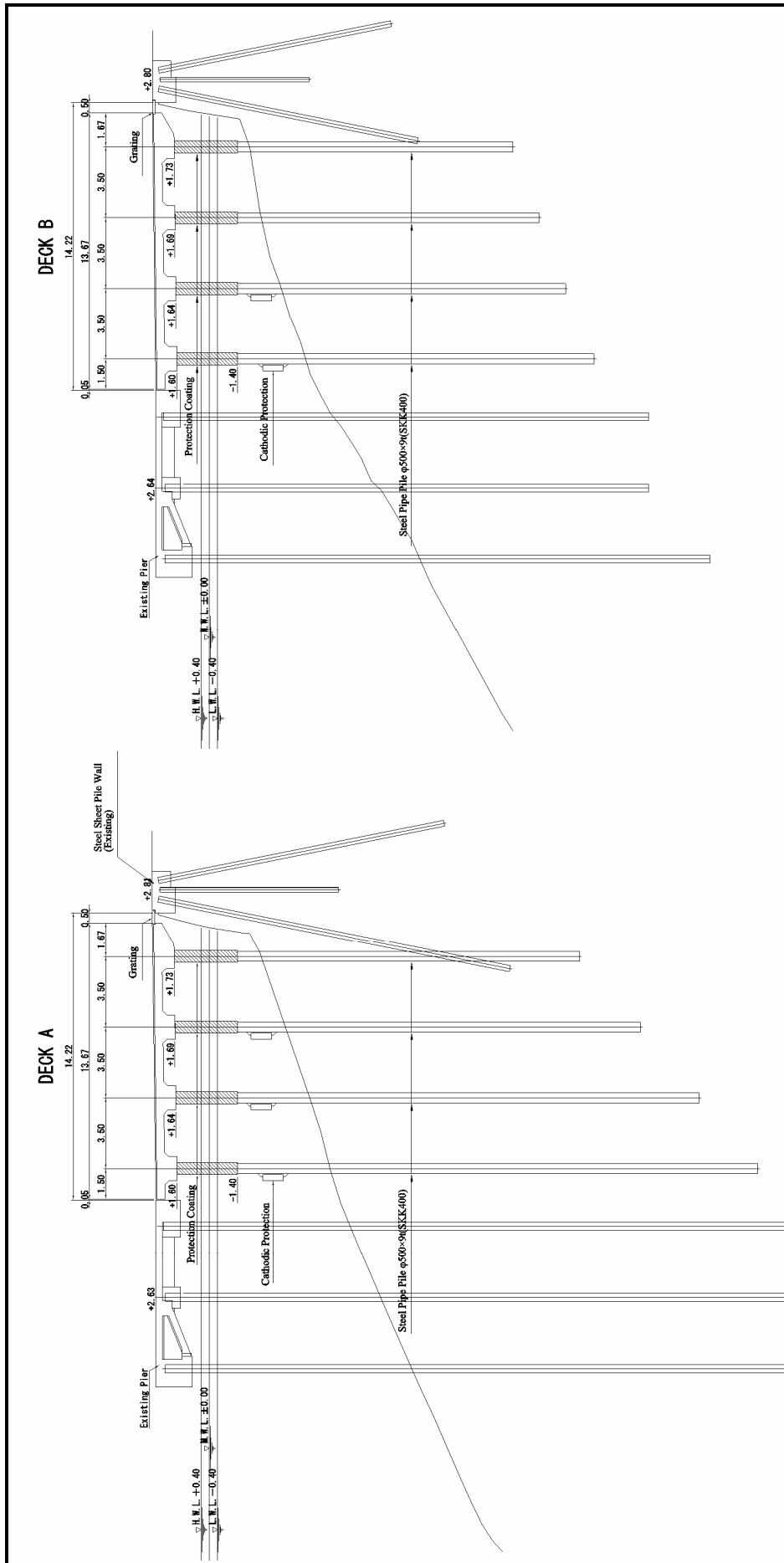


Figure -2.2.3-2 Standard section plan of the concrete deck

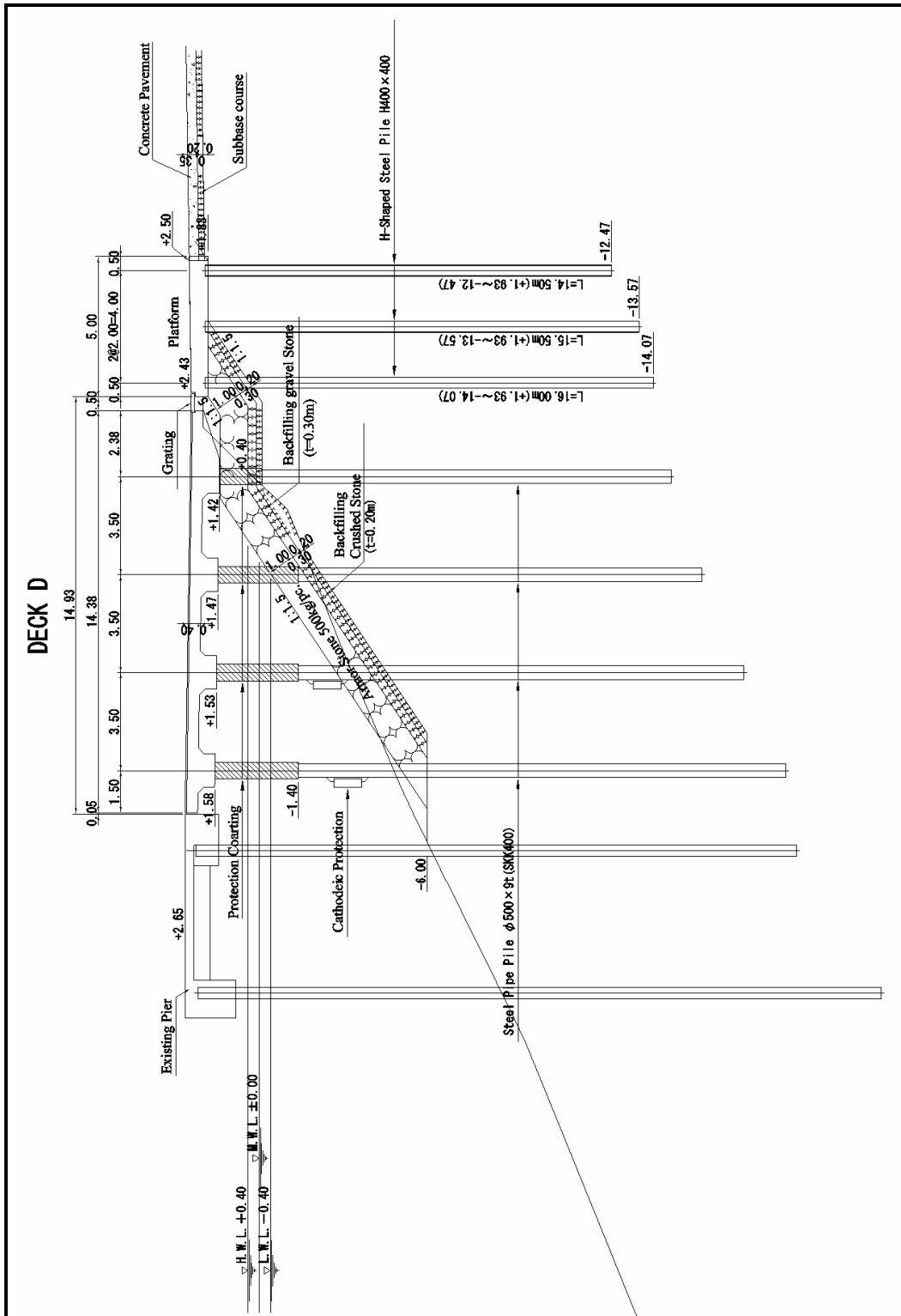


Figure -2.2.3-3 Section plan of the concrete deck (in the westernmost part)



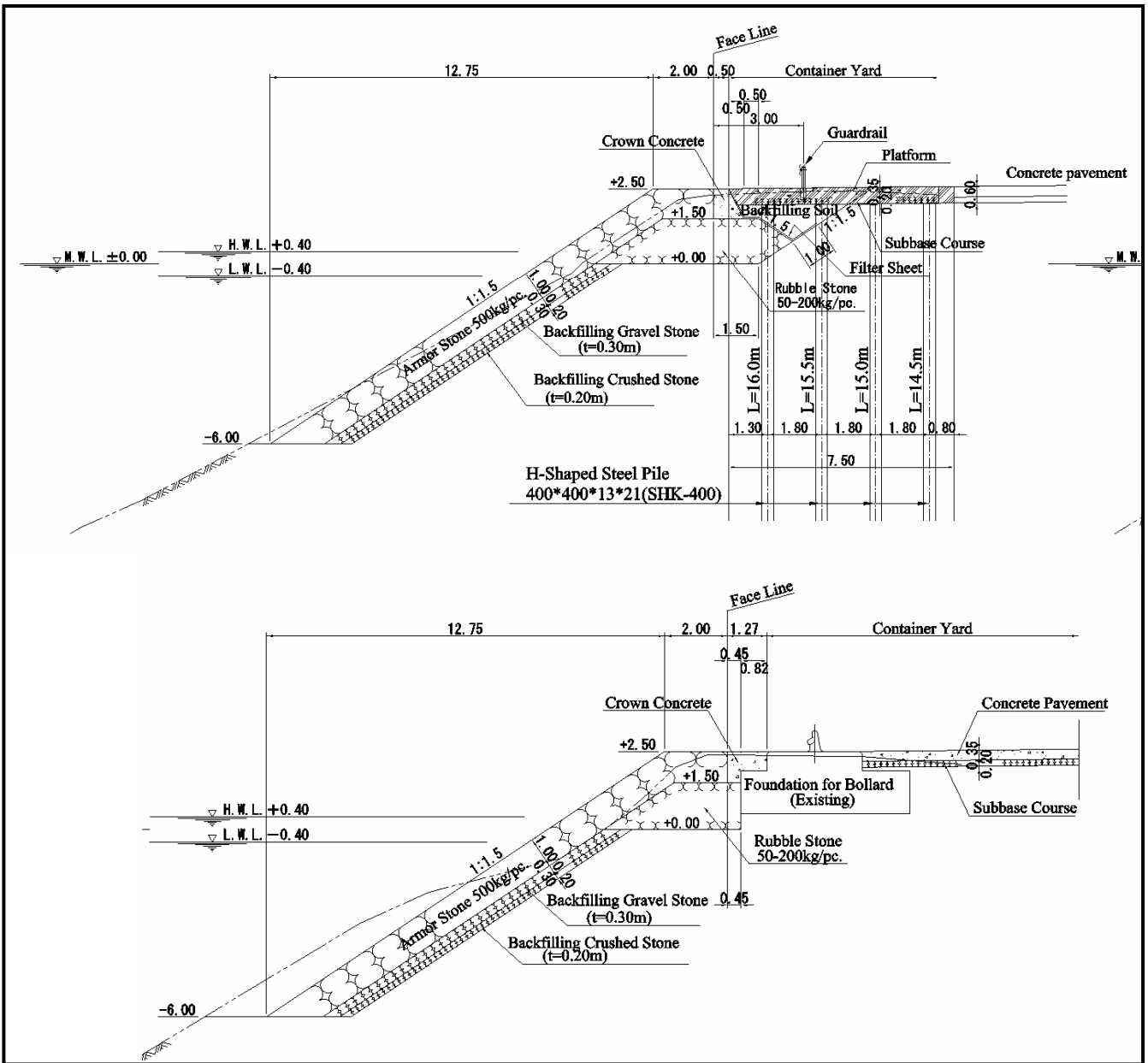


Figure -2.2.3-4 Section plan of the westside shore protection

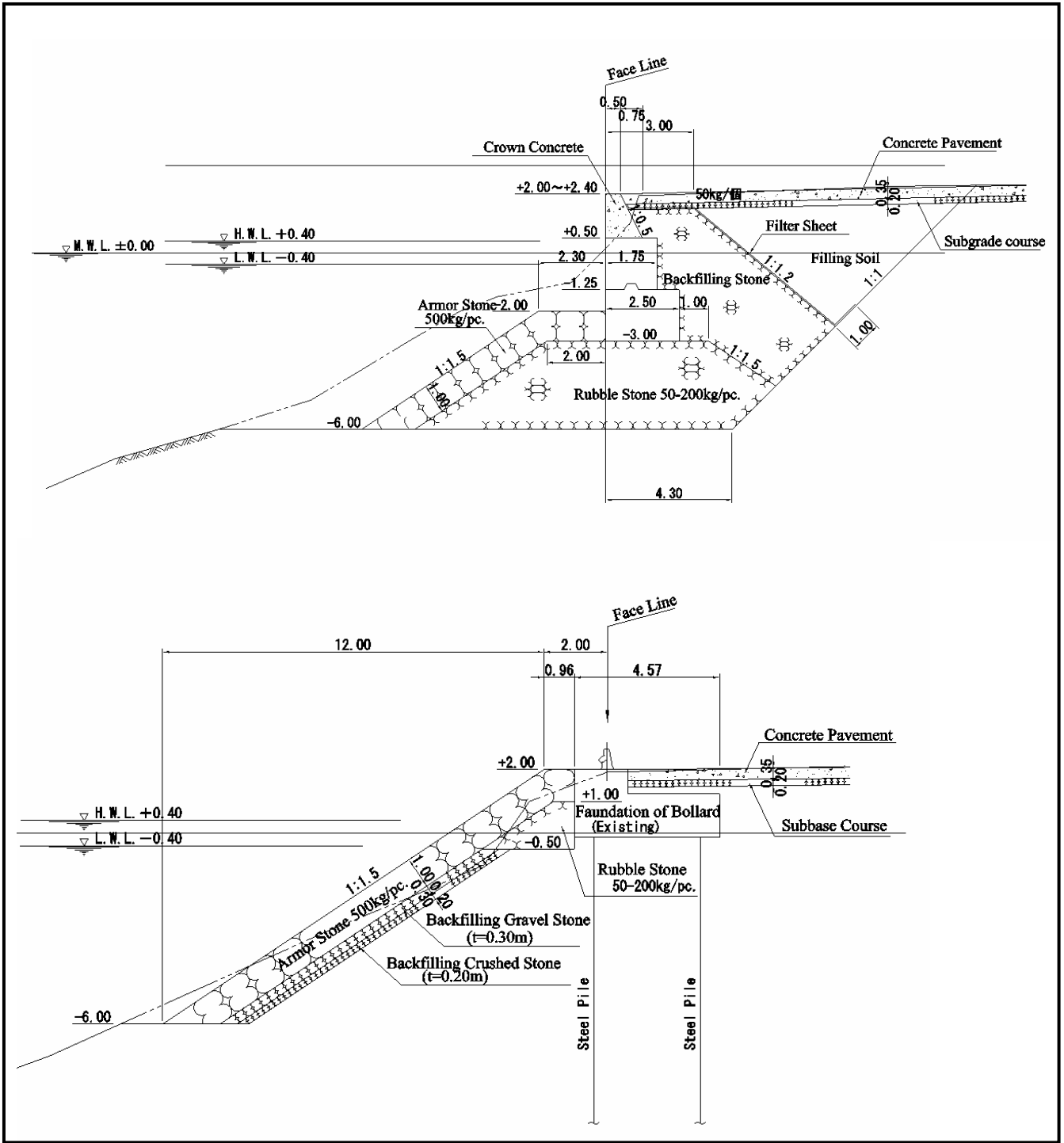


Figure -2.2.3-5 Section plan of the eastside shore protection

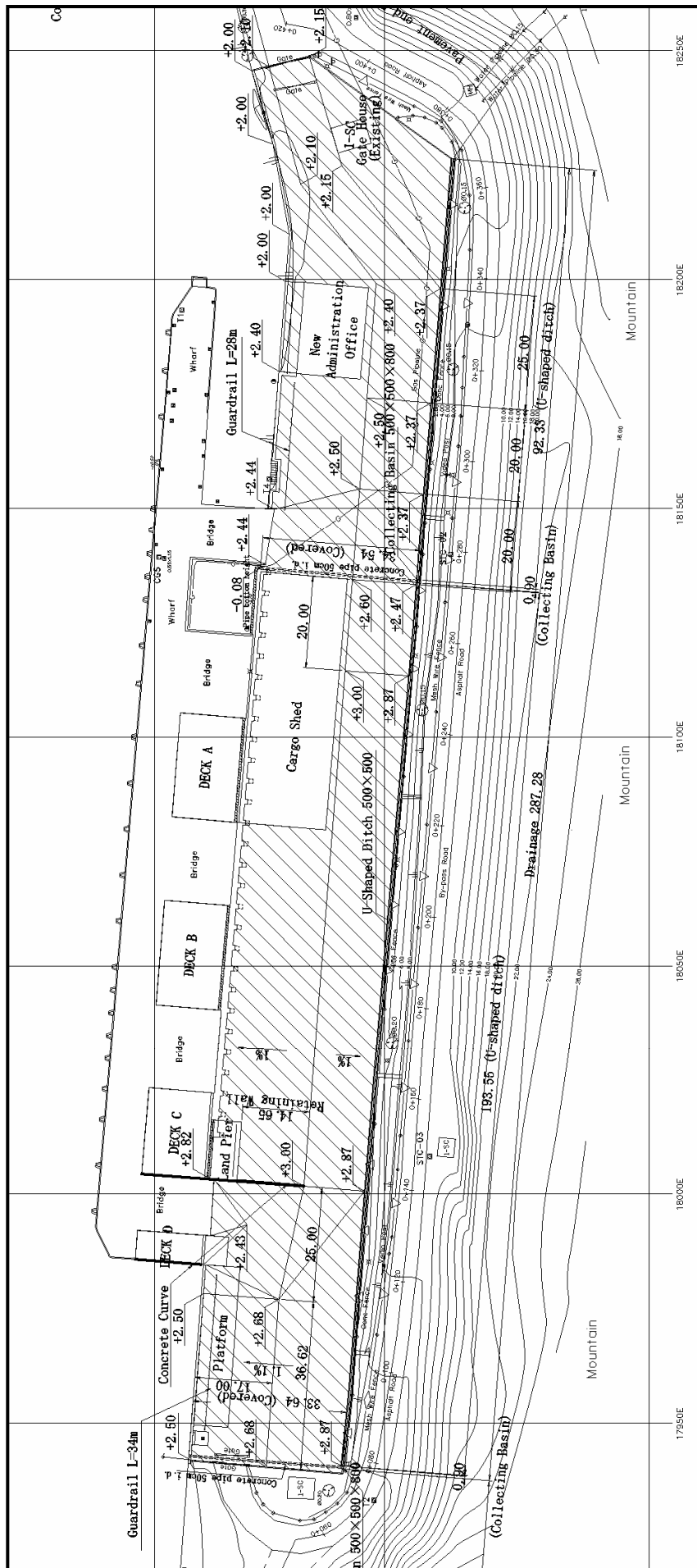


Figure-2.2.3-6 Floor plan of the pavement of the Cargo-Handling Area

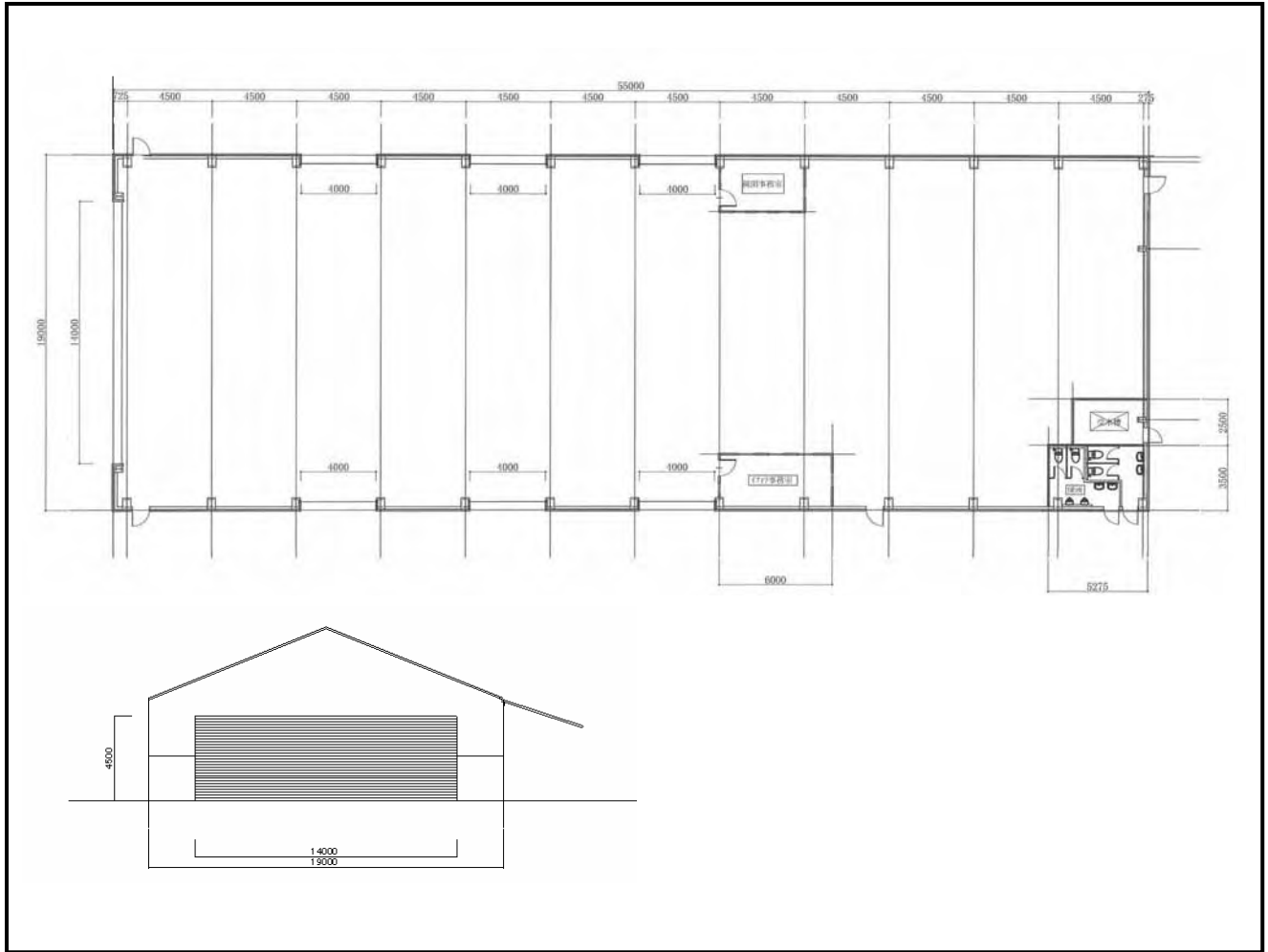
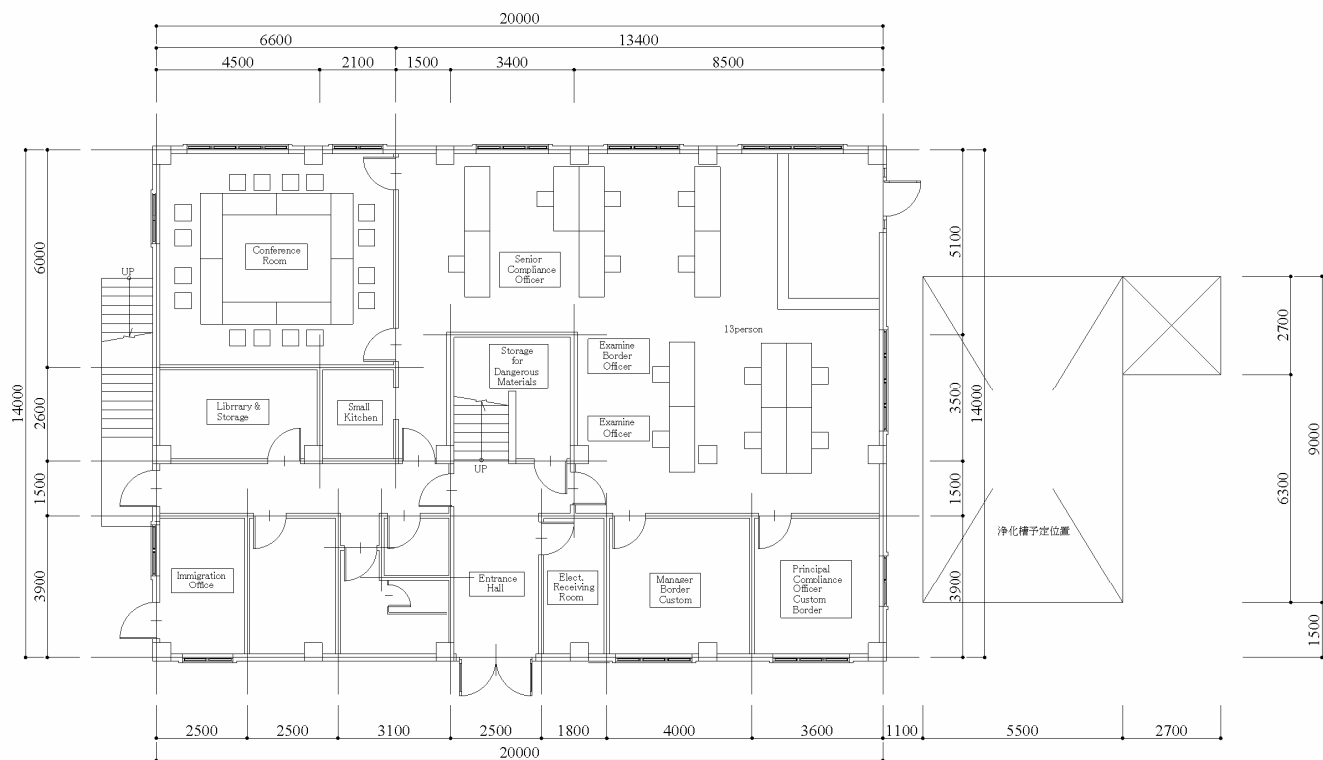
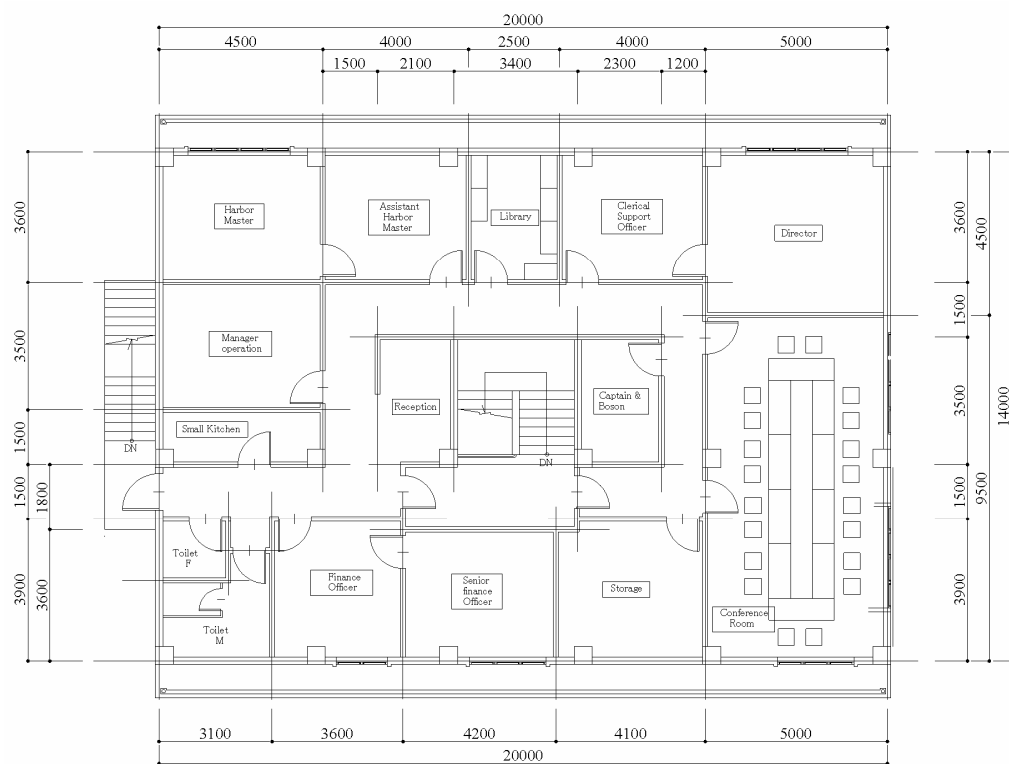


Figure -2.2.3-7 Floor and elevation plans of the Shed for Loose Cargoes



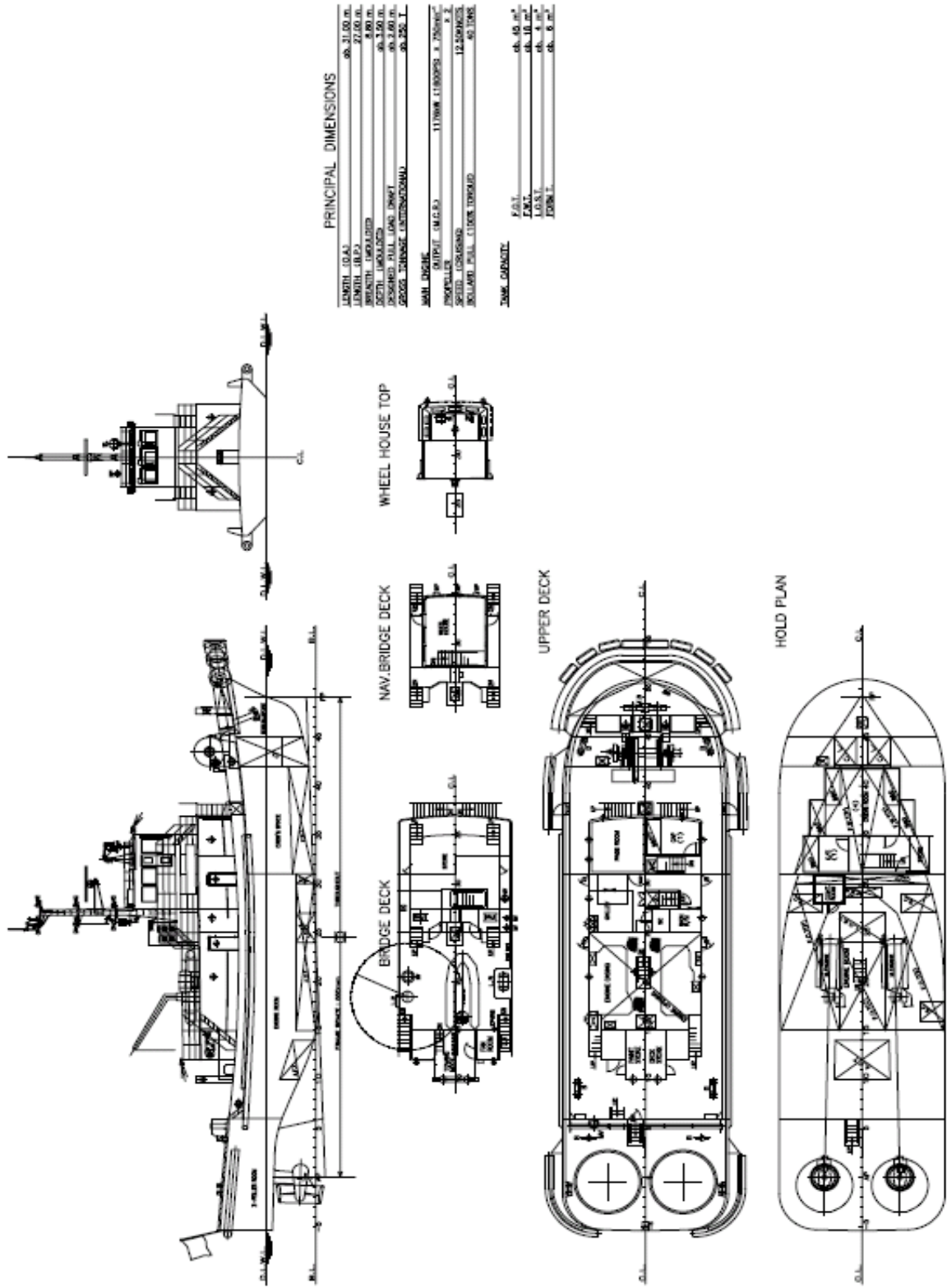
Floor plan of the Administration Office (first floor)



Floor plan of the Administration Office (second floor)

Figure -2.2.3-8 Design floor plan of the Administration Office

# GENERAL ARRANGEMENT



## PRINCIPAL DIMENSIONS

LENGTH (O.A.)	66.31.00 m.
LENGTH (R.P.)	27.00 m.
BREADTH (R.P.)	9.00 m.
DECK AREA (R.P.)	66.3.00 m.
DECK AREA (INTERNATIONAL)	66.300 T.
NET TONNAGE	117000 T (R.P.)
NET TONNAGE (INTERNATIONAL)	12.200 T (R.P.)
NET TONNAGE (INTERNATIONAL)	45.100 T (R.P.)
TANK CAPACITY	66.30 m <sup>3</sup>
TANK CAPACITY	66.30 m <sup>3</sup>
TANK CAPACITY	66.30 m <sup>3</sup>
TANK CAPACITY	66.30 m <sup>3</sup>

Figure -2.2.3-9 General arrangement of the tugboat

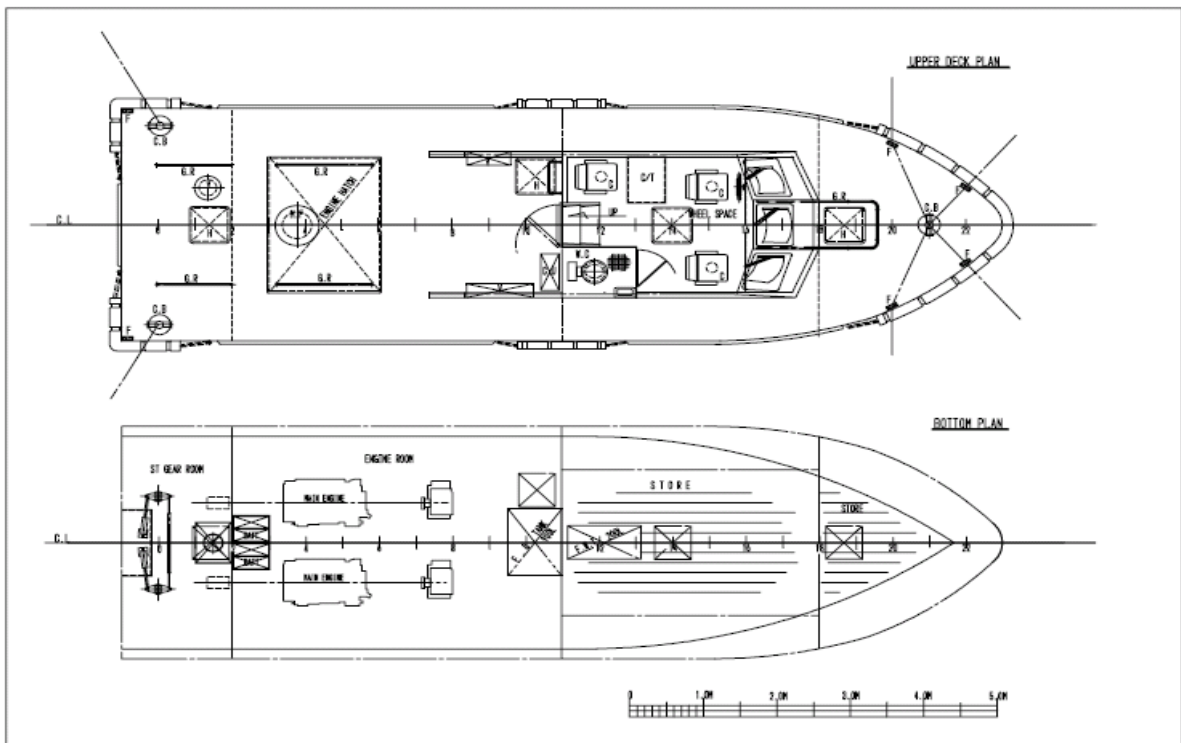
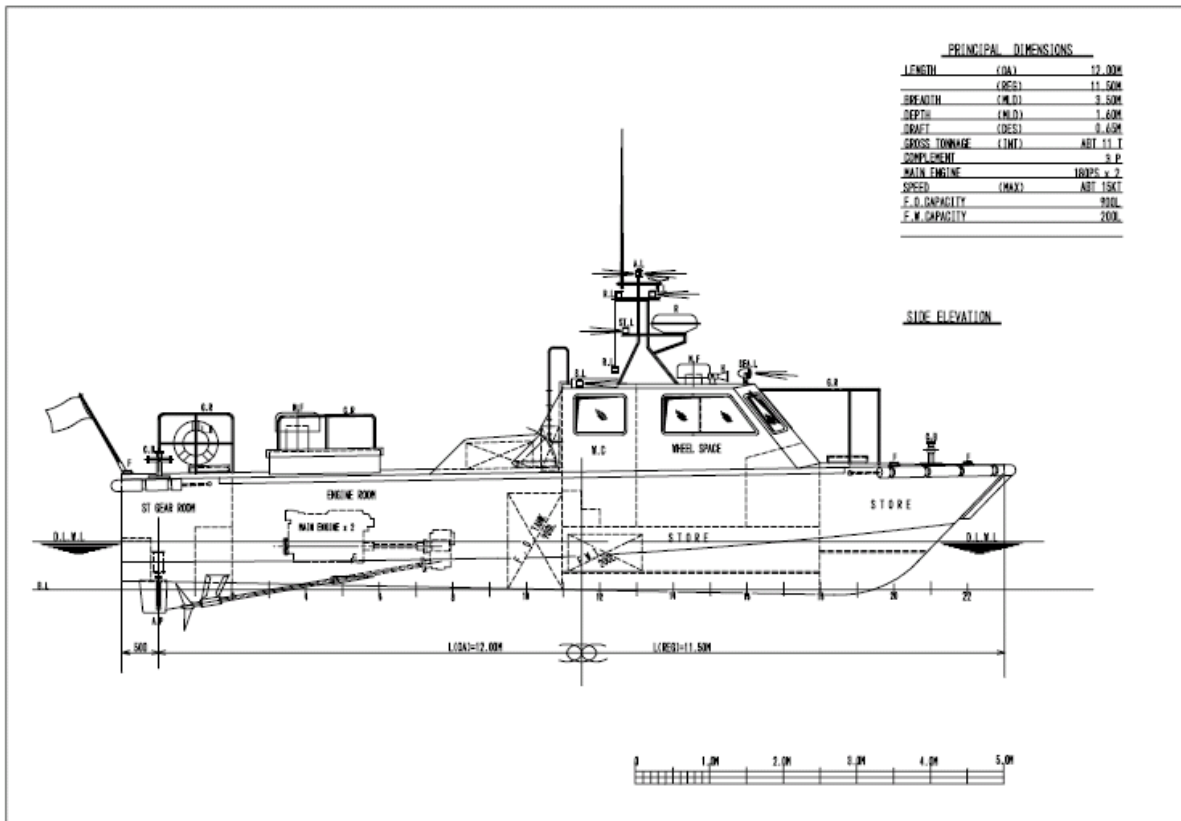


Figure -2.2.3-10 General arrangement of the pilot boat

## **2-2-4 Implementation Plan**

### **2-2-4-1 Implementation Policy**

#### (1) Basic issues concerning project implementation

A consultant contract will be concluded between a consultant of Japanese nationality and the Government of Vanuatu, after the Exchange of Notes (E/N) between the Governments of Japan and Vanuatu regarding the implementation of this project has been concluded.

The consultant will prepare the drawings, specifications and bill of quantities required for the work and the documents required for the tendering and contract for the work. Once these documents have been approved by the Government of Vanuatu, a construction company and a shipbuilding company, both incorporated in Japan, will be selected as the contractors of this project through the tendering process, which will include pre-qualification and evaluation of the tender documents.

The construction work will be implemented in accordance with the construction contract to be concluded between the Government of Vanuatu and the construction company. The duration of the construction work is assumed to be approximately 18 months, judging from the scale and details of the facilities, the social and natural environment and the geographical conditions of the planned construction site. The shipbuilding will be implemented in accordance with the shipbuilding contract to be concluded between the Government of Vanuatu and the shipbuilder. The duration of the shipbuilding is assumed to be 26 months, taking into consideration the current condition of the shipbuilding sector in Japan.

#### (2) Basic policy concerning construction execution and equipment procurement

##### 1) Construction execution

###### \* Consideration for the port facilities in use

The harbor at Port Vila is the hub of goods transportation in Vanuatu. The work of repair and improvement of the port facilities will be executed in accordance with an execution plan drafted and formulated in full consideration of not only guarantee of the safety of visiting ships and of normal cargo-handling functions, but also safety measures for port facility users. In particular, the work schedule will be designed on the assumption that all work in the port area will be suspended while a cruise ship is at anchor.

###### \* Coordination with the schedule of the works in the scope of the government of Vanuatu

The schedule for driving steel pipe piles in the concrete decks will depend on the progress of the removal of the existing Shed for Loose Cargoes in the scope of the works of the government of Vanuatu. The construction of the new Administration Office will not be able to be launched until the work on the eastside shore protection has been completed while retaining the existing Administration Office. The Vanuatu side will demolish and remove the existing Administration Office after the construction of the new Administration Office and relocation of the offices have been completed. Then, after completion of the removal, the paving work in the Cargo-Handling Area will begin. As



the entire work schedule of this project is thus intertwined with the works in the scope of the counterpart government, close coordination with the counterpart government will be required and time for such adjustment should be included in the work schedule.

\* Implementation / Procurement policy

The construction machinery owned by local construction companies is limited in number and performance. In neighboring Australia, because of the boom in the construction of export ports on the eastern coast created by the increase in the export of iron ore and coal, it is impossible not only to employ construction workers but also to procure construction machinery. Thus, procurement of construction machinery from Japan or a third country, such as New Zealand, will be considered.

2) Equipment procurement

\* The boats to be built in Japan will be procured from Japan.

\* When the building of the boats, their trial operation on the sea and handover of the spare parts and completion drawings have been completed, the tugboat will be navigated and the pilot boat will be transported on board a regular-service cargo ship to Port Vila in Vanuatu. The builder of the boats will bear the responsibility and costs of the transport. The boats will be handed over to the implementing agency of Vanuatu after verification of the absence of problems by inspection of the condition of the boats and confirmation trials. If any defect is found during the confirmation trials, the shipbuilder will bear the responsibility for taking corrective measures promptly. The shipbuilder will bear the cost of fuel and other expenses of the confirmation trials.

(3) Project implementation organizations of the recipient country

The following are the responsible bodies and implementing agencies on the Vanuatu side of this project.

Tendering agency : Ministry of Infrastructure and Public Utilities ( MIPU )

Project coordination agency : Ministry of Infrastructure and Public Utilities ( MIPU )

Work implementing agency : Public Works Department (PWD), Ministry of Infrastructure and Public Utilities

Maintenance/management agency after facilities completion:

Public Works Department (PWD), Ministry of Infrastructure and Public Utilities

Organization responsible for operational management of the facilities and boats:

Ports and Harbours Department (PHD), Ministry of Infrastructure and Public Utilities

## 2-2-4-2 Implementation Conditions

### (1) Construction of the facilities

#### 1) Current condition of the local construction sector

##### \* Construction companies

There are several construction companies in Vanuatu. However, they are very small in scale and incapable of independently implementing full-scale civil works on land or port facility works like those in this project. However, they may be utilized as sub-contractors under the supervision of the Japanese contractor.

##### \* Construction machinery

Local construction companies in Vanuatu own general-purpose construction machinery for civil works. However, it is quite likely that the machinery owned by local construction companies is not only limited in variety and quantity, but also of old models and unusable because of insufficient maintenance and servicing. Therefore, of the construction machinery to be used in this project, the machinery for the civil works and the materials will, in principle, be procured locally. However, equipment and materials which cannot be procured locally will be procured from New Zealand or Japan.

##### \* Construction materials

The major construction materials required for this project are quadrate blocks for the concrete decks and shore protection, stones, reinforcement bars and concrete for the concrete pavement and steel pipe piles for the concrete decks. Of these materials, stones, reinforcement bars and concrete are procurable in Vanuatu. The steel pipe piles and lighting buoys will be procured from Japan and other major materials will be procured from Japan or a third country, *e.g.* New Zealand.

##### \* Laborers

Specialized work such as casting of steel pipe piles with a crawler crane, guidance in production of concrete blocks, installation of concrete blocks and rubble mound/cover stone leveling, will require guidance from skilled engineers. While general workers can be employed from local construction companies, there is a need to consider employment of workers from Japan or a third country, such as New Zealand, for the types of work which require operational skills.

#### 2) Construction Works

##### \* Safety management

Because this project will include repair work of the wharf in use, the following safety management plans will be formulated with regard to the construction schedule and work safety, so that execution of the work will not affect the navigation of general ships and cargo handling.

##### a) Construction site and temporary yard

As measures to prevent entry of third parties to the construction site and temporary yard, construction signboards, construction safety signboards and safety fences will be installed. In addition, traffic controllers will be posted at the entrance used by construction vehicles and security guards will be

posted at the material depot 24 hours a day.

b) Works on land

At the site of the concrete deck construction, container yard paving, shore protection work and construction work, in order to ensure the safety of the cargo handling equipment and vehicles, signs indicating the boundaries of the work area will be installed to prevent unauthorized entry.

\* Pollution prevention

The water quality in the sea area included in this project is deteriorating because of retention of household and other wastewater. Nevertheless, to prevent diffusion of pollution created by the work in this project to the surrounding sea area, preventive measures, such as use of silt protectors, will be taken during the casting of rubble stones and excavation for the foundations in the shore protection work.

\* Contractor

The contractor will prepare appropriate temporary work, execution and work schedule plans taking the natural and oceanographic conditions at the site into full consideration and execute the work after obtaining the approval of the consultant and the implementation agency of the recipient country for the plans.

Dispatch of personnel and specialized engineers will be planned in appropriate quantity, for appropriate durations and at appropriate stages of the work in accordance with the progress of the type of work concerned.

3) Equipment procurement

- i) For strict adherence to the work period, the quality standards and inspection standards of the shipbuilder will be duly supervised and inspection of the materials and hulls will be strictly conducted. In addition, efforts will be made to grasp and control the manufacturing processes of the main engines.
- ii) Various tests provided by the ship classification society will be conducted during the shipbuilding, and the functions and performance of the boats will be verified by conducting official sea trials after the completion of the equipment work.
- iii) During the last stage of the process, the crews of the boats of the Ports and Harbors Department in Port Vila will be invited to witness the trial runs and handover inspection. They will also receive training in maintenance/management of the boats by the shipbuilder and manufacturers of the major equipment.

### **2-2-4-3 Scope of Works**

(1) Scope of the works of the Japanese side

- 1) Detailed design of the port facilities in this project, assistance in the tender process and consultant work including execution supervision
- 2) Provision of all the construction materials and labor required for the construction works in the scope of the Japanese side in this project

- 3) Marine transportation for the importation of the materials and equipment required for the construction and equipment procurement in the scope of the Japanese side in this project and payment of the transportation insurance premium
  - 4) Quality inspections required for the construction and equipment procurement in the scope of the Japanese side in this project
  - 5) In the infrastructure works for the lighting facility work, the scope of the works of the Japanese side, in principle, consists of a) all components of the power supply work (including a substation, if necessary) downstream of the lead-in from the boundary of responsibility at the electric pole nearest to the project site, b) all components of the water supply work (including a reserve tank) from the water supply pipe inside the boundary of the project site, and c) all components of the drainage work in this project.
  - 6) Consultant's duties from the detailed designs through assistance in the tender process and building supervision to completion of the building (at the dock of the shipbuilder) of the boats in this project
  - 7) Building of the boats in Japan, procurement of the onboard equipment and apparatus and implementation of the required tests
  - 8) Support for the education/training of the boat crews in handling, maintenance and management of the onboard equipment
  - 9) Transport of the procured boats to Port Vila, Vanuatu, and handover and confirmation trials of the boats in Vanuatu
- (2) Scope of the works of the Vanuatu side
- 1) Securing of the planned construction site of this project (and removal of obstacles from the site)
  - 2) Water-supply lead-in work from the nearest water supply main to the planned construction site
  - 3) Electric power lead-in work up to the electric pole nearest to the planned construction site
  - 4) Securing of a site for the Temporary Work Yard and a site to dispose of construction waste
  - 5) Acquisition of all the documents required for the transport of goods to Vanuatu
  - 6) Securing of the mooring sites and docks for the procured boats after their arrival at Port Vila
  - 7) Formalities concerning official registration of the boats in Vanuatu and their inspection
  - 8) Prompt handling of the procedures for tax exemption and customs clearance of the procured boats and their accessory equipment and registration of the boats
  - 9) Reception of the procured boats at Port Vila and assignment of their crews
  - 10) Trouble-free execution of the budget for operation, fuel, maintenance/management and spare parts and required budgetary measures

#### **2-2-4-4 Consultant Supervision**

##### **(1) Consultant Supervision**

###### 1) Policy regarding consultant supervision

- \* The consultant will maintain close communication with the relevant organizations of both countries

and their representatives and make reports to them, with the aim of completing the facility construction without delay, in accordance with the execution schedule.

- \* The consultant will provide timely and appropriate guidance and advice to those involved in the execution of the facility construction, in accordance with the design documents.
- \* Adoption of construction methods which utilize locally available materials will be given priority as far as there is no problem in the quality or delivery period of the materials to be used in the construction work.
- \* The consultant will adopt the attitude of encouraging technology transfers regarding the execution methods and technologies, in order to fully realize the impact of the Grant Aid Program.
- \* The consultant will facilitate smooth operation of the facilities by providing appropriate advice and guidance on maintenance and management of the facilities after they have been handed over to the recipient country.

## 2) Supervision work

### i) Cooperation regarding the work contract

The consultant will select the contractors, decide on the format of the work contracts, prepare the work contracts, inspect the contents of the cost estimation and witness the conclusion of the construction contracts.

### ii) Inspection and verification of the execution drawings, etc.

The consultant will inspect the execution drawings and materials submitted by the contractors.

### iii) Guidance on the work

The consultant will examine the work plan and schedule, provide guidance to the contractors and report the progress of the work to the owner.

### iv) Cooperation in the payment approval procedure

The consultant will give assistance in verification of the contents of the invoices and procedures related to the payment of the construction costs during and at the completion of the work.

### v) Witness to inspection

The consultant will inspect the work against the amount of work done during the work period as need arises and give guidance to the contractors. The consultant will complete his duties by verifying the completion of the work and the fulfillment of the contents of the contracts, witnessing the handing over of the objects of the contracts and receiving the owner's confirmation of acceptance. The consultant will also report essential matters related to progress during the construction, payment processing and completion and handing over of the work to the relevant personnel in the Government of Japan.

## (2) Procurement Management Plan

### 1) Policy concerning procurement management

Specialized engineers dispatched by the consultant will supervise in-factory trials of the major equipment, hull construction, equipment installation, installation and inspection of the main engines

and shafting and installation of electric and communication equipment during boat-building in accordance with the boat-building schedule. They will witness and control the inspections and give the required support, advice and recommendations to the shipbuilder. Upon completion, they will witness the handover of the completion drawings, certificates, spare parts and required tools and confirm the transfer of these items to the boats.

## 2) Procurement management duties

After the conclusion of the construction contract, the consultant will perform a series of consultant supervision duties, including, in the order of the work flow, tender-related duties, conclusion of the boat-building contract, examination, approval and confirmation of the boat-building drawings, examination and approval of the list of manufacturers of the equipment to be procured, supervision and inspection during boat-building and handover/receipt, in accordance with the Execution Design Contract with the Government of Vanuatu. In addition, the consultant will communicate with the Government of Vanuatu and JICA on matters related to this project.

### **2-2-4-5 Quality Control Plan**

#### (1) Quality Control Plan in construction execution

In accordance with the description in the construction specifications, the contractor will control each stage of the works himself and, later, the consultant will inspect and approve the works. “Common Specifications for Port Construction Work,” “Construction Technique Specifications” and “Standard Specifications for Concrete Structures” will be used for quality control of the construction works and “Common Specifications for Construction Work” and “Common Specifications for Building Equipment” will be used for quality control of the buildings.

#### (2) Quality Control Plan for the equipment to be procured

The consultant will guarantee the required design performance of the equipment by quality control performed in accordance with Japanese Shipbuilding Quality Standards (JSQS), in addition to the inspection by the ship classification society. After examining the quality control system of the shipbuilder, he will take measures to maintain the standard of quality of the various materials, equipment and shipbuilding techniques. He will supervise the shipbuilder by confirming whether it has obtained and maintained certification of the quality management system (ISO certification).

### **2-2-4-6 Procurement Plan**

#### (1) Materials and equipment for facility construction

By carrying out thorough investigation of the quality (and status of inspection) and supply capacity (in terms of delivery period and quantity) of locally available materials and equipment, the possibility of local procurement will be sought as much as possible.

1) Procurement from Japan

Of the materials and equipment to be procured from Japan, a meticulous procurement and transport plan will be prepared for equipment which requires customized production or processing, as ordering, production, packing and shipment of such equipment takes a long time.

2) Local procurement

Of the materials to be procured locally, procurement sources of major items, such as stones, aggregate, cement, reinforcement bars, etc., will be selected after thoroughly reviewing the quality of the materials and transport capacity.

3) Cost

For materials and equipment which can be procured both locally and from Japan, the costs of the two procurement methods will be compared and the less expensive method will be adopted. It will be noted that additional costs of packing, transport, insurance and port fees, and tax-exemption will apply to procurement from Japan. E/N between the two countries clearly states that materials and equipment imported into or procured within Vanuatu by Japanese construction companies will be tax-exempt.

4) Items to be procured

i) Materials

Local procurement: Stones (rubble stones), aggregate, oil and lubricants and cement (concrete)

Procurement from Japan and/or a third country:

Steel pipe piles, H shape steel, Reinforcing bar, Navigation buoy, Lighting tower, etc.

ii) Construction machinery:

Local procurement: Crawler crane with 50t lift capacity, Rough Terrain Crane with 25t lift capacity, Back hoe, Dump trucks, concrete breaker, etc.

Procurement from Japan and/or a third country: Diesel hammers, earth augers, etc.

(2) Procurement plan for the tugboat, pilot boat and accessories

The boats will be built in Japan. As the accessory equipment is not manufactured in Vanuatu, it will be procured in Japan. Procurement in Japan will lead to reduction in the time required for procurement and transport costs, facilitate response to remarks made during approval of the building drawings, negotiation with manufacturers and witnessing of factory inspections and, thus, be advantageous to quality, stability of supply and costs.

**2-2-4-7 Initial operation training and operation training plan**

Initial operation training will be given to three local crew members (the captain, chief engineer and an officer) of the tugboat. The training duration will be a total of 30 days (including 4 days for transfer) and

will be conducted prior to completion of the building of the tugboat. A Japanese engineer will be assigned full-time to accompany the three participants. The training will consist of maintenance/management methods of the major onboard equipment and systems. The draft training implementation plan of the training is shown in the table below. Initial operation training at the shipbuilder's will not be conducted for the pilot boat.

Initial Operation Training Schedule															
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Captain															
Chief Engineer	Transfer	Training in specifications, design and systems, training in maintenance and repair					Self-study			Familiarization with onboard equipment and systems, witnessing of inspections				Self-study	
Officer															
Ship's Engineer		Training instruction					Training instruction								
Day	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Captain															
Chief Engineer	Transfer	Training in operation and maintenance of major equipment					Transfer, self-study		Witnessing of trial runs, practical training in operation and handling of boat				Transfer		
Officer															
Ship's Engineer		Training instruction					Training instruction								

**2-3-4-8 Implementation Schedule**

If this project is implemented under Grant Aid Cooperation of the Government of Japan, the Government of Vanuatu will select a consultant incorporated in Japan and the Government of Vanuatu and the consultant will conclude the design supervision contract. Subsequently, the detailed design, preparation of tendering documents, tendering conclusion of the work contracts and the construction work will be carried out in this order and the project will be completed.

(1) Detailed design

After the conclusion of the consultant contract between the implementing agency of this project for the Government of Vanuatu and the consultant incorporated in Japan and subsequent attestation of the contract by the Government of Japan, the consultant will commence the detailed design. A set of tender documents including detailed design drawings, specifications and guidelines for tenderers will be prepared in the detailed study on the basis of this basic design study report. During the same period, the consultant will hold consultations with the Government of Vanuatu on the details of the facilities and equipment and obtain final approval for the set of tendering design documents of the Government of Vanuatu. The preparation of the execution design will require approximately four months.

(2) Tendering

A contractor (a construction company incorporated in Japan) and a shipbuilder (a shipbuilding company incorporated in Japan) will be selected through the tendering process. In the tendering process, tender opening, acceptance of application for pre-qualification, pre-qualification, distribution of the tender



documents, tendering, evaluation of the result of the tender, appointment of the construction contractor, appointment of the shipbuilding contractor, conclusion of the contract for the construction work and conclusion of the contract for the shipbuilding will be carried out in this order. The whole process is expected to take approximately four months.

(3) Construction work and shipbuilding

After conclusion of the work contracts and subsequent verification of the contracts by the Government of Japan, the construction work and shipbuilding will commence. Taking into consideration the scale of the facilities and the details of the work included in this project, the condition of the local construction business and the condition of the shipbuilding business in Japan and assuming that no event of force majeure happens during the work period, the required period for implementing the entire project is estimated at approximately 26 months (25 months for shipbuilding, 1 month for transport), which corresponds to the period required for the shipbuilding.

The execution schedule from the conclusion of E/N to the completion of the work is shown in the following table.

No. of Month	1	2	3	4	5	6	7	8	9																											Remarks																											
Detailed Design	■ Consultant Agreement · Final confirmation of project contents (in Vanuatu)																																																														
	■ Preparation of tender documents (in Japan)																																																														
	■ Approval on tender documents (in Vanuatu)																																																														
	■ Tendering (in Japan)																																																														
No. of Month	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35										Remarks																											
Procurement · Construction	■ Preparatory · Temporal Works																																																														
	■ Site Clearance																																																														
	■ Civil Works																																																														
	■ Concrete Deck																																																														
	■ Pavement for Container Yard																																																														
	■ Drainage																																																														
	■ East Revetment																																																														
	■ West Revetment																																																														
	■ Lighting Facility																																																														
	■ Navigation Buoy																																																														
	■ Architectural Works																																																														
	■ Cargo Shed																																																														
	■ Administration Building																																																														
	■ Shipbuilding																																																														
	■ Tug Boat																																																														
	■ Pilot Boat																																																														
■ Works by Vanuatu side																																																															
■ Demolition of Toilets & Septic Tank																																																															
■ Demolition of Administration Office																																																															
■ Demolition of Cargo Shed																																																															

(4) Factors affecting the progress of the work

As this project involves renovation of the existing port, the construction shall be executed without causing an adverse effect on port functions. Coordination with the works in the scope of the Vanuatu side shall be prudently planned.

Factors which will have an impact on the progress of the work are summarized in the table below.

Stage	Factor
Prior to the launch of construction	Time required for issuance of the construction permit Time required for approval of the contracts Time required for the acquisition of work permits Time required for securing the construction (temporary work) yard
Preparatory work	Schedule of cargo ships from abroad Time required for unloading at the port in Vanuatu
Direct construction work	Availability of the materials and equipment to be procured Relocation of the offices in the Administration Office and the Shed for Loose Cargoes Demolition of the existing Administration Building Demolition of half of the existing Shed for Loose Cargoes

## 2-3 Obligations of the Recipient Country

### 2-3-1 General conditions of the projects under the Japanese Grant Aid Cooperation

During the period of this study, it was confirmed in the minutes and other official communications that the following are the obligations of the recipient country.

- (1) To secure a site for temporary work for the construction: a site for temporary work and access roads for construction vehicles to the temporary work and construction sites are to be secured. The empty containers on the site are to be sorted and removed.
- (2) To secure water and power supplies for the construction
- (3) Various procedures for the application for the various permits required for the execution of this project and acquisition of the permits prior to the commencement of the construction works
- (4) Distribution of the required power to the planned site
- (5) Commissions related to the Banking Arrangement and Authority to Pay
- (6) To exempt Japanese personnel who will enter Vanuatu for the purpose of executing the certified contract and duties related to the contract from all taxes and other levies imposed in Vanuatu
- (7) All expenses essential for the implementation of this project which are not included in the scope of the Grant Aid Cooperation of Japan.

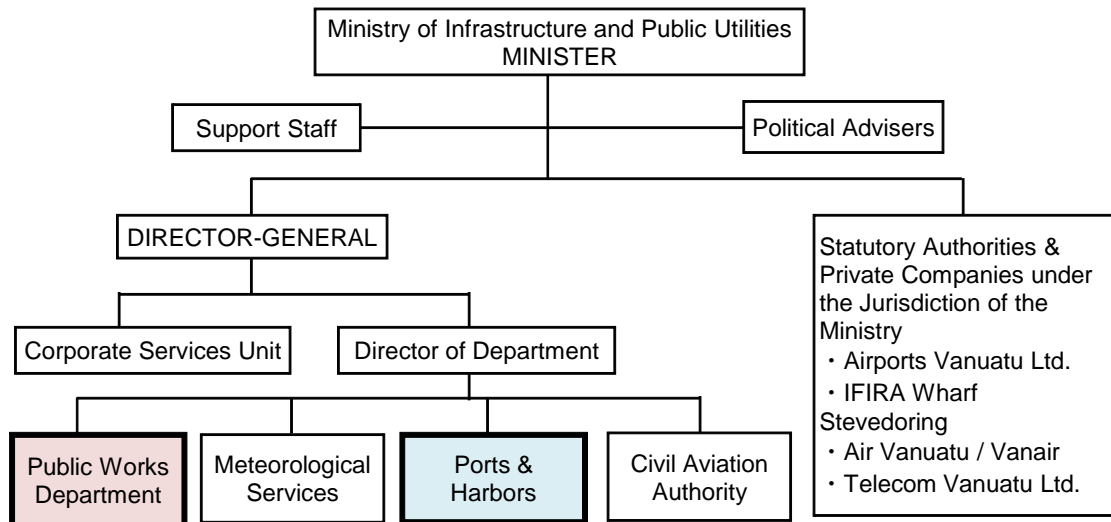
### 2-3-2 Issues specific to this project

- (1) Securing of workshop space
- (2) Partial demolition/removal of the Shed for Loose Cargoes
- (3) Demolition and removal of the Administration Office
- (4) Demolition and removal of the outdoor lavatory and septic tank
- (5) Installation of drainage ditches and trenches outside the eastern gate
- (6) Relocation of the monitoring cameras

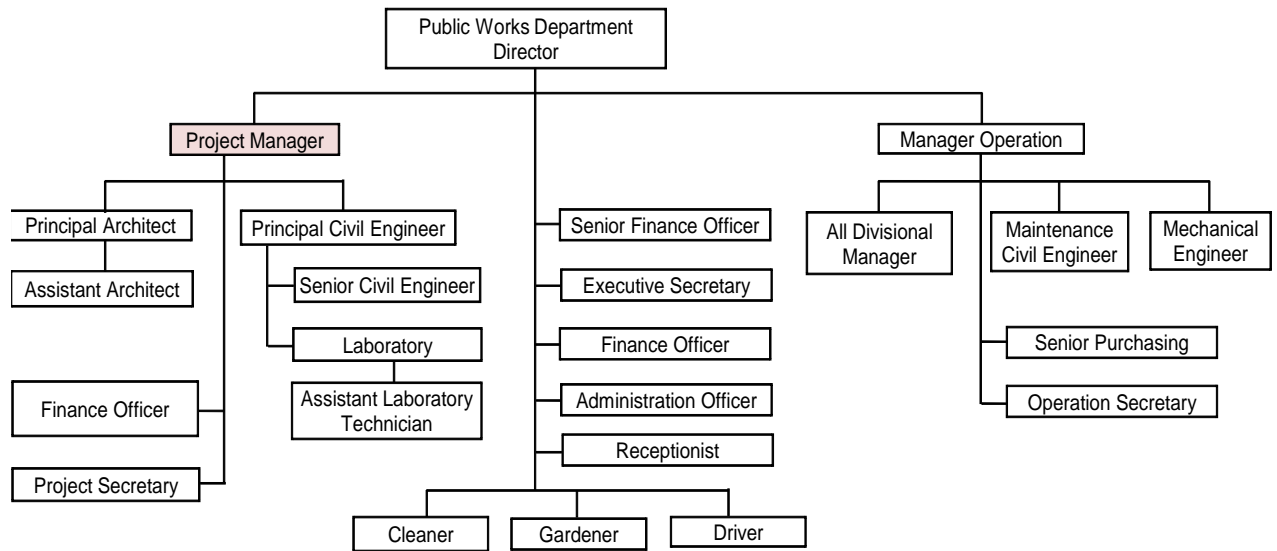
### 2-4 Project Operation Plan

- (1) Organization and personnel

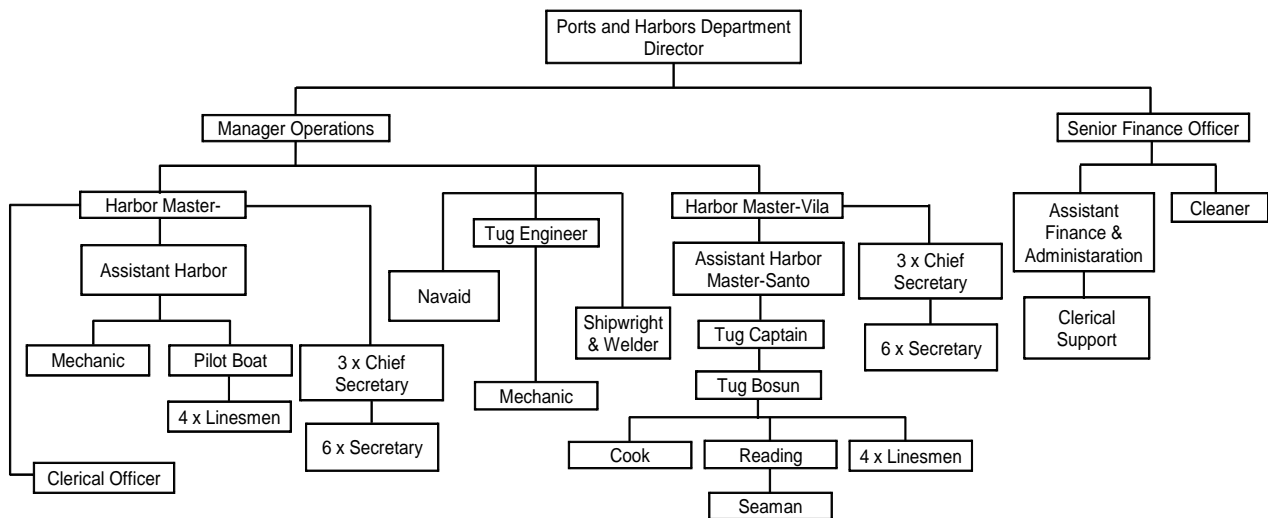
PHD and PWD of MIPU will take responsibility for operational management and maintenance/management, respectively, of the port facilities including the Cargo-Handling Area (such as reefer container storage) which will come under the responsibility of MIPU. The operation and maintenance/management of the boats will be the responsibility of PHD.



Organizational Chart of MIPU



Organizational Chart of PWD



Organizational chart of PHD

(2) Main items in operation and maintenance management

The following are the main items in operation and maintenance management.

- 1) Inspection and maintenance of the port facilities
- 2) Inspection, repair and maintenance of the boundary fences around the bonded area in the port
- 3) Inspection related to effective land use in the port area
- 4) Inspection and maintenance of a pilot boat and tugboat

The procured boats can be docked at the dockyard of a private workshop at Luganville, Santo Island, and a workshop near Port Vila harbor for regular inspection or repair work. Consumable parts can be procured from Australia through local agents. Maintenance and service of the main engines by a specialized engineer from the manufacturer or an agent will be recommended.

## 2-5 Project Cost Estimation

### 2-5-1 Initial Cost Estimation

#### (1) Costs borne by the Vanuatu side

The Vanuatu side is to bear the cost of the works in the table below in addition to the cost of the general works related to the grant aid cooperation of Japan. From the annual budget for 2006 of approximately 436,000,000VT, MIPU will spend 12,140,000VT, or approximately 2.7% of the annual budget, as expenses associated with the project. When the scale of the budget of the Government of Vanuatu is taken into consideration, it is considered that MIPU will be able to bear expenses of this amount.

Item	Quantity	Cost (VT)	Remarks
Demolition and removal of the existing Shed for Loose Cargoes	2,200 m <sup>2</sup>	6,600,000	
Removal of the existing administration office	280 m <sup>2</sup>	1,400,000	
Removal of the toilets and septic tanks	40 m <sup>2</sup>	200,000	
Drainage of the road on the eastern side	1 unit	200,000	
Relocation of security cameras	5 unit	600,000	
Securing of the land for the workshop	2,500 m <sup>2</sup>	1,440,000	Cost varies in accordance with location
Commission related to bank arrangement	1 set	1,700,000	
Total		12,140,000	

### 2-5-2 Operation and maintenance cost

Major maintenance/management works to be created in the area of Port Vila by improvements realized through implementation of this project, other than existing works, are daily inspection and repair duties shown in the table below. PWD is technically capable of handling these works. New maintenance/management works are expected to require an average annual maintenance/management cost of approximately 2,000,000VT. As this amount corresponds to approximately 1.8% of the 111,096,000VT annual operational budget of PWD in 2006, PWD is considered financially capable of handling these works.

**Major maintenance/management works**

Work	Frequency	Inspection/repair part	Type of work	Cost (thousand VT)	Remarks
Repair of the boundary fences around the bonded area	Once a year	Wire mesh and posts	Closing of holes in the wire mesh and painting	1,000	
Repair of the Shed for Loose Cargoes and the Administration Office	Once a year	Steel frames, exterior walls and roof	Anti-corrosive painting	1,000	Manual application
Average annual maintenance/management cost				2,000	

As shown in the table below, 29,320,000VT/year will be required for maintenance and management of the tugboat and pilot boat. Their deployment is expected to create new income of 25,425,000 VT. The difference of approximately 3,895,000 VT between the two figures corresponds to approximately 2% of the 183,221,000VT income of the port in 2006. However, as the budget for the maintenance/management costs of the tugboat and pilot boat has been already incorporated into the budget of PHD, it is considered that there will be sufficient financial resources to maintain and manage the boats.

**Maintenance/management costs of the two boats**

Cost item		Maintenance/management costs (thousand VT)/year
Operational costs	Fuel	16,037
Ship costs	Personnel	5,760
	Other allowances	1,938
	Lubricant	85
	Repairs	5,500
Total		29,320

**Towing and pilotage income**

Item	Towing and pilotage income (in thousand VT)/year
Towing/pilotage fees	11,450
Mooring fees	5,500
Surcharge and miscellaneous fees	8,475
Total	25,425

**2-6 Other Relevant Issues**

The points to consider for smooth implementation and facilitation of the cooperation project are summarized below. As this project will be jointly implemented by Japan and Vanuatu, the project will not be implemented smoothly unless all those concerned have a sense of ownership. Thus, MIPU which is the receiving organization in constructing the facilities and procuring the equipment under this project, PWD and PHD which are the organizations to implement the project, and the Japanese side concerned

should implement and facilitate this project, giving careful consideration to the following points.

**(1) Vanuatu**

- 1) Vanuatu will promptly perform the procedures necessary for construction permission by the government of Vanuatu and the procedures to obtain permission for execution and procurement.
- 2) Vanuatu will demolish the existing facilities (administration office and shed for loose cargoes) and provide a temporary area, which are the obligations of the government of Vanuatu, without fail.
- 3) Vanuatu will facilitate the project by holding close discussions with the Fiji Embassy of Japan, JICA Vanuatu Office, the consultant in charge and the corporations, and responding in a prompt manner.
- 4) Cargo handling operations in the port area and public transportation within and outside the port area may be disturbed during the construction works (i.e. construction traffic may disturb cargo handling operations and the passage of loading vehicles and general vehicles). Thus, cargo handling operations and vehicle traffic will be temporarily restricted in the adjacent areas of the planned site as needed.
- 5) The roads within and outside the port area and other transportation infrastructure may be further damaged by construction traffic during the construction works. Thus, Vanuatu will repair any damaged parts as needed.

**(2) Japan**

- 1) Japan will strive to avoid friction with the local community, giving due respect to the climate and customs of Vanuatu.
- 2) Japan will facilitate the project by holding close discussions with MIPU, PWD, PHD and the authorities concerned.
- 3) Japan will facilitate the project in consideration of environmental conservation measures such as development of a plan for an appropriate temporary area.

## **CHAPTER 3**

### **PROJECT EVALUATION AND RECOMMENDATIONS**



## **CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS**

### **3-1 Project Effects**

#### (1) Direct Effects

- 1) The distance of 100m to 1km for container transportation can be shortened to 100m to 200m by constructing a container storage yard within the port district.
- 2) The cycle time per cargo container (the time required for unloading of the container from the ship, transportation on land and return of transportation machinery to the ship) can be reduced from 13 to 9.6 minutes by shortening the container transportation distance.
- 3) The mooring time per ship can be reduced from 11.3 hours to 7 hours by shortening the cycle time, contributing to higher efficiency of cargo handling and improved port services.
- 4) The procurement of a tugboat will reduce the water area for turning ships calling at the port from 3 to 4 times the ship's length to 1 to 1.5 times, ensuring safety of navigation. In addition, the support provided for ships to berth at and depart from the wharf will improve the safety of berthing and departure and shorten the berthing and departure time.
- 5) Berthing can be conducted in a wind velocity of 10m/s to 15m/s which was not possible before.

#### (2) Indirect Effects

- 1) The restart of the tugboat service will provide safe and steady support for ships entering and leaving the port, shorten their berthing and departure time, reduce accidental damage to the wharf and provide an appropriate means of dealing with sea accidents and firefighting at coastal facilities, contributing to improved port services.
- 2) Customs clearance can be executed within the port district and lighting facilities within the port premises will be improved, ensuring greater security within the port premises.
- 3) The cargo handling machinery will not run on general public roads, thereby easing the congested traffic situation with general vehicles on public roads.
- 4) The safety of ships calling at the port and the shorter cargo handling time will stabilize marine transportation and goods distribution in Vanuatu.

### **3-2 Recommendations**

#### **3-2-1 Problems to be tackled by the recipient country and recommendations**

The considerations and recommendations for more effective and efficient implementation of this Project are summarized below.

For effective use of the port facilities after completion of the construction of the facilities and the procurement of equipment and materials for ships, it is recommended that the MIPU of Vanuatu,

which is the maintenance and operation agency for this Project, take the following points into full consideration to maintain and operate the facilities and equipment:

(1) Appropriate Operation Management

For smooth operation of the facilities and greater efficiency of cargo handling work, MIPU will be required to provide appropriate guidance and regulations to parties concerned with the port and port users.

(2) Appropriate Maintenance Management

After completion of the facilities, MIPU should manage the appropriate and necessary maintenance of the facilities and procured equipment and materials.

1) Maintenance of Facilities

The facilities constructed in this Project (including shore protection, concrete decks, cargo handling yard pavement, drainage facilities, lighting facilities, lighting buoys, administration office and storehouses for bulk goods and cargoes) are not maintenance-free. Therefore, MIPU is required to undertake appropriate operation, maintenance and management to demonstrate the effective functions of these facilities. It is also important for MIPU to improve the consciousness of managers by training them as trustworthy managers through proper and regular inspection work.

2) Maintenance of Equipment and Materials

The PHD has experience in operation and maintenance of tugboats and pilot boats. However, the planned tugboat will have a higher output than the tugboat which has been in operation so far because the ships calling at the port have increased and are larger. Accordingly, it is anticipated that the operation and maintenance costs will be need to be increased. Therefore, it is desired to secure the sufficient budget to be appropriated to these costs. The services of the tugboat and pilot boat are necessary to provide safe and steady support to ships calling at the port. For these boats, it is necessary to formulate and execute daily inspection and maintenance programs and to make continuous efforts to maintain the performance of the boats.

(3) Proper Use of Existing Piers and Connection Bridges at the Wharf (Access Restrictions for Cargo Handling Machinery)

In this Basic Design Study, it has been made clear that the use of forklifts in cargo handling work on the existing piers at the wharf should be prohibited and that SISU container movers can be used as an alternative means if the existing piers and connection bridges are in a sound condition and have adequate durability as initially designed. However, it is expected that higher loads than the initial design conditions will be applied to the piers even in cargo handling work with the SISU machines that are used at present. If damage to the piers and connection bridges is likely to expand in the course of continuous monitoring, the use of such piers should be prohibited immediately in order to

conduct a durability evaluation by the consultant and to carry out appropriate repair of the damage.

《Monitoring of the deterioration of existing piers and connection bridges at the wharf and future repair work》

After completion of the facilities in this Project, an investigation into deterioration of the concrete deck bottom will be made (through fixed-point observation of crack widths every 4 months and overall investigation every year) and temporary measures will be taken if necessary. If the advance of deterioration is confirmed, the necessity of future repair work will be examined.

**【Temporary Measures (Simple Repairs)】**

Temporary measures will be taken for maintenance of the port facilities if any cracks or fractures are found in the concrete of the facilities in the monitoring survey. Concrete cracks will be cut in the form of a V and filled with filling material such as concrete adhesive or waterproof mortar to prevent the inflow of water and salt. Fractures will be cut out and filled with mortar mixed with an adhesive and finished. (This work can be executed by any local constructor in Vanuatu.)

**【Repair Work (Repair Level by ADB)】**

Repair work will be carried out on a large scale prior to 2016 when the life-prolonging period of 15 years as targeted by the ADB repair works expires. The steel piles and steel planks will be coated with a corrosion-resistant paint and provided with reinforcing steel plates and electric anticorrosive plates (anodes). Reinforcing bars at the concrete cracks and fracture points will be exposed to check the corrosion of the bars. Depending upon the corrosive condition of the bars, the bars will be replaced or coated with antirust paint and concrete will be placed so that it adheres to the existing concrete using adhesive. Fenders will be replaced depending upon their deterioration. (Such repair work cannot be done by any local constructor in Vanuatu.)

**(4) Necessary Protection of Pavement of Cargo Handling Yard**

The pavement design for the cargo handling yard in this Project is based on the standard for work using a 40-ton class top-lifter. In work involving handling of heavy cargoes with cargo handling machinery such as a side lifter or crane, MIPU is required to direct cargo handling companies to protect the pavement of the yard by covering the spaces in the outrigger installations with lining plates in order to prevent the pavement from fracture.

**(5) Improvement of Container Storage Method in Cargo Handling Yard**

MIPU is required to direct cargo handling companies to store each lot of containers effectively in the very limited space in the cargo handling yard.

**(6) Improvement of Container Storage Method in Cargo Handling Yard**

The Port Vila Harbor Authority has experience in operation and maintenance of tugboats and pilot

boats. However, the planned tugboats will have higher outputs than those which have been operated so far because the ships calling the port have been decreasing and larger. Accordingly, it is anticipated that the costs of operation and maintenance will be required to be increased. Therefore, it is desired to secure the sufficient budget to be appropriated to those costs. The services of tugboats and pilot boats are to provide safe and steady supports to the ships calling the port. For these boats, it is necessary to formulate and execute the daily inspection and maintenance programs and to make continuous efforts to maintain the performance of those boats.