**THE COMMONWEALTH OF DOMINICA**

**MINISTRY OF AGRICULTURE,
FISHERIES AND FORESTRY**

# BASIC DESIGN STUDY REPORT
# ON
# THE PROJECT FOR CONSTRUCTION
# OF
# PORTSMOUTH FISHERIES CENTER
# IN
# THE COMMONWEALTH OF DOMINICA

**March 2009**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**FISHERIES ENGINEERING CO., LTD.**

# Preface

In response to a request from the Government of the Commonwealth of Dominica, the Government of Japan decided to conduct a basic design study on the Project for Construction of Portsmouth Fisheries Center in the Commonwealth of Dominica and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Dominica a study team from July 29 to August 24, 2008.

The team held discussions with the officials concerned of the Government of Dominica, 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 Dominica in order to discuss a draft basic design, and as this result, the present report was finalized.

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

I wish to express my sincere appreciation to the officials concerned of the Government of the Commonwealth of Dominica for their close cooperation extended to the teams.

March 2009

Ariyuki Matsumoto
Vice-President
Japan International Cooperation Agency

March, 2009

# Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Construction of Portsmouth Fisheries Center in the Commonwealth of Dominica.

This study was conducted by Fisheries Engineering Co., Ltd., under a contract to JICA, during the period from July, 2008 to March, 2009. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Dominica 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,

Toshiya Ogasawara
Project manager,
Basic design study team on
The Project for Construction of
Portsmouth Fisheries Center
in the Commonwealth of Dominica
Fisheries Engineering Co., Ltd.

# Summary

1) Outline of the Country

Situated in the northernmost part of the Windward Islands that make up part of the Caribbean West Indies, the Commonwealth of Dominica (hereinafter, referred to "Dominica") is an island state comprising a single island with a land area of 750 $km^2$ and approximately 150 km of coastline. Sixty-five percent of the land is covered in forest. The island has a tropical oceanic climate, with annual precipitation of approximately 2,000 mm. From June to November is the wet season, and from December to May the dry season.

Portsmouth, the Project site, is located in the coastal area of the St. John District, which is in the northwest part of Dominica. The hinterland is mountainous and includes the highest peak in Dominica, Morne Diablotins. Sheltered by the bulk of the island, the area suffers little damage from the hurricanes and tropical storms that strike from the east once a year or so; but occasionally a hurricane or tropical storm passing through from the west causes severe damage. Hurricane Lenny in 1999 and Hurricane Omar in 2008 inflicted immense damage on the area.

The total population of the country as of 2005 was 70,690, and approximately 15,000 (20% of the total population) are concentrated in the capital, Roseau. As the country's second city, Portsmouth has a population of approximately 3,000 (4% of the total population), which rises to 8,000 (approximately 11% of the total population) when the populations of the nine landing sites that are the subject of this project are included. The total population of the three districts covered by the project (St. John District, St. Peter District and St. Joseph District) comes to 13,000 (18% of the total population).

The nation's GDP is EC$ (East Caribbean Dollar) 557.5 million (US$ 206.5 million) in 2005 and per capita GDP is EC$ 7,887 (US$ 2,921). The GDP composition (2005) of Dominica is as follows: 18 % for primary industry (Agriculture, Forestry and Fishing : 17.1%, Mining and Quarrying : 0.7%); 21% for secondary industry (Manufacturing : 6.3%, Construction : 7.2%, Electricity and Water : 4.9%, Others), 61% for tertiary industry (Wholesale and Retail trade : 14.7%, Transport : 9.6%, Bank and Insurance : 13.8%, Government Services : 19.9%, Others). The agricultural industry, which is dominated by banana production, accounts for 12.5% of GDP and plays a major part in the nation's economy.

Although the GDP grew to EC$456 million in 2000, it plummeted in 2002 and 2003 to EC$415 million and during the same period GDP recorded a negative growth rate of 4% to 5%. In 2005, GDP recorded an increase of 3.3% and in 2006, 4.0% (IMF, 2007), but in 2007 the banana production, which is the nation's major industry, was severely hit by Hurricane Dean. As the result, in 2007 to 2008, again, GDP growth rate lost momentum and went down to a marginal growth rate of 1.5% to

2.5% (IMF, 2008), indicating the vulnerability of the Dominican economy relying heavily on agriculture.

According to the Country Poverty Assessment conducted by the Caribbean Development Bank (2003), 39% of the Dominican total population live below the poverty line and the major cause for this is an increase of unemployment and slumping of job opportunities due to the rapid decline of the economic growth in 2002 and 2003.

2) Background, history and basic concept of the requested project

In order to resolve the problem of growing unemployment and slump in job opportunities, in April 2006 the Government of Dominica set forth the Medium Term Growth and Social Protection Strategy (hereinafter referred to as "GSPS") in the form of a 5-year plan.

In the GSPS, the Dominican fishing industry is positioned as an important industry with the task of creating earning opportunities through sustainable employment and economic growth. Within the fishing industry the substitution of imported fisheries products through an increase in an effective utilization of domestic fisheries products, and an improvement in the income of the fishermen are considered as the urgent issues.

The annual estimated landings at Portsmouth and the 9 nearby landing sites that are the target of this project is 260.7 tons (2007), and is equal to roughly thirty percent of the total landings in Dominica (845.4 tons, 2007). However, the lack of properly equipped fish landing infrastructure in and around Portsmouth hinders an effective utilization of the domestic fisheries products due to the operational and distributional problems described below, that can lead to raising the level of consumption of imported frozen meat.

In the northwest part of Dominica, in which Portsmouth is located, there is no fish landing jetty where large fishing boats can moor and unload their catches. The large fishing boats registered at Portsmouth or at the nearby landing sites are therefore forced to transfer the catch at sea onto smaller boats, which are inefficient method of landing the catch. Meanwhile, most of the fishermen who use small fishing boats land and sell their catches at Portsmouth, where distribution activities are brisker than elsewhere in the area. However, because of the lack of ice-making and cold storage facilities in the immediate area, they are not abele to store their landings in an appropriate state and suffer from the post-harvest loss by having to sell their catch at a reduced price or discard it. In order to reduce these losses, some fishermen go to the Roseau Fisheries Center to buy ice; but this takes time, and forces them to reduce the time they spend for fishing. There are also no fuel supply stations near the fish landing sites, and the time spent for purchasing fuel causes loss of operating time both for large and small fishing boats.

In addition, because there is no permanent enclosed facility where fish can be sold, the sale of fish is

carried out on board the beached fishing boats or on the cart under the sun, bringing certain hygiene problems. In the meantime, in order to purchase fish, consumers must guess the time fishermen return to shore so that they can make their way to the landing site, sometimes having to wait a long time for the boats to return ashore before they can buy fish.

The Government of Dominica has drafted the "Project for Construction of Portsmouth Fisheries Center in the Commonwealth of Dominica" to increase the fish landings at Portsmouth and to raise the income of the fishermen around the area. The project was to provide fish landing and distribution infrastructures including the construction of a fish landing jetty, ice-making and cold storage facilities and fish retailing shops. The project aimed at not only to make the landing of catches more efficient and increase the time spent at the fishing grounds through the provision of landing facilities in Portsmouth, but to promote the integration of Portsmouth and the nearby 9 landing sites, to streamline the fish landing and distribution and to improve unhygienic conditions of fish retailing, by improving the freshness of the catch through the stable supply of ice, the provision of permanent retailing counters, and cold storage facilities. To implement the project, the Government of Dominica made a request in May 2000 to the Government of Japan for grant-aid cooperation.

In response to the request, the, Government of Japan decided to conduct a preliminary study, and in 2002 the Japan International Cooperation Agency dispatched a preliminary study team. In this preliminary survey however, the two governments failed to reach an agreement on the contents of the request.

From June to July 2007, JICA has sent a second preliminary study team to Dominica to hold discussions. Based on the result of the second preliminary study, the contents of the request were finalized as the request of the Dominican side. However, during the Basic Design Study conducted in 2008, it was noted that the land reclamation work (3,800 $m^2$) and a truck equipped with crane were not necessary for the function of the facility, and the Government of Dominica agreed to withdraw these items from the request.

3) Summary of study results and contents of the project

On the basis of the results of the preliminary study of 2007, the Government of Japan has decided to conduct a Basic Design Study. JICA has dispatched a Basic Design Study team to Dominica from 29$^{th}$ July to 24$^{th}$ August 2008, and a team to discuss the Draft Basic Design from 12th to 18th December, 2008.

As a result of these study, it was concluded that in this project fish landing and distribution facilities should be provided in Portsmouth to promote the integration of Portsmouth and nearby nine landing

sites, to streamline fish landing and distribution and to improve unhygienic conditions of fish retailing, thus increasing the landings at Portsmouth and raising the fishing income of the local fishermen. The appropriate scale and contents of this project as grant aid cooperation has been established as described below.

1. Fishing Port Infrastructure

| Item | Structure / Specification | Scale |
|---|---|---|
| 1） Fish landing jetty | Vertical steel piles type, Reinforced concrete structure, planned water depth: D.L. -2.1m | 123 m(L)× 6 m (W) |
| 2） Sea wall | Cast-in-place concrete block type with sloped mound | 65 m (L) |
| River revetment | Mat gabion type | 30 m (L) × 6 m (W) |
| 3） Slipway | Cast-in-place concrete block type | 20 m (L) × 6 m (W) |

2. On-shore Fisheries Infrastructure and Exterior works

| Item | Structure / Specification | Scale |
|---|---|---|
| 1. On-shore Fisheries Infrastructure | | |
| 1） Fisheries Center bldg. | Reinforced concrete, two-stories | 408 $m^2$ |
| Retailing outlets counters | Concrete, Ceramic tiles finish | 10 sets |
| Ice making machine | Flake type | capacity：1ton/day |
| Ice storage | prefabricated insulation panel | 3 tons |
| Cold storage | prefabricated insulation panel | 20 $m^3$ |
| Retailing space | | 100 $m^2$ |
| Market office | | 12 $m^2$ |
| Extension office | | 22 $m^2$ |
| Meeting room | Max. 40 persons | 60 $m^2$ |
| Fish processing room | | 100 $m^2$ |
| Toilet／Storage／Others | | 114 $m^2$ |
| 2） Fishermen's locker | Concrete blocks 4 $m^2$×19rooms＋6 $m^2$×19 rooms＋Staircase 12 $m^2$×2 | 214 $m^2$ |
| 3） Mechanic shop | Concrete blocks | 32 .5 $m^2$ |
| 4） Repair shed | Reinforced concrete | 180 $m^2$ |
| 5） Toilet and shower bldg. | Concrete blocks | 29 $m^2$ |
| | Total area | 863.5 $m^2$ |
| 2. Exterior works | | |
| 1） Site premises pavement | Concrete pavement | 1,500 $m^2$ |
| 2） Lighting fittings | Power outlets, Outdoor lighting | 1 set |
| 3） Power intake and distribution line | Power intake and distribution panel, Emergency generator | 1 set |
| 4） Water supply, Drainage and sewage system | Elevated water tank, septic tank | 1 set |
| 5） Fuel station | Gasoline tank（2,000 gl.） | 1 set |
| | Diesel tank（1,000 gl.） | 1 set |

3. Equipment

| Item | Structure / Specification | Number |
|---|---|---|
| 1） Insulated ice boxes | 750 liters<br>250 liters | 5<br>10 |
| 2） Fish trays | 60 liters | 30 |
| 3） Scales for weighing | 20 Lbs (Hanging scale)<br>500 Lbs (Platform Scale) | 13<br>2 |
| 4） Engine flushing tank | Built - in equipment for mechanic shop | 1 set |
| 5） Tools for mechanic shop | Hydraulic oil press, Electric welder set, Special tools for outboard engine | 1 set |
| 6） Equipment for Fish processing room | Band saw, Stainless table, High pressure water washing machine | 1 set |
| 7） Plastic buoys and concrete anchors | For mooring of small FRP fishing boats | 20 |

4) Project time period and project cost estimation

Should this project be implemented as with the grant-in-aid cooperation of the Government of Japan, the necessary period of work will be as follows; 6 months for the detailed design and bidding procedures, roughly 16 months for construction of facilities, 6.5 months for the procurement and transportation of equipment. The project expenses to be borne by the Dominican side is calculated at approximately 2.57 million yen for the purchase of fixtures including furniture and bookcases, the extension work of the power line and water supply main , and charges for the banking arrangement.

5) Project evaluation and recommendations

The agency in charge of the project is the Ministry of Agriculture, Fisheries and Forestry of the Government of Dominica, and the implementing body is the Fisheries Division, a department of the Ministry. After the handover of the facilities, the Fisheries Division will conclude lease contracts of the facilities with fisherman’s organizations through appropriate screening procedures. On the basis of these contracts the Division will sanction the use of the facilities and, as the owner of the facilities including the fish landing jetty and the Fisheries Center, will take the role of the administrator and coordinator of the whole facilities, and supervise the maintenance of the facilities.

It is planned that the Fisheries Division and a fisherman’s organization to be established will jointly undertake the operation and management of a Portsmouth Fisheries Center. It is estimated that the cost of operating, maintaining and managing the facility and the cost of renewing the ice making machines and cold storage will be met by the income from the use of the facilities, etc., and therefore no maintenance and management problems will be expected.

The project is expected to produce the benefits described below, and thus is appropriate to be implemented as the grant aid cooperation by the Government of Japan.

＜Direct Effects＞

1） The planned jetty can be used for large fishing boats to moor and land the catch directly without use of small transfer boats. The jetty will also enhance convenience and safety of the large fishing boats by making it possible to load ice and fishing gears directly. At the present time, the average time needed to land the catch is estimated to be roughly 150 minutes but is expected that this to be reduced to approximately 50 minutes, a saving of 100 minutes. For small fishing boats, they can also land their catches more safely and more hygienically at the jetty than on the beach.
2） The ice supply and use of cold storage can be realized in Portsmouth by the provision of ice-making and cold storage facilities. Fish can be kept fresh from being caught to distribution to the consumer, thus reducing the rate of discarded catch, which stands at present at 20%.
3） The consumers will obtain greater convenience at the Fisheries Center, as the catches can be stored and sold to the consumer at all times at the fish retailing space. Also, fishermen will no longer be restricted as to when they return from fishing, and it is estimated that the time spent in the fishing grounds can be extended to approximately 12 hours, three hours longer than an average of 9 hours at present, and thus anticipated to increase the annual landings of about 100 tons in 2007.

＜Indirect Effects＞

1） An increase in the fish landings can lead to an increase in the fishermen’s income.
2） The increase of the domestic fresh fish sales can result in less consumption of the imported meats by the Dominican people.

As described above, the benefits of this project will prevail to a population of as many as some 13,000 in the three districts (St. John District, St. Peter District and St. Joseph District) in which Portsmouth and the nearby nine landing sites are located.

It is suggested that ample attention be paid to the following points in order to ensure that the facilities and equipment under the project are put to full use for improving the efficiency of operations and distribution in Portsmouth and the neighboring areas.

（1） Applying the experiences gained from the existing Fisheries Centers

The Fisheries Centers in Roseau and Marigot, that was construction in 1995 and 2003 respectively through Japanese grant aid cooperation, have been maintained and managed by the joint operation of the Fisheries Division and the fisherman's organization. While the operation of Roseau Fisheries Center is scheduled to be transferred in the near future to totally independent operation by the Fisheries Cooperative, in the case of the Marigot Fisheries Center, the facility was being run by the Fisheries Division as of 2008, and it can be said that the transfer of the operation to the Fisheries Cooperative is not necessarily going according to the plan. However, the experience gained by the Fisheries Division from the operation, maintenance and management of these facilities since establishment are valuable and should be applied to the operation of the Fisheries Center in Portsmouth. It is important that lessons learned and experience gained in running the two existing Fisheries Centers be reflected on the establishment of the management system and operational regulations for the Fisheries Center in Portsmouth. For this reason it will be necessary to make the technology transfer be carried out by the personnel having experience of administrative know-how in the operation and management of the existing Fisheries Centers. Also, the training of the personnel at the existing Fisheries Centers will be effective, who will be assigned for the maintenance and management work in the Portsmouth Fisheries Center.

（2） Establishment of the management structure and cooperation system

The Portsmouth Fisheries Center will be managed jointly by the Fisheries Division and a fisherman's organization and will be run independently by the operating income from fish landing charges, fish vendors fees, cold/chilled room charges, ice sales, fishermen's locker rents, etc. However, in Portsmouth there is no established fishermen's organization including fisheries cooperative at present, though the local fishermen's group are trying to form a cooperative. The Fisheries Division, together with NAFCOOP, should give powerful support to the group in organizing a cooperative. The Division should also set up the linkage for the management of the Center with the St. Peter Fisheries Cooperative that is already active, and the Capuchin Fisheries Cooperative (provisional name) that in 2008 was in the process of applying for registration. The establishment of the management structure must be completed before the facilities will become ready for use, which shall function as the core organization for the joint management of the facilities.

Furthermore, in order that the fisherman's organization to start and continue independent operation of the facilities, it is essential to ensure that the fees from the use/rent of the facilities, ice sales etc., must be collected from the users. Until now, the catches have been landed on shore and fishermen have to sell fish directly on their boats or on cart in unhygienic conditions under the sun, however with the advent of this project, the distribution system will be completely switched to the new system, whereby the fish are landed on the jetty and are sold in the fish retailing space after passing through

the fish processing room. The new system will indisputably improve the quality of the catch and thus bringing higher added value to fish, which justifies collection of fees from the users of the facilities.

For this to be functioned smoothly, the Fisheries Division should invite the local fishermen for paying the charges by establishing a cooperative relation.

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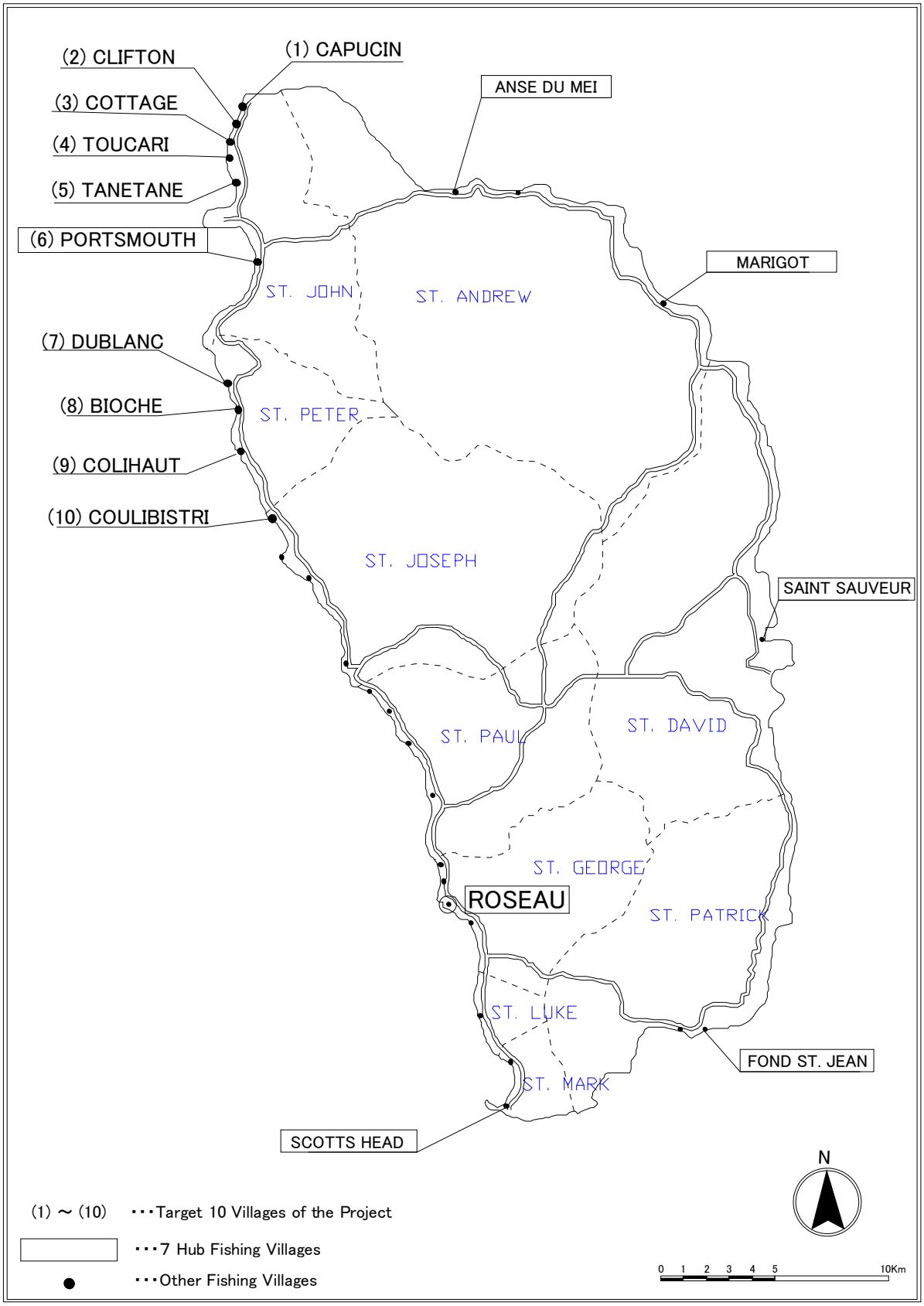


Location Map

Perspective（On-shore Fisheries Infrastructure）

Perspective（Fishing Port Infrastructure）

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# Abbreviations

| | |
|---|---|
| BS | British Standards |
| C.D.L | Chart Datum Level |
| COD | Chemical Oxygen Demand |
| D.L. | Datum Level |
| DOMLEC | Dominica Electricity Service Limited |
| DOWASCO | Dominica Water and Sewage Company |
| EC$ | East Caribbean Dollar |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| EU | European Union |
| FAD | Fish Aggregative Device |
| FAO | Food and Agriculture Organization |
| FEMA | Federal Emergency Management Agency of the United States |
| FRP | Fiber Reinforced Plastic |
| GDP | Growth Domestic Product |
| GSPS | Medium Term Growth and Social Protection Strategy |
| H.W.L. | Mean springs High Water Level |
| HCFC | Hydrochlorofluorocarbon |
| HFC | Hydrofluorocarbon |
| IBC | International Building Code |
| IEE | Initial Environmental Examination |
| IFAD | International Fund for Agricultural Development |
| IMF | International Monetary Fund |
| JICA | Japan International Cooperation Agency |
| L.W.L. | Mean springs Low Water Level |
| M.S.L. | Mean Sea water Level |
| MAFF | Ministry of Agriculture, Fisheries and Forestry |
| NAFCOOP | National Association of Fisherfolk Cooperative Society Ltd. |
| NOAA | National Oceanic and Atmospheric Administration |
| RC | Reinforced Concrete |
| UBC | Uniform Building Code |
| USAID | United States Agency for International Development |
| USGS | United States Geological Survey |
| WFP | World Food Programme |
| WHO | World Health Organization |

# CHAPTER 1 BACKGROUND OF THE PROJECT

## 1-1 Background of the Project

In the Commonwealth of Dominica (hereinafter, referred to "Dominica"), 39% of the total population (70,690; 2005) live below the poverty line, the highest level among the countries of the eastern Caribbean. One of the major reasons for the country's poverty is the country's growing unemployment and the slump in job opportunities caused by the sharp decline in economic growth in 2002 and 2003.

The Government's Medium Term Growth and Social Protection Strategy (hereinafter, referred to "GSPS") ranks fisheries as one of the important industries leading the country's economic growth, and states that it is an urgent task to replace the imported meats and fisheries products with domestic fisheries products through an effective use and increase of the domestic production and to improve fishermen's income. As the objectives for the country's fisheries sector, the GSPS also looks to increase the number of full-time fishermen so that the country's fishing capacity can be improved, to develop Fisheries Centers and to strengthen the fishermen's organizations.

Portsmouth, the project site, and the nearby 9 fish landing sites land an annual estimated total catch of 260.7 tons (2007), which corresponds to about thirty percent of the country's total annual estimated fish landings. In addition, the number of registered fishermen in Portsmouth (including full-time and part-time fishermen) is relatively large and, if registered fishermen in the nearby fish landing sites are included, the area has greater registered fishermen than anywhere else in the country. As the above data shows, the area has a very active fishing industry, however the landing site infrastructure is undeveloped. The problems described below have hindered efforts towards effective use of fisheries products and increased catches, preventing the region's fishing industry from further development, while also being one factor in delaying the replacement of imported frozen meat with domestic seafood.

The specific problems at the Project site are: 1) Since there is no jetty where fish can be landed, large fishing boats are forced to transfer their fish catches to smaller boats out at sea, an inefficient method of landing the catch; 2) Because of the lack of ice-making and cold-storage facilities, the catches cannot be stored in an appropriate state and, therefore, the fish have to be sold at reduced prices and losses are generated; 3) Some fishermen have no other choice to go to the faraway Roseau Fisheries Center to purchase ice to store their catch, reducing the time they can spend fishing and spending the extra cost for gasoline; and 4) Since there are no permanent fish retailing facilities, catches are sold in unhygienic conditions, from on board the beached boats or from cart. Both fishermen and consumers suffer inconvenience, as the fishermen have to return shore while the consumers are there to buy their fish by spend less fishing time, while the consumers have to wait for a

long time for the fishermen to come back from the sea before they can purchase fresh fish.

In view of an urgent need for a fish landing jetty, a Fisheries Center building and other facilities in Portsmouth, the Government of Dominica drew up the "Project for Construction of Portsmouth Fisheries Center in the Commonwealth of Dominica." The plan aims to develop the infrastructure for fish landing sites in order to promote the effective use of fisheries products, increasing both catches and local fishermen's incomes through the integration of Portsmouth and the nearby 9 landing sites, the streamlining of the fish landing and distribution and the improving unhygienic conditions of fish retailing. In May 2000, the Dominican government made a request to the Japanese government for grant aid with which to implement the Project.

In response to this request the Government of Japan decided to conduct a preliminary study, and in 2002 the Japan International Cooperation Agency dispatched a preliminary study team; but in this preliminary survey the two governments were not able to reach agreement on the contents of the request.

After this JICA sent a second preliminary study team to Dominica from June to July 2007, and held discussions. Based on the result, with this second preliminary study the contents of the request were finalized as the request of the Dominican side. However, as a result of the discussion during the Basic Design study in 2008, it was concluded that the land reclamation work (3,800 $m^2$) and a truck equipped with crane were not necessary for the function of the facility, and the Government of Dominica agreed to withdraw this part from their request.

Based on the results of the preliminary study, the Government of Japan decided to conduct a basic design survey and JICA dispatched a basic design survey team to Dominica from 29$^{th}$ July to 24$^{th}$ August, 2008 and a team to discuss the draft basic design from the 12$^{th}$ to the 18$^{th}$ December 2008.

As a result of the study, it was determined that the Project to be carried out with the aim of promoting the streamlining of the fish landing and distribution system through the provision in Portsmouth of a fish landing and distribution infrastructure, comprising a fish landing jetty, an ice-making machine and cold storage and a fish retailing area, thus promoting the effective use of fisheries products, increasing the catch landed and raising the fishing income of the local fishermen. The following scope and contents appropriate for grant aid cooperation were set out.

Table 1-1: Comparison of components between Preliminary study and Basic Design Study

| Item | Preliminary study | Basic Design Study | Reference |
|---|---|---|---|
| 1.Fishing Port Infrastructure | 1) Fish landing jetty<br>Planned water depth : : 0.8 m,<br>Scale : 270 $m^2$ | 1) Fish landing jetty<br>Planned water depth : D.L. - 2.1 m,<br>Scale : 600 $m^2$ | Expansion of target from small fishing boats to include large fishing boats |
| | 2) On-shore landfill (3,600 $m^2$) | — | Exclusion of large-scale land reclamation works from components of assistance |
| | 3) Landing wharf (120m) | 2) Sea wall (65m)<br>River revetment (30m×6m) | Addition of river revetment to protect the foundations of existing vegetable market |
| | 4) Slipway (600 ㎡) | 3) Slipway (120 ㎡) | Reduction of scale |
| | 5) Boat yard (600 ㎡) | — | Utilization of natural foreshore |
| 2. On-shore Fisheries Infrastructure | 1) Fisheries Center bldg. | 1) Fisheries Center bldg. | |
| | Retailing outlets counters : 10 units<br>Ice making machine : 2 ton/day<br>Ice storage : 5 ton<br>Cold storage : 20$m^3$<br>Extension office : 50 ㎡<br>Meeting room : 100 ㎡<br>Fish processing room : 100 ㎡ | Retailing outlets counters : 10 units<br>Ice making machine :1ton/day<br>Ice storage : 3 ton<br>Cold storage : 20$m^3$<br>Extension office : 17.2 ㎡<br>Meeting room : 100 ㎡<br>Fish processing room : 100 ㎡<br>Toilet / shower, Service room<br>Equipment storage,<br>Market office | —<br>Reduction of scale<br>Reduction of scale<br>—<br>Reduction of scale<br>—<br>—<br>Addition of various necessary rooms |
| | 2) Fishermen's locker : 48 rooms | 2) Fishermen's locker : 38 rooms | Reduction of scale |
| | 3) Mechanic shop (80 ㎡) | 3) Mechanic shop (25 ㎡) | Reduction of scale |
| | 4) Repair shed (180 ㎡) | 4) Repair shed (180 ㎡) | — |
| | — | 5) Toilet and shower bldg. | Addition of facility functions |
| 3. Exterior works | 1) Site premises pavement | 1) Site premises pavement | — |
| | 2) Power intake and distribution line | 2) Power intake and distribution line, Emergency generator | Addition of emergency generator |
| | 3) Water supply, Drainage and sewage system | 3) Water supply, Drainage and sewage system | — |
| | 4) Fuel station | 4) Fuel station<br>Diesel tank : 1,000 US gallons<br>Gasoline tank : 2,000 US gallons | — |
| 4. Equipment | 1) Insulated ice boxes<br>100 liters×10 | 1) Insulated ice boxes<br>750 liters×5 sets<br>250 liters×10 sets | Addition of quantity |
| | — | 2) Fish trays (30 sets) | Addition of items |
| | 2) Scales for weighing (10 sets) | 3) Scales for weighing<br>Hanging scales : 13 sets<br>Platform scale : 2 sets | Addition of quantity<br>Addition of items |
| | 3) Engine flushing tank | 4) Engine flushing tank | — |
| | 4) Tools for mechanic shop | 5) Tools for mechanic shop | — |
| | 5) Equipment for Fish processing room | 6) Equipment for Fish processing room | — |
| | 6) Plastic buoys and concrete anchors | 7) Plastic buoys and concrete anchors : 20 sets | — |
| | 7) Track with lifting crane | — | Removal from aid components |

1-2 Natural condition of the Project site

1-2-1-1 Boring Survey

The boring survey was conducted at a total of 7 points: 3 points along the shoreline (to a depth of 10 meters : No. 1-3) and 4 offshore points along a line extended from Pembroke Street where the planned jetty will be constructed (to a depth of 20 meters: No. 4-7). Figure 1-1 below shows the points on which the natural conditions survey was conducted.

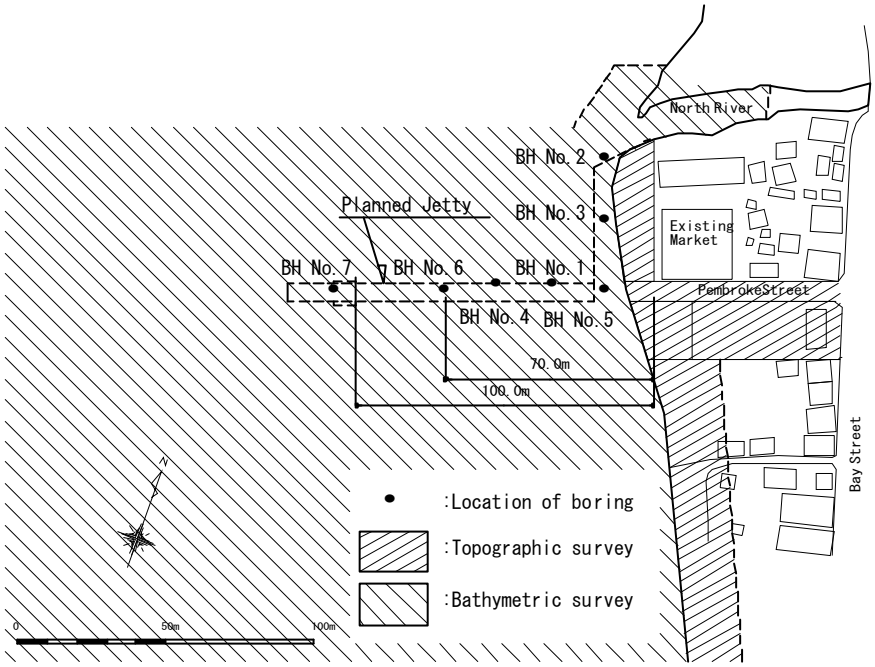



Figure 1-1: Location Map of Natural condition surveys

The stratum configuration at the 7 points where the boring survey was conducted: there were alternating strata of silty soil, sand, and gravel. At the offshore points No.4 to No.7, there appears a base layer (gravel layer) of more than N=50 at a depth of around 13.6-20.8m below the sea bottom. The N value of the upper silty sandy layer and the gravel layer varies between N=4 and N=34. There is also a tendency for the value to rise as the depth increases. In a comparison with existing boring survey data for a commercial port located approximately 2 kilometers to the south, the stratum configuration of the two is identical but the N value for the commercial port is higher than that for the planned Project site. The reason for this may be that the ground at the planned Project site contains a larger amount of silt. There is no viscous soil that might cause unequal settling when consolidation settlement occurs.

Appendix 5-1-1 shows the results of the boring survey (borehole log).

1-2-1-2 Topographical Survey

A terrestrial topographical survey was conducted in the following areas: an area along Pembroke Street, the former land of Social security board, the area between the vegetable market and the sea, and the projected site of a temporary bypass road to accommodate construction vehicles. The survey was conducted at the points shown in Figure 1-1.

The land slopes gently down toward Prince Rupert Bay, the C.D.L. being +2.2m at the intersection of Bay Street and Pembroke Street and +1.3m (approx. 60m) at the ocean side in front of the vegetable market (an inclination of approximately 1/66). The main road (Bay Street) side of the former land of Social security board has roughly the same value (C.D.L. +2.2m) as the main road, and on the seaward side there is a slight incline toward the sandy beach.

Appendix 5-1-2 shows the results of the topographic and sounding surveys.

### 1-2-1-3 Sounding Survey (Hydrographic Survey)

A sounding survey was conducted in front of the Project site, covering an area approximately 240 meters along the shoreline and about 300 meters out to sea, as well as in the mouth of the North River. The survey was conducted at the points shown in Figure 1-1.

Topographically, the ocean floor slopes down gradually at an almost uniform inclination for about 220 meters from the shoreline (an inclination of approximately 1/57) and from the 220 meter point the slope becomes a little steeper. The inclination changes again from about 250m out from the shoreline. Appendix 5-1-2 shows the results of the topographic and sounding surveys.

### 1-2-1-4 Oceanographic Survey

#### (1) Tide level

##### 1) Observation of tide level

In Dominica, tide level observation is not carried out. Therefore, in the sounding survey, a tide gauge was installed on a pile of a jetty for sightseeing boats, located to the north of the Project site in Prince Rupert Bay, to obtain the correction value for the depth from the sounding survey results, as well as to confirm the relationship between the Mean Sea water level (M.S.L.) indicated in the drawings for the existing jetty and the height of the sea surface during the period of observation.

In addition, based on tide level data shown in design calculation documents for the existing harbor facilities at Roseau and Portsmouth (1994) and in nautical charts, as well as tide level data shown in the final implementation drawings for facilities at Roseau and Portsmouth that have been implemented using grant aid, heights from sea level were confirmed on site and the relationship between the indicated levels for facilities in Dominica and the M.S.L. was confirmed.

Because the tide levels at the Project site were found to be identical to those as shown in nautical charts for Portsmouth issued by the United Kingdom Royal Navy (No.697), the values indicated in the nautical charts are used in this Project.

2) Establishment of design tide level

| | | |
|---|---|---|
| Mean springs High Water Level | (H.W.L.) | D.L. + 0.70 m |
| Mean Sea water Level | (M.S.L.) | D.L. + 0.55 m |
| Mean springs Low Water Level | (L.W.L.) | D.L. + 0.40 m |
| Chart Datum Level | (C.D.L = D.L.) | D.L. ± 0.00 m |

(2) Wave survey

Prince Rupert Bay where the Project site is located faces the Caribbean Sea and, because the prevailing easterly wind in this region is a land breeze year round, it is unnecessary to take into account the impact of high waves, except for those caused by hurricanes.

In Dominica, wave observation is not carried out, but reports regarding the calculation of high seas caused by hurricanes in the past were collected and analyzed and the results are shown in Table 1-2.

Table 1-2: Design offshore wave used in the design of Portsmouth commercial port (1993)

| Recurrence interval (years) | Significant wave height $H_{1/3}$ (m) | Maximum wave height $H_{max}$ (m) | Significant wave period T (sec) |
|---|---|---|---|
| 10 | 4.1 | 7.7 | 7.8 |
| 25 | 5.0 | 9.4 | 8.6 |
| 50 | 5.6 | 10.5 | 9.1 |
| 100 | 6.1 | 11.6 | 9.5 |

Source : 「Climactic Vulnerability Of OECS Ports（Volume I）, Roseau And Portsmouth-November 30, 1993 Prepared For The Port Management Association Of The Eastern Caribbean Funded In Part By Grant From The Canadian International Development Agency

Table 1-3: Estimated offshore waves caused by Hurricane Lenny in 1999 (2001)

| Wave direction | Significant wave height $H_{1/3}$ (m) | Significant wave period T (sec) | Reference |
|---|---|---|---|
| WSW | 7.77 | 10.54 | Calculated values based on the weather charts for Hurricane Lenny in November 1999 |

Source : Basic design study report on the project for improvement of coastal fisheries development in the Commonwealth of Dominica 2001

Table 1-4: 30-year-probability wave height value according to 1996 implementation review study report

| Wave direction | Significant wave height $H_{1/3}$ (m) | Significant wave period T (sec) | Reference |
|---|---|---|---|
| W | 7.00 | 10.5 | Of the hurricanes generated between 1955 and 1994 (40 years), probability processing carried out on only those cases that affected Dominica. |

Source : Basic design study report on the project for improvement of coastal fisheries development in the Commonwealth of Dominica 2001

Since the Project site is located at the head of Prince Rupert Bay and faces the Caribbean Sea (to the

west), the waves with the greatest impact are those from the west.

From interviews with local people, hurricane records etc., it is clear that of the hurricanes that have hit the western coasts of countries in the Caribbean Sea (ie along the Caribbean Sea coast), the highest waves were generated by Hurricane Lenny in November 1999; it is said that a hurricane of such scale hits the area only once in two hundred years. As shown in Table 1-3, calculations of Hurricane Lenny indicate WSW offshore waves with a height of $H_0$=7.77m and a wave period of T=10.54sec.

Meanwhile, the design wave values at the Roseau facility located in the western part of Dominica – a facility that was designed taking into account high seas approaching from the Caribbean Sea (i.e. from the west), are westerly offshore waves with a height of $H_0$=7.00m and a wave period of T=10.5sec for the 30-year probability wave value (Table 1-4). The above design offshore wave height is close to the estimated wave height of Hurricane Lenny.

As shown in Table 1-2, the significant wave height $H_{1/3}$(m) corresponding to an offshore wave height of H0 is 6.1m for the 100-year probability wave value; but the wave height value used in the jetty design for the Portsmouth commercial port indicated in the design study report is a marginal wave height based on the planned water depth, and there is no difference in wave height values according to year-probability.

Taking into account the results of past calculations, the present status of facilities constructed on the basis of these calculations, the direction the Project site faces and the water depth at which the planned facility is to be constructed, the wave parameters to be used in the civil engineering facilities design in this Project are based on the 30-year probability wave height data shown in the FY1996 Implementation Review Study Report (see the Basic Design Study Report on the Project for Coastal Fisheries Development in the Commonwealth of Dominica), and for offshore wave direction parameters, values that pose a threat to the Project site are used.

Accordingly, the offshore wave parameters to be used in the facility design are as follows:

Wave Direction W, WSW, SW
$H_0$=7.0m
T=10.5sec

With regard to the design wave height for the facility, as the water depth of the planned facility is less than 3m, the marginal wave height is limited by the water depth. Detailed study results are shown in Appendix 5-1-3.

(3) Tidal current survey

Observation of surface tidal currents at the Project site was conducted using drifting buoys.

The drifting buoys headed out to sea carried by an easterly wind and there was virtually no current towards the shoreline. A similar observation was conducted at other points along the coast of Prince Rupert Bay where the Project site is located, and no current towards the shoreline was observed.

Taking into account the coastal conditions of Prince Rupert Bay, it may be considered that there are virtually no tide-induced stationary currents.

(4) Survey of coastal conditions and corrosion/sedimentation trends

The coastal currents that provide the energy to transform the coastline constantly can be considered to be extremely weak. This was estimated from the fact that the energy may be diffused by the shape of the bay and the frequency with which high seas are generated from the direction of the Caribbean Sea is low. According to an interview survey conducted among the local residents, the shoreline has hardly moved either backward or forward; and therefore it can be considered that the shoreline is more or less stable and that there is no significant corrosion or sedimentation. .

Although there is a inflow of soil and sand from the river mouth, there is no sign of soil and sand accumulating at any particular point along the shoreline. The fact that no significant corrosion or sedimentation is found on either the north or south side of the base of the wave breaker situated at the mouth of the Indian River is confirmation that there is no significant sand drift along the shoreline.

There appears to be a general trend towards coastline change at the Project site. That is, it is likely that there is an infrequent but repeated cycle of replenishment of the beach by incoming waves during rough weather and the flushing-out of sand accumulated at the river mouth due to the increased flow of river water due to precipitation. This indicates that there is a small amount of energy working in both directions, seaward and shoreward.

In the interview survey, however, some residents said that they witnessed corrosion of the beach by Hurricane Lenny in 1999 and the beach seems not to have recovered even today. In particular, it was found some sandy beaches were scoured away where existing coastal structures and coastal road sea wall that appeared to be recently built were located. In addition, in several cases, the sandy beaches in front of buildings that stuck out into the beach were scoured away; the structure' foundations had been scoured away by wave action and the entire structure left in a state of collapse. Therefore, it is likely that there is a tendency for corrosion to occur on sandy beaches where there are man-made structures.

It may be considered that the cause of this erosion is a phenomenon whereby when a perpendicular structure is built on the sandy beach, the waves from a hurricane or tropical storm work directly on the perpendicular face so that a strong backwash is created against the front of the structure so that the beach is eroded and scouring of the front of the structure causes the foundations to collapse.

In future when erecting any structure on the beach, measures must be taken against erosion of the front part of the structure and against scouring of the structure itself.

(5) River survey

There are 5 rivers flowing into Prince Rupert Bay and the overview of these rivers is given in Appendix 5-1-5. Since the rate and speed of flow of none of these rivers is great and there is no

sedimentation of sand at the river mouths, it is difficult to imagine that the rivers supply a large amount of sediment.

In addition, the results of a field reconnaissance show that there are several water channels for domestic wastewater and storm-water road drainage ditches that are not shown on the nautical charts. All of the channels and ditches are small in scale.

(6) Weather survey

Dominica is located at latitude 15˚30' north, longitude 61˚20' west; its climate is tropical oceanic and the year is divided into a rainy season (June-November) and a dry season (December-May).

Weather surveys are conducted by the country's Meteorological Service, with meteorological observations for aviation carried out at 2 points, Melville Hall Airport on the east of the island and Cane Field Airport on the west. Since Portsmouth where the Project site is located lies on the west of the island, meteorological data from Cane Field Airport, which is also situated on the west of the island, were collected and analyzed.

1) Wind

Table 1-5 shows the results of monthly wind direction and velocity observations conducted from 2003 to 2007.

According to this table, the average wind velocity was around 5m/sec but it was a little higher than this in 2006 and 2007. The monthly maximum wind velocity was 20-30m/sec, and this shows no significant change throughout the year; but in August 2007, a maximum wind velocity of 68m/sec was observed. This was caused by Hurricane Dean (with a minimum central pressure of 906 hPa).

Table 1-5: Monthly wind direction and velocity (m/sec) (2003-2007)

| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | Direction | SE | ESE | SSE | SSE | SE | SE | SSE | SSE | S | SSW | S | SSE | SSE |
| | Speed | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 2 | 2 | 2 | 2 | 4 | 3.7 |
| | Maximum Gusts | 26 | 28 | 24 | 24 | 30 | 24 | 29 | 22 | 18 | 20 | 20 | 26 | 24.3 |
| 2004 | Direction | SSE | SSE | SE | SSE | SSE | ESE | SSE | SE | SSE | SSW | SSE | SSE | SSE |
| | Speed | 2 | 4 | 4 | 4 | 3 | 4 | 3 | 3 | 1 | 1 | 3 | 3 | 2.9 |
| | Maximum Gusts | 25 | 21 | 26 | 22 | 18 | 26 | 42 | 30 | 23 | 23 | 22 | — | 25.3 |
| 2005 | Direction | S | S | S | S | S | S | SSE | S | SSW | S | S | SE | S |
| | Speed | 3 | 36 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 6.8 |
| | Maximum Gusts | — | — | — | 29 | 28 | 33 | 31 | 32 | — | 28 | 26 | 30 | 29.6 |
| 2006 | Direction | SSE | SE | S | S | S | SE | SE | SSE | SSW | S | SSW | SSE | SSE |
| | Speed | 6 | 6 | 5 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 6 | 5.6 |
| | Maximum Gusts | 39 | 33 | 31 | 24 | 20 | 25 | 34 | 33 | 25 | 30 | — | 32 | 29.6 |
| 2007 | Direction | ESE | ESE | ESE | SE | SE | ESE | ESE | ESE | SE | SE | E | E | ESE |
| | Speed | 6 | 6 | 7 | 6 | 6 | 7 | 6 | 5 | 4 | 4 | 6 | 6 | 5.8 |
| | Maximum Gusts | 31 | 34 | 30 | 39 | 34 | 30 | 28 | 68 | — | — | — | — | 36.8 |

Source : Data from Cane Field Airport

2) Temperature

Table 1-6 shows the monthly average temperature from 2003 to 2007. The monthly average temperature was 26 - 29˚C, with little change throughout the year. The annual average temperature

was 28˚C.

Table 1-6: Monthly average temperature (2003-2007)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 26.6 | 26.9 | 27.3 | 27.9 | 29.0 | 28.5 | 28.5 | 28.7 | 29.4 | 28.7 | 27.7 | 27.3 | 28.0 |
| 2004 | 26.6 | 26.5 | 26.5 | 28.3 | 28.1 | 28.7 | 28.3 | 28.9 | 28.6 | 28.7 | 27.5 | 26.9 | 27.8 |
| 2005 | 26.7 | 26.2 | 28.2 | 29.2 | 29.4 | 29.1 | 29.2 | 29.5 | 29.6 | 28.8 | 27.5 | 27.2 | 28.4 |
| 2006 | 26.5 | 26.3 | 26.8 | 28.3 | 29.3 | 29.0 | 29.1 | 29.1 | 28.8 | 28.3 | 28.1 | 26.7 | 28.0 |
| 2007 | 26.2 | 26.8 | 27.2 | 28.2 | 29.2 | 29.8 | 29.2 | 28.6 | 28.4 | 28.1 | 27.7 | 26.5 | 28.0 |
| Average | 26.5 | 26.5 | 27.2 | 28.4 | 29.0 | 29.0 | 28.9 | 29.0 | 29.0 | 28.5 | 27.7 | 26.9 | 28.0 |

Source : Data from Cane Field Airport

3) Precipitation

Table 1-7 shows average monthly precipitation from 2003 to 2007. Annual precipitation is a little less than 2,000mm and in the rainy season from June to November, the average monthly precipitation is about 200mm.

Table 1-7: Average monthly precipitation (mm) (2003-2007)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 45.1 | 73.4 | 15.6 | 162.1 | 71.7 | 219.1 | 267.2 | 210.8 | 55.8 | 189.9 | 255.6 | 77.7 | 1644.0 |
| 2004 | 44.3 | 85.1 | 129.2 | 9.5 | 252.6 | 230.1 | 369.6 | 251.9 | 231.2 | 136.9 | 254.3 | 62.6 | 2057.3 |
| 2005 | 97.5 | 62.9 | 5.5 | 22.3 | 163.2 | 282.6 | 231.4 | 112.6 | 159.9 | 287.7 | 324.0 | 53.5 | 1803.1 |
| 2006 | 170.8 | 65.3 | 38.7 | 32.3 | 25.9 | 381.3 | 213.8 | 187.5 | 180.5 | 219.5 | 56.3 | 165.9 | 1737.8 |
| 2007 | 45.4 | 27.9 | 32.5 | 29.1 | 9.8 | 60.0 | 141.8 | 539.4 | 389.4 | 176.7 | 70.6 | 155.4 | 1678.0 |
| Average | 80.6 | 62.9 | 44.3 | 51.1 | 104.6 | 234.6 | 244.8 | 260.4 | 203.4 | 202.1 | 192.2 | 103.0 | 1784.0 |

Source : Data from Cane Field Airport

4) Hurricanes

In Dominica, hurricanes and tropical storms are a major cause of natural disaster.

As shown in Figure 1-2, even among the countries of the Caribbean, Dominica has suffered a large number of hurricanes and tropical storms during the past 20 years (14-18 hurricanes and storms).

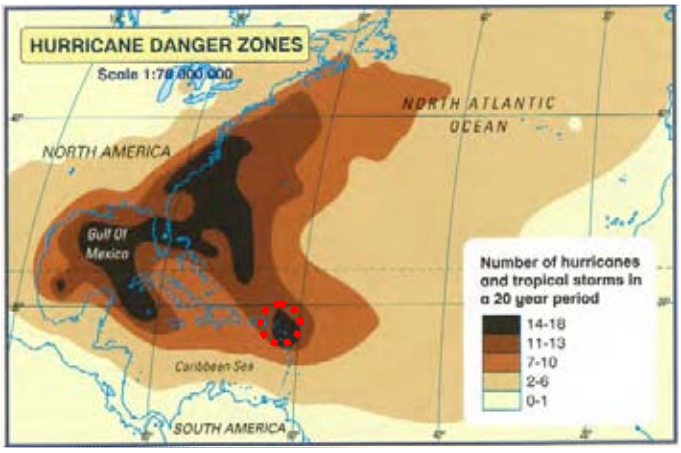



Figure 1-2: Number of hurricanes and tropical storms during the past 20 years

Source : Caribbean School Atlas (Third Edition)

The problems hurricanes bring with them include rainfall, strong winds, high seas and storm surges. The most destructive hurricane on record was Hurricane Lenny, which hit the country in 1999. Since most hurricanes approach Dominica from the east, the east side of the island suffers more severe damage. Hurricane Lenny, however, took an unusual course, passing through the Caribbean Sea from west to east, and leaving severe damage on the western side of the country, too. Another hurricane crossing the country from west to east was Hurricane Omar, which caused damage to the country in October 2008.

Figure 1-3 shows the paths of 6 hurricanes that caused severe damage in the 1990s. Of the 6 hurricanes, 2 were moving eastwards.

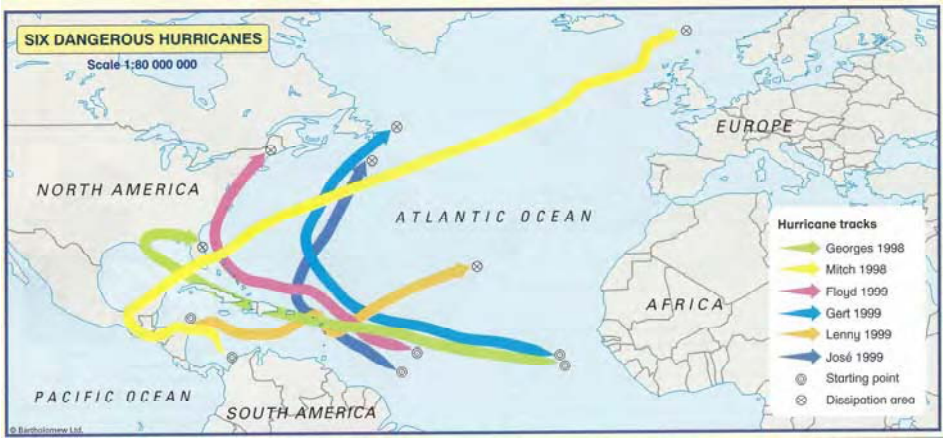



Figure 1-3: Paths of 6 hurricanes that caused severe damage in the 1990s

Source : Caribbean School Atlas (Third Edition)

(7) Earthquakes and earthquake-generated tsunami

Dominica is situated on the eastern edge of the Caribbean plate, approximately 300km from the boundary of the Caribbean plate and the North American plate. Earthquakes observed recently in the neighborhood of Dominica include one in 2004 with its seismic center in Guadeloupe (magnitude 6.2 on the Richter scale) and another in 2007 with its seismic center in Martinique (7.4 on the Richter scale). Figure 1-4 and 1-5 shows plate boundaries in the Caribbean Sea and environs and the world distribution of seismic centers.

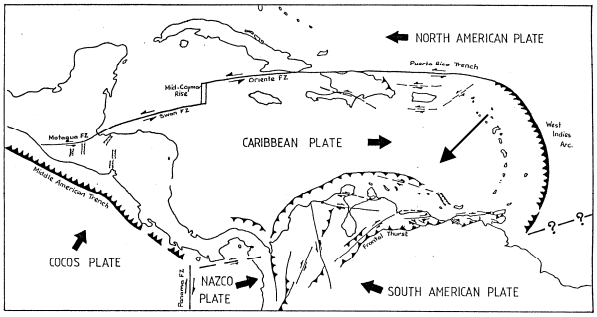
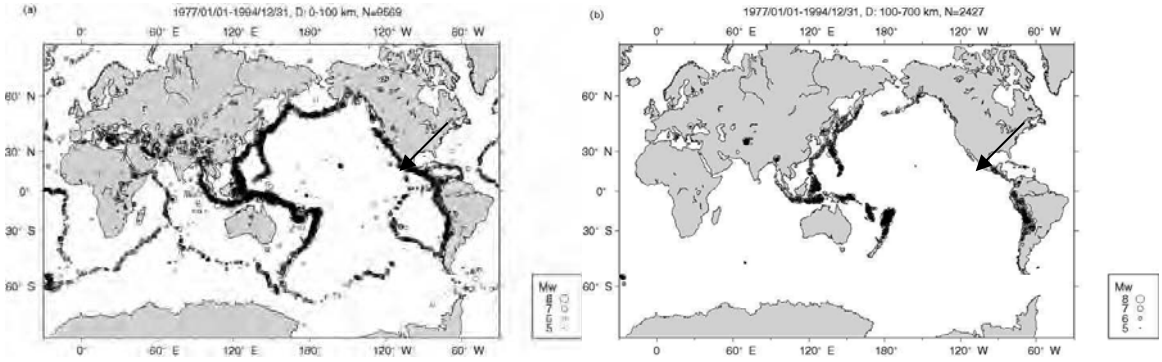



Figure 1-4: Caribbean plate




Under 100 km　　Over 100 km

Figure 1-5： World distribution of seismic centers

With regard to tsunami generated by local submarine earthquakes, systematic measures to issue tsunami warnings are taken by the National Ocean and Atmosphere Administration (NOAA), the Federal Emergency Management Agency (FEMA) and the U.S. Geological Survey (USGS), all of the United States.

Tsunami have been observed only twice in Dominica between 1900 and the present; once in 2004 (wave height 0.70m) and once in 1969 (0.46m), both caused by an earthquake occurring in Guadeloupe. (Source: National Geophysical Data Center)

(8) Water quality test

At a total of 6 points, 3 points along the shoreline and 3 other points at the planned jetty construction site, a water quality test was conducted and water temperature, pH, COD and coliform bacteria count were measured. The measurement results are shown in Appendix 5-1-4.

According to the result of the test, pH and COD values were within the range of acceptable water quality standards for public waters in Japan established under the Basic Environment Law (Environmental Conservation (Category C)). The coliform bacteria count was higher than the standards set out in the Water Works Law of Japan (water purity standards) at the mouth of the North River that runs behind the existing vegetable market and in the sea in front of the vegetable market. From this it was understood that it is possible that the coastal area is affected by organic matter (fish and agricultural residue), feces and urine. The coliform bacteria count at the front edge of the planned jetty site (offshore) was low compared to the coastal area.

## 1-3 Environmental and Social Considerations

Since this Project includes as components the jetty and other facilities that are harbor structures, it is classified as an Environment Category B project under the JICA Guidelines for Environment and Social Considerations, and so an initial environmental examination (IEE) was conducted during the preliminary study in 2007.

The authority in charge of the review of approvals and licenses in the Dominican environmental impact assessment procedure is the Development Approval Review Committee of the Physical Planning Division (hereinafter referred to as the "Committee"). Under the Physical Planning Act 5, 2002 of Dominica, harbor structure construction and coastal area development projects are prescribed as projects requiring the implementation of environmental impact assessment (EIA). However, the implementation of a detailed EIA is required only for those projects that the Committee judges to have a significant impact. Owners of projects that the Committee judges to have little impact are required to implement a simplified environmental examination.

As a result of the IEE implemented during the preliminary study[1], it was found that the largest concern is water contamination and its spread caused by land reclamation[2]. Since the ocean current is weak and no valuable species are found in the planned jetty construction site, it was pointed out that even if the Project had a land reclamation component, environmental approval could be obtained so long as a simplified environmental examination was conducted by means of a tidal current survey and a visual survey of benthic organisms by divers. Including these results, the following 4 environmental impact issues were anticipated at the time of the preliminary study: 1) Extinction of benthic organisms as a result of the land reclamation; 2) Generation of murky water as a result of the land reclamation/development of sea wall; 3) Traffic congestion in the city during the construction period; and 4) Noise caused by the jetty pile driving works. It was also pointed out during the basic study period that measures to mitigate the impact should be taken. As procedures remaining to be undertaken in the future, the need for Dominica to offer support for the holding of stakeholders' discussions following the confirmation of EIA implementation and the preliminary study was pointed out.

Because it was made a condition for the dispatch of the basic design study team that Dominica would implement the EIA and grant environmental approval, the environmental impact statement (EIS) was drawn up and submitted in April 2008 prior to the dispatch of the team, and was approved in July 2008[3].

On the basis of the results of the preliminary study, the content of the EIS was confirmed and mitigation measures were considered during the basic design study. Through discussions held in Dominica, the two sides reached an agreement that the land reclamation works should not be included in the project components. This therefore eliminated the risk of 1) Extinction of benthic organisms as a result of land reclamation, which had been hypothesized during the preliminary study. However, since harbor structures such as the jetty, sea wall, etc. remained a part of the Project components even after the preliminary study, discussions were held with the Dominican side and a proposal was put

[1] Conducted by the Chief Fisheries Officer of the Fisheries Division which is in charge of the Project, members of the Development Approval Review Committee and the Preliminary Study Team.
[2] As shown in Table 1-1, at the time of the preliminary study land reclamation was included in the contents of the request.
[3] The certification documents are attached as an appendix to the M/D at the time of the Basic Design

forward concerning the design of the jetty structure (piling method) and the scale of the sea wall (ground leveling up to the shoreline) to mitigate the impact of the Project on the environment.

In order to mitigate the environmental impact hypothesized during the preliminary study, namely 1) Generation of murky water as a result of the land reclamation/development of sea wall; 2) Traffic congestion in the city during the construction period; and 3) Noise caused by pile driving works, measures to be taken during the construction period were considered. The measures considered include: 1) The installation of screens to prevent murky water; 2) Construction of temporary roads for construction vehicles, and the introduction of traffic control; and 3) Setting up of a construction schedule (days and times) and the implementation of advance public information activities.

During the Basic Design study, the Fisheries Division organized stakeholders' meetings at the Project site in Portsmouth, and presented a summary of the Project to local residents, fishermen living in Portsmouth, and the representatives of fishermen from the neighborhood, and heard their opinions.

Fishermen approved that the Project be implemented and they asked questions about the details and the location of facilities to be constructed under the Project. In response to those questions, consultants offered explanation on the details and planned arrangement of facilities as far as possible at the time of the meeting. Also the Chief Fisheries Officer of the Fisheries Division explained that the Project details would be almost finalized based on the analysis and discussions to be made in Japan.

Local residents asked about the removal of existing facilities (shops, Fishermen's lockers, etc.). The Fisheries Division explained that the Government of Dominica would remove existing facilities, etc. that may hinder the construction work of the Project in advance so that the Japanese side can start construction smoothly.

# CHAPTER 2 CONTENTS OF THE PROJECT

## 2-1 Basic Concept of the Project

### 2-1-1 Overall Goal and Project Goal

The goal under the Project are to increase the catches landed by fishermen in Portsmouth and the nearby 9 fish landing sites and thereby to increase their income from fishing. By providing fish landing infrastructure in Portsmouth, the center of fish landing and consumption for neighbouring areas, it is envisaged that the integration of Portsmouth and nearby nine landing sites, the streamlining of fish landing and distribution and to improve unhygienic conditions of fish retailing in Portsmouth and its environs will be promoted, which all together produce about thirty percent of the country's total annual estimated landings (2007).

### 2-1-2 Basic Concept of the Project

In order to achieve the above project goals, this Project will develop the fish landing infrastructure. The development of the infrastructure is intended to promote the integration of fish landing sites in the area, to make preparations for fishing operation more efficient, to streamline catch distribution channels, to improve the quality of catches through the use of ice, and to promote the segregation of sales and fishing operations through the installation of permanent fish retailing counters and cold storage facilities. It is expected that as a result the fishermen will be able to spend more time at sea for fishing, leading to greater catches and an increase in their income. Therefore, the output indicator for this Project is set as "increased fish landing volume at Portsmouth" and "an increase in fish landing value in Portsmouth."

The components of the Project include civil engineering works for constructing: 1) a fish landing jetty where large fishing boats can moor; 2) a sea wall; and 3) a slipway. Architectural structures in this Project include: 1) a Fisheries Center building. (ice-making/storage facilities, cold storage, indoor processing room, permanent retailing counters, etc.); 2) a fishermen's lockers; 3) a mechanical shop; 4) a repair shed; 5) a toilet and shower building; and 6) a fuel station. The machinery and materials required for these facilities will also be provided.

### 2-1-3 Examination of Request

The request components of grant aid to be offered in this Project are indicated in Table 2-1.

Table 2-1: Components of assistance confirmed

| | |
|---|---|
| 1. Fishing Port Infrastructure | (1) Fish landing jetty |
| | (2) Sea wall and River revetment |
| | (3) Slipway |
| 2. On-shore Fisheries Infrastructure | (1) Fisheries Center bldg. |
| | Retailing outlets counters<br>Ice making machine<br>Ice storage<br>Cold storage<br>Market office<br>Extension office<br>Meeting room<br>Fish processing room |
| | (2) Fishermen's locker |
| | (3) Mechanic shop |
| | (4) Repair shed |
| | (5) Toilet and shower bldg. |
| 3. Exterior works | (1) Site premises pavement |
| | (2) Lighting fittings |
| | (3) Power intake and distribution line, emergency generator |
| | (4) Water supply, Drainage and sewage system |
| | (5) Fuel station |
| 4. Equipment | (1) Insulated ice boxes |
| | (2) Fish trays |
| | (3) Scales for weighing |
| | (4) Engine flushing tank |
| | (5) Tools for mechanic shop |
| | (6) Equipment for Fish processing room |
| | (7) Plastic buoys and concrete anchors |

In the following section, the necessity and appropriateness of these components will be reviewed.

2-1-3-1 Fishing Port Infrastructure

(1) Fish landing jetty

Currently, in Portsmouth and its neighboring areas, 3 large-size steel fishing boats and 2 large-size FRP fishing boats operate. In the development programs by the Government of Dominica for the fisheries sector, a policy to promote the use of large fishing boats has been clearly indicated. With the current status of Portsmouth, large fishing boats are forced to stay offshore and use smaller boats to transship fish catches or to make preparation before setting out for fishing (loading ice and

supplying water), because there are no fish landing facilities to accommodate existing large fishing boats. Large fishing boats operate mainly targeting at large-size fish like tuna and marlin and sometimes fish catch exceeds 1 ton in one operation. In order to land the catch of this volume, small boats have to run repeatedly between the large fishing boat staying offshore and the fish landing sites. With such situations in Portsmouth, large fishing boats land, in some cases, their catches at the Roseau Fisheries Center where they can directly moor at the wharf. This is because they cannot land fish efficiently in Portsmouth even though the demand for fresh fish is strong in Portsmouth.

Even in the case for small fishing boats, they face to inefficiency of landings and sanitary problems, as fishing boats have to be pulled up on the beach and catches are sold onboard or on the cart while being exposed directly to sunlight.

Construction of a fish landing jetty can allow fishing boats registered in Portsmouth to operate in safe, efficient and sanitary conditions, both for large and small fishing boats.

（2） Sea wall and river revetment

The planned sea wall shall be constructed to protect the front of the fish landing jetty and the land area for the repair shed to be located in front of the vegetable market from hurricanes and tropical storms that often hit the region. The sea wall can protect the land from erosion caused by waves during foul weather and it will be one of the indispensable facilities ensuring safe use of the jetty and for conservation of the Project site area.

Upon completion of the sea wall at the ocean side, the current caused by waves coming along the constructed sea wall can easily reach into the river from the river mouth when hurricanes and tropical storms hit, and may score the foundation of the vegetable market. In order to prevent erosion the foundation by wave-induced currents, it is necessary that river revetment be constructed at the river mouth.

（3） Slipway

The elevation from the sea surface at the Project site to the repair shed is approximately 1.5m. Fishing boats need to be pulled in and out to and from the repair shed through a slipway. Therefore, it is necessary to construct a slipway facing the repair shed.

Currently, small fishing boats made of wood or FRP are pulled ashore on lumber or logs laid on beach to dry and repair the hull. The lumber or logs are moved piece by piece as the boat moves up or down the beach. In this Project, a slipway is an indispensable facility because fishing boats have to be brought to the repair shed planned under the Project. By constructing a slipway installed with suitable slipping material on the slope, small fishing boats can be accommodated efficiently in the repair shed, while reducing the risk of damaging boat hulls.

The slipway shall be constructed in parallel to the shoreline on the seaside of the former land for the social security board so that it will be able to function as a sea wall to protect the Project site from waves during foul weather.

2-1-3-2 On-shore Fisheries Infrastructure

（1） Fisheries Center building

1） Retailing outlets counters

At the Project site, currently, there are a concrete retailing counter (3 booths) and 4 or 5 wooden retailing counters in an open-air area next to the beach, and fishermen and their families use these counters when they sell fish.

When the vegetable market is closed, fishermen sell fish directly to customers right after they returned from the sea if any customers have been waiting for them. If there are no customers waiting, fishermen use trolleys to carry fish to the crossing of Bay Street and Pembroke Street, where they blow a conch horn to let people know that fish have been landed. Also they sell fish under direct sunlight and in an unsanitary condition.

Because there are no permanent fish retail facilities in Portsmouth, fishermen who are also sellers of their own catches are forced to cut down hours to spend fishing on the sea and to come back to the beach in time for customers' shopping hours. These situations force fishermen to operate ineffectively. Meanwhile, consumers who are buyers are also dissatisfied because they can buy fish only when fishermen have returned from the sea with fish catch.

If retailing outlets counters inside the Fisheries Center building are prepared, it is expected that inconvenience for both the sellers and the buyers can be eliminated and the unsanitary retailing environment under direct sunlight can be improved.

2） Ice making machine and ice storage

In Portsmouth, many fishermen ice their fish catch after landing and demands for ice are strong. However, there are no ice making facilities for fisheries use in the neighborhood of Portsmouth, and fishermen in Portsmouth have to drive to the Roseau Fisheries Center to purchase ice. As the result, fishermen in Portsmouth and its neighboring areas have to use more expensive ice than fishermen in Roseau, because they have to pay for gasoline to drive to and from Roseau in addition to the ice bill.

Also, because no ice making facilities for fisheries exist in the Portsmouth and its neighborhood, a sufficient amount of ice for their catches cannot be obtained and, as a result, fish are sold at cut-rate prices or become rotten and are thrown away. In questionnaire surveys conducted in the fish landing site in Portsmouth and the neighboring 9 fish landing sites, approximately 80% of fishermen responded that they "need ice making machines" and they are expectant that the current situation will be improved.

It is reasonable to use flaked ice in Portsmouth, too, since the existing ice making machines at the Roseau Fisheries Center and some fish landing sites in the eastern part of Dominica produce flake ice—this type of ice is often used for fisheries—and there have been no problems in maintaining those flaked ice making machines. At the same time, it is determined that an alternative for CFCs, R410A (HFC) shall be used as the refrigerant because it gives less impact on the ozone layer.

3） Cold storage

The major means to preserve small-size fish (reef fish) caught in this region is to pack with ice in insulated boxes if the fishing boat is late to return from the sea or all the fish have not been sold on the day and, therefore, fish have to be sold next day. Meanwhile, in case of larger-size fish like tuna and marlin, it is difficult to sell up all at once. It is also difficult, however, to preserve large fish with ice in insulated boxes. As a result, large-size fish also suffers from loss after landing as fish have to be sold at cut-rate prices or thrown away if they become rotten.

In areas like Roseau and Marigot Fisheries Center, where cold storage facilities are in place, fishermen freeze large-size fish to sell later. It is expected that if cold storage is provided as a means to preserve large-size fish, the loss after landing can be minimized by avoiding sale at cut-rate prices or thrown away.

4） Market office

The market office is to be located on the first floor and will be used by the center's staff members including a facility manger and a market assistant. These staff members will manage and control the retailing outlets counters, ice making and cold storage facilities. The planned office in Portsmouth is expected to function similarly to the office located on the first floor of the fisheries centers at Roseau and Marigot. The staff members are essential if the planned fisheries center is to be managed efficiently and the market office is very necessary to accommodate these staff members.

5） Extension Office

At the Dominican Fisheries Division, there are the fishery officers in charge of the outreach of fishery technologies and in charge of data collection who collect fishery data at major fish landing sites, respectively. One fishery officer for fishery technology outreach is appointed to each of a total of five regions in Dominica (the northwest, the mid-west, the southwest, the northeast and the southeast) and the Project site in Portsmouth is in charge of the official appointed to the northwestern region. The official for fishery technology outreach in the northwestern region plays a role to introduce and test new fishing gear and methods to fisheries cooperatives and fishermen's groups and to promote communication and coordination between the division and the fisheries cooperatives in the region. Meanwhile, officials for data collection collect and analyze fisheries data such as the name of fishing boats in operation, species of fish and fish catches in Portsmouth and nearby fish landing sites, and they submit the data they collected to the Fisheries Division located in Roseau. One official for data collecting is appointed to the fish landing site in Portsmouth.

If an extension office is developed, the fishery officers appointed to the region will be able to correctly grasp the status of fisheries in the region and effectively operate for communicating data and information. In addition, these fishery officers will be able to manage and file the documents and materials they currently store personally because they have no office or storage facility.

6） Meeting room

In Portsmouth, there are no meeting places for people involved in the fisheries activities to use, for example, for fishermen's gatherings or for workshops on fishing methods or training forums organized by the Fisheries Division. In Portsmouth, people in the fisheries activities, therefore, are obliged to have such meetings in an outdoor space (on the beach) or at the vegetable market or they have to rent space at a restaurant, etc.

Table 2-2 indicates for what purposes and how often a meeting room will be used, if the meeting room is completed.

It is expected to be used mainly for fishermen's gatherings and the largest users of the room will be the annual meeting of NAFCOOP (National Association of Fisherfolk Cooperative Society Ltd.) and the general assembly of the northeastern region fisheries cooperative planned to be established near future. These meetings are expected to have an attendance of about 40 people and to take place once a year. Also, gatherings of fishermen in Portsmouth (a total of 51 full-time fishermen) and neighboring areas will be held once to twice a month. The meeting room will be utilized also for training sessions on fishing gear and methods, festival events to promote fish diet and conferences on the management and operation of the fisheries center.

In addition, considering that the meeting room is to be constructed on government-owned land and that such a facility should also serve for other local people, the meeting room is expected to be used for community meetings organized by local citizens, charity and fund-raising meetings and gatherings of female citizens, in addition to the fishermen's gatherings.

The meeting room, therefore, can be viewed not only as a facility developed for fishermen and others involved in the region's fisheries industry, but also as a facility to offer benefits to local communities.

Table 2-2： Expected meetings, users and use frequency

| Types of meeting | Purpose | Attendants | Frequency （times/month） |
|---|---|---|---|
| Fishermen's gatherings | Monthly fishermen's gathering | Fishermen's group （composed of 51 fishermen）: 42 fishermen | Once/month |
| NAFCOOP meetings | Annual meeting | 10 executives and about 3 members each from 10 fisheries cooperatives affiliated to NAFCOOP: 40 people in total | Once/year |
| Meetings on the management of the facility | Regular meeting on the facility management | Fisheries Division （4 officials）, users of the facilities （3 representatives of retailers, 3 persons from the fish processing room, 1 person from mechanic shop, 3 facility management staff members）: 14 people in total | Every other week |
| Fisheries workshop and training | Workshops on fishing gear and methods | 1 lecturer and 15-20 fishermen trainees | 4 times/year (5-day workshop) |
| Other private organizations' meeting | Various purposes | Charity organizations, local women's associations, the board of commerce and industry, community meetings | Irregular |

7） Fish processing room

The fish processing room is a facility to be used for the following purposes:

- To clean up fish brought to the processing room and, then, send them to retailing outlets counters or cold storage facility or export to regional markets
- To process cold stored fish （to cut with a band saw） for sale
- To add value to landed fish
- To sell ice

The above practices at the processing room are closely associated with the planned distribution infrastructure - which is assessed as highly necessary in this Project- composed of the ice making machine, the cold storage facility and the retailing outlets counters, and these practices contribute to an improvement in the freshness of fish and a more sanitary fish-retailing environment.

The fish processing room shall comply with the Environmental Health Inspection Standard for Food Places established by Dominica Bureau of Standard.

Of clipped parts of fish (guts, scales, heads and bones) produced in the processing room, guts and scales shall be collected by contracted traders as general wastes, and heads and bones shall be frozen and stored. The frozen heads and bones shall be brought to a fish meal plant at the Roseau Fisheries Center regularly to be processed into bone and fish meal.

（2） Fishermen’s locker

The Fishermen’s locker shall be provided for fishermen who are currently in operation based in Portsmouth.

Just as in Roseau, there are only a few fishermen who live near the fish landing site in Portsmouth and those living near the fish landing site store fishing gear at home. Meanwhile, fishermen living far from the fish landing site rent a lot near the site to build a simple tinplate locker to use to store their gear, alone or jointly with other fishermen. It was found that there are 30 such lockers in total around the Project site but, when considering more than one fisherman use jointly one locker, the number of the existing lockers does not represent the number of lockers that local fishermen will need.

There are such lockers at other fisheries centers, which total 40 at Roseau and 74 at Marigot, respectively. At Roseau, all the 40 lockers are currently used and fishermen are suffering from a shortage of lockers. At Marigot, of the 74 lockers, 69 are rented not only to fishermen but also to fishing gear retailers and general merchandise stores.

Considering that Fishermen’s lockers are already in place with support from WFP at Bioche and Dublanc, the present status of Fishermen’s lockers in the Project site and high utilization of lockers in the existing fisheries centers at Roseau and Marigot, it is clear that Fishermen’s locker in Portsmouth will become highly necessary facility for fishermen, if provided in the Project.

（3） Mechanic shop

Fishermen using the buoy line, trolling line or long line fishing method mostly operate near FADs （Fish Aggregative Devices） located 55 miles offshore to the west of Portsmouth and if any outboard engine failure occurs, that will give a significant consequences on their safe operation.

Most of the fishing boats registered at Portsmouth is equipped with a single outboard engine and, therefore, reliable engine maintenance is indispensable for safe operation. Currently, on the beach close to the planned fish landing jetty at the Project site, private repair shops offer repair service in a simple tinplate establishment.

In this Project, it is planned that maintenance engineers will be employed from applicants from the private sector, including those already operating a private repair shop.

In the questionnaire surveys, 62% of fishermen responded that they need a mechanic shop and it is also considered that such a facility is indispensable for ensuring safe operation. If a mechanic shop is constructed, it can offer significant convenience to local fishermen in terms of safe operation.

（4） Repair shed

Currently, small fishing boats made of wood or FRP are maintained once a year or so for getting repaired the bottom or painted, and in that case, they have to be pulled up on hand-made wooden rails to the beach in front of the Project site. Although maintenance is mostly carried out from May to September avoiding busy fishing season, it coincides with the rainy season (from June to November) and maintenance and repair cannot be carried out efficiently because it can be often interrupted by rainfall or repaired boats cannot be dried well due to rainfall. Therefore, a repair shed is highly necessary for keeping the rain away and for fully drying repaired boats.

The planned repair shed is also necessary for providing an area for those repairing fishing nets without being exposed to strong sunlight.

（5） Toilet and shower building

A toilet and shower building shall be constructed as a facility to be used by fishermen and other people involved in the fisheries activities. Shower facility will be provided for used by fishermen returned from fishing or fish retailers after work. This facility is necessary because some of those who live far from the fisheries center need to have a shower before changing clothes for reasons of hygiene.

2-1-3-3 Exterior works

（1） Site premise pavement

The Project site at the back of the sea wall is subject to flooding by hurricanes, and if the site is

not paved, the sea wall itself can be damaged. Therefore, considering the need to protect the facility as well as taking into account the site development plan, the site premises must be paved from the engineering viewpoint. In addition, for vehicles come into the site for transportation and for other works, it is highly necessary to pave the site premises because the properties of the site are sandy.

In Dominica, the surface temperature of asphalt-paved areas will rise significantly because of the intensity of sunlight and high temperature. In this Project, pavement shall be made with materials that can keep the surface temperature as low as possible.

（2） Electric equipment (lighting fittings, power intake and distribution line, and emergency generator)

Electric power shall be supplied through a branch line that connects from the existing power line running along Bay Street and shall be distributed to each facility through the power intake panel. Electric equipment such as lamps and power outlets shall also be provided at each facility.

In order to prepare for power failures or unstable voltage in Portsmouth, an emergency generator is considered highly necessary to supply power to the ice making machine and the cold storage facility during emergencies. The planned fisheries center is a facility to be constructed as the first distribution center in Portsmouth area and if the center is to function effectively, a stable supply of ice for maintaining the freshness of fish and a reliable cold storage operation that is not affected by power failures or unstable voltage is essential.

At the Project site, it is considered reasonable to provide an emergency generator for the ice making machine and the cold storage facility.

（3） Water supply, drainage and sewage system

In this Project, a water supply system shall be developed to supply water to each facility as necessary.

At the Project site, there is no public drainage and sewage system in place. In accordance with the domestic standards in Dominica, general wastewater such as rain water shall be drained away into the front sea area. Wastewater containing fish scales and residuals generated at the retail shops shall be processed with a simple filtration device and, then, directly released into the front sea area. Sewage water from toilets shall be treated by the infiltration process using a septic tank, in accordance with the standards established by the Environmental Health Department.

（4） Fuel station

Since there is no fuel station at the Project site, fishermen have to go a long way to a gas station to buy fuel by car or on foot and they endure time loss as they have to spend a long time for preparation for fishing in this way. Inconvenience caused by this is referred to in the questionnaire surveys and 76% of fishermen responded that they need a fuel station. Based on this, it is considered highly necessary to construct a fuel station.

2-1-3-4 Equipment

（1） Insulated ice boxes

In order to meet needs for ice at fish landing facilities in other areas than Portsmouth, insulated ice boxes of about 750-litre capacity shall be provided to transport and store ice manufactured in Portsmouth. Also, insulated ice boxes of about 250-litre capacity shall be provided to be used for storing fish with ice and for sale on the retailing outlets counters. These insulated ice boxes will improve the way to keep the freshness of fish.

（2） Fish trays

Fish trays shall be provided to transport fish sanitarily and efficiently at the time of fish landing.

（3） Scales for weighing

For use on retailing outlets counters, scales (hanging scales) that can weigh up to 20 pounds are necessary at the ratio of one scale to each retailing outlets counter. Platform scales are also necessary that can weigh up to 500 pounds in order to weigh an aggregate of fish catch at the time of fish landing.

（4） Engine flushing tank

An engine flushing tank is necessary for use in the propeller rotation test of outboard motors that have been repaired at the mechanic shop.

（5） Tools for the mechanic shop

Through monitoring and hearing surveys on existing small fishing boats, it was found that almost all of the outboard engine boats currently operating in the local area had a 10 to 120-horsepower engine made in Japan and, therefore, repair tools and special tools for the outboard engine used to repair those engines other than general tools such as wrenches and screwdrivers are necessary.

（6） Equipment for fish processing room

In Portsmouth, fish catch includes tuna and Marlin and it is not easy to sell the whole of any of such large-size fish at one time. Large-size fish are frozen and sold in smaller pieces at existing fisheries centers at Roseau and Marigot, which is a good way to sell fish catch effectively. Therefore, it is appropriate to provide band saws to cut off frozen large-size fish, stainless tables for the cutting process and high-pressure water washing machines to clean the processing room.

（7） Plastic buoys and concrete anchors

These types of buoys and anchors shall be provided at the sea wall to moor a total of 23 FRP fishing boats registered at Portsmouth. Currently, these boats are moored 5 meters offshore in an unorganized manner. When a jetty is constructed in this Project, the shore side of the jetty will be

used for fish landing by small fishing boats, and that will bring more frequent traffic of boats at the seaside. If nothing is done, fishing boats could collide with each other and easy and safe mooring of fishing boats can be inhibited. Unlike wooden fishing boats that have to be pulled up ashore for drying to repair, FRP boats have to be moored in the sea in order not to damage the boat bottom. Therefore, it is considered necessary to allocate plastic buoys and concrete anchors in the front of planned sea wall.

## 2-2 Basic Design of the Requested Japanese Assistance

### 2-2-1 Design Policy

Under this Project, the components as shown in Table 2-1 will be provided to increase fish landings at Portsmouth and the income of local fishermen. The Project will include the construction of a Fisheries Center with the incidental facility, a landing jetty to accommodate both large and small fishing boats and the procurement of the equipment required for these facilities. The contents of this Project will be planned in accordance with the following policies, based on the request made by the Government of Dominica and the results of the field studies and discussions.

#### 2-2-1-1 Overall Policy

- The Fisheries Center is planned to provide facilities mainly for the purpose of improving the fish landing functions, and does not incorporate any external port facilities such as breakwater. The Project is therefore designed on the assumption that the site will be flooded in the event of a rarely occurring hurricane attack from the western side, such as the Hurricane Lenny in 1999. However, in the event of a hurricane coming through Dominica from the eastern side which occurs almost every year, the project site will be designed free from flooding, where the shore facilities will be constructed. Small fishing boats mooring offshore or laying ashore will be moved on the Bay Street for evacuation, as currently being practiced.
- Since this Project is to be implemented under the Japanese Grant Aid with a limited period of work, appropriate construction conditions at the project site will be set out with regard to the structure, construction materials and construction methods. Efforts will be made to shorten and strictly observe the work schedule. In implementing the Project, labor, construction materials and machinery available in Dominica will be employed as much as possible in order to contribute to revitalization of the local economy through the construction work.

#### 2-2-1-2 Policy for Fishing Port Infrastructure

- The facilities structure will have durability against the high waves as estimated on the past hurricane data and will be made to minimize the impact of installation of new structures to be

extended to the surrounding coasts and existing facilities, by considering waves and currents expected by the new structures.

- The jetty facilities will be planned for greater convenience in fish landing and in preparations for fishing operations.
- Since Dominica has no established design criteria for civil engineering facilities, the civil engineering design code of Japan will be used.

2-2-1-3 Policy for On-shore Fisheries Infrastructure

- The size of the facilities is planned according to the current landed quantity, distribution quantity and number of fishing boats at Portsmouth and other 9 fish landing sites.
- The structures placed underground will be designed taking the uplift force into consideration, because it is foreseen that the shore facilities will be flooded in the event of a major hurricane attack such as Hurricane Lenny. The structures shall be designed to keep the facilities functioning even in the event of flooding. The shore facilities located adjacent to sea wall may be exposed to wave overtopping in the event of a hurricane attack from the eastern side more or less every year. These facilities shall be arranged to minimize the affect of wave overtopping functionally and structurally. Also, corrosion by seawater will be taken into consideration.
- Plans for Fisheries Center will be made based on the annual catch landed at Portsmouth in 2007, or approximately 100 tons and an average of 340kg per day. And the floor plan will be arranged in consideration of fish retailing space, numbers of retailing counters, capacities of ice making machine and area of fish processing room. In addition, the fish processing room will be constructed in compliance with the Environmental Health Inspection Standard for Food Places in Dominica.
- In Dominica, both large and small fishing boats keep their catch in ice for distribution. Some large fishing boats carry ice for fishing operations. Flaked ice is usually used for this purpose. In order to meet the demand for ice, an ice-making machine with the production capacity of1 ton of flaked ice per day and an ice storage facility with the capacity to hold 3 tons of ice. For the storage of large-size fish it is also planned to install cold storage facilities to receive 301kg of fish per day to store it for 3 days.
- The fishermen’s locker will accommodate the fishing gear for 38 full-time fishermen in Portsmouth out of the total 51, not including the 13 fishermen who live close to the fish landing site.
- The building standards for this Project will comply with the Commonwealth of Dominica Building Codes (general) but, with regard to the structural design, as there is no established structural code in Dominica, the Japanese standards will be applied.

2-2-1-4 Policy for Equipment

- The equipment to be procured will be that for storage and preservation of fresh fish, weighing of

products for sale, repair of outboard motors and maintenance of facilities. The number of large-size insulated ice boxes will be determined taking into consideration the fact that these will be used at each fish landing site, while quantities of other equipment will be decided on the assumption that they will be used within the planned facilities.

- Equipment that can be maintained around Portsmouth will be selected as far as possible.
- The gauging units will follow to those prevailing in Dominica.

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

#### 2-2-2-1 Overall Layout Plan

The components of the Project comprises Fishing Port Infrastructure (a fish landing jetty, a sea wall and river revetment and a slipway) and On-shore Fisheries Infrastructure (a Fisheries Center building, a repair shed, a Fishermen's locker, a mechanic shop, a fuel station and a toilet/shower building).

The layout plan for Fishing Port Infrastructure and On-shore Fisheries Infrastructure has been made on the following policies:

(1) Layout Policy for Fishing Port Infrastructure

- The fish landing jetty will be arranged in line with the extension of Pembroke Street in front of the project site, thus making a part of the main flow line of goods and people.
- The shore area connecting to the jetty will be congested, and as spacious as possible area shall be secured as a buffer zone.
- The slipway will be arranged taking into consideration for pulling up of FRP fishing boats and the protection of the site of the former land of Social security board.

(2) Layout Policy for On-shore Fisheries Infrastructure

- The Fisheries Center building which houses the fish retailing outlets counters will be arranged at a space adjacent to Bay Street in the former land of Social security board, enabling ease of access by consumers.
- The repair shed for fishing boats and fishing nets will be laid out at the site adjacent to the coast so that a certain spacious area can be used.
- The Fishermen's locker will have a two-story structure to secure the required quantity of 38 lockers while making effective use of the limited site area, and will be located east of the former land of Social security board, which is relatively open in the east-west direction.
- The incidental facilities including the mechanic shop, the toilet/shower building and the fuel station will be located west of the former land of Social security board to obtain easy access from

the sea side.

- The back yard of the Fisheries Center bldg will be a restricted area with doors and fences to limit the access by unauthorized persons from the viewpoint of hygiene control.
- The area along the southern beach is affected directly by waves in the event of bad weather. For locating the shore facilities in this area, it is necessary to construct a sea wall. The area is however one of a few valuable beaches in the Portsmouth Area and the fish landing and boat yards will be substantially limited, if these are located in this area. Consequently, this area will be used for the site for underground facilities such as the septic tank and for the boat yards of fishing boats, which eliminate construction of sea wall.

The planned flow lines and the layout plan are shown in Figure 2-1 and Figure 2-2 respectively.

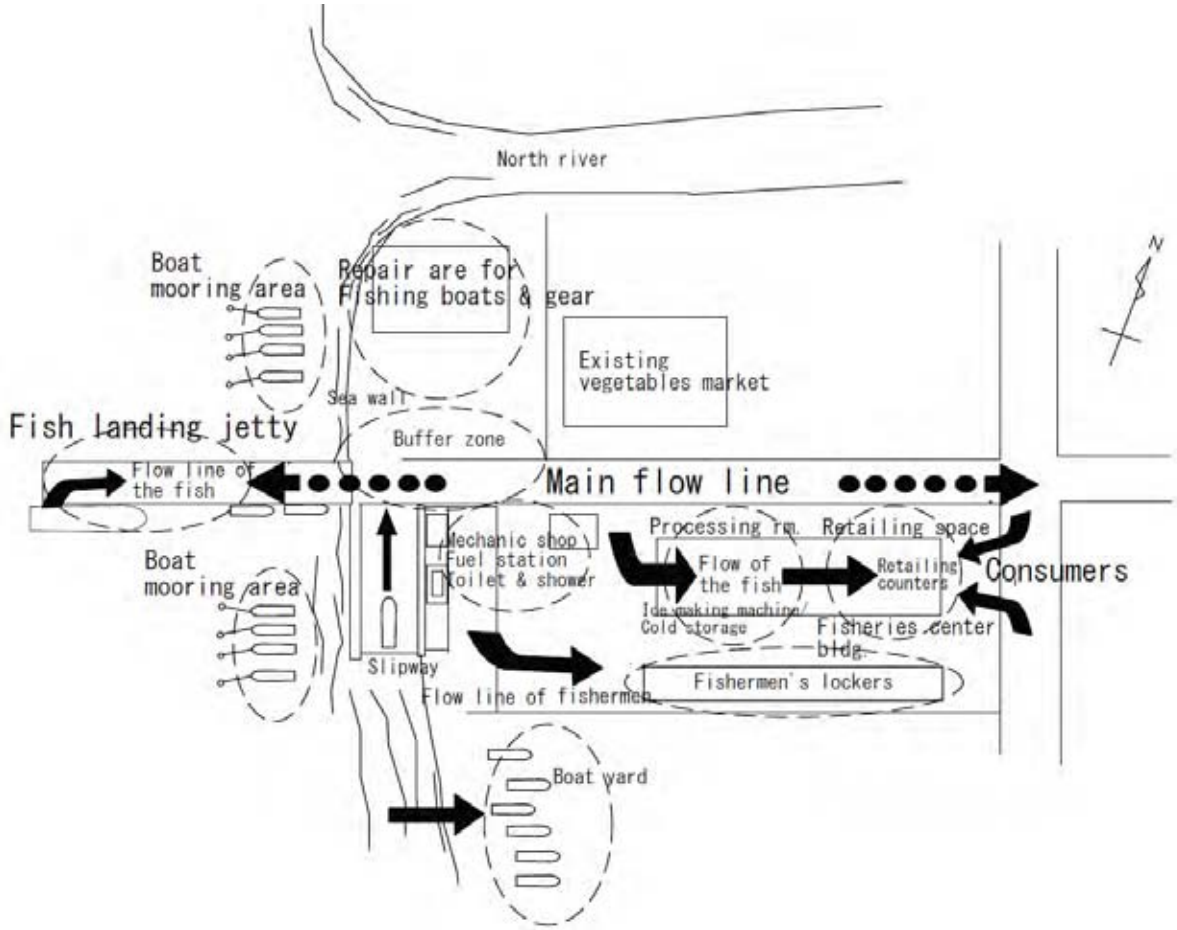



Figure 2-1: Diagram of planned flow lines

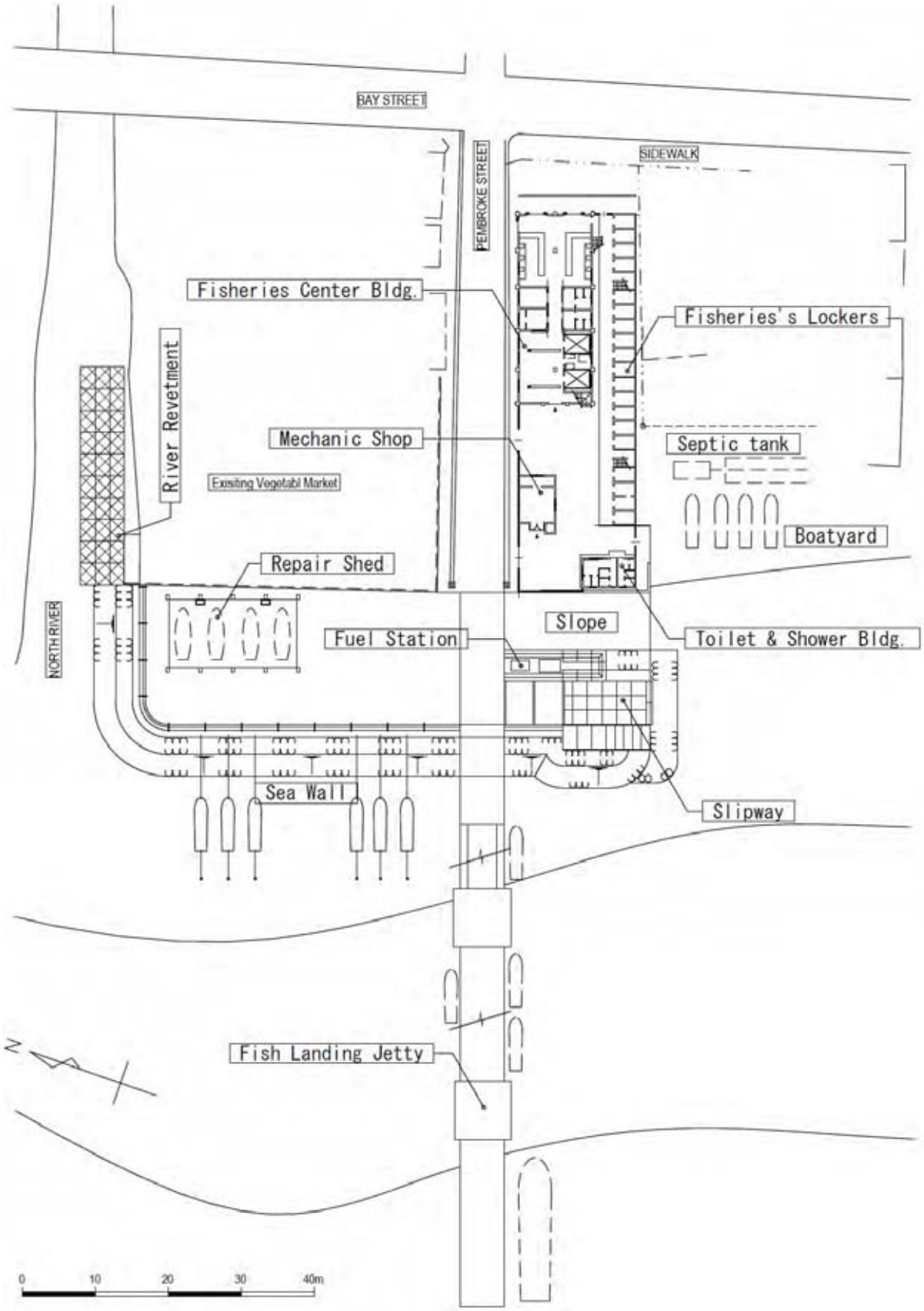



Figure 2-2 : Layout plan

### 2-2-2-2 Fishing Port Infrastructure

#### 2-2-2-2-1 Overall Plan

The Project's components for civil engineering work include fish landing jetty, sea wall (on the ocean side), river revetment and slipway.

There are no established standards in Dominica for the design of civil engineering facilities, and the selection of standards to be applied is the responsibility of the civil engineer in charge of design. In this Project, each of the civil engineering facilities is primarily for use in the fishing industry, and uniform standards for the design of such facilities is to be found only in Japan. Therefore, the Japanese standards will be used in the design of the civil engineering facilities.

An I - shaped fish landing jetty with 123 m in length and 6m wide will be constructed. The pile structure will be employed for the jetty with reinforced concrete super structure. The shape of the jetty has been decided considering ease of the traffic between the jetty and the related architectural structures on land, as well as the safety of moored fishing boats against waves. The sea wall (on the ocean side) will be constructed without changing the existing shoreline significantly. Length will be 65m long and made of cast-in-place concrete blocks. The backside (landside) of the sea wall will be used for the construction site of the repair shed under the Project. Construction of the sea wall may cause flow generated by waves run up easily to the mouth of the North River when a hurricane hits, and there is a possibility that the foundations of the existing vegetable market will be scoured by the waves. To prevent this, a 30m-long river revetment with the gabion basket structure will be constructed. The slipway will be 20m in length and 6m wide, and will run in parallel with the shoreline.

#### 2-2-2-2-2 Scale Design

(1) Fish landing jetty

1) Layout and plan shapes

The planned site of the jetty is located on Pembroke Street at a right angle to the coastline. It will be the most efficient for the flow lines to install the jetty on the extension line from Pembroke Street for ease of transportation of fish and loading of the materials (such as fishing gears, ice, fuel and water) necessary for fishing activities.

The shape of the jetty will be decided to have the shortest distance to the water depth required for the largest fishing boat to moor, and to ensure fishing boats are least affected by waves during mooring.

Fishermen usually moor their boats alongside the jetty, and when the boat is moored in the direction of receiving waves, the boat is stabilized and the landing and loading work be done safely. As waves are traveled from offshore to the shoreline, the fishing boat can be moored safely by directing the jetty in the traveling direction of the waves.

Therefore, the jetty will be extended to the direction of the extension line of Pembroke Street

at a right angle with the coastline as shown in Figure 2-2, so that the fishing boats can be moored safely against the wave direction.

2） Required water depth

The water depth necessary for the jetty will be determined relative to the fishing boat having the highest draught among the large fishing boats registered in Portsmouth at present.

According to Designing Manual for Fisheries Infrastructure（2003 Edition）, the standard water depth for mooring facilities is obtained by adding a depth margin of 0.5 to 1.0 m to the fully loaded draught of the boat, for which other conditions such as bottom property, waves and currents are also considered.

The draught of the largest fishing boat in the Project area is assumed to be about 2.0 m with fully loaded condition, and about 1.8 m (6 feet) at light condition. The estimation of the draught was made on the fishing boat registration certificates by the Fisheries Division in Dominica and also hearing information from boat owners. The sea bottom is sand with pebbles and the wave height and current are low when the jetty is used. Therefore, the berthing water depth for large fishing boats will be decided to be -2.5m（2.0m + 0.5m = 2.5m, D.L. -2.1 m）from L.W.L + 0.4.

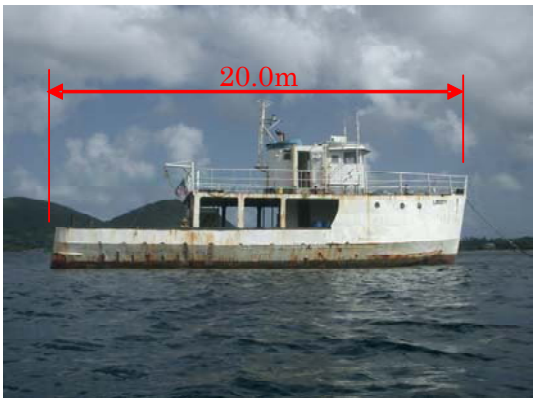
The water depth required for small fishing boats will be determined to be D.L. – 1.0 m, as most of small fishing boats have a draught of about 0.7 m.

3） Jetty length

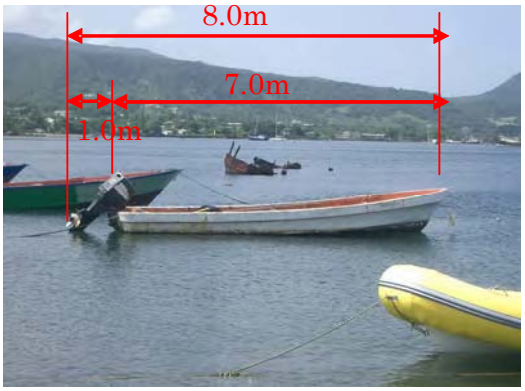
The front end point of the jetty side will be determined by adding the required length for the largest boat to berth to the point of the water depth of -2.5m, thus the total jetty length will be calculated.

The length overall (L.O.A) of the largest fishing boat under this Project is 18.3m (60 feet), according to the fishing boat registration certificates of the Fisheries Division. The hull length (bow to stern) is 20 m as actually measured. The fishing boat berths alongside the jetty by stretching ropes slantwise from its bow and stern. The length of the mooring facility will be determined by adding a margin for the mooring ropes. According to “Designing Manual for Fisheries Infrastructure (2003 Edition)”, the marginal length is 0.15 times of hull length. Thus, the required facility length for large fishing boats is 1.15×20m = 23m, which should be the required mooring length for large fishing boats.

As the result of the topographic survey of the sea bottom, the total jetty length is 123 m with the offshore front of the jetty at the point 23m extended from the water depth over – 2.5m (=D.L. – 2.1m) from L.W.L.+ 0.4.




Target boat（large fishing boat）




Target boat（Small fishing boat）

4） Jetty width

The jetty width will be determined based on the conditions that both sides of the jetty will be used simultaneously and that vehicles will run on two sides. Usually, the apron width necessary for landing fish and loading fuel, ice and fishing tools is deemed to be about 3 m. In the case that both lanes of the jetty are used, the minimum required jetty width is 3 m×2 = 6 m. If the jetty width is 6m, each lane width is sufficient for vehicles to run.

Therefore, the minimum jetty width is determined to be 6 m for two lanes.

5） Jetty crown height

The crown height of the jetty will be determined by considering the boat types, tide level and waves. The specifications for the existing fishing boats will be used because there is no immediate trend in Dominica that the size of boats is becoming larger. In general, the value obtained by adding the values shown in the following Table 2-3 to the H.W.L shall be the crown height depending upon the gross tonnage of target boat and the tide level difference, apart from any abnormal tidal surge and high waves.

The planned jetty is intended for use by boats under 20 gross tons at the condition of a tidal level difference of 0.3m. Therefore, the jetty crown height is D.L. + 1.4m as standard, which is obtained by adding 0.7m to the average high water line H.W.L (C.D.L. + 0.7m) at the spring tide.

Based on the result of the measurement of the crown height of the existing berthing facility in Dominica and also hearing information from ship owners, the crown height of the planned jetty will be D.L. + 1.5m for the section used by large fishing boats, which is 0.1 m higher than the standard value, and D.L. + 1.2m for the section used by small fishing boats, which is 0.2m lower than the standard value.

Table 2-3: The value of crown height

| Tide level difference (m) (H.W.L – L.W.L.) | Gross Tonnage of Target boat | | |
|---|---|---|---|
| | 0 – 20 ton | 20 – 150 ton | 150 – 500 ton |
| 0 – 1.0 | 0.7 m | 1.0 m | 1.3 m |
| 1.0 – 1.5 | 0.7 m | 1.0 m | 1.2 m |
| 1.5 – 2.0 | 0.6 m | 0.9 m | 1.1 m |
| 2.0 – 2.4 | 0.6 m | 0.8 m | 1.0 m |
| 2.4 – 2.8 | 0.5 m | 0.7 m | 0.9 m |
| 2.8 – 3.0 | 0.4 m | 0.6 m | 0.8 m |

Source: Designing Manual for Fisheries Infrastructure (2003 Edition)

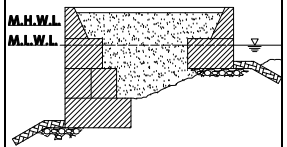
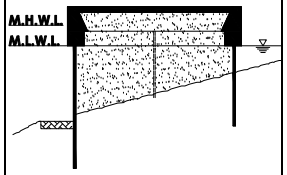
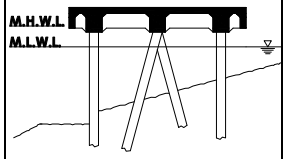
6) Jetty structure

The basic structure types for mooring facilities are generally categorized into 4 types: (i) gravity type; (ii) sheet piling type; (iii) pile type and (iv) floating type. Herein, the structure type will be determined from the comprehensive review by considering the characteristics of each structure type and comparing the conditions: a) natural conditions; b) use conditions and c) construction conditions, as well as considering the construction work schedule and the cost.

A floating jetty has the advantages that it can be installed at a location with a high water depth and tidal level difference and that the new construction and relocation is relatively easy. On the other hand, the site of installation is limited to locations with a high tranquility. The project site is not provided with external facilities such as breakwaters and it is affected directly by waves. In addition, the planned water depth is shallow and the tidal level difference is not large. Compared with the 3 fixed types, the floating type is inferior in structural strength and its maintenance cost will be high. Thus, the floating type has been excluded from the comparative discussions this time.

Therefore, the comparison of (i) gravity type, (ii) sheet piling type and (iii) pile type is shown in Table 2-4.

Table 2-4: Comparison of jetty structure types

| Item examined | Schematic diagram | a) Natural conditions | | | b) Usage conditions | | | c) Execution conditions | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (1) Correspondence to the existing ground | (2) Correspondence to the water depth at the front | (3) Safety against impulsive force from boats | (1) Ease of cargo handling | (2) Calmness in the hinterland | (3) Main construction materials | (1) Main construction machinery to be procured abroad | (2) Main temporary work | (3) Main construction contents and technology |
| Gravity type |  | In general, it is applicable to a hard sand gravel layer. However, the depth of the rubble-mound has to be decided depending on the conditions of the sand layer. Inferior in blocking the tidal flow and in permeability | It is not appropriate for a site with a large water depth. | It is the strongest against impulsive force from boats. | Good for all types | It improves calmness in the hinterland as it acts as a wave absorbing dyke. | Large-sized rubble is required for the foundation work below the concrete blocks. | Large heavy equipment is required for installation of the concrete blocks. | A yard to prepare the concrete blocks is required near the planned site. | Skilled technicians are required for a large amount of the underwater work when constructing the rubble foundation and installing the concrete blocks. As it is executed on ground, of the three types, the concrete work is relatively easy. |
| Sheet-pile type |  | It is appropriate for a sand layer. However, the existence of cobblestone may require consideration of the use of another method such as water-jet at the sheet piling. Inferior in blocking the tidal flow and in permeability | | It is relatively strong against impulsive force from boats and it has large absorbing energy. | | | Procurement of sheet piles is required. | Procurement of cranes, vibrohammers and generators for sheet piling is required. | Simple scaffolds are required. | The work is the simplest of the three. |
| Pile type |  | Considerations similar to those for the sheet-pile type are necessary for this type. Does not block the tidal flow and superior in permeability | It is applicable to a site with a large water depth. | Although it is strong against impulsive force from boats, it is likely to become unstable if the force causes destruction. | | Less improvement in calmness than with the other two types can be expected. | Steel pipe piles and materials for a temporary stage are required. | Procurement of a pile driving barge is required. | A large-scale temporary stage is required for the concrete work for the beams and slabs. | There is a large amount of pile driving and concrete work in the sea. Skilled workers are required. This was the method used for the existing jetty. |

From the results of study of the location conditions, the sounding survey and sub-soil investigation at the Project site, it has been determined that the pile type jetty is superior for the following reasons:

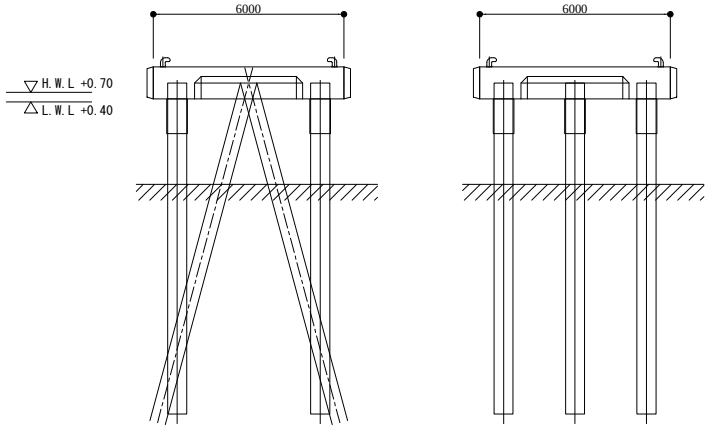
As shown in the Design Policy for the fishing port infrastructure, the pile structure is superior for the jetty because it is a structure with high permeability and does not impede the waves and flow, and minimize the impact on the surrounding coasts and the existing facilities.

If an impermeable structure such as the sheet pile type or gravity type is used, reflected waves from the structures are generated, changing the wave conditions at the surrounding coasts or the waves beating upon the beach lines and the surrounding existing facilities. The impermeable structure, which has a relatively large jetty length, may give a large impact on the flow (beach drift) due to the waves generated in the event of a high wave attack such as a hurricane or tropical storm. The beach drift change may cause a change of sea bottom topography. The pile type structure does not impede the waves and flow to the surrounding coast and gives the minimum impact to the surrounding facilities. In addition, there is no fear that the structures will be scoured by waves.

7） Structural section of pile-type jetty

There are two section types of pile jetty, the raker pile type and vertical pile type. The raker pile type is often adopted as a structural type against horizontal external forces such as docking force and traction force.

While raker piles are suitable in cases where horizontal displacement is small and horizontal external force is great in relation to horizontal force (seismic force and impulsive and traction forces from boats), a specialized pile driving barge or a specialized pile driver to drive piles aslant is absolutely essential for execution of raker piles construction.

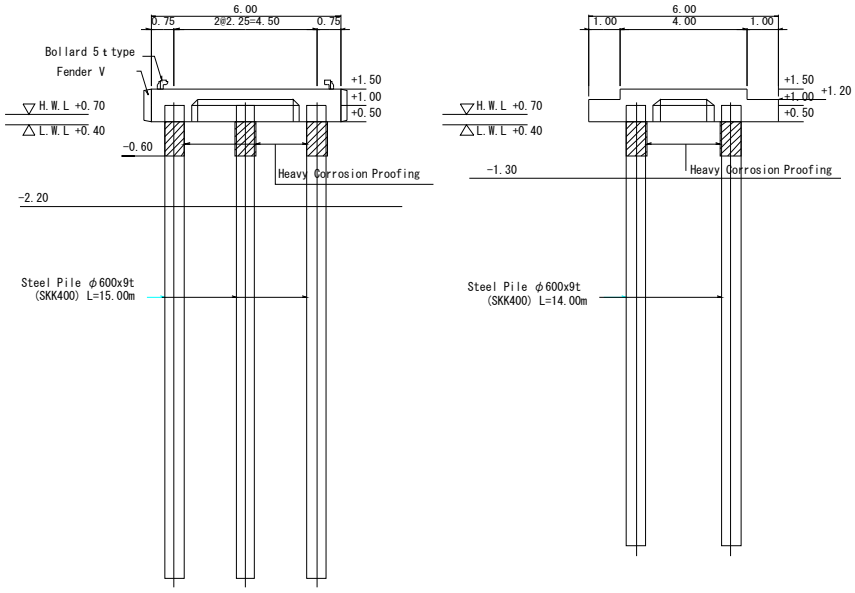



raker pile type　　vertical pile type

Figure 2-3： Section types of pile jetty

The planned jetty does not expect to receive large horizontal force in the presumed use conditions under the Project. The Project site is located in an island country in the Caribbean Region, and it is difficult to procure the necessary large-scale civil engineering machinery for marine development within the country and from the neighboring countries. Under these circumstances, it is disadvantageous to adopt raker piles type. Therefore, the adoption of vertical piles type is deemed to be appropriate.

Since the pile anchorage length at the project site is affected by the uplift force of waves, the economic comparison between the pile type with a grating (grating floor board type) superstructure and the pile type with no grating (RC floor board type) was made in order to reduce the uplift force onto the superstructure and to shorten the pile anchorage length. As a result, it is recommended that the RC floor board type be used, which is economical for the construction cost and advantageous in maintenance and use.




For large fishing boat For small fishing boat

Figure 2-4: Structural section of pile-type jetty

8) Jetty facilities

a) Water supply facilities

No piping work to the jetty is planned. Water supply to the fishing boats berthing at the jetty will be carried out through a hose connected to a hydrant provided at the jetty base.

b) Fuel supply facilities

No piping work to the jetty is planned. The installation of a gasoline and diesel oil dispensers are planned to supply oil through an extension hose to fishing boats.

c） Additional facilities

For efficient and safe use of the jetty, the following incidental equipment will be installed.

- Fenders: The jetty front end will be provided longitudinally with the V-type fender for large fishing boats and small fishing boats, and the stepped section of the superstructure will be provided sideways.
- Mooring post: Mooring posts will be installed at the jetty front-end section for large fishing boats.
- Curb: Curbs will be installed on the jetty to prevent vehicles from dropping down into water.
- Mooring rings: Mooring rings will be installed on the jetty for small fishing boats.
- Light beacon: Light beacon be installed on the jetty.

（2） Sea wall and site premises

1） Sea wall layout

The layout of the sea wall will be designed without making a substantial change to the existing beach line in order to minimize the impact on the surrounding coasts. As the project site is located at the river mouth on the east side bank of the North River, it is planned that the flow of the North River will not be impeded by any projections from the facilities into the river mouth. The shape of the river mouth may be changed in the rainy season and the dry season as well as after a hurricane attack. Therefore, the sea wall shape will be determined not only based on the present river mouth shape but also on the sediment conditions in the river mouth as shown in the past aerial photos and maps.

As the result of topographic survey, the arrangement of the sea wall shall not substantially exceed the range of D.L.±0.0m, and that will be 20m offshore from the block fence of the existing vegetable market.

2） Level of the site

The crown height for the site will be required between D.L. +1.5 and 2.5m by referring to the site height of the surrounding zone where the existing facilities with sea walls are located and to the site heights of Roseau and Marigot Fisheries Center. However, the existing floor height of the vegetable market and street height adjacent to the project site is D.L. +1.0m, and a slope will be required if the project site height is substantially changed from the surrounding land height. Adjustment of the ground height of the project site by making slopes means either decrease of the usable land area for the Project or gains against the existing land area.

Therefore, the minimum necessary project site height will be determined at D.L. +1.5m, and the height of the sea wall will be D.L. +2.5m by installing 1.0m-high parapets on the sea wall.

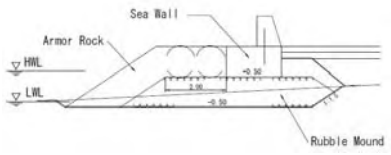
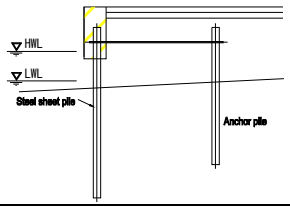
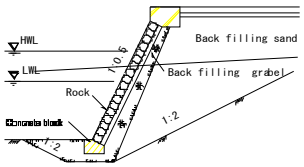
To facilitate mooring of the fishing boats and boarding of fishermen, the front end height of the sea wall will be D.L. +1.5m or same level with the ground height of the project site, and will be extended to seaward at 1.0m wide. Therefore, the parapets will be installed at 1.0m on the shore side from the sea wall.

Appendix 5-1-3 shows more details.

3） Structure type

The sea wall structure type will be determined by considering the structure types of the existing sea walls, the ground conditions, the water-level conditions and the construction conditions. The engineering methods that can be used in Dominica are three types: (i) cast-in-place concrete block type; (ii) anchored sheet pile type and (iii) rock and soil based sea wall type. A comparison of these structure types has been made as shown in Table 2-5.

Table 2-5： Comparison of sea wall structure types

| Item | （i） Cast-in-place concrete block type | （ii） Anchored Sheet pile type | （iii） Rock and soil based sea wall type |
|---|---|---|---|
| |  |  |  |
| Features | ・ Concrete blocks are installed on good ground.<br>・ Usable on good ground. | ・ A structure having steel piles on the front side and anchored piles on the rear side.<br>・ Generally used for reclaimed sea walls. | ・ The surface is covered with rocks and soil.<br>・ Generally installed on ground that is exposed when the tide is out. |
| Geologic conditions | ・ Adequate for ground having a relatively high bearing capacity such as a gravel layer. | ・ Adequate for a soft ground or sand layer | Usable on soft ground |
| Durability | No problem | There is no problem with corrosion for a long period of use by taking rust-preventive and corrosion-resistant treatment. | The main structure is weak against wave forces that have a direct action on the wall in event of a hurricane or tropical storm. |
| Water depth/ topographic conditions | Effective at a shallow water depth. | Effective at a medium water depth. | Effective at a shallow water depth. |
| Constructability | ・ No need of any special manufacturing yard.<br>・ Simple structure and ease of construction<br>・ Capable of construction on shore | ・ Simple structure and ease of construction<br>・ Capable of construction on shore | ・ Simple structure and ease of construction<br>・ Capable of construction on shore |

| Item | (i) Cast-in-place concrete block type | (ii) Anchored Sheet pile type | (iii) Rock and soil based sea wall type |
|---|---|---|---|
| Cost | The materials except concrete can be procured locally at relatively low cost. | The sheet piles are procured from any third country and heavy machinery for construction is required, and the high cost is high. | Most materials can be procured locally at relatively low cost. |
| Construction cost | 1.0 | 1.3 | 1.0 |
| Work period | ・ The construction period at the site is short.<br>・ Construction is possible with locally available materials. | ・ The construction period at the site is short.<br>・ The sheet piles are imported. | ・ The construction period at the site is long.<br>・ Construction is possible with locally available materials. |
| Evaluation | ○ (high) | Δ (medium) | Δ (medium) |

Based on the result of the above comparative discussions, this Project will adopt (i) Cast-in-place concrete block type.

With the existing sea wall structure within Prince Rupert Bay, the beach in front of the structure was eroded and part of the structure collapsed due to scouring.

Therefore, the front side of the sea wall will not have an upright structure, but have a structure capable of buffering the waves softly and will be provided with a sloped mound on the front side to prevent scouring by the waves in event of a hurricane or tropical storm.

The sloped mound will be installed lower than the crown height of the sea wall, ensuring the advantage that the users of small fishing boats mooring and resting at the front side of the sea wall can get on and off relatively easily.

4) Required weight for covering stone

The weight of the covering stone to be used on the front side of the sea wall is calculated using the Hudson formula and the design wave height (H = 1.6m) for the sea wall. The results of this calculation set the necessary weight at 0.95 ton. However the end section of the sea wall will require 1.5 times the above weight and, therefore, the calculation is as follows: W = 0.95 x 1.5＝1.43 tons. Since the sea wall is to be divided in two sections by the jetty and there will be an end section on each side, 2 tons of stone will be needed for the entire length of the sea wall.

5) Site premises pavement

The site premises behind the sea wall have a risk of flooding, and if the area is not paved, the waves and sea water over the sea wall will infiltrate over the ground behind the sea wall, leading to damage of the sea wall itself. Therefore, the site premises pavement is indispensable considering the facility maintenance and the utilization pattern of the site from the engineering point of view.

If the site premises are paved with asphalt, the pavement will have a considerably high surface temperature due to the high atmospheric temperature and strong sunlight all the year round in Dominica. Many fishermen are repairing of fishing boats or fishing nets on the pavement floor. It is desirable to take some measure to prevent raising the surface temperature of the pavement at the project site. The sectional diagrams of the sea wall and the site are shown in Figure 2-5.

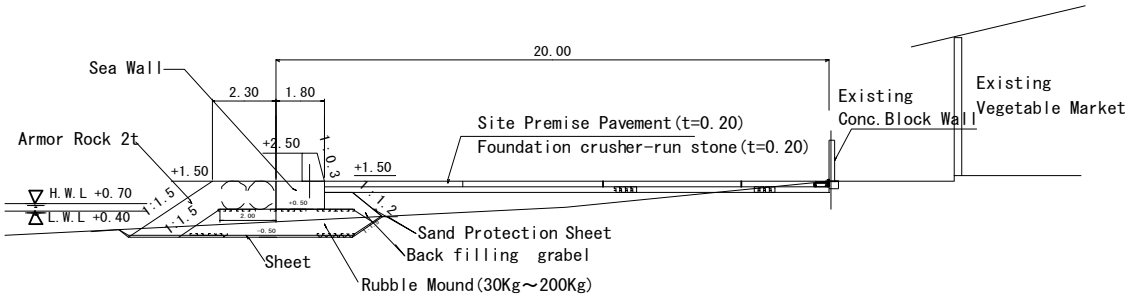



Figure 2-5： Sectional diagrams of sea wall and site

（3） River revetment

At the east side of the vegetable market adjacent to the project, there is a dry river bed where plants grow among fist-sized stones. The height of the concrete foundation floor is low, about 0.3m above the river water level at normal times.

If the sea wall is completed on the sea side as described in (2) above, the sea waves may easily run up along the new sea wall through the river mouth into the river, resulting in scouring the foundations of the vegetable market buildings. Therefore, it is necessary to take a countermeasure against such scouring by the inflow of sea waves of the foundation at the east of the vegetable market.

As the foundation height of the vegetable market is low, if the height of river revetment in this Project is high, it is impossible to facilitate drainage from the vegetable market when flooded in case of abnormal rise of the river water level due to rainfall or a high tide due to a hurricane or tropical storm. Therefore, construction of river revetment having enough height to protect from the waves is limited.

For the structure type for the river revetment, therefore, a mat gabion type will be adopted which is made of locally available materials, able to be maintained and repaired locally and durable to a more or less changed river bed. Such a mat gabion type is also used for the river revetment in Dominica and requires no special technique or machine in the construction work. The mat gabion shall use corrosion-resistant material because it will be installed in the brackish water area at the river mouth where fresh water is mixed with seawater and in the environment in which steel materials will be likely corroded.

The installation range will cover the length (L) = approx. 30m, same length as the foundation of the vegetable market and the same width as the current minimum dry river bed width of 6.0m.

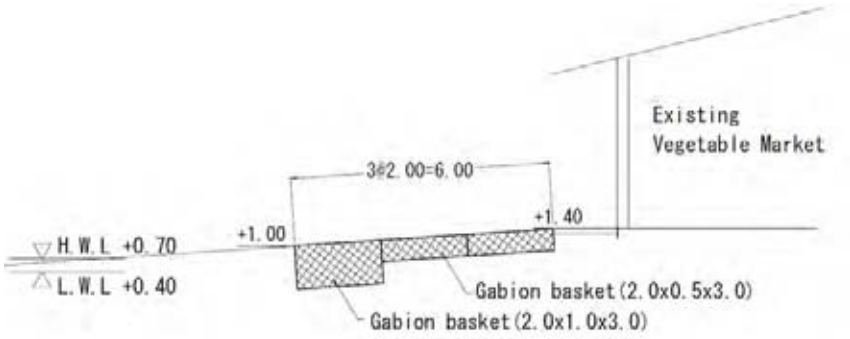



Figure 2-6： Sectional diagram of river revetment

（4） Slipway

1） Layout

The slipway will be installed in parallel with beach line.

By doing so, the fishing boat can be towed by a vehicle to the slipway.

The slipway facility requires concrete walls at both sides to protect the structure from wave actions. The wall on the offshore side will also function to protect the shore facilities such as the Fisheries Center building and the Fishermen's locker against the waves in bad weather. This structural arrangement may also improve the convenience of the slipway by extending water area offshore.

2） Width


The width of the slipway will be determined depending upon the widths of fishing boats, the marginal widths of both sides and the peak usage rate. At the project site, it is not expected that two fishing boats use the slipway simultaneously for repair, and the slipway width will be 6.0m, calculated as the small fishing boat width of 3.0 m plus 1.5m (marginal widths) on both sides.

3） Crown height

The crown height of the slipway will be D.L. +1.5m considering the level of movement on which a fishing boat is carried up to the adjacent repair shed.

4） Slope angle

According to Designing Manual for Fisheries Infrastructure（2003 Edition）, it is deemed to be desirable that the slope of the slipway is a single slope as 1 : 6 ~1 : 10. A gentle slope makes it easy to raise or lower a fishing boat, but the slipway has a longer horizontal distance. The

slipway slope for fishing boats is often 1:6 to 1:8 for limited anchorage areas and site premises. Roseau Fisheries Center, one of the fishing ports that have been provided with a slipway has the composite slope section of 1 : 6 and 1 : 8. A slipway with a 1 : 7 slope is installed at Marigot Fisheries Center. These slipways are operated without problem according to the survey of the use conditions in Dominica.

The slipway slope at the project site will be 1 : 8 based on the planned land level, and the existing ground height based on the result of topographic survey.

5) Water depth at slipway front

The draught of the small fishing boats using the slipway is 0.7 m, which is a water depth allowing safety sailing by keeping a margin to the lower end of the outboard engine. On the other hand, the water depth at the slipway end should be enough to allow the tip of the bow of the fishing boat put on the slipway. Usually, the bow is directed to the shore side for slipping, and the bow draught is shallower than the maximum draught. The slipways at Roseau and Marigot Fisheries Center have the water depth at the slipway end at about -0.7 m, the depth same as the boat draught.

Therefore, the water depth at the slipway end of D.L. -0.5m should be secured, and this may ensure the depth of 0.9 m even at the tide level of L.W.L +0.4m.

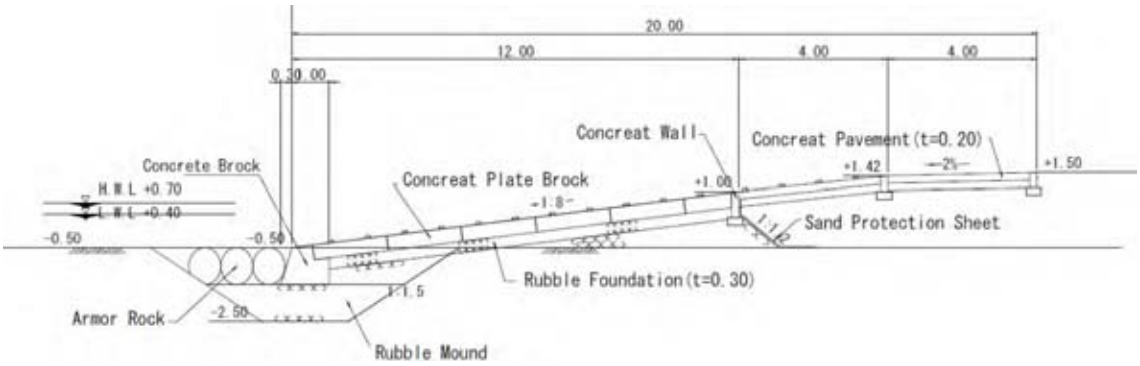



Figure 2-7: Sectional diagram of slipway

The scales of Fishing Port Infrastructure as calculated based on the above review are shown in Table 2-6 below.

Table 2-6: Scales of Fishing Port Infrastructure

| Fishing Port Infrastructure | | Scale |
|---|---|---|
| Fish landing jetty | | |
| water depth: | D.L. -2.1m | |
| Crown height: | D.L. +1.5 (large fishing boats)<br>D.L. +1.2 (small fishing boats) | Width: 6m<br>× length :123 m |
| Structure: | vertical steel piles type | |
| Superstructure: | Reinforced concrete | |
| Sea wall | | |
| Structure: | Cast-in-place concrete block type with sloped mound | length :65 m |
| Crown height: | D.L. +2.5 (parapets) | |
| and river revetment | | length :30 m |
| Structure: | mat gabion type | |
| Width: | 6m | |
| Slipway | | Width:6m |
| Structure: | Cast-in-place concrete block type | × length :20m |

2-2-2-2-3 Structural Design

(1) Applicable codes and standards

There is no standard for design of Fishing Port Infrastructure in Dominica and the applicable standard for each facility is selected by the responsible technical person in charge of civil engineering.

This Project will be implemented under the Japanese grant aid cooperation and it is reasonable to design the Project in accordance with the Japanese standards considering the ease of procurement, reliability and constructability of the industrial products such as steel materials. Also, the Japanese engineers in charge should be familiar with the standards to be used. The Roseau and Marigot Fisheries Centers has been designed and constructed under the Japanese grant aid cooperation and no technical problem has brought to date.

The Fishing Port Infrastructure in this Project is intended specifically for the fishing activity, and there is no technical standard for the design of such facilities other than in Japan. In this Project, therefore, the facilities will be designed in accordance with the following standards considering the natural conditions in Dominica in general:

(i) "Designing Manual for Fisheries Infrastructure (2003 Edition)" issued by National Association of Fisheries Infrastructure, JAPAN
(ii) "Technical Standards and Commentaries for Port and Harbour Facilities in Japan (2003 Edition)" issued by Japan Port and Harbor Association
(iii) "Standard Spec Book of Concrete" issued by the Civil Engineering Society of Japan
(iv) "Design and Construction – Manual of Steel pipe pile" issued by the Association of Steel Pipe Piles

（2） Planning and use conditions

1） Planning conditions

a） Water depth

i） Fish landing jetty: D.L. -2.2 m ～ 0.4 m

ii） Sea wall: D.L. -0.7 m ～ 0.0 m

b） Planned crown height

i） Fish landing jetty: D.L.+1.5 m (for large fishing boat)
D.L.+1.2 m (for small fishing boat)

ii） Sea wall: D.L.+2.5 m

c） Total length

i） Fish landing jetty: 123.0 m

ii） Sea wall: 65.0 m

iii） River revetment 30.0 m

d） Apron width

i） Fish landing jetty: 6.0 m

ii） Sea wall: 1.0 m

2） Usage conditions

a） Boats using the jetty

The largest fishing boat to use the jetty is an 80GT-class boat (Name : LIBERTY). The forefront part of the jetty will be allocated to the largest fishing boat class. Small fishing boats of 3 to 5 ton class with an outboard engine and the 5GT-class fishing boats will use the shallow water section of the jetty.

| Type | Gross Tonnage | Length（m） | Width（m） | Draught（m） |
|---|---|---|---|---|
| Large fishing boat | 78 | 20 | 7.02 | 1.83 |
| Small fishing boat | Under 5 | 7 | 2-3 | 0.7 |

b） Berthing speed

The berthing speed is determined depending on boat size, berthing method, meteorological/oceanographic conditions and dock structure. Berthing speed for fishing boats are shown in Table 2-7.

Table 2-7: Berthing speed of fishing boat

| Gross Tonnage | Berthing speed (m／sec) |
|---|---|
| Less than 20 | 0.50 |
| Over 20 and less than 40 | 0.40 |
| Over 40 and less than 90 | 0.35 |
| Over 90 | 0.30 |

Source: Designing Manual for Fisheries Infrastructure (2003 Edition)

Therefore, the berthing speed will be 0.35m/s for large fishing boats and 0.50m/s for small fishing boats. The berthing force will be handled as a constant load because these fishing boats will use the jetty normally.

3) Working lifetime and anti-corrosion measures

a) Working lifetime

30 years

b) Anti-corrosion measures

Coating and extra thickness added to the piles

c) Coating

Heavyduty coating will be applied to the underwater and inter-tidal zone from 1.00m below the seabed to the lower edge of the beams.

Meanwhile, a corrosion allowance will be considered for the underground part 1.0m below the seabed.

d) Corrosion rate

The following generally adopted figures on Table 2-8 specified in the technical standards for ports and harbors will be adopted.

Table 2-8: Standard figures for the corrosion rate of steel materials

| Corrosion environment | Corrosion rate (mm/year) | Amount of corrosion (mm) | Anti-corrosion measures |
|---|---|---|---|
| At or above H.W.L. | 0.3 | 9.0 | Heavy duty coating |
| Between H.W.L. and L.W.L.-1.0 m | 0.3 | 9.0 | ditto |
| Between L.W.L.-1.0m and seabed | 0.2 | 6.0 | 6.0 |
| In muddy sediment on seabed | 0.03 | 0.9 | 1.5 |

Source : Designing Manual for Fisheries Infrastructure (2003 Edition)

(3) Natural conditions

1) Sea level

| | | |
|---|---|---|
| Mean springs High Water Level | (H.W.L.) | D.L. + 0.70 m |
| Mean Sea water Level | (M.S.L.) | D.L. + 0.55 m |
| Mean springs Low Water Level | (L.W.L.) | D.L. + 0.40 m |
| Chart Datum Level | (C.D.L = D.L.) | D.L. ± 0.00 m |

2) Level of existing seabed

a) Fish landing jetty

i) At head for large fishing boat D.L. - 2.2 m

ii) In middle D.L. - 2.1 m

iii) At head for small fishing boat D.L. - 1.3 m

b) Sea wall D.L. - 0.7 m

3) Wave height

The design wave height will be determined by each facility and its location as shown in Table 2-9.

Table 2-9: List of specifications of design waves

| Specifications of Offshore Waves | | | |
|---|---|---|---|
| Wave Direction | Wave Height | Period | Wave Length |
| W, WSW, SW | $H_0$=7.0m | T=10.5sec | $L_0$=171.99m |
| Specifications of Design Waves | | | |
| Jetty end for large fishing boats (D.L.-2.2m) | Middle section (D.L.-2.1m) | Jetty end for small fishing boats (D.L.-1.3m) | Breakwater (Foundation Design) (D/L/-0.7m) |
| H=3.0m (h=D.L.2.4m) | H=2.7m (h=D.L.2.1m) | H=2.1m (h=D.L.1.4m) | H=1.6m (h=D.L.0.7m) |
| Angle of incidence β = 0° | Angle of incidence β = 0° | Angle of incidence β = 0° | Angle of incidence β = 0° |

4) Soil conditions

a) Sea wall (BH-1-3)

| Ground depth | Soil name | Mean N value | Unit weight ($kN/m^3$) | Internal friction angle (°) | Cohesion ($kN/m^2$) |
|---|---|---|---|---|---|
| Existing ground | Sandy soil | | | | |
| -5.00m | Sandy soil | 13 | 18 | 32 | — |
| -10.00m | Sandy soil | 18 | 18 | 32 | — |

b) Fish landing jetty （BH-4-7）

| Ground depth | Soil name | Mean N value | Unit weight (kN/m$^3$) | Internal friction angle (°) | Cohesion (kN/m$^2$) |
|---|---|---|---|---|---|
| Existing ground | Sandy soil | | | | |
| -13.0m | Sandy soil | 17 | 18 | 36 | — |
| -20.00m | Sandy soil | 34 | 18 | 37 | — |
| -20.0m~ | Sandy soil | >50 | 18 | Over 40 | — |

5) Design seismic intensity

Using the values for mooring facilities B (not including major landing piers and piers used by regular liners and ferries) indicated in the “Guidelines for the Design of Fishing Ports and Fishing Ground Facilities (2003)”, the horizontal seismic intensity to be used in the design of civil engineering facilities will be kh = 0.15.

(4) Load conditions

1) Unit weight of concrete

(i) Concrete without reinforcement $\gamma c = 22.6$ kN/m$^3$

(ii) Concrete with reinforcement $\gamma c = 24.0$ kN/m$^3$

(iii) Steel/cast steel: $\gamma i = 77.0$ kN/m$^3$

2) Vertical load

(i) At normal times $w = 5$ kN/m$^2$

(ii) At time of earthquake $w' = 2.5$ kN/m$^2$

3) Moving load

The vehicles using the jetty will be trucks of about 2 tons and passenger cars, which are less than the overburden load and are not specially considered.

4) Traction force

The traction force for a fishing boat is calculated considering the gross tons of the boat, and the number of berthing boats.

The standard traction force values are shown in Table 2-10.

Table 2-10: Traction capacity for fishing boat (per mooring boat)

| Gross tonnage of fishery boat | Normal time |
|---|---|
| Less than 10 ton | 10kN |
| Over 10 ton and less than 50 ton | 30kN |
| Over 50 ton and less than 100 ton | 50kN |
| Over 100 ton and less than 200 ton | 70kN |
| Over 200 ton and less than 500 ton | 100kN |
| Over 500 ton and less than 2000 ton | 150kN |

Source：Designing Manual for Fisheries Infrastructure（2003 Edition）

The traction capacity will be 50kN for large fishing boats and 10kN for small fishing boats according to the standard values shown in Table 2-10.

（5） Conditions of main materials

a）Steel materials

| Material | Allowable unit stress （N/mm2） |
|---|---|
| Steel pipe piles （SKK400, SKK490 or equivalent） | 140 （SKK400）, 185 （SKK490） |
| Steel bar （SD295A or equivalent） | 176 |

Source：JIS

b）Corrosion speed of steel bars

| Corrosion environment | | Corrosion speed （mm/year） |
|---|---|---|
| Area | Above H.W.L. | 0.3 |
| | Between H.W.L. and L.W.L. –1.0m | 0.3 |
| | Under L.W.L. –1.0m to sea bottom | 0.2 |
| | Below sea bottom | 0.03 |

Source：JIS

c）Concrete

| Material | Unit weight | Allowable unit stress |
|---|---|---|
| Reinforced concrete | 2.45 t/ $m^3$ | 24 $N/mm^2$ |
| Plain concrete | 2.30 t/ $m^3$ | 18 $N/mm^2$ |

Source：JIS

2-2-2-3 Additional Facilities

Plans for a pile-type jetty require the following additional facilities.

1） Fenders 1 set

Using “Designing Manual for Fisheries Infrastructure（2003 Edition）” issued by National Association of Fisheries Infrastructure, JAPAN as a reference, the size, installation place and number appropriate for the boats under consideration at the site will be decided.

2） Mooring posts 1 set

Using “Designing Manual for Fisheries Infrastructure（2003 Edition）” issued by National Association of Fisheries Infrastructure, JAPAN as a reference, the size, installation place and number appropriate for the boats under consideration at the site will be decided.

3） Curb 1 set

As vehicles including trucks with a load capacity of approximately two tons enter the jetty and make turns on the jetty, curb will be installed at the edge of the jetty to prevent them from falling off the jetty.

4） Mooring rings 1 set

Mooring rings will be installed to moor small fishing boats on the jetty.

5） Light beacon 1 spot

A light beacon will be installed at the jetty end for boats to maintain safety of sailing at night time or under poor visibility.

2-2-2-3 On-shore Fisheries Infrastructure

A Fisheries Center building, a Fishermen’s lockers, a mechanical shop, a repair shed and a toilet and shower building will be constructed as the on-shore facilities.

The Project site is an area currently used as a fish landing and outdoor retailing space for the Portsmouth area and the social infrastructure in this area (roads, water supply, electricity, telephone, etc.) is well developed.

The Project site has a total area of 2,000m$^2$ and is divided by Pembroke Street into a northern area (815 m$^2$) and a southern area (1,185 m$^2$). The northern area is state-owned land bordered by the North River, the existing vegetable market, the shoreline and Pembroke Street. The southern area is composed of state-owned land, the former land of the Social Security board, and state-owned land continuing on from that on the shore side (land purchased from private owners), and is bordered by Pembroke Street, Bay Street which crosses Pembroke, adjacent private residences and the shoreline. As shown in Figure2-2, the facilities that will be used more frequently by the fishermen (fuel station, mechanical shop, fishermen’s locker block, etc.) will be located on the ocean side and those used more frequently by consumers (retailing counters at the Fisheries Center building, etc.) will be located on the Bay Street, thus segregating the movement of fishermen and consumers, The repair shed will be located in the northern part of the Project site near the shoreline to protect other facilities from waves overtopping the sea wall.

In Dominica, the Commonwealth of Dominica Building Code shall apply when designing buildings, electricity, water supply/sewage, and fire prevention. The structural standard in cooperation projects

however, it is often seen for the standards of the donor country have been applied. In the case of the Roseau and Marigot Fisheries Centers, which were constructed with grant aid from Japan, the structural design code of Japan was applied. Using the same design standards as the existing facilities will have the advantage in view of maintenance and management of the facilities, and in this Project the Commonwealth of Dominica Building Code will be applied with regard to the architectural design standards (general), and the structural standard of Japan will be applied to the structural design of the facilities.

2-2-2-3-1 Scale Design/ Floor Plan

(1) Fisheries Center building

The scales of the rooms in the Fisheries Center building and the plans are shown below.

1) Retailing outlets counters

The existing retailing outlets counters at the project site are one concrete retailing counter (3 booths) and 4 to 5 wooden retailing and processing counters which are found along Pembroke Street in front of the vegetable market. On Tuesdays, Fridays and Saturdays when the vegetable market is open, the customers wait for fishermen to return to shore. The fishermen and their families sell the landed fish directly to the customers using these counters. Selling of fish on the boats landed on the beach is also practiced.

At the existing Roseau Fisheries Center, during 20 months prior to June 2008, the number of persons who sell fish on the retailing counters was 4.7 persons/day in average, with 6.7 persons/day at maximum and 2.8 persons/day at minimum. These were the number recorded by New Town Fisheries Cooperative that operates the Center, calculated at 25 operated days per month. The fish retailing quantity per day at the retailing counters was approximately 90kg/day as presumed from the purchase prices in Roseau Fisheries Center.

The average volume of fish landed at Portsmouth is approximately 340kg/day (101 tons / 12 months / 25 days); this is about 3.5 times the volume of fish handled at Roseau. Calculating from the number of retailers using the retailing counters at Roseau, the number of retailing counters required at Portsmouth will be 17, based on: average 4.7 retailers/day x 3.5 = 16.45 retailers/day. Then again, on average about 14 fishing boats from Portsmouth go out to fish each day (data from the Fisheries Division, Dominica), so if 1 retailing counter is provided for every fishing boat, the number of retailing counters required will be 14. In Portsmouth, however, some retailers use the retailing counter only in the morning or only in the afternoon, because different fishing methods make the fishing boats return at different times. Taking this into consideration, the number of retailing counters considered necessary at the planned facility in Portsmouth is 10, twice the number at the Roseau Fisheries Center (4.7 retailers/day x 2 = 9.4

retailers). 10 retailing counters will be set up at Portsmouth that can be used by 10 retailers at a time, with temporary counters set up at times this is insufficient.

The conditions for determining the facility scale are as follows:

- The business hours of the Portsmouth Fisheries Center will be 7 hours from 7:00 a.m. to 2:00 p.m.

- The estimated quantity dealt with at the retailing outlets counters will be 272 kg per day as follows:
  The landed fish quantity per day will be 340kg/day, of which 20% will be a self-consumed quantity（by adoption of the highest percentage of the results of the questionnaire survey）. Thus, 340kg/day×80% = 272kg/day will be dealt with at the retailing outlets counters.

- The daily number of general consumers who will visit the retailing outlets counters is calculated as follows:
  The quantity purchased by one consumer per visit is 3 to 4 pounds (1.4 to 1.8kg) according to the results of the questionnaire survey. Assuming that the average quantity of purchase is 1.6kg, the number of consumers per visit will presumably be about 170 persons per day.
  272kg/day ÷ 1.6kg = 170 persons/day

- Number of visitors per hour
  The average number of visitors per hour during 7 business hours will be:
  170 persons ÷ 7 hours ≒ 24.3 persons/hour

- It is estimated that there will be 10 retailing outlets counters at which 5 fish-cleaning workers (one worker in charge of 2 retailing outlets counters) will be working.

- One insulated ice box (250 liter capacity) will be provided per retailing outlets counter.

The counter size is about 0.8×1.5m per unit that can exhibit 2 fish trays of 0.85×0.52×0.20m, same as that used in Roseau, and the space necessary for 10 units is $12m^2$. For a sink with a processing space, 0.8×1.5m per unit will be necessary and a space of $6.0m^2$ is required for 5 units.

Retailing outlets counters: 0.8×1.5m×10 units = $12.0m^2$
Sink with processing space: 0.8×1.5m×5 units = $6.0m^2$

The working space of 30m$^2$ will be required for a total of 15 persons (10 retailers and 5 fish-cleaning workers), based on the estimated space of 2m$^2$/person.

The number of visitors per hour is 24.3 buyers and the density of buyers per counter will be 2 to 3m$^2$ per person. Thus, a required total scale of shopping space will be 48.6 to 72.9m$^2$.

Therefore, the total required space area is approximately 96.6 to 120.9m$^2$.

Based on the above calculations, in case the retailing outlet counters are arranged on the both sides of the central passage, the shopping area will be 47.5m$^2$ and the density of buyers will be 2m$^2$/person. This is deemed to be reasonable.

In the layout plan, 6 processing sinks for removals of fish internals and scales will be arranged （3 units per retailing counter）. Together with a space for the selling and processing works, the required total floor area of the retailing shops will be 100m$^2$.

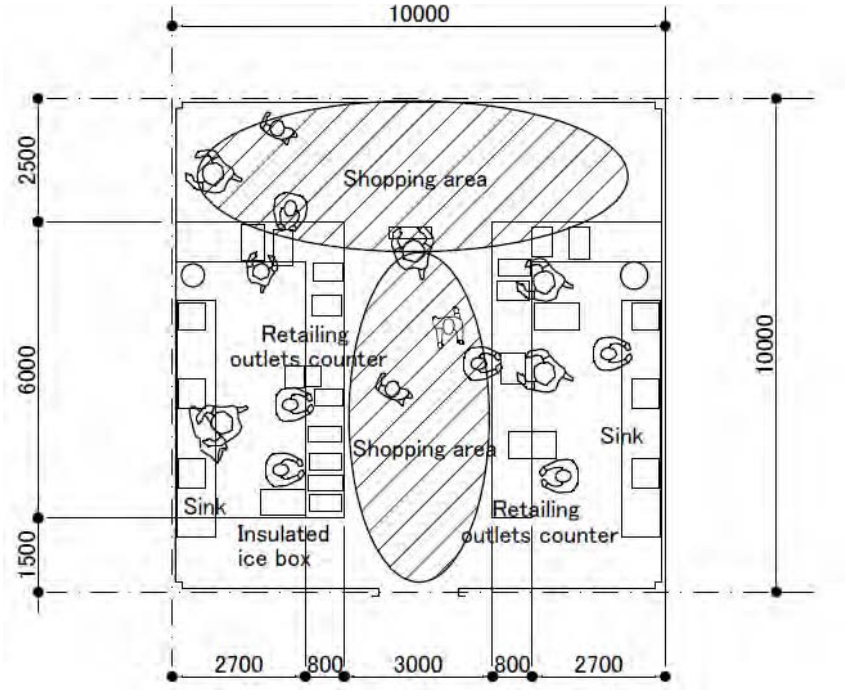



Figure 2-8： Fish retailing space

In addition, the toilet/locker room will be provided to enable the retailers to change their cloths. The floor area of the toilet/locker room including the necessary moving space as well as the space for required installation and fixtures is estimated at 24m$^2$. The layout plan is shown in Figure 2-9 (left)

The storage will be used to store the apparatus to be arranged in the retailing shops and the processing room. The storage will keep the 250-liter insulated ice boxes（1.2×0.6×0.9m×10

units =7.2m$^2$), hanging scales, washing buckets, processing tools in the processing room, high-pressure water washing machines, and carts.

The floor area of the storage to keep this apparatus and equipment including the necessary moving space will be 12 m$^2$, and the layout plan in the storage is shown in Figure 2-9 (right).

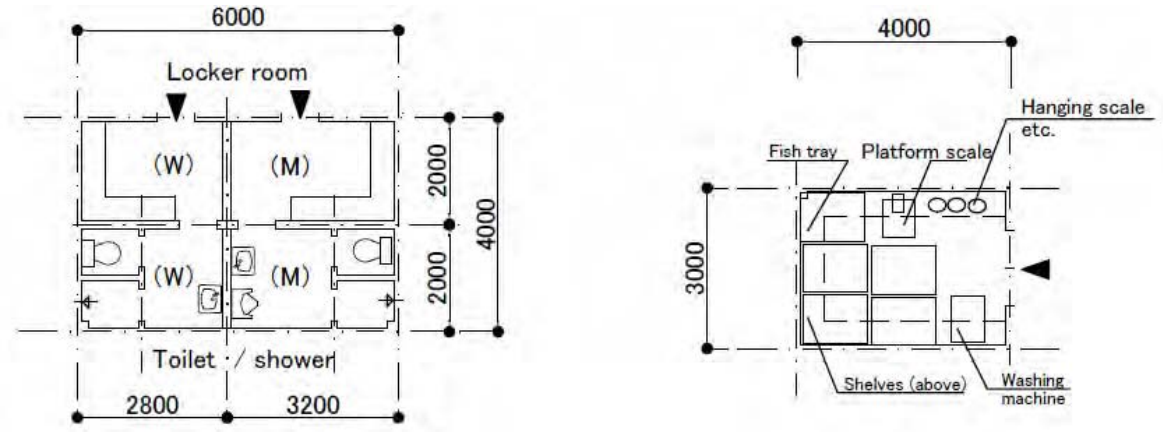



Figure 2-9: Toilet/locker room and storage

2) Ice making machine and ice storage

The landed fish quantity in the peak season in Portsmouth and the surrounding 9 landing sites was approximately 32.5 tons/month (in March 2007), and the quantity after deduction of 20% for self-consumption (by adoption of the maximum percentage of the results of the hearing survey) was 26 tons/month. The average quantity of landed fish per day is approximately 1,000kg, which is obtained by dividing 24 tons/month by 25 days (excluding Sundays when no fishing operations made). Based on the hearing survey results, additional landings of 1,000 to 1,500kg/boat will be made when large fishing boats landed fish. The ice use ratio is 0.5 ice for 1 unit of fish. The large fishing boats carry ice for fishing operations at the same ratio for distribution. Therefore, the required ice quantities are as follows:

Ice quantity required for landing from small fishing boat:

500kg/day（for 1,000kg fish）

Ice quantity required for landing from large fishing boat:

500 to 750kg/boat（for 1,000 to 1,500kg fish）

Ice quantity required in fishing operations for large fishing boat:

500 to 750kg/boat（for 1,000 to 1,500kg fish）

Based on the hearing survey results, the required ice quantities are estimated as shown in Table 2-11, which depend on the frequency of fishing operations and landed fish quantity of each large fishing boat.

Table 2-11: Estimated ice quantities required for large fishing boats

| Name of Large Boat | Boat Length (m) | Frequency of operation per month (times) | Landed Quantity per operation (tons) | Ice Quantity required for landing (tons) | Ice Quantity required for operation (tons) | Ice Quantity required per month (tons) |
|---|---|---|---|---|---|---|
| LIBERTY | 18.30 | 2 | 1.5 | 0.75 | 0.75 | 3.0 |
| CHARMER | 9.76 | 4 | 1.0 | 0.5 | 0.5 | 4.0 |
| Ykot | 9.76 | 2 | 1.0 | 0.5 | 0.5 | 2.0 |
| U&I | 10.67 | 2 | 1.0 | 0.5 | 0.5 | 2.0 |
| Lady G | 7.32 | 4 | 0.5 | 0.25 | 0.25 | 2.0 |
| | Total | 14 | 5.0 | 2.5 | 2.5 | 13.0 |
| | Average/week | 3.5 | | | | 3.25 |

According to Table 2-11, 5 large fishing boats which are making fishing activities at the bases in Portsmouth and its environs operate 2 to 4 times per month and the frequency of landing fish at the project facility is therefore considered to be 3.5 times per week on average. The required capacity of the ice making machine is estimated to be about 1 ton/day to supply ice for large fishing boats required for use in fish distribution and fishing operations. The required capacity of the ice storage is estimated to be about 3 tons so as to cover the ice quantity required for fishing operations and landing by large fishing boats in consecutive days.

As regards the shape of the ice, flake ice type will be adopted as this type of ice has been widely accepted by fishing boats, and the Roseau Fisheries Center is using flake ice and there is also no problem from the viewpoint of maintenance.

The existing Roseau Fisheries Center has been using R22 as refrigerant, which is a type of the specific HCFC (hydro-chlorofluorocarbon). However, HCFC will be fully abolished in 2020 under the international convention for protection of the ozone layer and it is proposed to switch to HFC (hydro-fluorocarbon) as the alternative CFC that has little influence on the ozone layer. Therefore, R410A (HFC) as the alternative CFC will be adopted as refrigerant in this Project. The replenishing gas for the refrigerant is an imported item, but it can be procured in Dominica.

The required equipment consists of an ice making machine, compressor and air-cooled condenser.

The ice making machine will be installed on top of the ice storage and the compressor will be installed in the machine room planned on the ground level. The air-cooled condenser will be installed in the outdoor free space that is not directly exposed to sea winds.

The capacity of ice storage required is 3 times the ice weight in the case of flake ice;
Required ice weight 3 tons×3 times = $9m^3$.

The size of the ice storage for the flake ice volume of $9m^3$ is 3.5m×2.6m×2.2m (inner size).

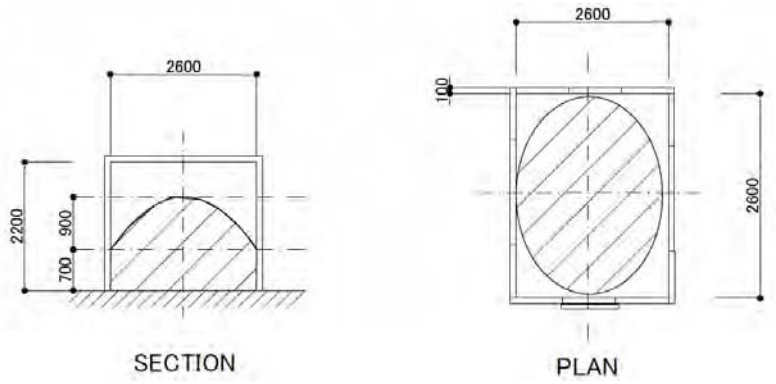



Figure 2-10： Ice storage

3） Cold storage

Use of a cooler box with flake ice for keeping small fish will be adopted, which are to be sold on next day due to late returning to the port or which is left unsold on the day. However, it will be difficult to sell out a full single large fish such as tuna and marlin within a day. This fact is clear from the situations in Roseau or Marigot Fisheries Center, both are equipped with a cold storage, and also the selling conditions at the beach of Portsmouth. To improve present situation, the method of keeping the landed fish in the cold storage and sell it later will be adopted. Therefore, the cold storage is planned as a facility mainly to keep large fish.

The landed quantity of tuna and Marlin in Portsmouth was 41.94 tons/year (2007) (as shown in Table 2-12). These species of fish are caught all year round, including the good season from September to January (Figure 2-11). In December when the highest catch was landed, the number of days with 1,000kg or more fish landed was 5 days per month (Figure 2-12).

Table 2-12： Monthly landing quantities of tuna and marlin in Portsmouth (2007) (Unit: tons)

| | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Landing quantities of tuna and marlin | 4.16 | 0.64 | 0.52 | 2.97 | 1.28 | 0.53 | 1.29 | 3.47 | 6.39 | 5.71 | 4.49 | 10.49 | 41.94 |
| Total landing quantities | 9.60 | 5.10 | 14.0 | 12.0 | 7.70 | 4.90 | 4.50 | 6.20 | 9.50 | 8.40 | 6.50 | 13.0 | 101.4 |
| Ratio of tuna and marlin | 43% | 13% | 4% | 24% | 17% | 11% | 28% | 56% | 67% | 68% | 69% | 81% | 41% |

Source：Fish landing statistics prepared by Fisheries Division (2007)

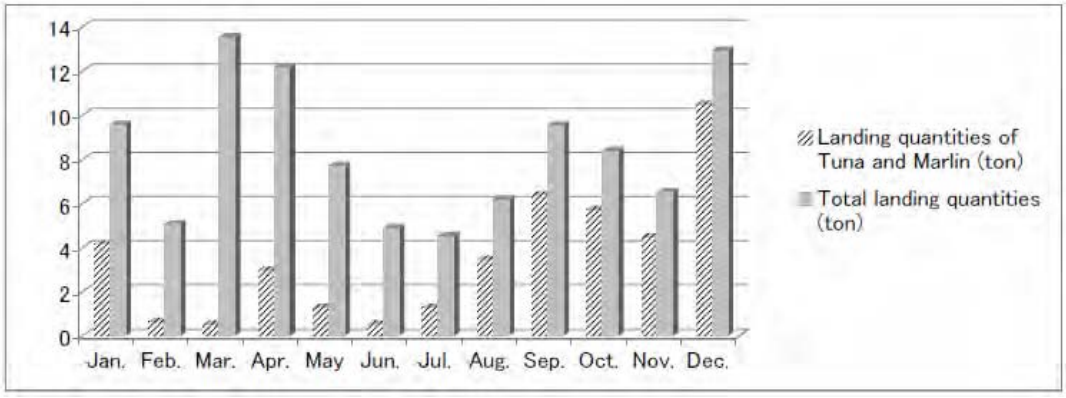



Figure 2-11： Monthly landing quantities of tuna and marlin in Portsmouth (2007)

Source：Fish landing statistics prepared by Fisheries Division (2007)

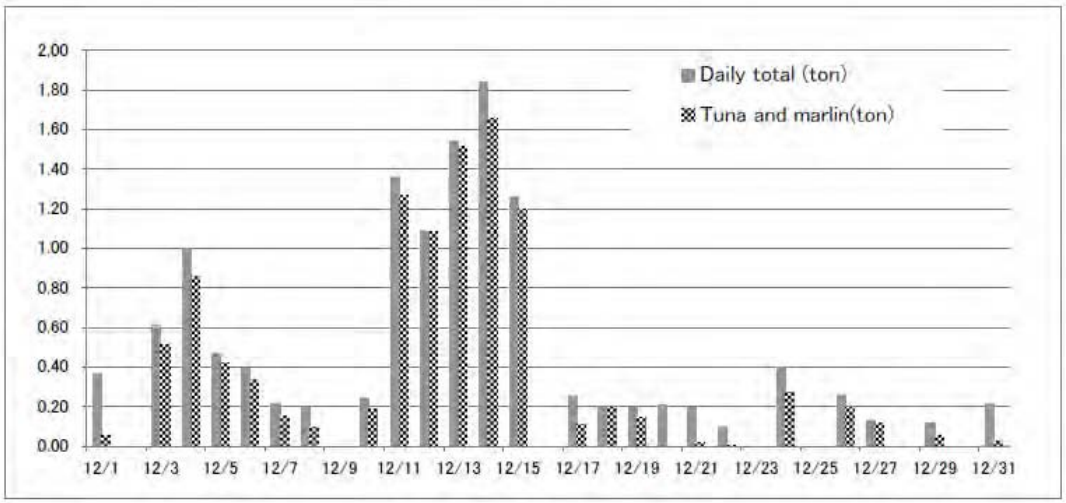



Figure 2-12： Daily landing quantities of tuna and marlin in Portsmouth (Dec., 2007)
Source：Fish landing statistics prepared by Fisheries Division (2007)

Based on the present circumstances as described above, the scale of facilities is determined based on the following conditions:

- The targeted quantity of fish landings was calculated based on the average of top 3 months (September, October and December) of landings recorded in 2007 in order that the capacity of the facilities will be adequate for the high season:

  Landed quantity = 22.59 tons (Total of the top 3 months) ÷ 3 months ÷ 25 days/month (days of fish operation excluding Sundays and national holidays) = 301kg/day

- From the hearing survey at Roseau and Marigot Fisheries Center, the period of storing large fish was usually about 3 to 5 days, eventually one month at longest. At Portsmouth, the period of storage is determined to be 3 days as there is a high demand from hotels and restaurants as well as general consumers.

  Thus,

  Required storage quantity = 301kg × 3 days = 903kg

  If the landed quantity exceeds the estimated above per day capacity, the excess fish will be forwarded to the Roseau Fisheries Center.

  The required storage quantity will be approximately 900kg of large fish such as tuna and marlin, and the capacity of the cold storage will be discussed based on the following conditions:

  - A working space of about 1.2m will be secured at the center of the cold storage.
  - Tuna and marlin will be stored upright on the left and right side of the working space.

- The weight of tuna and marlin is 20 - 30kg.
- The stored quantity will be 15 to 22.5 pieces in 2 lines on each side.
- Each single fish will be 30cm diameter.

  Length of cold storage = （15 to 22.5 pieces）/ 2 lines×30cm = 2.25 to 3.37m

  Width of cold storage = {（2 lines×30cm）× 2 （left and right sides）} + 1.2m （working space） = 2.4m

As tuna and marlin will be stored on the floor, the upper part near the ceiling of the cold storage can be used for storage of other large fish such as sea breams and sea basses contained in fish trays or bags and stored on stainless steel shelves provided. If such fish is placed in fish trays of 0.85×0.52×0.20m （approx. 20-30 kg per tray）, 3 shelves×8 trays = 24 trays will be storable on the left and right shelves, allowing the storage of 0.48 – 0.72 ton.

The required volume of the cold storage is determined to be about 2.6m×3.5m×2.2m (H) (inner size) based on the existing panel size of the prefabricated cold storage in which a working space for workers and the actual storage capacity of tuna and marlin are considered, and storage shelves for fish trays are installed, as shown in Figure 2-13.

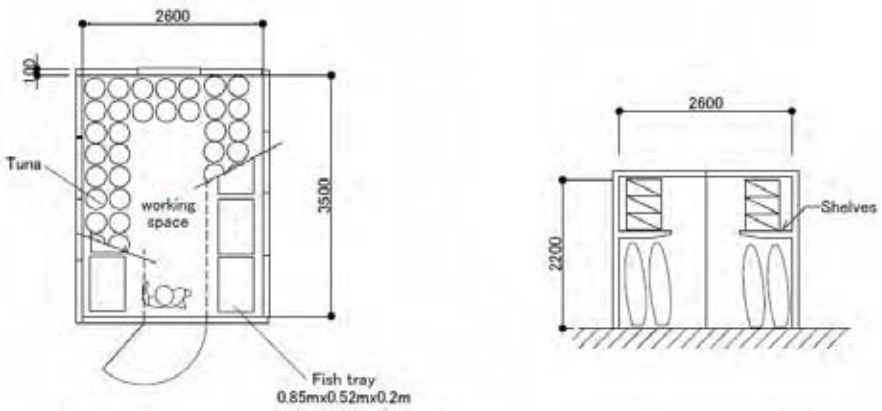



Figure 2-13： Required volume of cold storage

4） Market office

The market office will be provided on the first floor for a facility manager and a market assistant, who will manage and operate the fish retailing outlets counters, ice making facility and cold storage. This area will be used for the same intension as in the operation office of the Roseau Fisheries Center. Furniture will include 2 office desks, 2 chairs and 2 bookshelves and the required floor area is estimated to be 9.0 $m^2$, considering moving space.

In addition, a built-in closet to store the sales/operation data and other office supplies will be installed. The required floor area for this closet is estimated to be 3.0$m^2$.

Thus, the total floor area of the market office will be 12.0$m^2$.

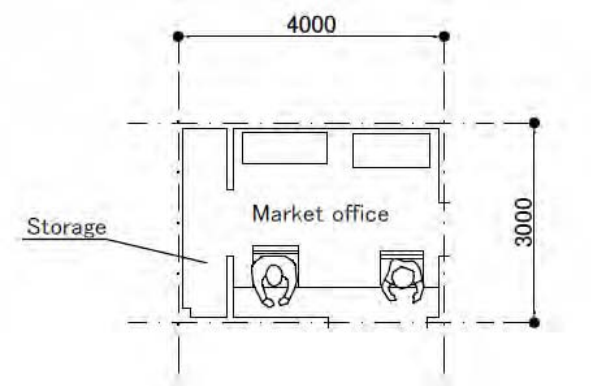



Figure 2-14: Market office

5) Extension office

The extension office is intended for 2 fisheries officers of the Fisheries Division who are a fishery extension staff and a data collector. Furniture includes 2 office desks, 2 chairs, and 2 bookshelves. The required floor area for this office is estimated to be 18.0 $m^2$ including moving space.

The built-in cabinets are necessary for keeping the raw collected data for 1-2 years after these data are stored in electronic files. In this Center, 2 sets of cabinet of approx. 1.2mW×1.8mH×0.3mD will be installed for this purpose. In addition, 1 set of storage shelves of 1.2mW×1.8mH×0.3mD will be installed for keeping various extension materials and office supplies as well. The required floor area for built-in cabinets is estimated to be 4.0 $m^2$. The required floor area for the extension office is estimated to be 22.0 $m^2$.

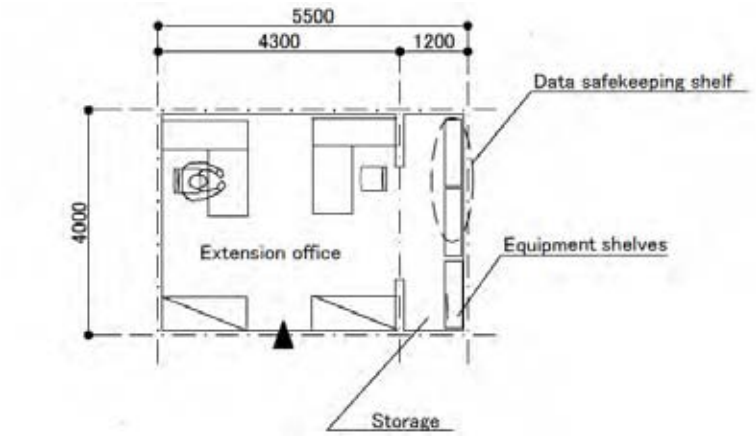



Figure 2-15: Extension office

6) Meeting room

The meeting room will be used mainly for the general meetings of NAFCOOP, Fisheries Cooperatives in the northwest region including Portsmouth and the local fishermen's group and as a lecture room for the fishermen training courses.

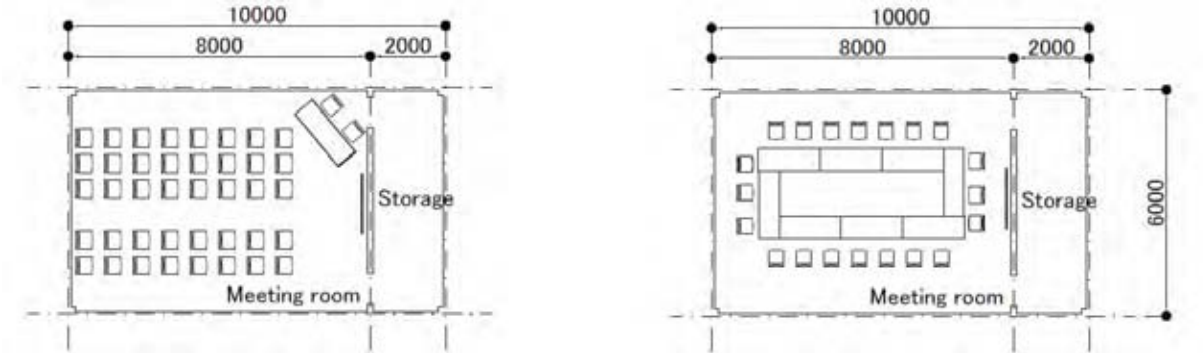
The maximum capacity of the room is estimated to be 40 participants in the general meetings (with no conference table) and 20 persons in each local meeting and the training of fishermen

(with a conference table).

Pattern 1: 40 meeting chairs, one long table and 2 chairs

Pattern 2: Long meeting tables and chairs for 20 persons

The required floor space for the meeting room is estimated to be 48.0m$^2$ by considering the arrangement of the above furniture and the moving space.




(Pattern 1) (Pattern 2)

Figure 2-16: Meeting room

The storage for chairs, tables and blackboard in the meeting room will be installed.

The required floor space of the storage is estimated to be 12.0m$^2$ by considering space for 40 collapsible chairs, 8 collapsible meeting tables, one shelf for training tools, and a move-in/out space for chairs and tables.

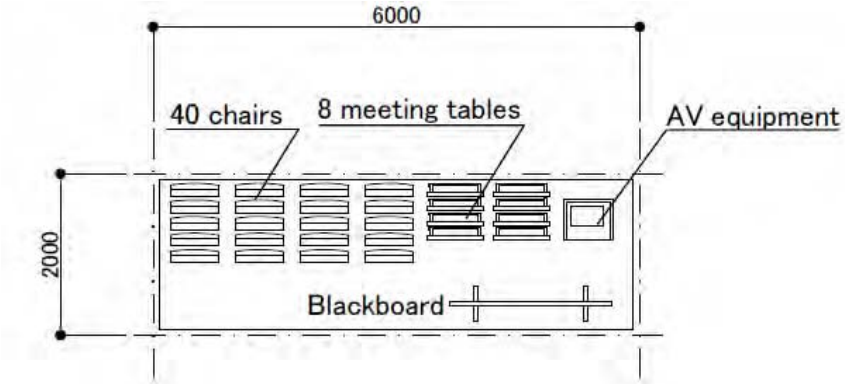



Figure 2-17: Storage in meeting room

Thus, the required total floor area for the meeting room will be 60.0m$^2$.

In addition, a toilet and a service room will be installed as incidental rooms to the extension office and the meeting room.

The toilet will be provided with one booth and a toilet for men and with two booths for women. The toilet, the service room and the storage for cleaning tool are estimated to be 14.3m$^2$, 4.2m$^2$ and 1.3m$^2$ respectively (2.2 m$^2$ for the corridor portion).

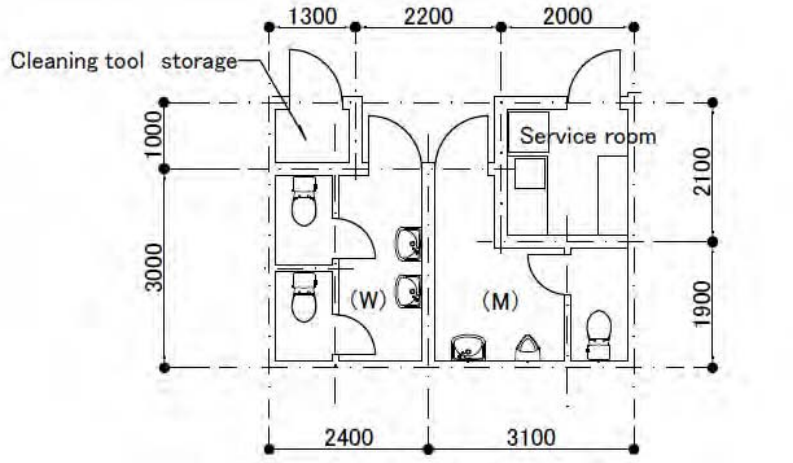



Figure 2-18： Service room, toilet and storage

7） Fish processing room

The purpose of fish processing room is shown 2-1-3-2 (1) 7).

This facility will meet the standard required for the domestic distribution of fish within Dominica or export to the regional markets. The facility finishing will meet “Environmental Health Inspection Standard for food places” established by Dominica Bureau of Standard.

The equipment to be installed in this facility will include a cold storage, an ice making machine, an ice storage and an emergency generator, as well as band saw and stainless tables.

The facility scale of fish processing room is specified as follows:

- The fish processing capacity will be 68.0kg as calculated on the following assumptions.
- Landing quantity per boat = 19.44kg : 340kg (average per day landings at Portsmouth) ÷ 14 boats = 24.3kg/day less 20% for self-consumption
- Number of fishing boats returning per hour = 3.5 boats/hour : 14 boats ÷ 4 hours (same period as currently observed i.e. 4 hours from 12:00 to 4:00p.m.)
  Simultaneous landing quantity = 68.0kg/hour : In case 3.5 boats carry the fish into the processing room simultaneously, 19.44kg (landing quantity/boat) × 3.5 boats/hour =68.0kg/hour
- As a fish tray measures 0.85×0.52×0.20m and can carry 20 to 30 kg fish, 3 to 4 fish trays will be brought in.

（i） Floor area required for cleaning and removal of internals

2 processing tables and 4 fish trays are arranged, plus the working space for 4 cleaning/processing workers, the required floor area will be 36 $m^2$.

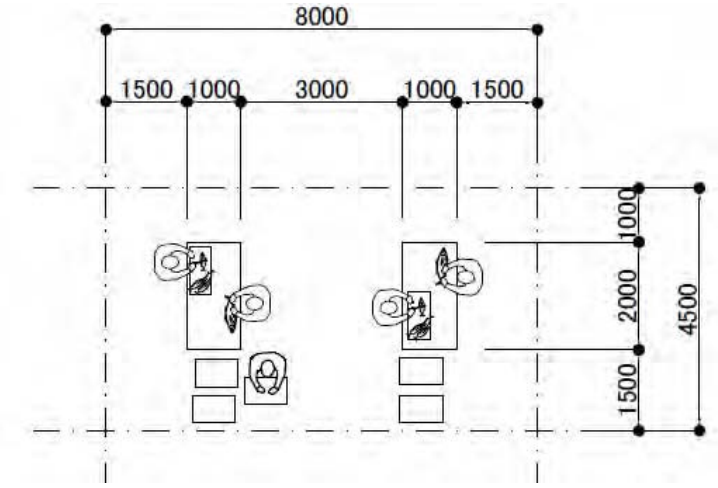



Figure 2-19： Floor area for cleaning and removal of internals

（ii） Area for cold storage, ice making machine/ice storage and machine room

Floor area fro the cold storage, ice making machine/ice storage and machine room, as well as fish handling space for the cold storage and the handling space for the ice storage are required. The required floor area will be 58 $m^2$.

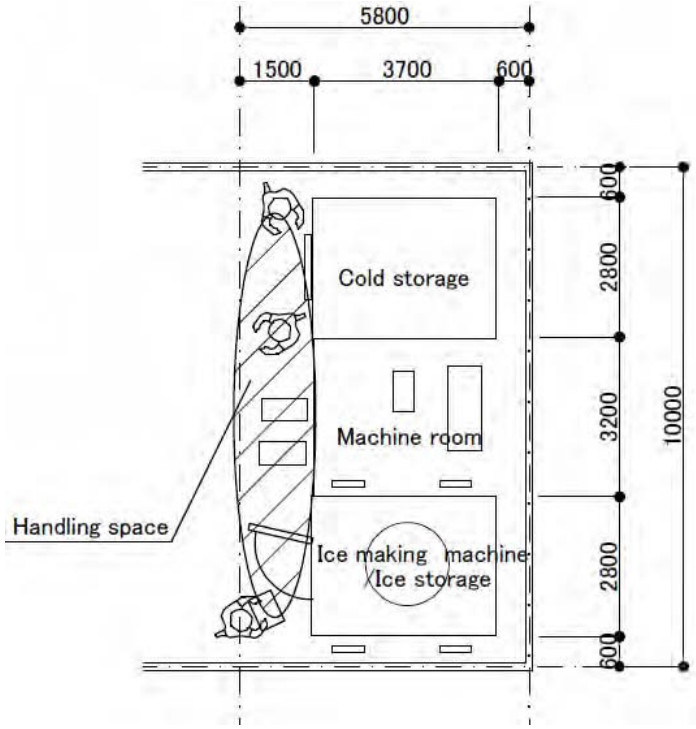



Figure 2-20： Floor area for cold storage, ice making machine/ice storage and machine room

（iii） Floor area required for frozen fish cutting/processing work

A band saw is provided and a working space is secured, the required floor area will be 9$m^2$.

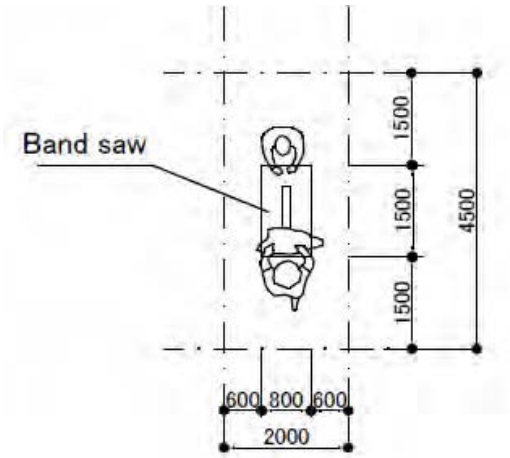



Figure 2-21 : Floor area for frozen fish cutting/processing work

The total required floor area for the equipment and for the working space in the fish processing room is estimated to be 103m$^2$. As a result of the layout study, the area of the fish processing room comes 100m$^2$. The floor plan of the fish processing room is shown in Figure 2-22.

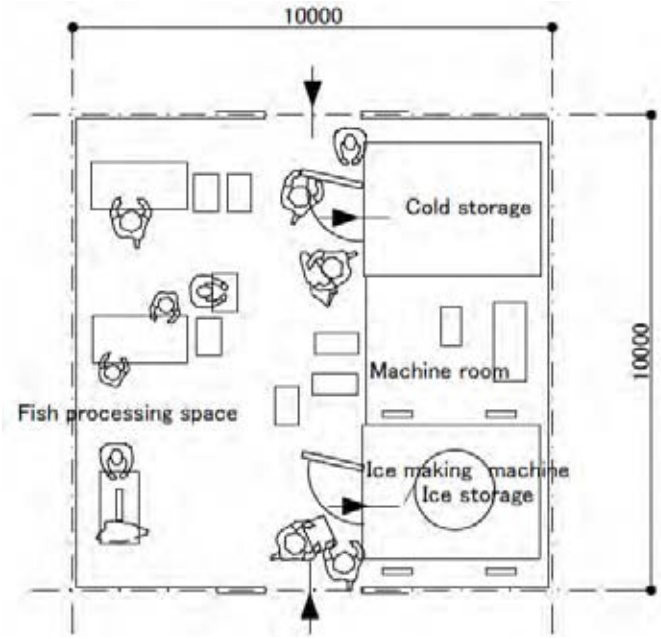



Figure 2-22 : Floor plan of fish processing room

In the layout plan for the Fisheries Center building, the rooms related to distribution will be provided on the first floor for ease of the fish moving in/out operations. The fish processing room in which the ice storage, ice making machine and others will be arranged will be provided on the jetty side (west side) of the first floor to simplify the movement of fish and ice. The fish retailing space will be arranged along the Bay Street side of the first floor for ease of access by customers from Bay Street.

The Market office, toilet/locker room and equipment storage will be provided at the center of the building.

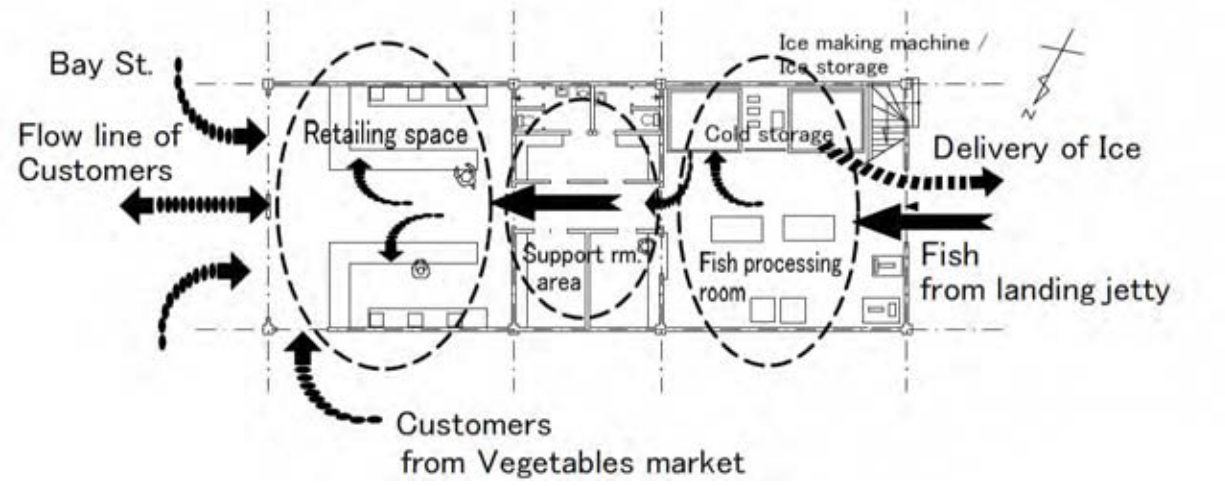



Figure 2-23: Line of flow on the first floor of Fisheries Center building

The east and north sides of the fish retailing outlets counter will have large openings facing Bay Street and the Pembroke Street. Hollow concrete block wall will be provided on the south side on the boundary to facilitate effective ventilation and shading from the direct sunlight for the fresh fish handling facility.

Dominica is located at 15° north latitude, and the lowest solar altitude is about 51.5° at the winter solstice. The hollow concrete block wall on the south side shall be designed to make shade for the time period from 10:00 a.m. to 3:00 p.m. to interrupt the most intense sunlight to the retailing outlets counters and the processing sink.

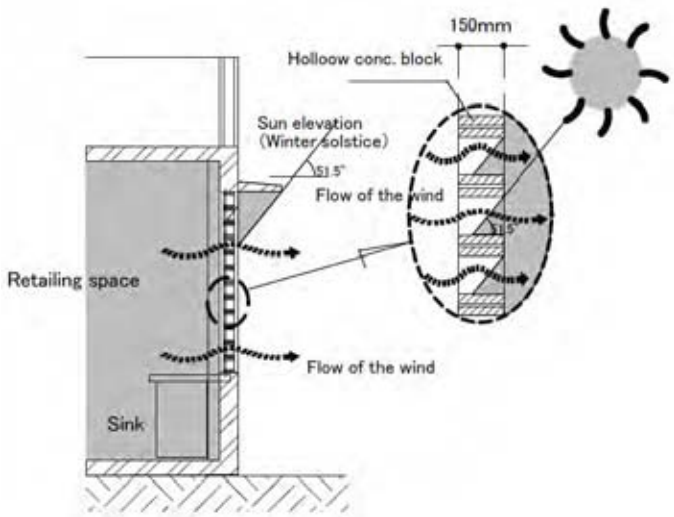



Figure 2-24: Sunlight to Fisheries Center building

The extension office, the meeting room and the service room are planned on the second floor. The total floor area of the planned Fisheries Center building will be 408 $m^2$ including 260$m^2$ on the first floor and 148 $m^2$ on the second floor. The floor plan of the Fisheries

Center building is shown in Figure 2-25.

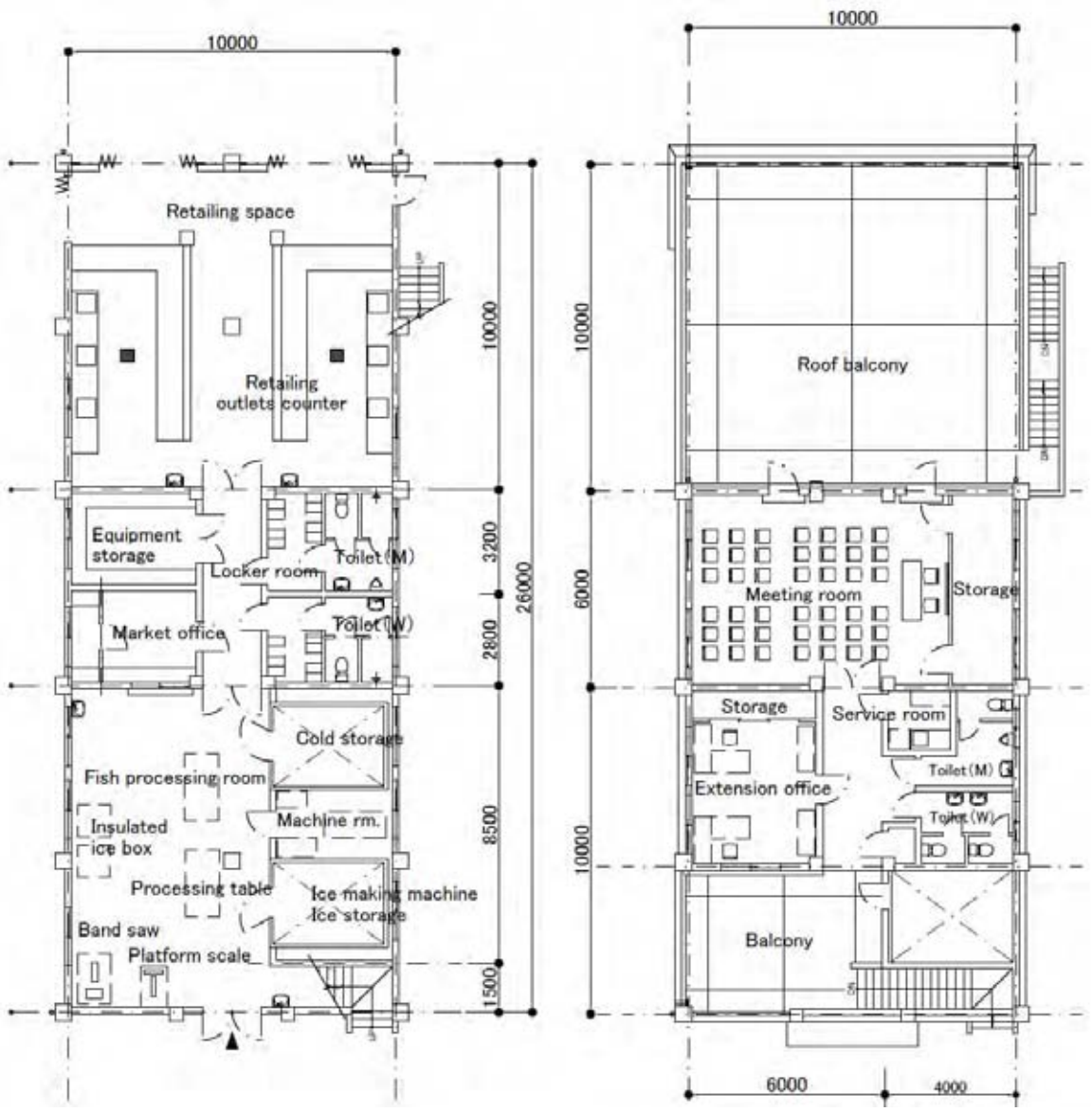



Figure 2-25: Floor plan of Fisheries Center building

(2) Fishermen's locker

The fishermen's locker will be built for the fishermen who are making fishing activities at Portsmouth.

The registered fishermen in Portsmouth (2007) are 51 full-time fishermen and 40 part-time fishermen. The total number of registered fishing boats (2007) is 69, with 49 boats operating.

There are about 20 Fishermen's lockers located in the vicinity of the fish landing site in Portsmouth. Some fishing boats are operating based in the vicinity of the Indian River east of the project site, where about 10 Fishermen's lockers are built. A total of 30 lockers are found in the entire area of Prince Rupert Bay.

In Portsmouth, the fishermen living near the beach carry back their fishing gears to their

homes or their own lockers provided by themselves, but there are not many fishermen own their houses near the fish landing site. Fishermen living far from the beach have installed their lockers by paying rent to the landowner near the beach, but suitable land on which lockers can be installed is limited. Therefore, there are many cases that several fishermen share one locker jointly, and the actual number of existing lockers is not equal to the number of fishermen. The number of Fishermen's lockers at the existing Fisheries Centers is 40 at Roseau and 74 at Marigot. All 40 lockers at Roseau are used (of which 5 lockers are used by the Fisheries Division) and are not enough. Sixty nine of 74 lockers in Marigot are rented not only to fishermen, but are also used as fishing gear shops and miscellaneous goods shops.

The size of the existing lockers is $4m^2$ (2×2) both at Roseau and Marigot Fisheries Center, and most of those at Portsmouth are of the size of about $4m^2$ to $6m^2$.

The registered fishermen in Marigot (2006) consisted of 21 full-time fishermen and 62 part-time. In the parish of Saint Andrew including Marigot, there are 59 full-time and 214 part-time fishermen. Comparing the number of full-time fishermen and the number of lockers in the parish of Saint Andrew (59 fishermen/74 lockers), the requested number of 48 lockers is considered as reasonable for 51 full-time fishermen in Portsmouth.

The fishermen's goods to be stored in the Fishermen's locker include outboard engine, oil tanks, cloths and insulated ice boxes. For the fishermen who are conducting （i） dragnet fishing and （ii） fish basket fishing, such storage lockers are sufficient. For the fishermen who conduct （iii） gillnet fishing and （iv） set-net / trawl-net/ long-line fishing, in addition to these good, it will be necessary to store other fishing gears such as nets, buoys and ropes. Therefore, 2 types of locker in different size will be built to take account of the difference in storage volume with fishing methods, and referring also to the scales of the existing facilities.

The required floor areas for the lockers are 2m×2m (for small type) and 2m×3m (for large type). Though the requested number of lockers is 48, but 38 lockers will be provided under the Project. The building will be two-story type because of limited site area.

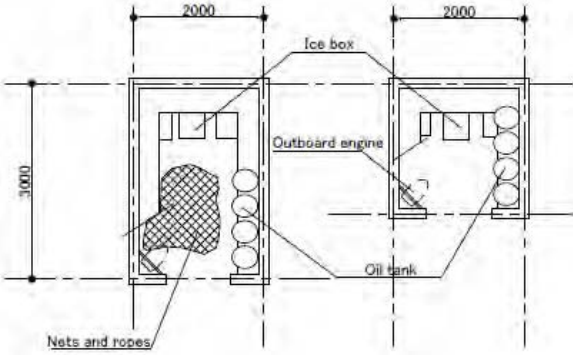



Figure 2-26： Fishermen's locker

(3) Mechanic shop

Any failure of an outboard engine will give a critical consequence on the safety of life for the fishermen who are operating near the Fish Aggregative Devices (FAD) located 55 miles off shore east of Portsmouth for pelagic fish.

Many fishing boats in Portsmouth use a single outboard engine and carry their engines to the repair shop for independent inspection and maintenance every year.

The total number of registered boats in Portsmouth and in 9 other fish landing sites is 187, of which 69 boats are registered in Portsmouth. If the outboard engines of these boats are brought to an inspection/maintenance shop once a year, the average number of outboard engines per month is estimated as: 69 boats÷12 months = 5.75 ≒ 6 units/month.

According to the repair record for the period of January to June 2008 in the similar mechanic shop at Roseau Fisheries Center, the average repaired number of units was 3.7 units/month, with the total repair quantity of 22 units and the highest repaired quantity of 5 units/month in January and in March.

34 full-time fishermen (whose boats are owned by the New Town Fisheries cooperatives) have brought their outboard engines to the mechanic shop at Roseau Fisheries Center, but in Portsmouth, there are 51 full-time fishermen, that is 1.5 times the number in Roseau, who will carry their outboard engines to the mechanic shop. By comparison between the numbers of full-time fishermen in Roseau and in Portsmouth, the monthly quantity for repairing in Portsmouth may be estimated at 5.43≒6 units/month.

3.7 units/month (average repaired quantity in Roseau)×1.5 = 5.55 ≒ 6 units/month.

The quantity of outboard engines to be repaired is estimated at 6 units per month in Portsmouth.

The scale of the mechanic shop will be determined by referring to the minimum plan (approx. 5.0m×5.0m) for the ordinary workshop recommended by the outboard engine manufacturer.

The repairing equipment to be provided for the mechanic shop to repair about 6 units of engines per month includes a press machine, a engine flushing tank and a working table. The required floor area is estimated to be 25m$^2$, taking account of the layout of the repair equipment and space for movement.

The storage for materials will require floor area of 7.5m$^2$, which is allocated for 2 storage shelves of approximately 1.2mW×1.8mH×0.3mD, each for storage of tools and spare parts separately and for handling space for tools and the spare parts.

Therefore, the total floor area of the working space and storage in the mechanic shop is estimated to be 32.5m$^2$.

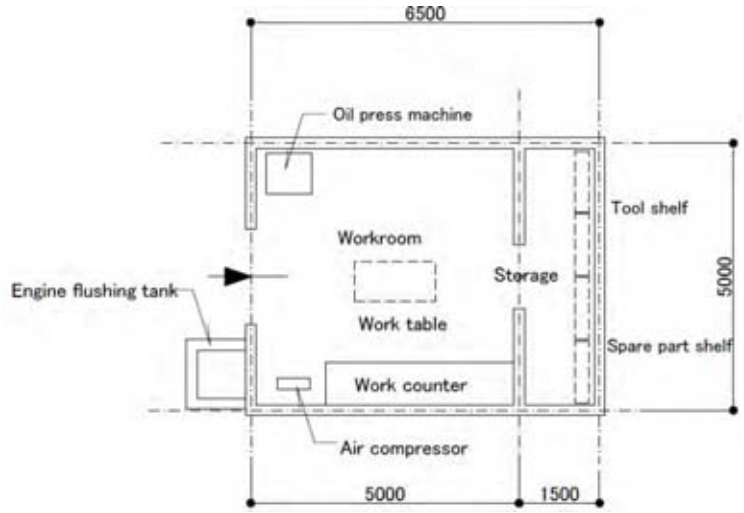



Figure 2-27： Mechanic shop

（4） Repair shed

The repair work for wooden boats consists mainly of re-painting and filling of leaks, except for some special repair. For FRP boats repair for the FRP laminated layers of the exterior is the main work. To apply painting to a wooden boat, it is necessary to dry the hull as much as possible, and the repair of laminated layers of an FRP boat requires absolute rejection of water.
69 fishing boats are registered in Portsmouth and the repairs works are carried out during May to September avoiding the peak fishing season, except for any emergency case. The number of fishing boats to be repaired per month and the number of simultaneous repairing boats per month are estimated to be 96.6 boat.days/month and 3.86 boats respectively with the following conditions:

- 69 fishing boats registered in Portsmouth will be repaired.
- The repair period will be 5 months from May to September.
- The number of working days for drying, repair and coating will be 7 days/boat.
- The repairing period will be 25 days per month.

69 boats ÷ 5 months = 13.8 boats/month × 7 days = 96.6 boat.days/month ÷ 25 days/month = 3.86 boats

The scale of the repair shed will be estimated for the conditions that only the fishing boats registered in Portsmouth will use the repair shed and that the number of simultaneously repaired boats will be 3.86boats ≒ 4 boats.

The required floor area for the repair shed is estimated to be 180m$^2$, considering the space necessary for simultaneous repairing of boats and the work space.

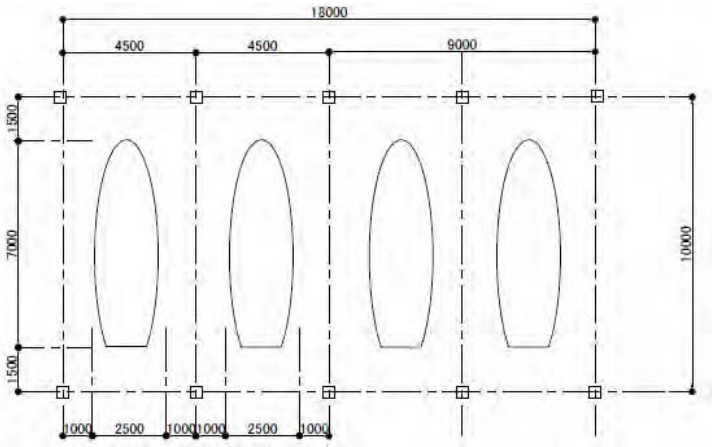



Figure 2-28： Repair shed

（5） Toilet/shower building

Toilet and shower rooms will be provided for fishermen. The number of booths will be two for men and one for women, considering the simultaneous use by fishermen when they have returned to the landing site.

The required floor area of the toilet/shower building is estimated to be 29.0m$^2$ based on the floor plan.

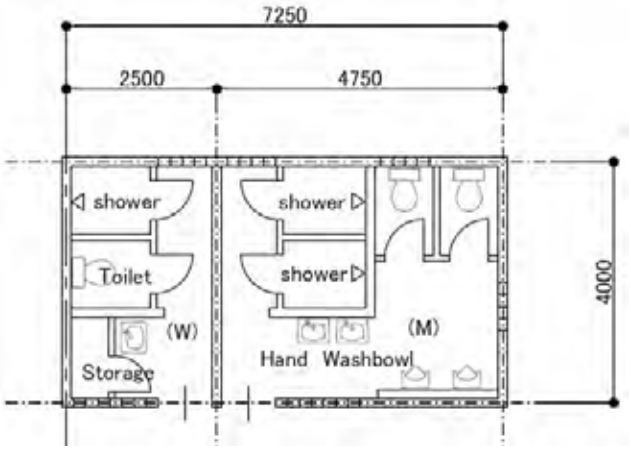



Figure 2-29： Toilet/shower building

The scales and required floor areas of the On-shore Fisheries Infrastructure are shown in Table 2-13.

Table 2-13: Scale and required floor area for On-shore Fisheries Infrastructure

| On-shore Fisheries Infrastructure | Total Area ($m^2$) |
|---|---|
| 1) Fisheries center bldg. | 408 |
| 1 floor | (260) |
| Retailing space (Retailing outlets counters : 10sets) | 100 |
| Equipment storage | 12 |
| Market office | 12 |
| Toilet, Shower and Lockers | 24 |
| Corridor and others | 12 |
| Fish processing room, Ice making machine, Ice storage, Cold storage | 100 |
| 2 floor | (148) |
| Meeting room／Storage | 60 |
| Toilet／Storage | 15.6 |
| Service room | 4.2 |
| Extension office／Storage | 22 |
| Corridor and others | 46.2 |
| 2) Fishermen's locker | 214 |
| 1 floor Locker (Large) 6 $m^2$×19 lockers | 114 |
| 2 floor Locker (Small) 4 $m^2$×19 lockers | 76 |
| Stair cases | 24 |
| 3) Mechanic shop／Storage | 32.5 |
| 4) Repair shed | 180 |
| 5) Toilet and shower bldg. | 29 |
| Total | 863.5 |

2-2-3-2 Section Planning

The ground height of the Fisheries Center building is determined as the same level to Pembroke Street and Bay Street (C.D.L. + 2.1-1.5m), taking into account the sea level, ocean waves or running up of waves.

The floor height of each facility shall be determined in accordance with the usage and requirements of the each facility. However, the height of the concrete foundation shall be raised (C.D.L. + 2.5) for the electric apparatus and machines for the ice making machine/ice storage and cold storage that will be housed in the machine room.

Slopes connecting from the fish landing jetty, the space leading to the shore situated between the slipway and the Fisheries Center building, and the vegetable market shall be determined appropriately taking into account the level for the water drainage system.

The floor level of the retailing space and the fish processing room shall be 20cm higher than the planned ground level in order to maintain enough inclination for discharge of large amount of water to be used for floor washing, etc. The floor height of the Fishermen's lockers, the toilet and shower

building and the mechanic shop shall also be made 20cm higher than the planned ground level, taking into account the access from the sea and water drainage, etc. For the repair shed to be located at the back of the sea wall, the floor level of C.D.L. + 1.5m will be adopted for ease of carrying fishing boats for repair, which is the same level as the sea wall and the ground height.

The Fisheries Center building shall be the largest one to be constructed in the Project, and shall be two-storied. The roof shall be a deck roof.

The ceiling height of the existing similar facilities is over 4.0m, in case for markets and goods handling facilities, and between 2.8m to 3.5m for office, etc. The ceiling height of the processing room and the Fishermen's locker at Roseau Fisheries Center is 4.35m and between 2.4m to 3.2m, respectively.

In this Project, the floor and ceiling heights of facilities shall be in accordance with Table 2-14, considering the work to be performed at each facility and the ceiling heights of existing local facilities.

Table 2-14: Ceiling height of planned facility

| Facility name | Room name | Ceiling height | Remarks |
|---|---|---|---|
| (1) Fisheries Center building | Processing area<br>Retailing shops<br>General offices, Storages, etc. | 3.1 m<br>3.6 m<br>2.8 m | Double ceiling<br>No ceiling<br>Double ceiling |
| (2) Fishermen's locker | Locker | 2.85 m | No ceiling |
| (3) Mechanic shop | | 3.5 m | No ceiling |
| (4) Repair shed | | Eave height: 3.0m | No ceiling |
| (5) Toilet and shower building | Toilets and showers | Eave height:2.5-3.0m | No ceiling |

2-2-3-3 Structural Design

(1) Applicable codes and standards

1) Architectural and structural codes

In Dominica, the Commonwealth of Dominica Building Code is applied to making designs for facilities. It is also required to submit application forms to the Physical Planning Office, the authority in charge, to receive review and approval. Those codes and standards are applicable to facility planning, including general architecture, electric facilities, water supply/drainage and sanitary systems, fire-preventing system, etc. In principle, the Project designs shall follow the above applicable codes and standards and the application forms shall be submitted to receive review and approval.

In most cases, the British Standards (BS) and the International Building Code and Uniform Building Code of the U.S. (IBC and UBC) are applied as structural design requirements in Dominica but, in case of projects under the international assistance, codes and standards of the country offering the assistance have often been applied in the past. Although there are differences among the structural design and calculation methods of these countries, the results obtained in accordance with

codes and standards of the U.K., the U.S. or Japan can be considered not very different from each other. When making calculations, conditions such as loads and lateral forces need to be evaluated by checking up each country's codes and standards prior to calculation.

This Project is to be implemented by the Japan's grant aid scheme and the construction works are to be performed by Japanese construction company(ies). In order to carry out efficient and economical construction work, therefore, it is desirable to carry out the works in accordance with Japan's structural design requirements. In addition, facility management in this Project will be facilitated by adopting the same standards that have been already applied to existing facilities of the Fisheries Centers in Roseau and Marigot. (construction works in Roseau and Marigot were also under the responsibility of MAFF). Therefore, it is determined that the architectural design requirements (general) shall be in accordance with those established in Dominica and the structural design requirements shall be in accordance with those established in Japan.

2) Seismic force

The Uniform Building Code (UBC) of the United States provides for seismic loads for a total of five areas in the United States — 4, 3, 2A, 2B and 1—and Dominica is classified into Area 3. The seismic load for Area 3 is established as 75% of that of Area 4. In the United States, seismic activities differ significantly from area to area and the level of earthquake motion of the Western part of the United States (area 4), where seismic activities are strong, is considered to be at the same level of Japan[4]. Based on the above, the Japanese seismic load shall be applied to this Project, by establishing the seismic zoning factor of Dominica as Z = 0.75.

3) Wind design

Wind design shall be calculated by using a basic wind speed of Vo = 46m/sec (a 10-minute averaging time). In Japan, the basic wind speeds are established within a range of Vo = 30m/sec to 46m/sec and the velocity applied to this Project is the maximum value as well as the same to that applied to the Okinawa area in Japan.

(2) Substructure

Sub-soil investigation survey has been conducted at 7 locations in total—3 locations close to the shoreline and 4 locations along the construction site of planned fish landing jetty. According to the 7 borehole logs obtained from the surveys, although there is a small difference in N values, not much difference can be found in their soil layer composition and the soil is composed of alternate layers of silty sand and gravel. There exists no viscous soil that may consolidate to cause differential settlement and, because N value is at the mid level, the soil's bearing capacity is expected to be between 5t/$m^2$ and 15t/$m^2$.

[4] Source: Comparison of seismic design codes for steel buildings in Japan and the United States, March 2005, Vol. 12, No. 45

Therefore, for facilities to be constructed in this Project, including the Fisheries Center building, Fishermen's locker, the mechanic shop, the repair shed and the toilet and shower bldg., the economical spread foundation shall be selected.

（3）Superstructure （building frames and roof finishes）

In this Project, optimal superstructures shall be selected by giving attention to the following points:

- Local materials and construction methods shall be adopted, wherever possible.
- Since this Project is composed of multiple facilities of different functions, a superstructure shall be selected to meet each building's functional requirements and, at the same time, the selected superstructures shall be highly durable.
- Since the facilities are to be constructed in a coastal area, their superstructures shall fulfill natural conditions, for example, they shall be protected from salt damage and durable against ocean waves, strong winds and rainfall caused by hurricanes.
- Taking into account that the procurement of construction materials, etc. mostly relies on imports, complicated combinations of materials shall be avoided and simple superstructures comprising carefully selected materials shall be applied.
- Superstructures shall be easy to maintain and manage.

1） Building frame

In Dominica, concrete block structure or a reinforced concrete structure are commonly found, which have the same scale as planned facilities in the Project, though there are some masonry buildings built during the colonial days. It is effective and economical to select construction methods commonly applied and materials easily procurable in Dominica. In this Project, reinforced concrete and concrete block structures shall be used.

Steel structures have an advantage that on-site construction period can be shortened, but the procurement period can be longer and transportation and construction machinery will be necessary. Also, regular maintenance after completion is required and steel structures shall not be selected in this Project.

The superstructure selected for each facility is as follows:

Fisheries Center building and repair shed:

-- Reinforced concrete, rigid frame method

Fishermen's lockers, toilet and shower bldg. and mechanic shop:

-- Concrete blocks, wall panel method

2） Roof

In Dominica, there are some buildings built with a combination of different methods, for example, reinforced concrete building with steel sheet roof. However, when considering materials that can be procured and a possible shortage of skilled construction workers, selection of a single construction method for the structure and the roof will have a rationale, as repeated use of materials such as form panel and supports are possible. As a result, the construction period can be shortened and the construction works can be carried out economically. For the roof of the facilities in this Project, the reinforced concrete shall be selected.

The roof construction method selected for each facility is as follows:

Fisheries Center building:

- RC method, deck roofing, asphalt waterproofing/concrete overlaying

  *An elevated water tank will be placed on the roof of the Fisheries Center building, the roof shall be constructed using the RC method.

Fishermen's lockers and toilet and shower building:

- RC method, shed roof, mortar waterproofing

Mechanic shop:

- RC method, hipped roofing, mortar waterproofing

Repair shed:

- RC method, folded-plate roofing, mortar waterproofing

With regard to the columns for the repair shed, no intermediate columns shall be placed between the main span facing the front, as small fishing boats (2.0m in width and 7.0m in length) will be carried in and out and the working space for that will be necessary.

The roof of the repair shed shall be of RC construction, considering various factors including ease of the construction work, availability of materials, durability and economical viewpoint.

3） Major materials to be used

（i） Reinforcing bars/steel

SD295A, SD345, SS400 or their equivalent.

（ii） Concrete

| Material | Specified concrete strength |
|---|---|
| Reinforced concrete | 21 to 24 N/mm$^2$ |
| Unreinforced concrete | 18 N/mm$^2$ |

2-2-3-4 Building Material Plan

（1） Finish

The finishes of interior and exterior works shall be planned to use local materials, based on the natural conditions in Dominica.

- Finishes that can be constructed and repaired with methods commonly used in the local area shall be selected.
- Finishes shall be selected so that the maintenance cost can be kept low.
- Finishes shall be selected so that the facility can be salt resistant.
- Finishes shall be suitable for high temperature and humidity.
- No materials containing asbestos shall be used in finishes.
- For the fish processing room of the Fisheries Center building, finishes shall satisfy the Environmental Health Inspection Standard for Food Places in Dominica, as stated in the M/D (Appendix 4).

The planned exterior and interior finishes for each facility are as follows:

1） Exterior finishes

Table 2-15 below indicates exterior finishes for each facility.

Table 2-15： Exterior finishes for facilities

| Facility name / Area to be finished | Fisheries Center building | Fishermen's locker/Toilet and shower bldg. | Mechanic shop | Repair shed |
|---|---|---|---|---|
| Roof | R-1 | R-2 | R-3 | R-4 |
| Under-eave ceiling | E-1 | E-1 | E-1 | — |
| Exterior wall | W-2 | W-2 | W-2 | W-2 （columns） |
| Skirting board | W-1 | W-1 | W-1 | W-1 （column bases） |

R-1: Deck roof, asphalt waterproofing and concrete overlaying
R-2: Shed roof, mortar waterproofing
R-3: Hipped roof, mortar waterproofing
R-4: Folded-plate roofing, mortar waterproofing
E-1: Synthetic resin emulsion paint(EP) monolithic surface finish
W-1: Mortar finish
W-2: Multi-layered wall coating (spray tile)

・ External openings

The similar facilities and the neighborhood facilities of the Project site have aluminum or wooden doors and aluminum or steel sash windows. Large-size openings in factories, storages, etc. are generally steel doors. In this Project, doors of offices and general rooms (Meeting room, Market office, Extension office, etc.) shall basically be aluminum or wooden doors. Due to the high temperature and humidity in Portsmouth, openings shall be made as much as possible. Especially, fish retailing space shall have openings on three sides to facilitate natural ventilation and light.

2） Interior finishes

Table 2-16 below indicates interior finishes for rooms.

Table 2-16: Interior finishes for rooms

| Room name | Floor | Skirting board | Wall | Ceiling |
|---|---|---|---|---|
| Fisheries Center building | | | | |
| -- Retailing space | F-1 | W-3 | upper part: W-4<br>lower part: W-3 | W-2 |
| ・Fish processing room *1 | F-1 | W-3 | upper part: W-4<br>lower part: W-3 | C-2 |
| ・Toilet and locker room | F-1 | W-3 | upper part: W-2<br>lower part: W-3 | C-2 |
| ・General residential rooms （Meeting room, Market office, Extension office, etc.） | F-1 | W-3 | W-2 | C-1 |
| ・Storages | F-2 | W-1 | W-2 | C-2 |
| Fishermen's lockers | F-2 | W-1 | W-2 | W-2 |
| Mechanic shop | F-2 | W-1 | W-2 | C-2 |
| Toilet and shower building | F-1 | W-3 | upper part: W-2<br>lower part: W-3 | C-2 |
| Repair shed | F-3 | W-1 | W-4 | W-2 |

F-1: Ceramic tiles, F-2: Mortar finish, F-3: Concrete monolithic surface finish
W-1: Mortar finish, W-2: Synthetic-resin emulsion paint(EP) finish, W-3: Ceramic tiles
W-4: Multi-layered wall coating (spray tile)
C-1: sound-absorbing plasterboard, C-2: synthetic resin EP finish on cement board
*1: In compliance with the Environmental Health Inspection Standard for Food Places in Dominica.

### 2-2-2-4 Exterior Works

#### 2-2-2-4-1 Site premise pavement

Pavement works shall cover the area of the former land of the Social Security board where the Fisheries Center building is to be constructed and the area west to the vegetable market. The total area to be paved is approximately 1,500 $m^2$.

The concrete pavement shall be applied as the materials can achieve an appropriate level of strength

and relatively low surface temperature rise.

2-2-2-4-2 Electric equipment

・ Electric lamps and electricity receiving and distribution equipment

Fixtures such as electric lighting and power outlets shall be provided. For lighting, natural illumination shall be used basically and the minimum electrical lighting shall be provided. In addition, lighting fixtures and piping materials that can be easily maintained locally, and resistant to salt-damage, shall be selected. Power shall be supplied through a branch line that connects from the existing power cable （high-voltage line of 1.1kV and low-voltage line） and runs along Bay Street on the east side of the Project site. Costs of branching the main line to the meter box shall be borne by the government of Dominica, including provision of the meter box. Lying of the service cable from the meter box to the Project site shall be included in this Project. The power distribution method locally used （3-phase, 4-wire, 415/240V, 50Hz） shall be adopted in this Project.

For indoor lighting fixtures, fluorescent lights shall be used and the light intensity shall be based on the standards shown in Table 2-17.

Table 2-17： Indoor lighting plan

| | |
|---|---|
| General residential rooms and fish processing room | Approx. 250 lux |
| Toilets, storages, etc. | Approx. 150 lux |
| Retail space | Approx. 100 lux |

Outdoor lighting shall be provided around the repair shed, the fishermen's locker and within the premises of the Fisheries Center building. Power outlets shall be constructed for general-purpose rooms, which shall be single-phase outlets (230V/50Hz).

・ Emergency generator

One emergency generator shall be provided to supply power to the ice making machine and the cold storage. Capacity required for the normal operation of these two facilities is 18.5kw. Electric capacity required for the emergency generator is calculated to be approx 30kVA, with direct starting up to 7.5kW output and the star-delta starting for 11kw output.

2-2-2-4-3 Water supply system

The water the main pipe of 8 inches diameter are in place along the Project site on the Bay Street side. A branch pipe shall be laid from the main pipe to supply water to the Project site. The water supply pressure is around 130psi. Water shall be supplied directly to the elevated water tank and then supplied to each facility from the tank by gravity flow.

As shown in Table 2-18, the city water supply is planned as 4,000 liters per day. Water supply to large fishing boats is excluded since such a supply occurs on an irregular basis.

Table 2-18: Water supply

| Facility | Unit quantity consumed | Unit | Consumed water (liter) | Consumed quantity (liter) | Remarks |
|---|---|---|---|---|---|
| 1 Fisheries Center Bldg. | | | | | |
| 1) Ice making machine | 1,000 | Litre | 1 | 1,000 | |
| 2) Fish outlets counters | 270 | kg | 1 | 270 | *3, *2 |
| Floor washing | 100 | $m^2$ | 6 | 600 | *4 |
| 3) Fish processing room | 270 | kg | 1 | 270 | *3, *2 |
| Floor washing | 70 | $m^2$ | 6 | 420 | *4 |
| 4) Toilets/Shower | | | | | |
| Shower (1 floor) | 10 | person | 20 | 200 | *1 |
| Toilets (1 floor) | 12 | person | 13 | 156 | *1 for retailers |
| Toilets (2 floor) | 2 | person | 13 | 26 | *1 for officers |
| 2 Toilets/Shower bldg. | | | | | |
| Toilets | 33 | person | 13 | 429 | *1 Number of fishing boats x fishermen and crew |
| Shower | 33 | person | 20 | 660 | *1 |
| | | | Total | 4,031 | |

Source *1: "Handbook of Heating Air-Conditioning and Sanitary Engineering," Vol. 13, Society of Heating Air-Conditioning and Sanitary Engineers of Japan.
*2: FAO Fisheries Circular, No.905, FIIU/C905. *3: Average Daily Transaction of Fishery Products.
*4: Referential figure for floor cleaning, 6-8 liters per $1m^2$, obtained from similar projects.

City water system in Portsmouth has no problem in terms of volume, pressure and quality, but when a hurricane hits the region, the reservoir water can get turbid, which often leads to temporary shutdown of water intake from the reservoir and disrupted water supply. Taking these conditions into account, the capacity of water receiving tank and the elevated water tank in this Project shall be sufficient to reserve at least 8,000 liters, twice the daily water consumption.

To supply water to large fishing boats moored at planned fish landing jetty, a hosepipe shall be used, which should be connected between the hydrant and the boat, and no water pipe distribution to the jetty shall be made.

2-2-2-4-4 Drainage facilities

At the Project site, there is no public drainage and sewage system. In this Project, rain water from the roof, water used for floor washing, and general domestic wastewater shall be drained into the front sea area through buried drainage pipes and side ditches within the site, in accordance with the standards in Dominica. For wastewater containing fish scale and residuals in the retailing outlets counters and fish processing room, a basket shall be placed in each of wastewater pits to remove solid waste materials as a preliminary treatment and, then, discharged into the font sea. Sewage water and soil water from toilets and the Fisheries Center building shall be treated with the septic tank, which shall be provided in accordance with the standards established by Environmental Health Department

(based on the WHO standards). As shown in Figure 2-30, sewage water will be disposed of through evaporation and seepage after anaerobic treatment in the multi-chamber septic tank with penetration pipes. Mechanical aeration or chemical treatment shall not be applied in this Project.

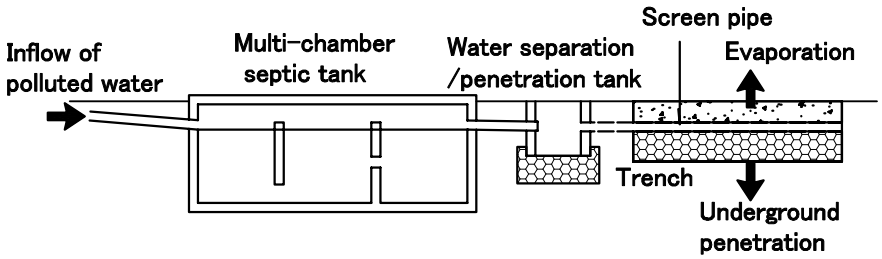



Figure 2-30： Schematic diagram of toilet wastewater treatment

2-2-2-4-5 Air-conditioning & ventilation system

Since it is expected that the meeting room can be used by a large number of people at one time, and also meeting room rents will be charged, the room will be equipped with an air-conditioning system. In other rooms, it is planned that no air-conditioning system shall be installed and natural ventilation shall be utilized. Ceiling fans shall be installed in the rooms for people use and in fish retailing space in the Fisheries Center building. Ventilation fans shall be installed in the machine room, toilets and service rooms in the Fisheries Center building, where odor, steam and heat can be generated.

2-2-2-4-6 Fire control system

There is a fire hydrant on a crossing the Bay Street and Pembroke Street, it is not particularly required to install fire control system such as fire hydrants and fire alarms, however, for safety purpose, stand-alone type fire alarm equipment shall be installed in the meeting room and in the extension office. In addition, small-size fire distinguishers shall be installed at the market office at the Fisheries Center building, the machine room and the mechanic shop.

2-2-2-4-7 Fuel station

The gasoline tank shall have a capacity of 2,000 U.S. gallons and the diesel oil tank shall have a capacity of 1,000 U.S. gallons. These tank sizes were determined based on the following conditions:

- Gasoline supply requirement for a small fishing boat with outboard engine for fishing operations: 20-litre tank x 4 cases
- The average number of outboard engine boats to be supplied per day—14 boats/day
- Diesel oil supply requirement: Supply for large fishing boats is 750 to 1,500 liters and the average supply per boat is 1,000 liters.
- The number of large fishing boats to be supplied per week—3.5 boats/week.
- Supply by the oil company’s oil tanker is estimated as once a week.

- The tank capacity shall have a 10-percent extra room plus the actual quantity.

Based on the above conditions:
The calculation of gasoline tank capacity is as follows:

- 20-liter tank x 4 cases x 14 boats/day x 6 days = 6,720 liters x 1.1 = 7,392 liters x 0.263 gallon/liter = 1,944 gallons ≒ 2,000 gallons; and

The calculation of diesel oil tank capacity is as follows:

- 1,000 liters x 3.5 boats/week = 3,500 liters x 1.1 = 3,850 liters x 0.263 gallon/liter = 1,013 gallons ≒ 1,000 gallons.

At the fuel station, the gasoline tank shall be buried into ground and the diesel oil tank shall be placed on the ground. Also, oil dikes shall be installed.
With regard to the supply methods for gasoline and diesel oil, although it was formerly one of the studied methods, it is determined that no oil pipes shall be laid down to the fish landing jetty, for the following reasons:

- For a private organization such as fisheries cooperatives which to be in charge of maintenance and management for fuel station, it may be difficult to make proper and regular maintenance on the fuel supply pipes installed at a jetty due to lack of experience.
- During inclement weather, it is expected that pipes will be damaged if hit by driftwood or other debris.

Therefore, a fuel supply outlet shall be installed on the gasoline tank to be buried into ground and a portable dispenser shall be connected to the outlet to supply gasoline to portable tanks of small fishing boat with outboard engine.

Also, a fuel supply outlet with a built-in dispenser shall be installed on the diesel oil tank to be placed on the ground and an extension hose shall be connected to the dispenser to supply diesel oil to the front end of the jetty along which large fishing boats are moored.

### 2-2-2-5 Equipment

#### 2-2-2-5-1 Insulated ice boxes

In order to meet the needs for ice for other fish landing sites, insulated ice boxes of about 750-liter capacity shall be provided to transport and store ice manufactured in Portsmouth. Also, insulated ice boxes of about 250-liter capacity shall be provided to be used for storage of ice and fish on the retailing outlets counters.

A total of 5 750-litre capacity insulated ice boxes shall be provided to distribute to Toucarie/Cottage, Dublanc, Bioche, Colihaut and Coulibistrie fish landing sites where the fisheries activities is relatively high. With regard to Capuchin, Clifton and Tantan, it was decided that the insulated ice box located at Toucarie/Cottage should be shared, as there are no more than 10 registered fishermen and geographically close to Toucarie/Cottage.

A total of 10 insulated ice boxes of 250-litre capacity shall be prepared for the retailing outlets counters.

2-2-2-5-2 Fish trays

It is considered that 20 fish trays will be necessary, 2 trays each for a total of 10 retailing counters for selling and displaying products. In addition, since most catches are landed during a very short period of time, enough fish trays to carry 340kg fish per day on average will be necessary. Assuming that a 60-litre fish tray is used 40-50% full of fish, each tray will carry 30-36 liters (= 30-36kg), which means 10 trays (≒ 9.4 - 11.3 trays) will be necessary for carrying fish. In total, 30 fish trays will be necessary.

2-2-2-5-3 Scales for weighing

In order to be used on retailing outlets counters, hanging scales that can weigh up to 20 pounds shall be provided at a ratio of one scale to each retailing outlets counter.
In order to weigh an aggregate of fish catch at the time of fish landing, platform scales that can weigh up to 500 pounds shall also be provided.

The number of hanging scales weighing up to 20 pounds shall be 10 units, same as the number of the retailing outlets counters, and 3 units for fish processing room - a total of 13 units. The number of platform scales weighing up to 500 pounds shall be 2 units for the fish processing room.

2-2-2-5-4 Engine flushing tank

In order to be used in the propeller rotation test of outboard engines at the mechanic shop, one flushing tank shall be provided. The flushing tank is planned as built-in equipment for the mechanic shop, not as part of the equipment plan.

2-2-2-5-5 Tools for mechanic shop

Through field and hearing surveys, it was found that almost all of outboard engine boats currently operating in the target fish landing sites had a 10 to 120-horsepower engine made in Japan and, therefore, in this Project, repair tools and special tools for the outboard engine required for repair of those engines and other than general tools such as wrenches and screwdrivers shall be provided. The quantity and outline of specification of these tools are indicated in Table 2-19 below.

2-2-2-5-6　Equipment for the fish processing room

In this Project, the following equipment shall be provided: band saws to cut large-size fish and frozen fish, stainless tables and high-pressure water washing machines to clean the fish processing room.　The quantity and outline of specification of the equipment are indicated in Table　2-19 below.

2-2-2-5-7　Plastic buoys and concrete anchors

In Portsmouth, there are a total of 23 FRP (Fiber Reinforced Plastic) boats registered and in this Project, 20 sets of plastic buoys and concrete anchors shall be provided to moor these FRP boats close to the sea wall.

Table　2-19：　List of Equipment

| Name | Outline of specification | Amount |
|---|---|---|
| Insulated ice box (Large) | 750 liters | 5 |
| Insulated ice box (Small) | 250 liters | 10 |
| Fish trays | 60 liters | 30 |
| Hanging scale | Weighing up to 20 pounds | 13 |
| Platform scale | Weighing up to 500 pounds | 2 |
| Engine flushing tank | Built-in equipment for mechanic shop | 1 set |
| Tools for mechanic shop | | |
| Torque wrench | Large, Midium, Small | 1 set |
| Cylinder gauge | 35～150 mm | 1 set |
| Anvil | 30 kg | 1 |
| Vice | 200mm dia | 1 |
| Chain block | 2 ton | 1 |
| Electric bench drill | 200W、φ 4mm～13mm | 1 |
| Electric bench grinder | 400W | 1 |
| Electric welder set | 200 A | 1 set |
| Battery charger | 50 A | 1 |
| Hydraulic oil press | 15 ton | 1 |
| Air compressor | 1.5kw、8kg／sqm | 1 |
| Hand operated crane | oil pressure、500kg | 1 |
| Special tools for outboard engine | | 1 set |
| Tools for fish processing room | | |
| Band saw | Fixed table type | 1 |
| Stainless table | 1,800mm×900mm | 2 |
| High pressure water washing machine | Engine, 6ps | 1 |
| Plastic buoys and concrete anchors | | 20 set |

2-2-3 Basic Design Drawings

G-1 SITE PLAN
C-1 FISHING PORT INFRASTRUCTURE SITE PLAN
C-2 FISH LANDING JETTY SECTION
C-3 SEA WALL, GABION BASKET, SLIPWAY SECTION
C-4 SEA WALL SECTION (1)
C-5 SEA WALL SECTION (2)
C-6 SEA WALL SECTION (3)
C-7 FISH LANDING JETTY PLAN
A-1 FISHERIES CENTER BLDG.
A-2 FISHERIES CENTER BLDG. ELEVATION & SECTION
A-3 FISHERMEN'S LOCKER PLAN, ELEVATION & SECTION
A-4 REPAIR SHED PLAN & ELEVATION
A-5 MECHANICAL SHOP, TOILET & SHOWER BLDG. PLAN, ELEVATION & SECTION

N

NORTH RIVER

30000

6000

RIVER REVETMENT

REPAIR SHED

18000

FL.=+1.6

SEA WALL

EXISTING VEGETABLE MARKET

10000

+1.5

EXISTING CONC.BLOCK WALL

CONCRETE PAVEMENT

44000

23000

100.000

20000

63000

BAY STREET

FISH LANDING JETTY

2

1

+1.5

6000

100.000

+1.5

26000

26000

9500

6500

10000

FISHERIES CENTER BLDG.

PEMBROKE STREET

1990

8750

+1.5

+1.7

+1.8

TOILET/
SHOWE BLDG.

MECHANIC SHOP

FL.=+2.4

+2.2

10000

3000

3000

1850

FUEL STATION

SLOPE

7250

SLIPWAY

FL.=+1.9

+1.7

FL.=+2.3

FL.=+2.4

+1.0

RETAINING WALL

FISHERMEN'S LOCKER

SIDEWALK

SEPTIC TANK

20000

52000

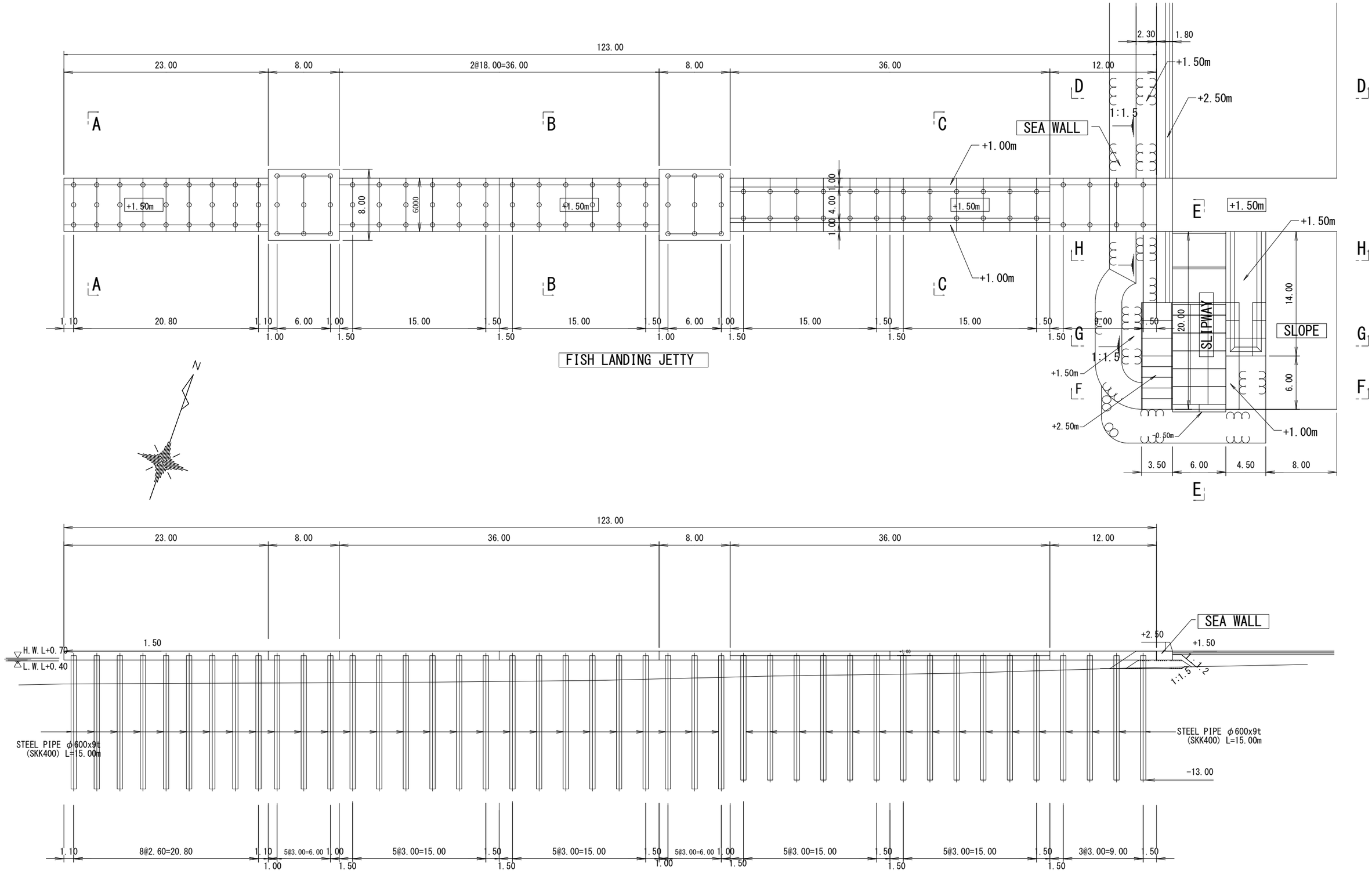
11000

BOAT YARD

0 10 20 30m

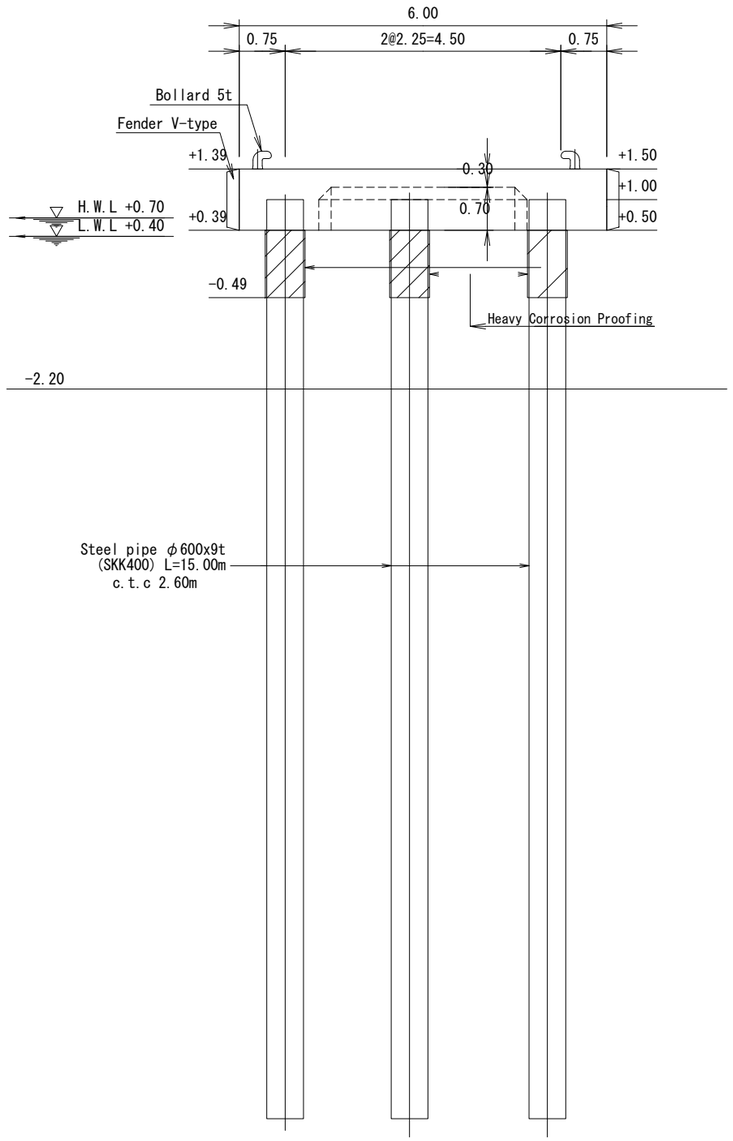
1:400

# G-1 SITE PLAN

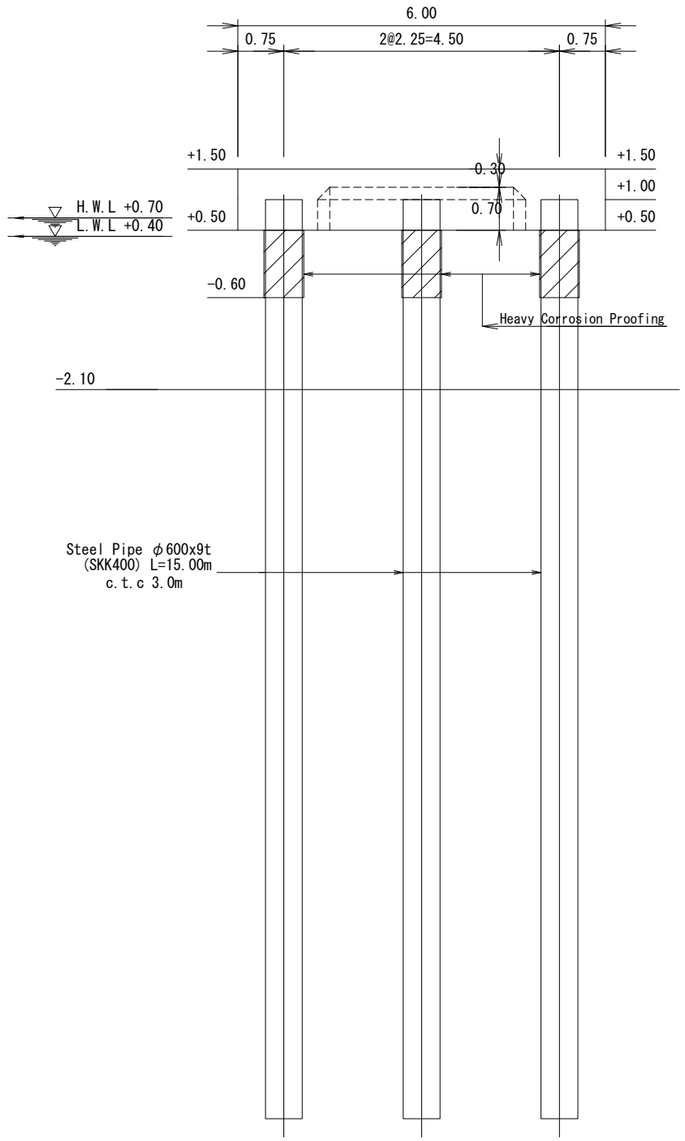



# C-1 FISHING PORT INFRASTRUCTURE SITE PLAN

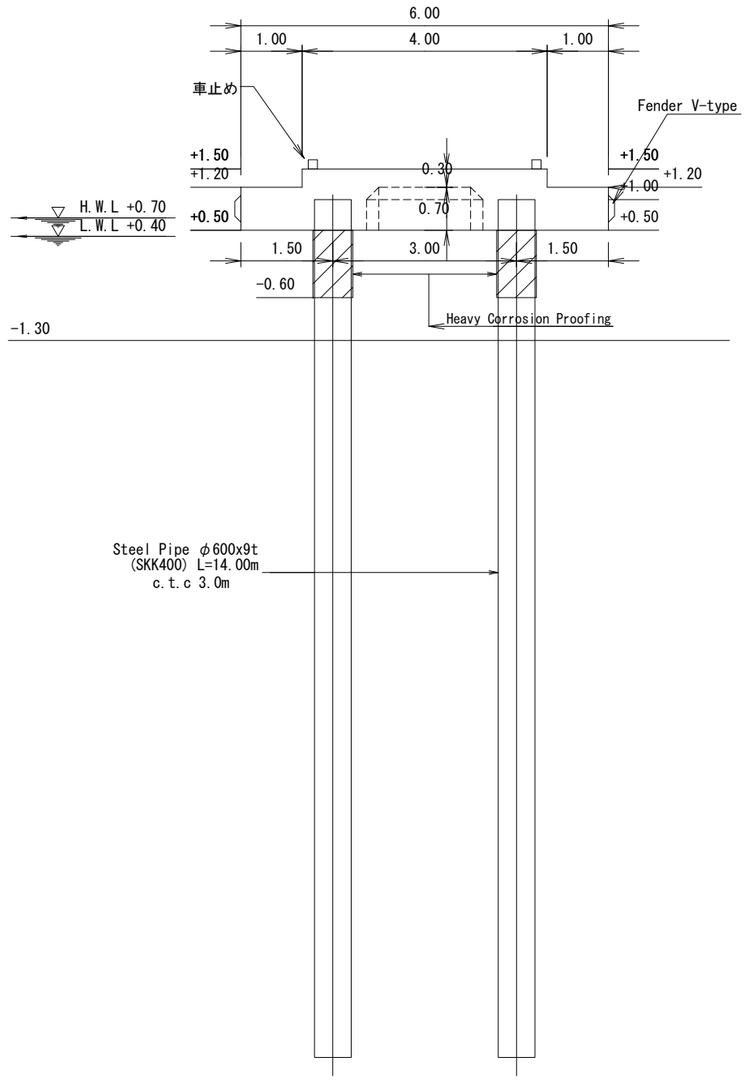
## A-A SECTION




## B-B SECTION




## C-C SECTION

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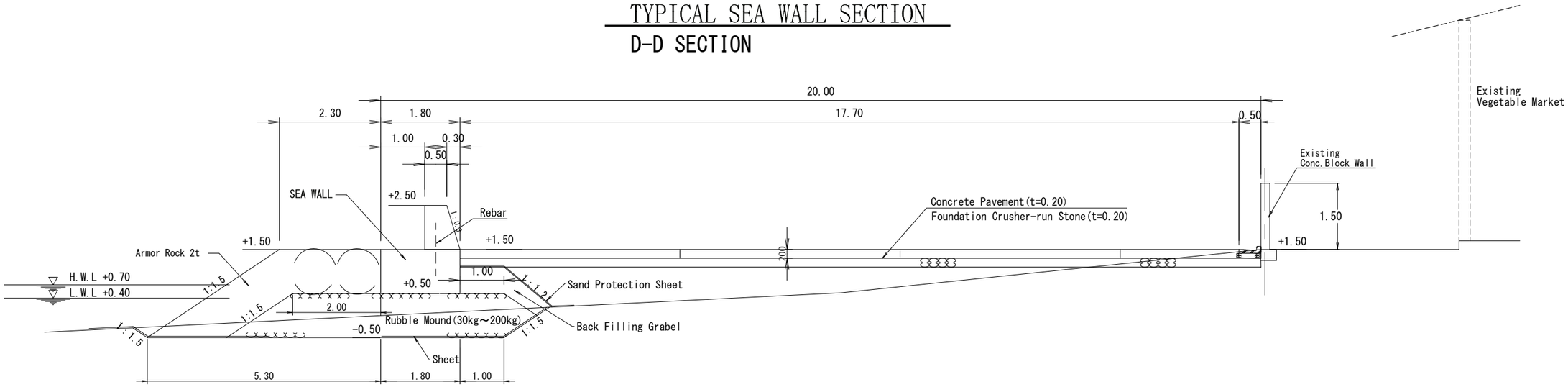
# C-2 FISH LANDING JETTY SECTION

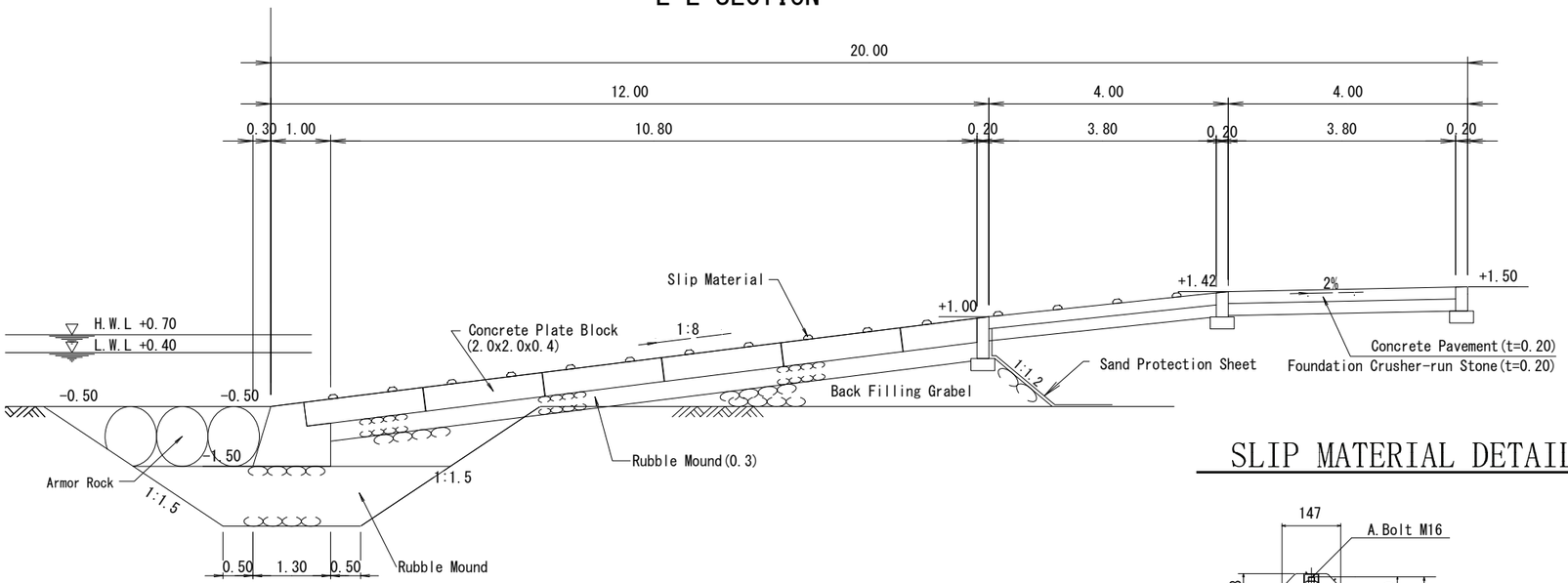
## TYPICAL SEA WALL SECTION

### D-D SECTION

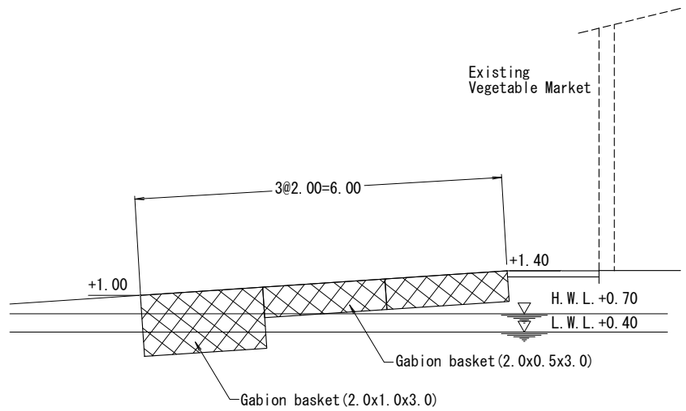



## SLIPWAY SECTION

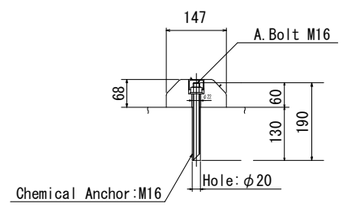
### E-E SECTION




## TYPICAL RIVER REVETMENT SECTION




## SLIP MATERIAL DETAIL

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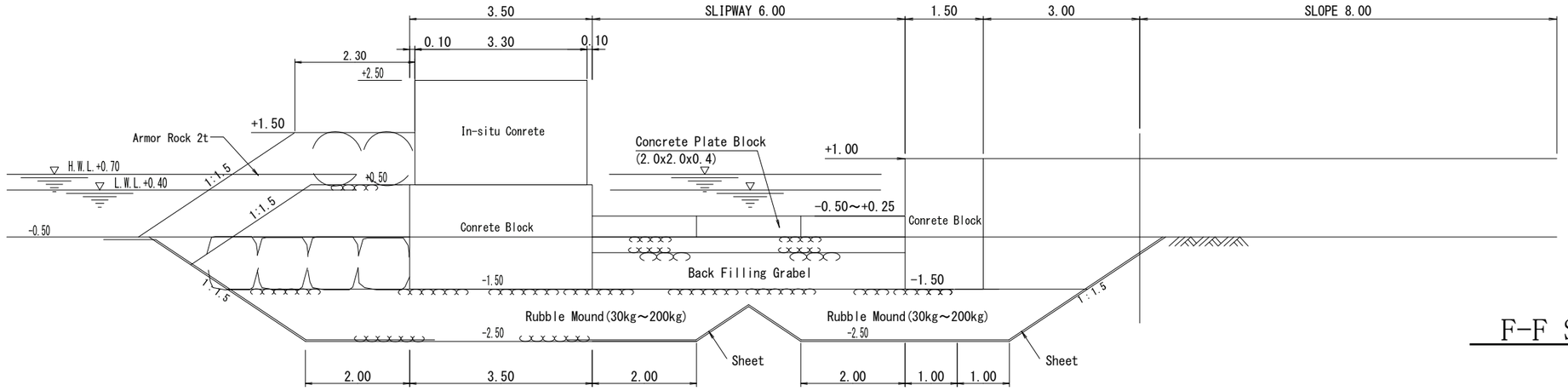
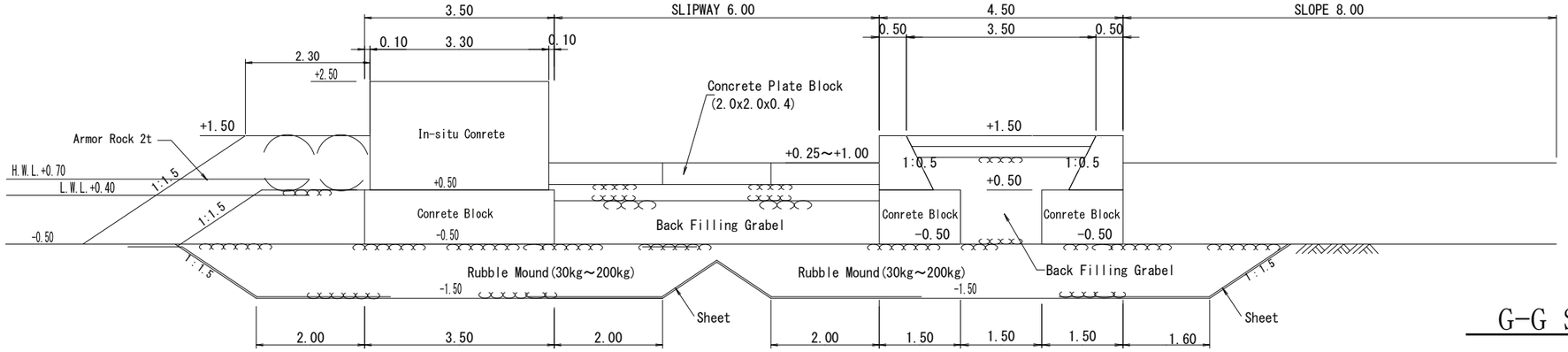
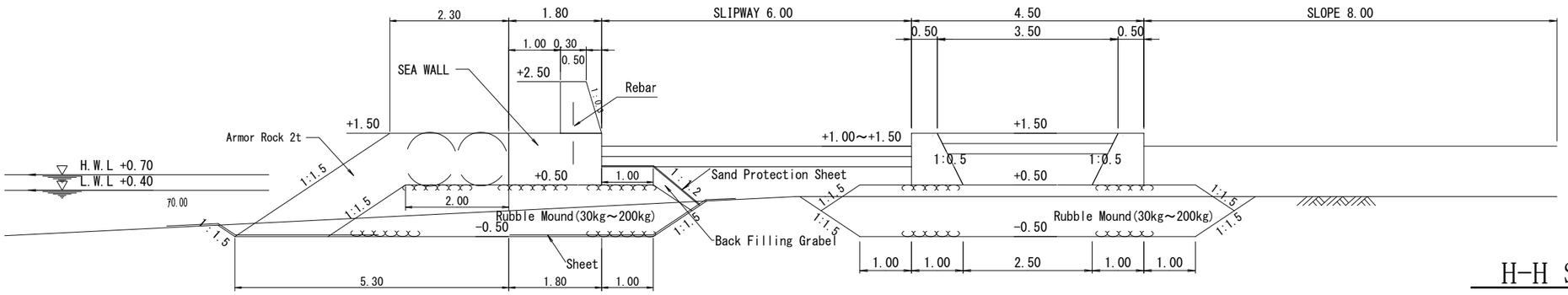
## C-3 SEA WALL,GABION BASKET,SLIPWAY SECTION




F-F SECTION




G-G SECTION



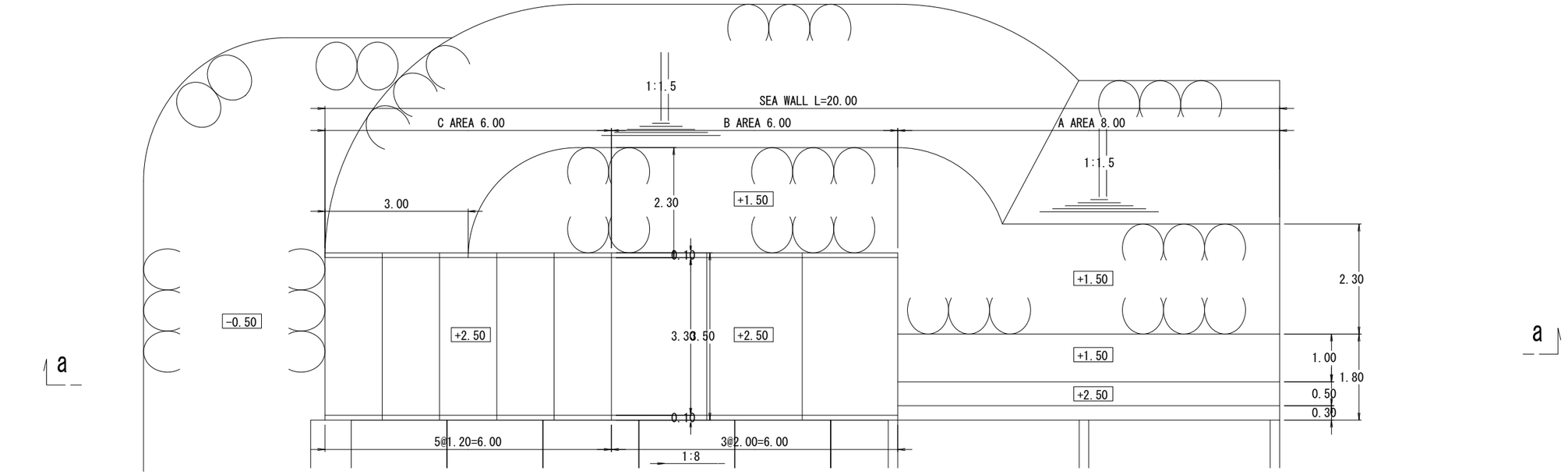

H-H SECTION

0 1 5m

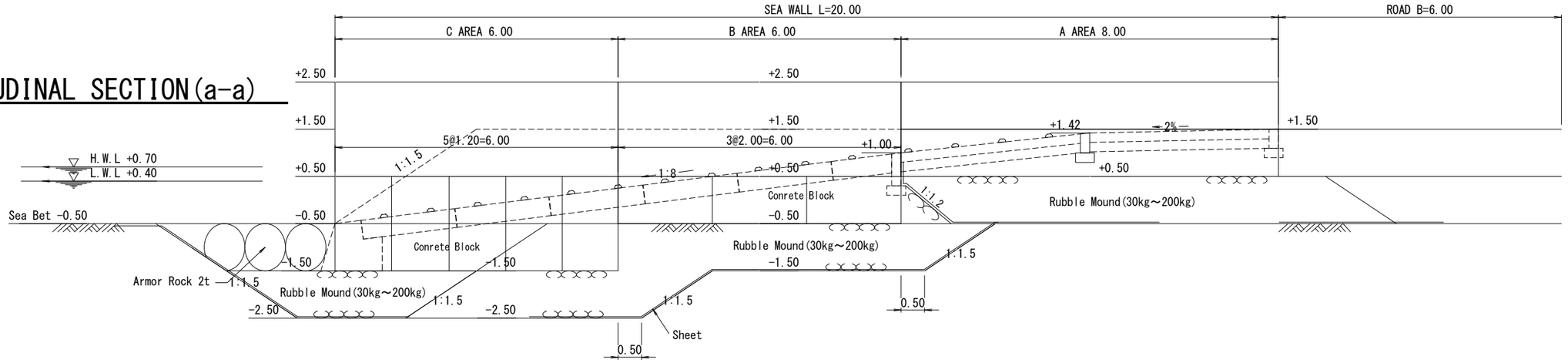
1:100

# C-4 SEA WALL SECTION (1)

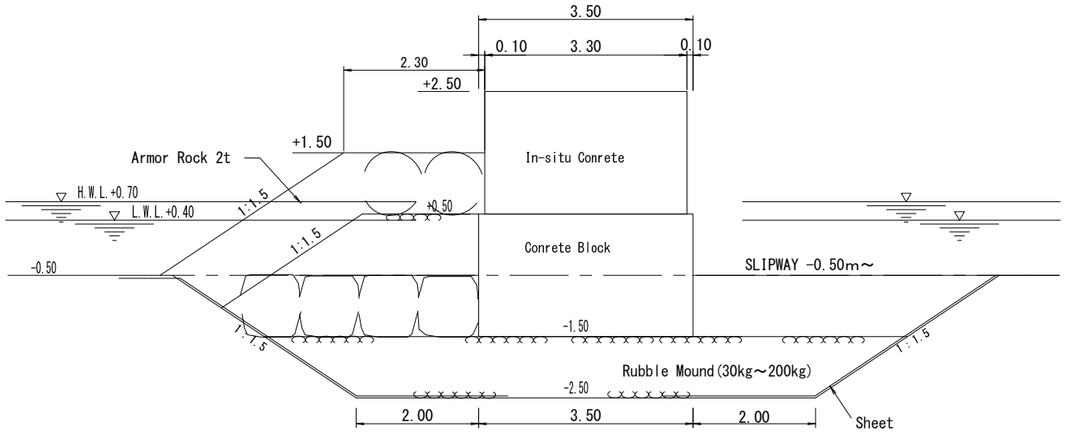
## PLAN



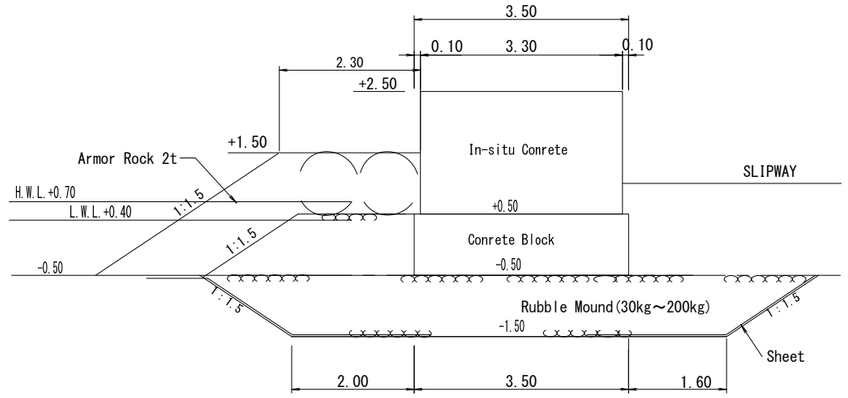

## LONGITUDINAL SECTION(a-a)




### C AREA SECTION




### B AREA SECTION




0 1 5m

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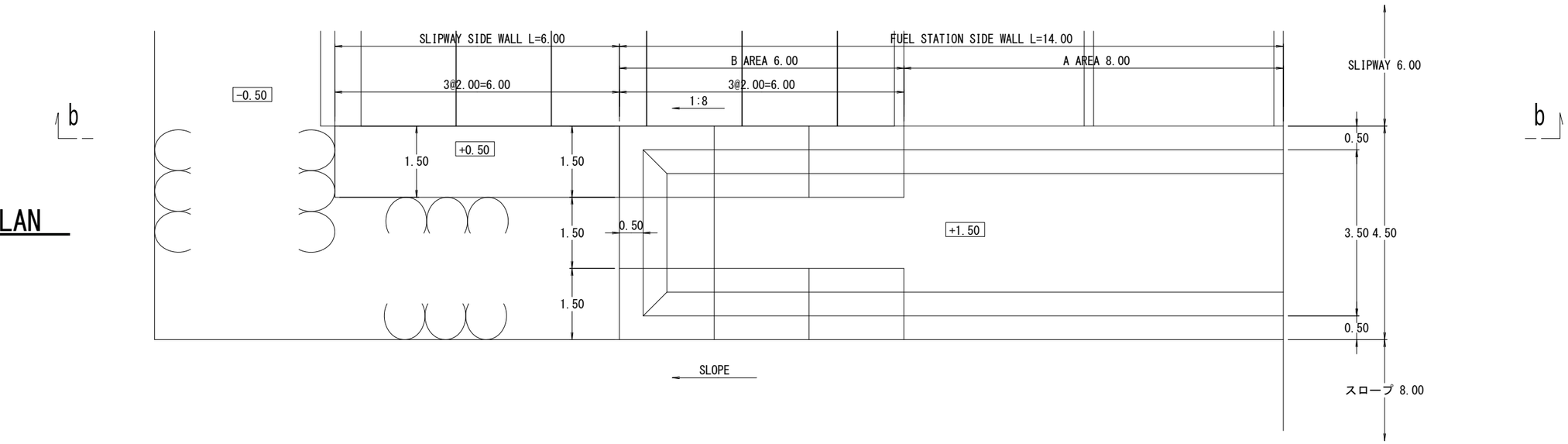
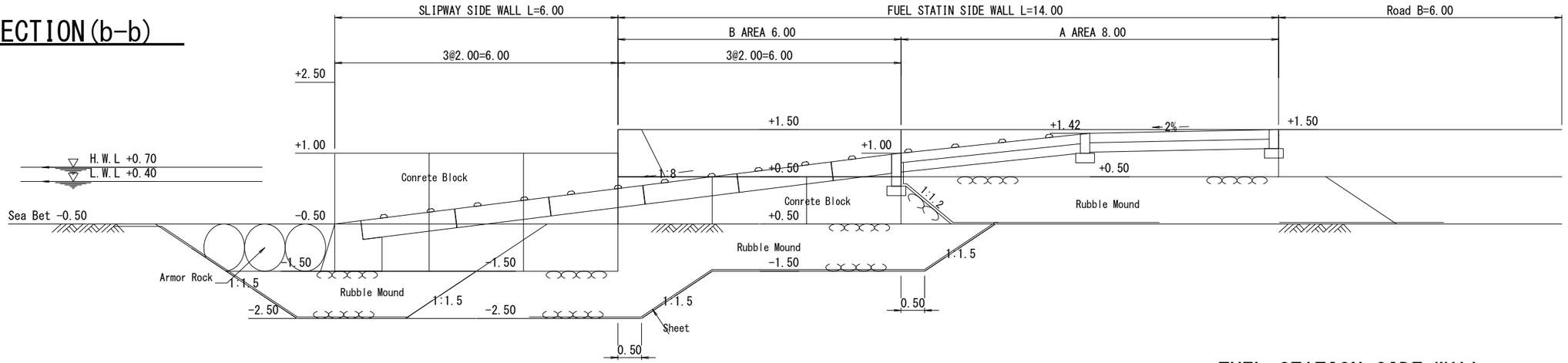
# C-5 SEA WALL SECTION (2)

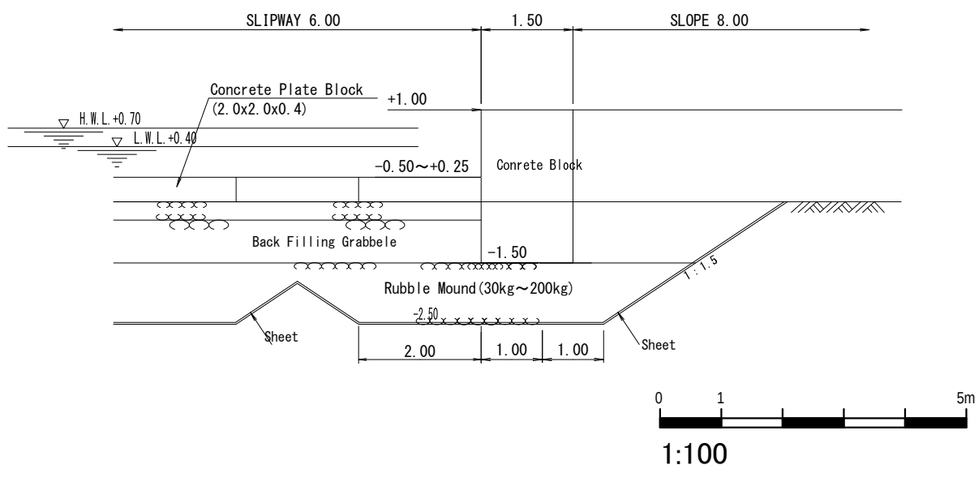
## PLAN



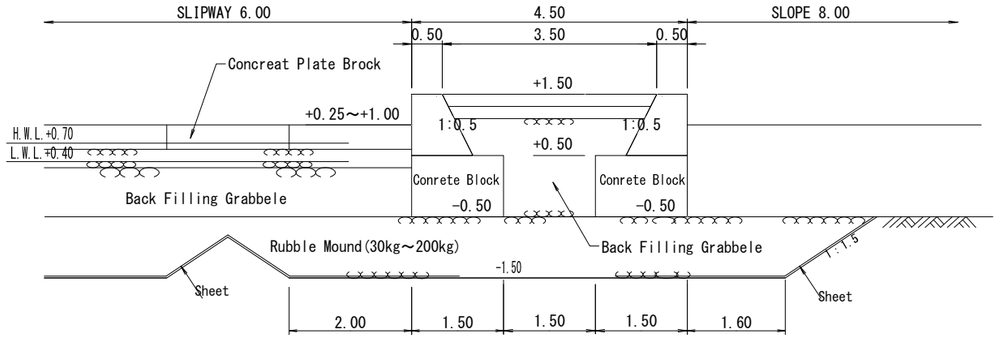

## SECTION(b-b)



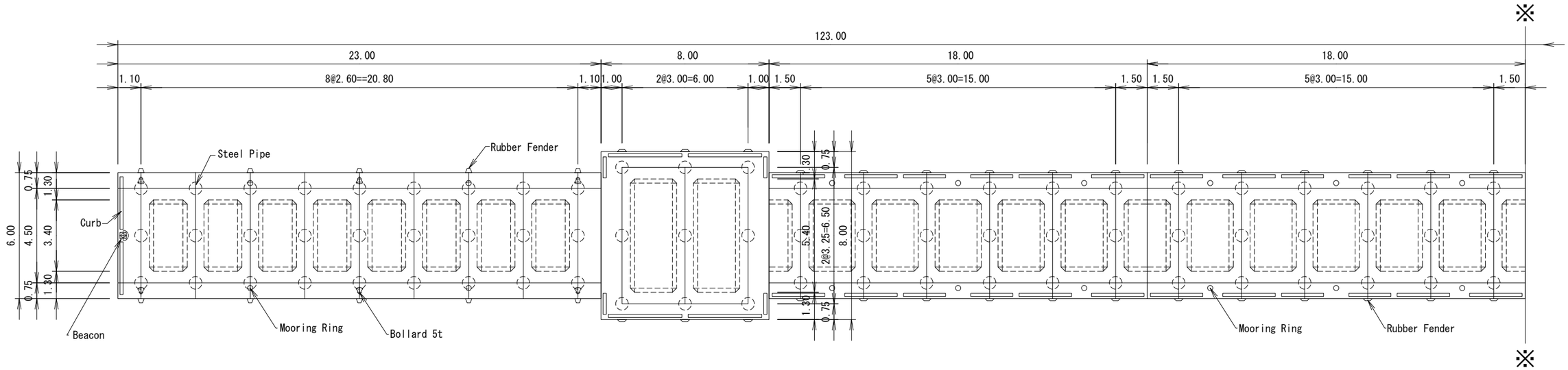

## SLIPWAY SIDE WALL

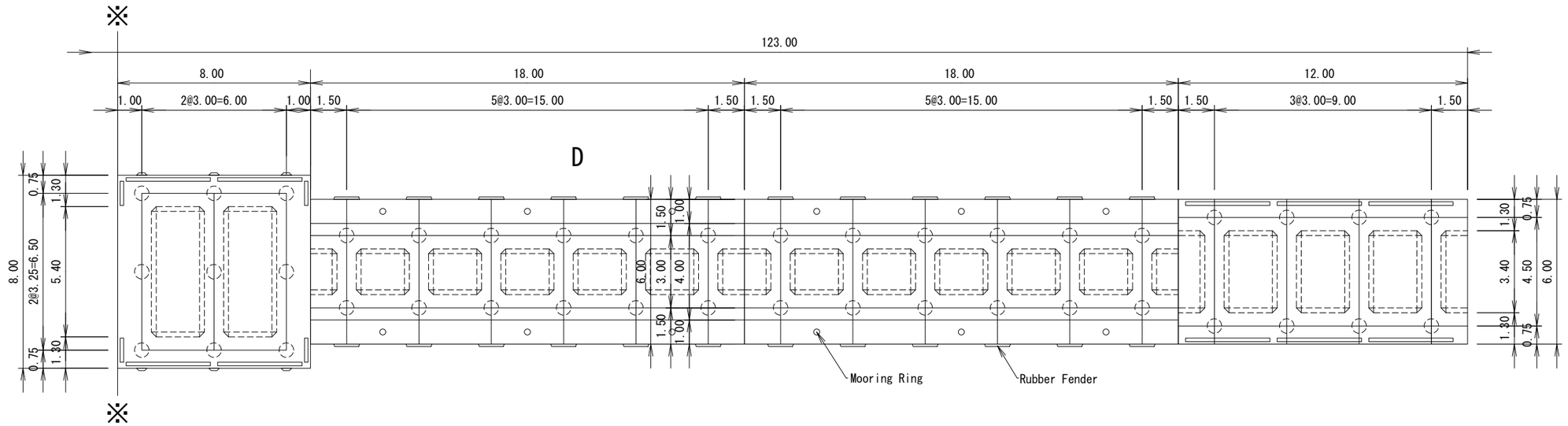



## FUEL STATION SIDE WALL
## B AREA SECTION




# C-6 SEA WALL SECTION (3)

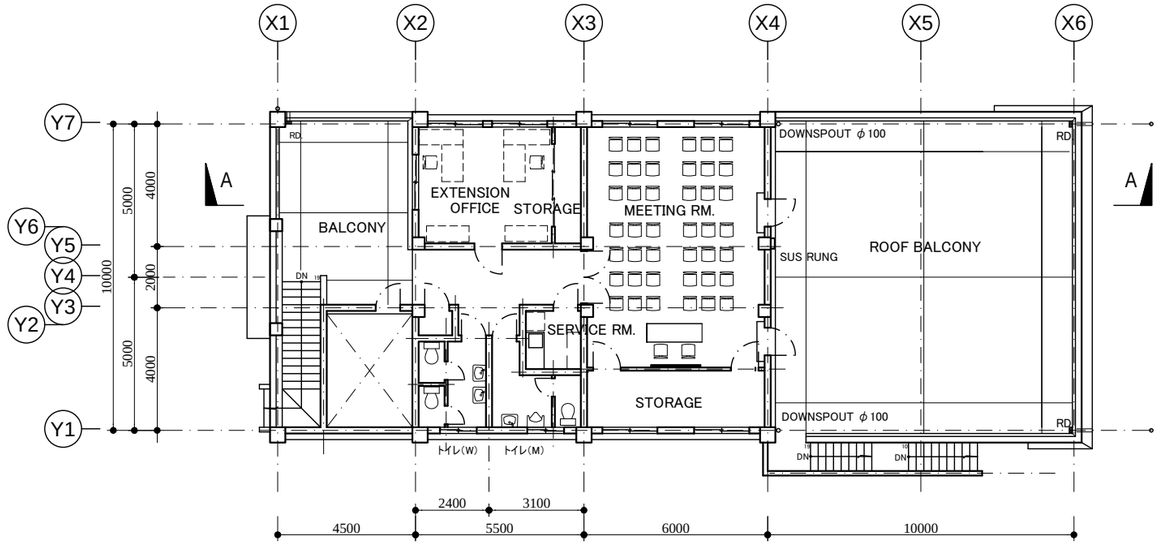


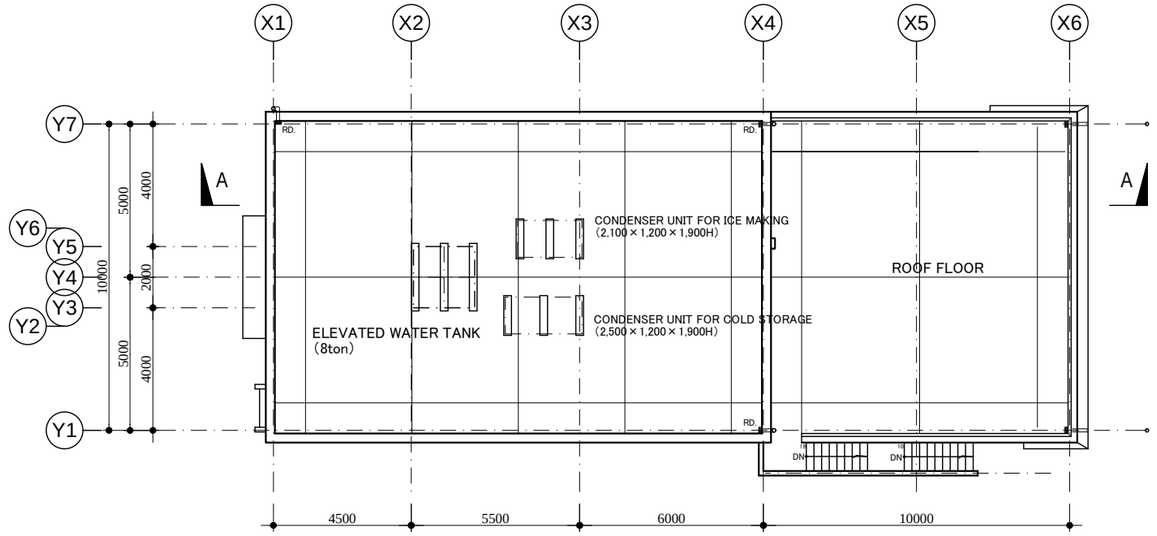

0 10 20 30m

1:200

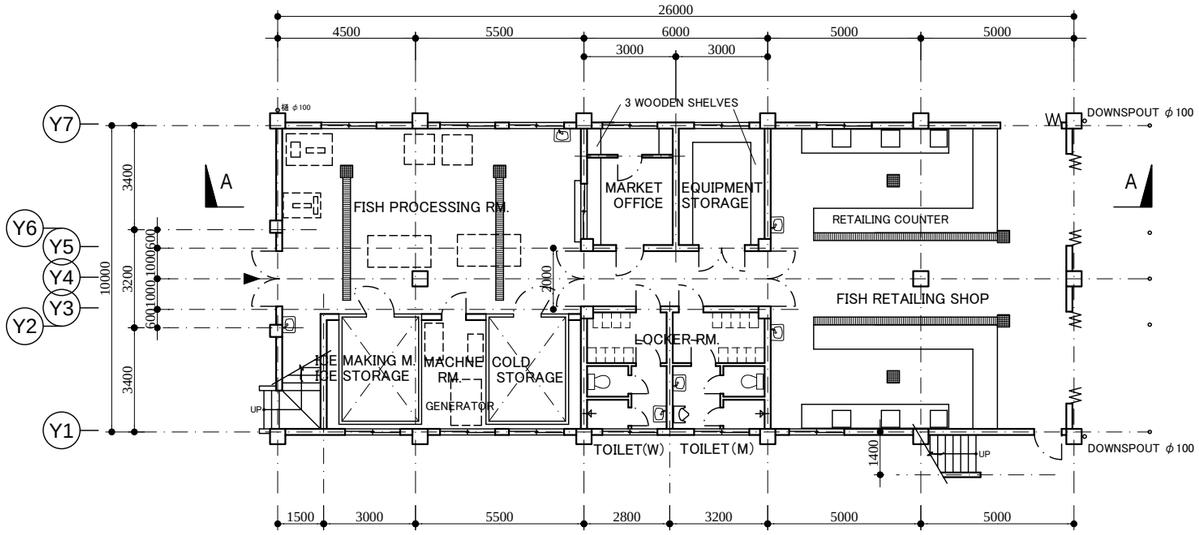
# C-7 FISH LANDING JETTY PLAN



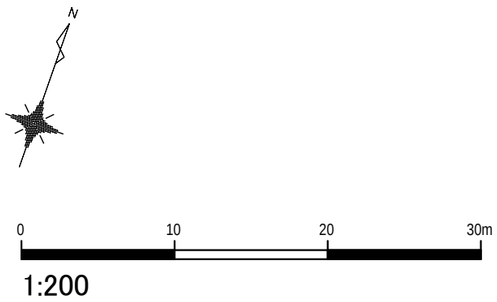

1st FLOOR PLAN S=1/200



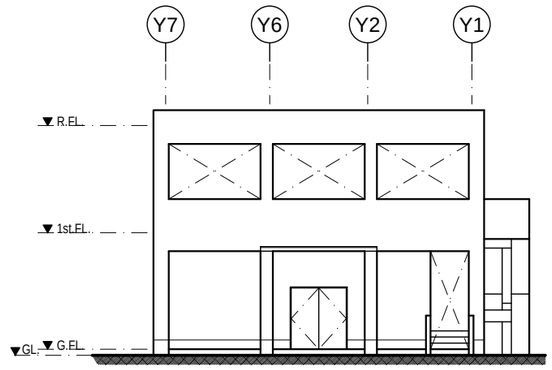

ROOF PLAN S=1/200



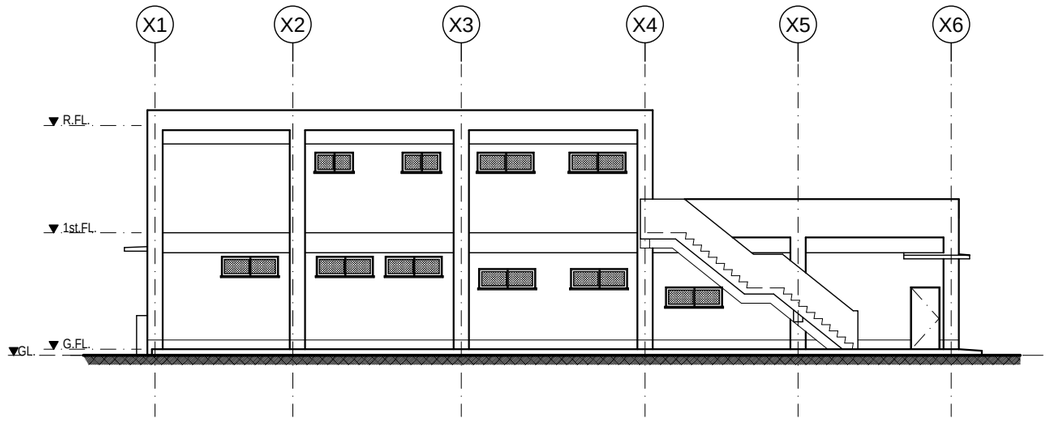

GROUND FLOOR PLAN S=1/200



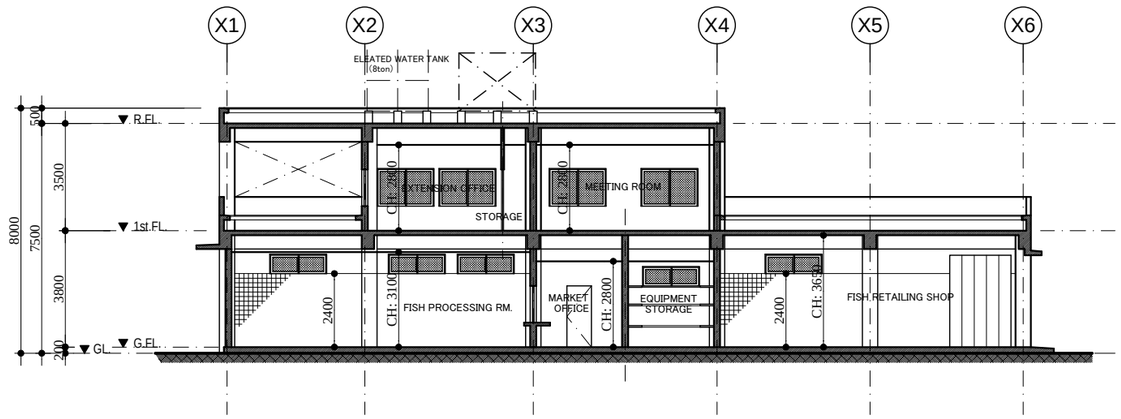

# A-1 FISHERIES CENTER BLDG.



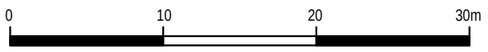

WEST ELEVATION S=1/200




SOUTH ELEVATION S=1/200




A-A SECTION S=1/200

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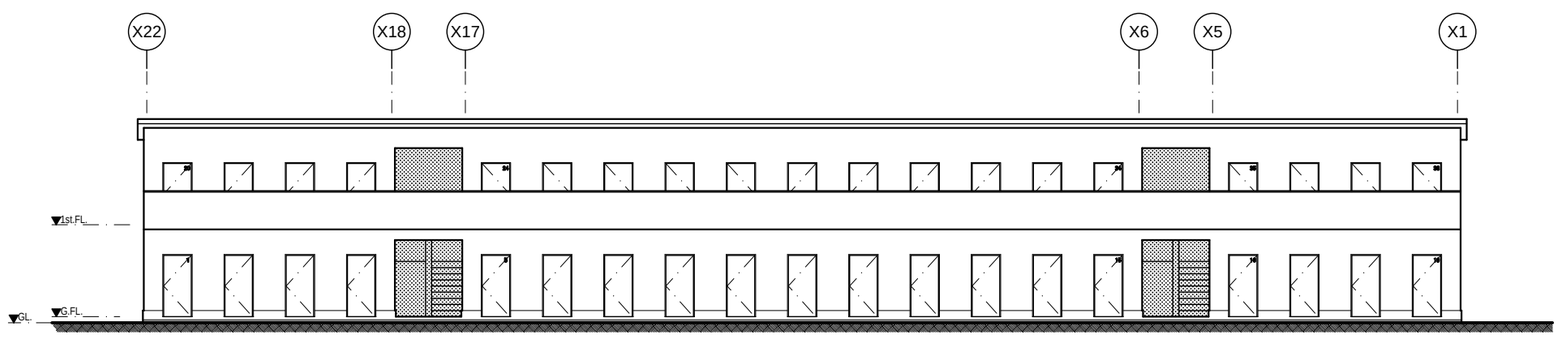
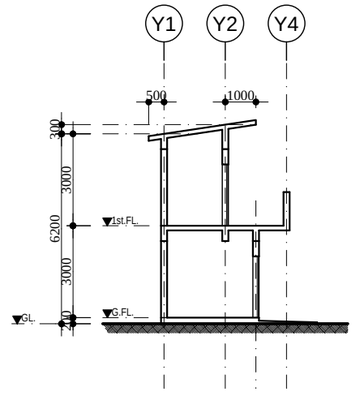
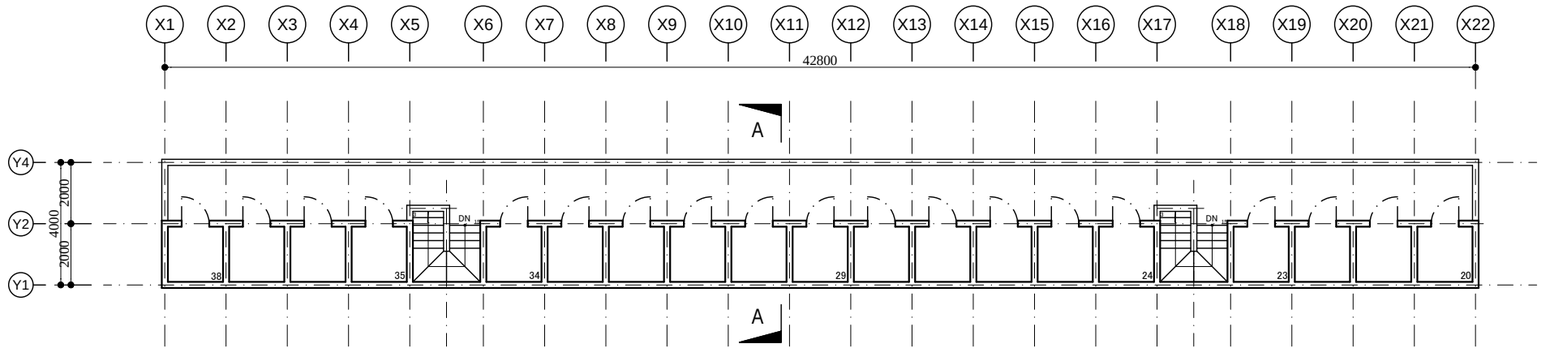
# A-2 FISHERIES CENTER BLDG. ELEVATION & SECTION



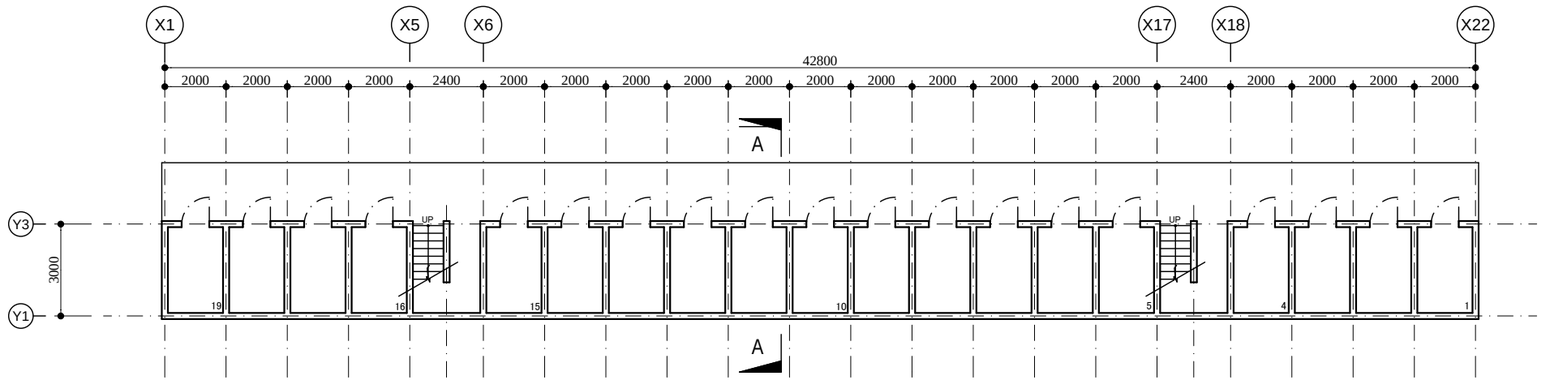

NORTH ELEVATION S=1/200



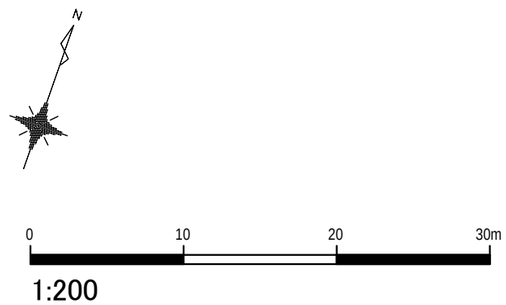

A-A SECTION S=1/200



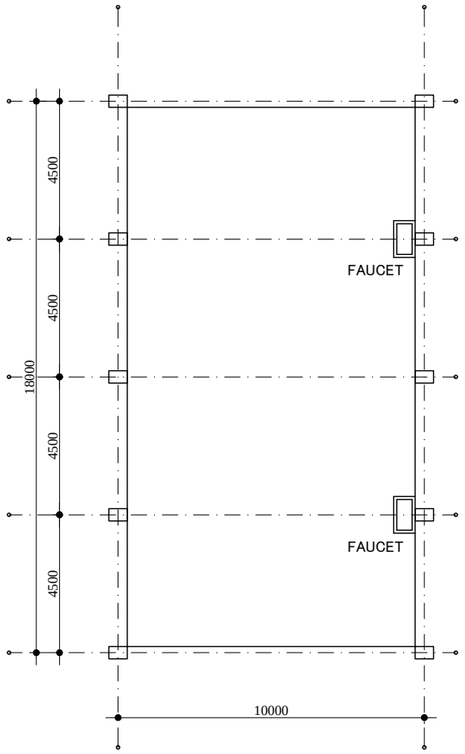

1st FLOOR PLAN S=1/200



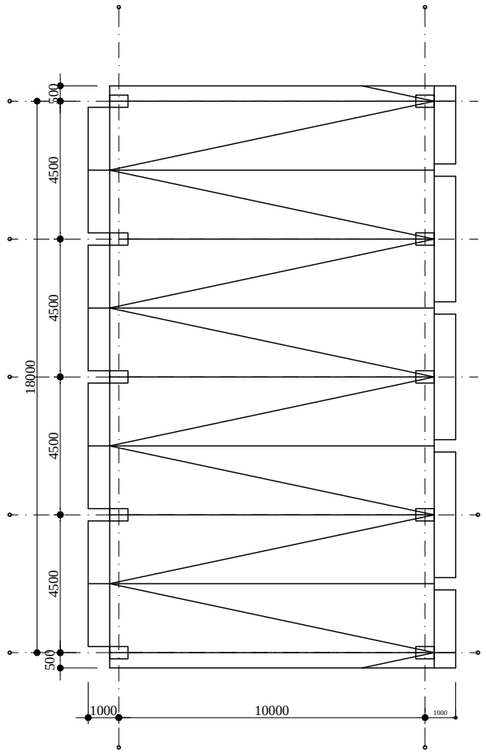

GROUND FLOOR PLAN S=1/200



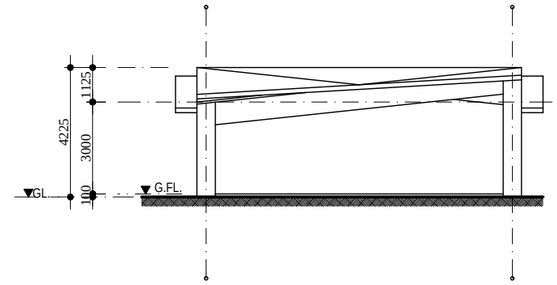

# A-3 FISHMEN'S LOCKER PLAN,ELEVATION & SECTION



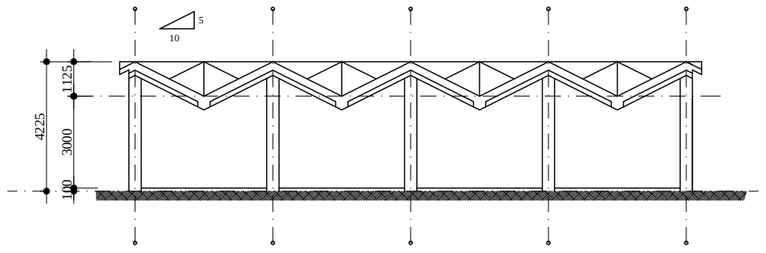

GROUND FLOOR PLAN S=1/200



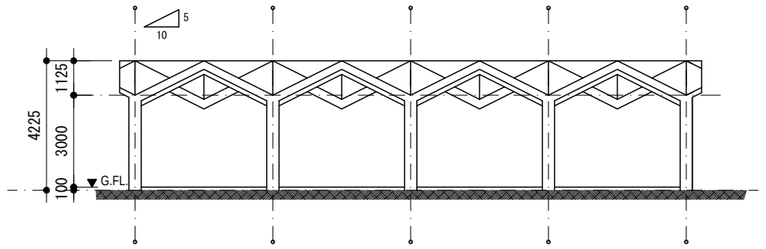

ROOF PLAN S=1/200



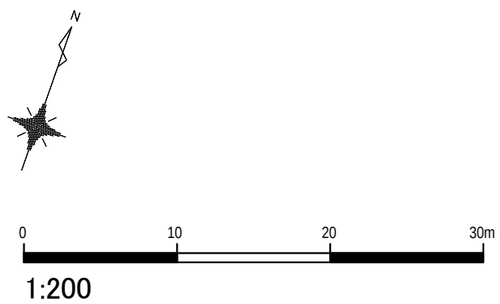

SOUTH ELEVATION S=1/100



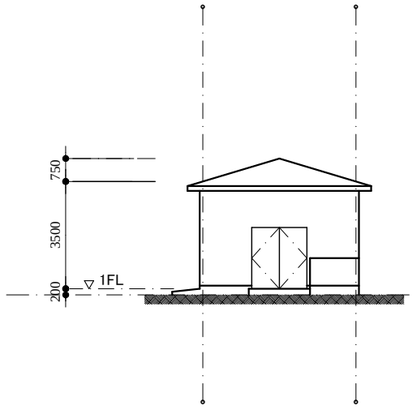

WEST ELEVATION S=1/200



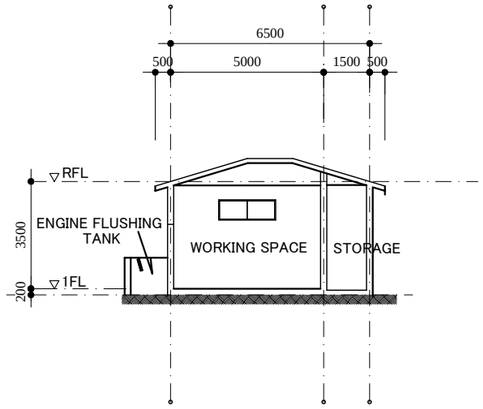

EAST ELEVATION S=1/200



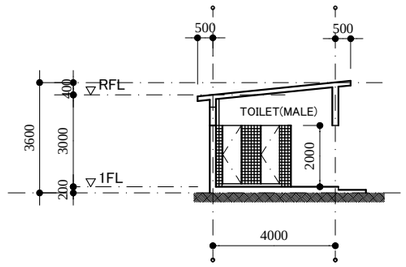

# A-4 REPAIR SHED PLAN & ELEVATION



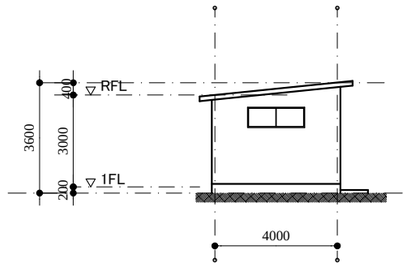

WEST ELEVATION S=1/200



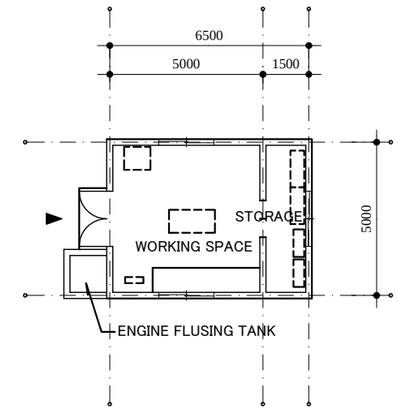

SECTION S=1/200



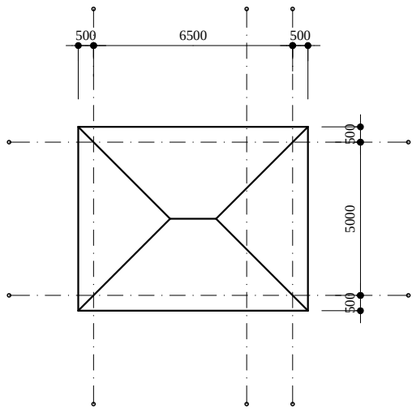

SECTION S=1/200



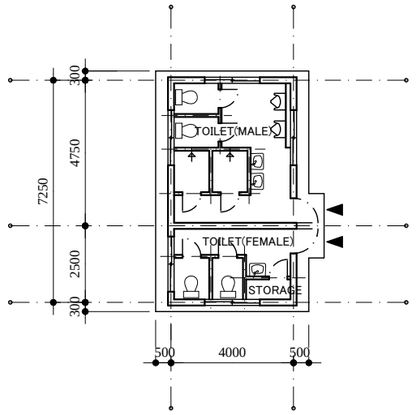

SOUTH ELEVATION S=1/200



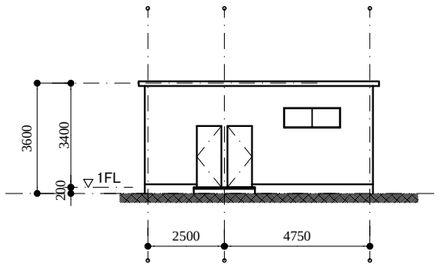

GROUND FLOOR PLAN S=1/200




ROOF PLAN S=1/200



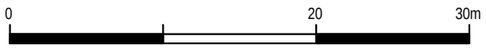

GROUND FLOOR PLAN S=1/200




EAST ELEVATION S=1/200


MECHANIC SHOP

TOILET & SHOWER BLDG.

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# A-5 MECHANICAL SHOP,TOILET & SHOWER BLDG. PLAN,ELEVATION & SECTION

## 2-2-4 Implementation Plan

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

(1) Implementation policy

（i ） Since this Project is to be implemented under the Japanese grant aid scheme, strict observance of a construction period will be a precondition. Therefore, an appropriate construction schedule plan will be prepared so that contractual conditions will be met within the term of the Exchange of Notes.

（ii） Dominica has a high-temperature and high-humidity climate with 2,000mm annual precipitation and it is expected that the country is hit by severe ocean waves when a hurricane attacks the region, which occurs every year. Therefore, the implementation plan shall be established paying attention to the country's natural conditions.

（iii） Dominica is an island nation and it has only a small-sized construction industry, which limits the procurement of construction materials, equipment, and of workers. In order to establish efficient plans, architectural structures and construction methods that can shorten the on-site work period shall be selected.

（iv） Currently, there is a vegetable market adjacent to the Project site. In implementing this Project, efforts shall be made not to interrupt commercial activities at the vegetable market and to ensure safety of people involved in the market activities during the construction period. Particularly, the implementation plan shall be established so that safety and a shorter construction period can be ensured.

（v） As the facilities in the plan are complex facilities and require construction work (Fisheries Center Bldg. Fishermen's locker etc.) and the civil engineering work (Fish landing jetty, Sea wall etc.) as well. The construction methods that enable sharing of equipment, materials and personnel between the two types of work shall be selected.

(2) Procurement policy

1）General construction materials are commercially available in Dominica. However, since the domestic markets for industrial products are not large in Dominica as an island nation, most of the construction materials commercially available in the country are imported from neighboring Caribbean countries, United State of America, Europe and South America. Therefore, due attention will be paid to domestic stocks and the period required for procurement of individual materials in the implementation plan.

2） Only limited types of equipment and materials can be procured in Portsmouth. Cement, sand and gravel will have to be transported by land within Dominica and other construction materials, such as steel pipe piles, roofing materials and fenders, will have to be procured from Japan or third countries. The marine transport service is the only means of regular transport available from Japan or third countries to Dominica, any unexpected incident may result in a longer interval between services. To avoid interruption of the work because of a shortage of construction materials at the site caused by a delay in transport, materials and equipment will have to be brought to the site as early as possible.

3） Materials containing asbestos will not be used as construction materials in this project.

(3) Policy on utilization of local contractors

As it is an island country, there are few contractors capable of implementing works over a certain scale in Dominica. Therefore, when implementing construction works over such a scale, companies from Japan and neighboring countries have been contracted to implement the works. Some of these foreign companies have branch offices in Dominica. With regard to laborers, though unskilled workers can be employed locally, engineers will have to be dispatched from Japan for the implementation of the pile work and superstructure work, which will be carried out as marine construction work. General skilled workers will be employed at Roseau or Portsmouth.

(4) Policy on operation/maintenance and management

This project does not include provision of machinery and systems which require sophisticated techniques. In planning power supply system, water supply and drainage facilities, simplified and effective design will have to be made, to avoid complicated operation, maintenance and management. This policy is necessary in order to meet the requirements of the maintenance and management program being designed by the Fisheries Division. Consideration will be given to maintenance and management of the equipment, including adoption of similar equipment as existing Fisheries Centers in order to maintain compatibility of parts and repair method.

Responsible Agency and Implementing Agency of this project in Dominica are as follows;

1） Responsible Agency

Ministry of Agriculture, Fisheries and Forestry

2） Implementing Agency

Fisheries Division, Ministry of Agriculture, Fisheries and Forestry

3） Operation and maintenance agency after hand over

Fisheries Division and Fisheries Cooperative(s) or fishermen’s group. The fishermen’s organizations, however, might vary depending on components.

### 2-2-4-2 Implementation Conditions

#### 2-2-4-2-1 General Conditions in Portsmouth

（i ） Contractors/distributors of imported construction materials

As the construction industry in Dominica is relatively small, large-scale construction work have been often implemented by the contractors in the neighboring Caribbean countries such as Trinidad and Tobago, Barbados. Although a few local companies may be employed as subcontractors in this construction work, they will be concentrated in the capital, Roseau. As the majority of the construction materials will be imported from neighboring countries, the majority of the suppliers of construction and other materials will also be located in Roseau. Therefore, there will be a need for the Japanese contractor in this plan to be involved in communication and coordination works in Roseau when he establishes himself at the site and during the implementation.

（ii） Imported materials and equipment

Materials and equipment required in this project are not produced in Portsmouth. Aggregate for concrete and construction blocks are manufactured around Roseau. Cement and reinforcement available in the country are imported from neighboring Caribbean countries and United States of America. Other construction materials, materials for the facilities, equipment and electric engineering materials are also imported from industrialized countries in the region and distributed in Dominica. The amount of these imported materials and equipment for distribution is not always sufficient. Therefore, implementation of this plan will require a detailed procurement plan and a system for close communication with the distributors of imported goods.

（iii） Safety control

The construction work in this project will take place in the existing urban area and near the existing vegetable market and landing site, which shall continue their activities during the construction work. As the existing vegetable market is the place for frequent visits by general users and vehicles, safety measures will be considered. Safety control measures for the safety of third parties will include clear demarcation of the construction area by appropriately erecting temporary fences, establishment of a separate access route for construction vehicles and appropriate posting of security guards during the construction.

#### 2-2-4-2-2 Implementation conditions

（i ） As activities at the existing vegetable market cannot be interrupted during the implementation period, public access to the market will be guaranteed in the site plan for a depot for construction materials and equipment and a transport route.

（ii） During this Project, it is expected that not only fishing boats but also leisure boats such as yachts and cruisers have often access to the sea area close to the construction site of the fish landing jetty throughout the year. The construction area shall be clearly indicated during the work period and safety measures shall be taken to ensure safety of these boats.

2-2-4-3 Scope of Works

Table 2-20 below shows the scope of work in the project.

Table 2-20: Scope of work of Japan and Dominica

| | Undertakings in construction, procedures and expenses | Japan | Dominica |
|---|---|---|---|
| 1. | Securing of construction site （including removal of wrecks, securing of site for a construction materials depot, an on-site office and temporary roads for construction） | | ○ |
| 2. | Planting and provision of furniture and general goods in the facilities after completion of the work | | ○ |
| 3. | Installation of power and water supplies to the site | | ○ |
| 4. | Application for and acquisition of all the approvals and permits in Dominica related to the Project （including authorization of building, use of power supply and water supply infrastructure and construction license, etc.） | | ○ |
| 5. | Consultancy services including detailed design, assistance in the tender process and work supervision | ○ | |
| 6. | Construction of the Fishing port infrastructure | ○ | |
| 7. | Construction of the On-shore fisheries infrastructure | ○ | |
| 8. | Import and customs-clearance for the materials and equipment required for implementation of the Project | | ○ |
| 9. | Banking Agreement （B/A） with a Japanese bank and bank commissions for it | | ○ |
| 10. | Provision for the Japanese personnel to enter and stay in the Dominica in relation with the implementation of the Project | | ○ |
| 11. | Appropriate and efficient operation and management of facilities and equipment provided under the Project | | ○ |
| 12. | Payment of or exemption from domestic taxes including value added tax imposed upon materials, equipment and services procured by the contractor of the Project in Dominica | | ○ |

2-2-4-4 Consultant Supervision

(1) Policy on consultant supervision

1） For trouble-free construction work, the consultant will always maintain close communication and hold due consultation with the relevant personnel on Dominica side from the stage of detailed design to the stage of procurement and implementation to achieve completion of the

construction of the facilities without delay in accordance with the implementation schedule.

2） For trouble-free progress of the implementation, the consultant will always maintain close communication with, hold due consultation with and provide appropriate advice and instructions to the relevant personnel on Dominica side and the contractor.

3） A supervisor specializing in civil engineering who will be resident locally at the site will play a central role in the consultant supervision system and Japanese engineers specializing in construction will be dispatched in a timely fashion for supervision.

(2) Detailed design work and selection of contractors

After conclusion of the exchange of notes on this plan between the governments of Japan and Dominica, a consultancy contract on detailed design and consultant supervision will be concluded between the implementing agency of this project, the Ministry of Agriculture, Fisheries and Forestry (MAFF), and the Japanese consultant and the following works will be implemented.

1） Detailed design work

On the basis of the results of the basic design survey, the consultant will conduct a detailed survey and detailed design of the facilities to be constructed and the equipment. The detailed design will include the following items:

- Design conditions and standards
- Design report
- Design documents
- Bill of quantities
- Implementation plan
- Bidding documents

2） Selection of contractors

After preparation of the detailed design documents for the construction work and procurement of equipment have been completed, MAFF will select a Japanese contractor who will undertake the works through tender with the assistance of the consultant. The consultant will assist MAFF in the following processes:

- Bid opening
- Pre-qualifications
- Explanation of bidding documents
- Opening of bids
- Bidding evaluation
- Contract negotiation

(3) Consultant supervision

The consultant's responsibilities in procurement and implementation supervision are as follows:

1) Cooperation in conclusion of procurement and construction contracts

The consultant will prepare bidding documents consisting of a draft of the assessment method of pre-qualification in the bidding and construction contract, technical specifications and design documents and a bill of quantities for the project costs. The consultant will assist tendering and contract procedures and provide an evaluation of and advice on selection of the contractors and contract conditions.

2) Instructions to contractors

The consultant will examine the implementation plan and provide the necessary instructions on the construction methods and work schedule in a timely fashion.

3) Examination and approval of working and shop drawings

The consultant will examine and approve working drawings, shop drawings, samples of materials and finish.

4) Construction supervision work

The consultant will verify the construction methods and control quality of the work through supervision by a resident engineer and short-term engineers in specific fields.

5) Witness to inspections

The consultant will conduct interim on-site inspections in a timely fashion while the work is in progress. After completion of the work, the consultant will conduct the completion inspection.

6) Report on progress of the work

The consultant will prepare reports on the progress of construction of the facilities, problems encountered, measures taken against the problems and the outcome of the measures taken, and submit the reports to the relevant government organizations of Dominica and JICA in Roseau and the Embassy of Japan in the Trinidad and Tobago.

7) Witness of handover

The consultant will witness submission of the handover documents at the time of work completion and handover.

8） Confirmation for payment approval

The consultant will provide cooperation in confirmation and approval of the amount of work done corresponding to the construction costs payable to the contractor in accordance with the contract, or completion of the work, and examination and processing of the payment documents.

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

(1) Main points in quality control relating to natural conditions

Sufficient attention will be paid to salt damage prevention and anti-corrosive measures for seaside structures that will be subjected to sea breezes and seawater spray. There will be a particular need to establish a system which enables on-site inspection of the salt concentration in the aggregate and mixing water, types of cement, concrete mix and quality and thickness of the concrete cover of the concrete for the structural skeleton. Heavy-duty coating will be applied to the part of the steel pipe piles exposed to seawater.

(2) Concrete work

The quality of the concrete will be maintained and controlled by conducting the following verification and tests and by preparing concrete strength control tables （including X-R control charts） for the respective mix proportions.

Table 2-21： List of concrete quality controls

| | |
|---|---|
| Cement | Verification of type, standard and performance |
| Admixture | Verification of test results |
| Mixing water | Content of detrimental materials |
| Aggregate | Verification of grading, specific gravity and water absorption<br>For fine aggregate, verification of chloride content |
| Trial mixing | Verification of slump, strength, mix proportion and quality |

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

(1) Policy on procurement

When procuring materials and equipment, their costs and quality will be thoroughly investigated and the costs of local procurement, procurement from Japan and procurement from third countries of materials and equipment of equivalent quality and availability will be compared. Those with the lowest costs will then be procured. Particularly for the materials and equipment locally available, their quality and availability will be thoroughly investigated.

(2) Procurement of major construction materials and equipment

Domestically produced and imported construction materials available in Dominica will be procured locally for this project so long as they satisfy the qualitative and quantitative requirements and are inexpensive. Although domestic products are limited to aggregate/sand, concrete blocks and wood, their quality and availability shall meet the demands of this project. A control system will be required at the time of manufacturing the pile materials. Inspection (of actual size/welding/tack-welding and paint) during manufacturing, in particular, will be closely connected to the quality guarantee. The period required for pile manufacturing will be a critical factor in determining the period of construction. For these reasons, procurement of pile materials from Japan is considered appropriate.

Equipment for the fuel station shall be procured in third country in consideration of availability and local standard.

Most of the facility materials are available locally as stocks of imported goods. However, in order to construct a reliable system, some of the electrical materials and equipment such as switchboards and distribution boards, which cannot be procured locally, will be procured from Japan, in consideration of both quality and costs.

Table 2-22 below shows the procurement sources of major construction materials and equipment to be used in this project.

Table 2-22: Procurement sources of major construction materials and equipment

| | Major construction materials | From Japan | Locally*1 | From third country | Remarks |
|---|---|---|---|---|---|
| 1 | Cement | | ○ | | General Portland cement can be procured locally. Since blast furnace cement is not procurable locally, however, it shall be procured in Japan in view of quality. |
| 2 | Aggregate for concrete | | ○ | | Inexpensively procurable locally |
| 3 | Concrete blocks | | ○ | | 〃 |
| 4 | Form materials | | ○ | | 〃 |
| 5 | Reinforcement | ○ | | | |
| 6 | Pile materials | ○ | | | |
| 7 | Fenders | ○ | | | |
| 8 | Wood and plywood | | ○ | | Inexpensively procurable locally |
| 9 | Fittings and fixtures | | ○ | | 〃 |
| 10 | Electric wire and light fixtures | | ○ | | 〃 |
| 11 | Facilities and materials for water supply, sewerage and hygiene systems | | ○ | | 〃 |
| 12 | PVC pipes | | ○ | | 〃 |
| 13 | Pumps and valves | ○ | | | |

| | Major construction materials | From Japan | Locally*1 | From third country | Remarks |
|---|---|---|---|---|---|
| 14 | Switchboards and distribution boards | ○ | | | |
| 15 | Fuel tanks, dispensers and extension hose | | | ○ | To be procured from third country (U.S) in consideration of availability and local code. |

*1） Items produced locally and imported goods readily available for local procurement

(3) Major construction machinery

The construction machinery required for this project includes machinery for marine construction （for the jetty construction） and machinery for construction on land （for the Fishery Center building construction）.

The construction machinery required for the land facilities includes excavators for the foundation work, mixer for the reinforced concrete work and dump trucks for the transport of materials. As construction companies located in Roseau own and maintain/manage these types of construction machinery, they will be able to be used in the project. However, as local procurement of pile drivers, barges for offshore construction, crawler cranes would take a long time, they will have to be procured from Japan or the third countries including neighboring Caribbean countries.

(4) Procurement plan for equipment

In this Project, equipment hall be procured but such equipment shall not require sophisticated techniques to handle. The equipment shall be easily operated and maintained in Dominica. Equipment to be procured and countries from where the equipment shall be procured are indicated in Table 2-23 below. Insulated ice boxes and scales manufactured in third countries shall be procured in Dominica and other equipment and tools shall be manufactured and procured in Japan.

Table 2-23： Source countries of the equipment to be procured

| | Equipment | Japan | Dominica | Third countries | Remarks |
|---|---|---|---|---|---|
| 1 | Insulation ice box | | | ○ | Inexpensive<br>To be procured from Trinidad and Tobago. |
| 2 | Fish trays | ○ | | | |
| 3 | Scale for weighing | ○ | | ○ | Marketability<br>To be procured from U.S.. |
| 4 | Tools for mechanic shop | ○ | | | |
| 5 | Equipment for fish processing room | ○ | | | |
| 6 | Plastic buoys and concrete anchors | ○ | | | |

(5) Transport plan

The items among the materials and equipment required for the project that are to be procured from Japan are the pile materials. The ordinary transport service route runs from Japan to the Port of Roseau or Portsmouth via United States of America. Domestic land transport connects the Port of Roseau and Portsmouth（approximately 40 km）. It takes approximately two and half or three months to transport goods from Japan to the Port of Roseau.

2-2-4-7 Implementation Schedule

The Project will require a period of 3.5 months from the field study to the detailed design and tender documentation approval works, and 2.5 months of tender-related works including the tender announcement and the tender execution. The total work execution period will require 16 months (including 15 months in the Dominica) from the award contracts with contractors and the preparation of construction works to the completion of the construction work and roughly 6.5 months for the procurement and transportation of equipment.

Figure 2-31 shows the table of work execution schedules.

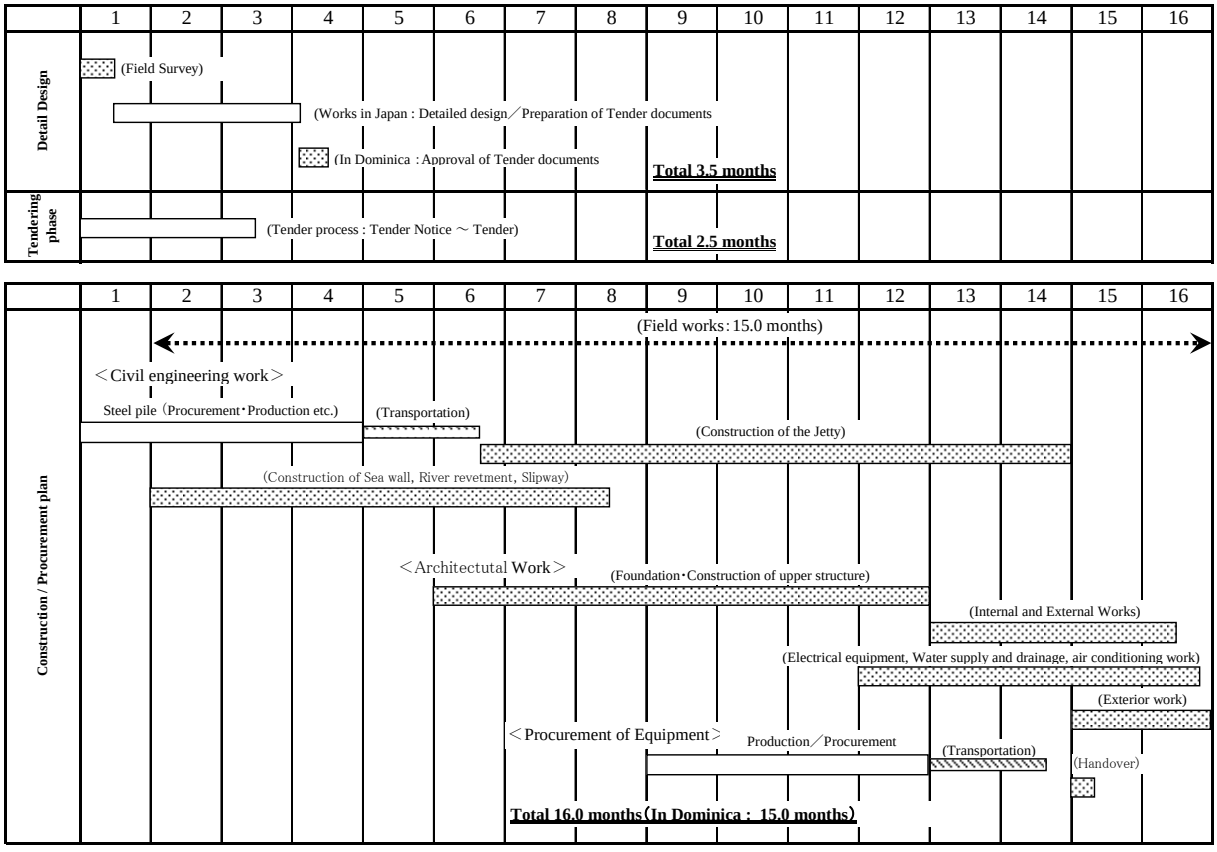


Figure 2-31： Implementation schedule

## 2-3 Obligations of the Recipient Country

In implementing this Project, Dominica side will be required to fulfill obligations as listed below during a prescribed period.

(1) Securing of the premises

A piece of leveled land for the facility construction planned for the Project shall be prepared by the Government of Dominica.

(2) Removal of existing facilities and ground leveling at the Project site

- Removal of existing Fishermen's lockers from the Project site
- Removal of existing walls and buildings at the Project site (former land for the Social Security board)
- Removal of wrecks from the site where the jetty will be constructed
- Removal of trees and the like at the Project site

(3) Procurement of a site to construct temporary roads and removal of existing facilities

- Relocation of existing private houses
- Removal of barge debris

(4) Preparation of Furniture and fixtures

Furniture and fixtures such as desks, chairs, tables, bookshelves and lockers to be installed in the meeting room, office rooms and locker rooms shall be provided by the Government of Dominica.

(5) Securing of sites for temporary use for construction

The Government of Dominica shall secure sites for temporary use during the construction.

(6) Introduction of water supply, electricity and telephone line

The 8-inch water pipes laid in Bay Street shall be connected to the water mains. The electric power line shall branch from the power grid line alongside Bay Street and be routed to the planned project site. The telephone line shall come from the telephone line alongside Bay Street. Water supply, Electricity and telephone line and shall be introduced into the construction site in a timely manner at the cost of the Dominica side, but not later than the commencement of the mechanical and electric works for the Project.

(7) Acquiring all construction and other necessary permits, as required for Project implementation

All applications for authorizations related to construction works for the facilities in this Project such as permission for use of electric power, water supply system, construction permit, etc.

shall be carried out by the Dominica side and the necessary authorizations must be obtained prior to the commencement of the construction works.

（8） Exemption from any duties, taxes or levies imposed upon any equipment or materials to be imported to Dominica in conjunction with the Project and prompt customs clearance thereof.

（9） Exemption from the value added tax, and other domestic taxes
Any domestic tax such as value added tax on the payment of material, equipment and services to be procured by the contractor(s) under the Project shall be exempted or borne by the Dominica side.

（10） Issuance of authorizations to pay, based on Banking Arrangement (B/A) with a Japanese bank with respect to payments provided for in the contract(s) for the Project, and to bear commissions to the Japanese bank.

（11） Exemption of taxes or surcharges to be imposed on Japanese nationals regarding the supply of services in relation to this project in Dominica.

（12） All other items required for the implementation of the Project not specifically included in the undertakings by the Government of Japan.

## 2-4 Project Operation Plan

### 2-4-1 Operation and maintenance agencies and operation plan

The operation and maintenance of the Portsmouth Fisheries Center will be under the joint responsibility by the Fisheries Division and fisherman’s organizations through appropriate screening procedures by Fisheries Division.

The components of this Project will consist of a Fisheries Center building, a fish landing jetty, a slipway, a repair shed, a Fishermen’s locker, a mechanic shop, a fuel station, a toilet/shower building and boat berthing equipment. As the owner of these facilities, the Fisheries Division will be responsible for taking general control and coordination of the entire Center, as well as supervising maintenance work of the facilities and equipment.

After handover of these facilities, lease contracts for use of these facilities will be entered into between the Fisheries Division and fisherman’s organizations through appropriate screening procedures by Fisheries Division.

The fisherman’s organization(s) will provide service to the users of each facility under the lease

contract and obtain the service fees. Such organization will also be responsible for the maintenance of each facility and equipment and will also operate the facility by taking responsibility for the daily management including cleaning, disposal of remnants, security and observance of rules.
The facilities to which this operation system will be applied will be the fish retailing outlets counters, the ice making machine and ice storage, the mechanic shop, and the fuel station in the Portsmouth Fisheries Center.

The Fishermen's locker will be operated independently by the fishermen's groups using these lockers by organizing an administration body that will enter into a facility usage agreement with the Fisheries Division. The administration body will take full responsibility for the operation of the facility including collection of rental fees and maintenance of the lockers. The same operation system has been adopted in Roseau Fisheries Center.

### 2-4-2 Operation & Maintenance System

The Fisheries Division as the owner of the Portsmouth Fisheries Center will take responsibility for general control and coordination of the entire Center including the Fisheries Center building, fish landing jetty, slipway, repair shed, related equipment, Fishermen's lockers, mechanic shop, fuel station and toilet/shower building, and also undertaking supervision for maintenance of the facilities and equipment.

For the maintenance of the cold storage and ice making machine, maintenance personnel are provided in the existing Fisheries Centers at Roseau and Marigot and no specific problems have been emerged. In this Project, one maintenance personnel will be assigned to carry out the maintenance of those facilities.

The organizational chart of the operation and maintenance system is shown in Figure 2-32.

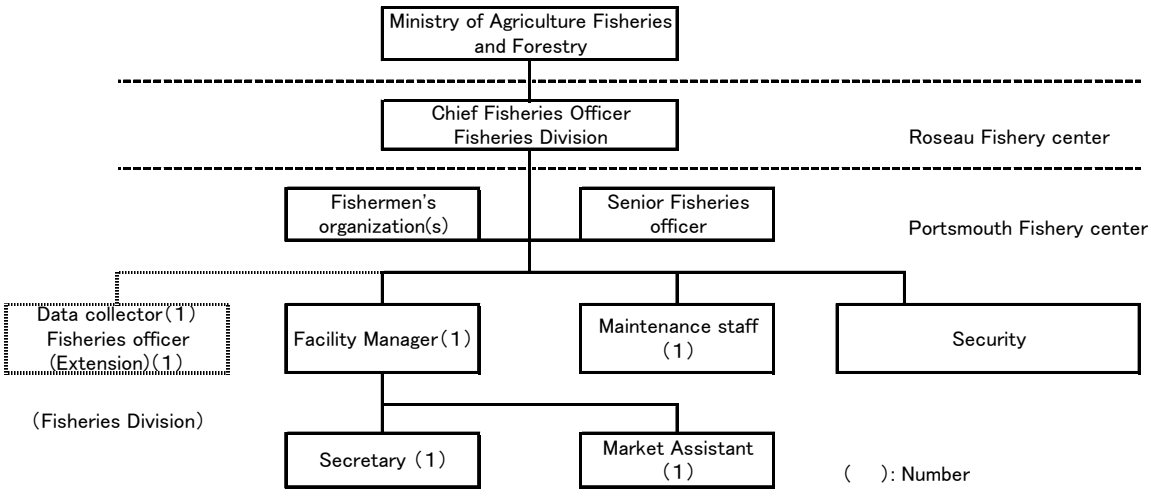


Figure 2-32: Organizational chart of operation and maintenance

## 2-5 Project Cost Estimation

### 2-5-1 Initial Cost Estimation

The cost required to implement this project of which Dominica shall be borne is calculated as EC$ 62,800. The breakdown of the costs according to the demarcation of the works between the two countries as described before is estimated as follows, based on the calculation parameters given in (2) later. However, this cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

(1) Cost to be borne by Dominica

64,700 EC$（approx. 2.57 million yen）

In implementing this Project under Japanese grant aid cooperation, the expenses that Dominica will share are as follows:

| | |
|---|---|
| Furniture and fixtures | EC$30,000（approx.1.2 million yen） |
| Water supply piping work and Power lead-in work cost | EC$32,800（approx.1.3 million yen） |
| Charges for the banking arrangement | EC$ 1,900（approx.0.07 million yen） |
| Total | EC$64,700（approx.2.57 million yen） |

(2) Calculation parameters

| | | |
|---|---|---|
| 1） | Time of calculation | August 2008 |
| 2） | Exchange rate | 1.00 US$ = 105.81 yen<br>1.00 EC$ = 39.36 yen |
| 3） | Implementation period | Implementation period for detailed design, construction and procurement are as proposed in the implementation schedule shown in Figure 2-31. |
| 4） | Others | This project shall be carried out under Japan’s grant-aid assistance scheme. |

### 2-5-2 Operation and Maintenance Cost

The Portsmouth Fisheries Center is planned to be operated on the self-supporting basis in which the cost for operation and maintenance of the Center can be met by revenue from collecting service fees for fish landing, berthing, fish vending, fish clean and cut, cold/chilled room charges, ice sales, mechanic shop, Fishermen’s locker rents and meeting room rents. The estimated operation revenue and expenditure of the Portsmouth Fisheries Center and the yearly revenue/expenditure plan based on the Fisheries Division operation plan will be described below.

The unit price (*1) used in the operation plan prepared by the Fisheries Division is applied for calculation.

### 2-5-2-1 Operation Revenue and expenditure

(1) Revenue

The fishermen who want to use the facilities of the Portsmouth Fisheries Center including the jetty will have to pay the berthing fees and the fish landing charges depending upon their catch of fish to the facility manager.

The fish landing charge is EC$0.25*1 for one pound of fish catch and the yearly income from fish landing charges in Portsmouth is estimated to be EC$44,444 based on 80 tons, or the volume after reducing the self-consumed portion of 20% (by adoption of the highest percentage of the results of questionnaire survey) from the total landed quantity per year of 100 tons.

80,000kg/year÷0.45kg （per pound）×EC$0.25/pound = EC$44,444/year

It was decided that the berthing fee would be EC$25 per boat per month for fishing boats less than 25 feet in length and EC$40 per boat per month for fishing boats over 25 feet in length. As there are 55 small and 14 large boats registered, annual revenues from berthing fees are calculated to total EC$23,220.

55 boats x EC$25 /boat/month x12 months = EC$16,500 /year
14 boats x EC$40 /boat/month x12 months = EC$ 6,720 /year

The fish vender fees will be collected from the retailers using the fish retailing outlets counters in the Center at the rate of EC$10.0 per day*1.

The total fish vender fees per year is estimated on the basis of 10 counters used per day and 25 business days per month:

10 counters×25 days/month×12 months×EC$10.0/counter/day = EC$30,000/year

The cold/chilled room charges will be collected from the retailers and fishermen using the cold storage in the Center at the rate of EC$0.12 per pound *1. The fish to be stored is large fish such as tuna and Marlin, and approximately 42 tons per year is to be stored with the storage period of 3 days.

The total of cold/chilled room charges per year is estimated:

42,000kg/year÷0.45kg （per pound）×3 days×EC$0.12/pound = EC$33,600/year

Fees from ice sales will be collected from retailers, fishermen using ice for distribution and owners of large fishing boats using ice for fishing operation and distribution. The total landed volume was 260 tons (2007) in 10 fish landing sites including Portsmouth, and after reducing the self-consumed portion of 20%, 208 tons of catch will use ice, of which 13 tons were landed by large fishing boats.

Ice will be used at the ice/fish rate of 0.5/1 fish for distribution and fishing operation, and the ice sales price is estimated to be EC$0.23/pound *1.

The yearly ice sales amount for distribution is estimated:
208,000kg/year÷0.45 （per pound）×0.5 （ice ratio）×EC$0.23/pound = EC$53,156.

The yearly ice sales amount for fishing operation of large fishing boats is estimated:
13,000kg/year÷0.45×0.5 (ice ratio) ×EC$0.23/pound = EC$3,322.

Thus, the yearly total of ice sales is estimated to be EC$56,478.

The consumers will pay fish cleaner fees who want purchased fish de-scaled and gutted and cutting it to appropriate sizes. The fish cleaner fees is 1.0EC$ per pound, and each cleaner will pay the Center Manager the amount of EC$10.0/person/day*1 to use the facility.

One cleaner will be attending two retailing outlets counters, and the number of cleaners is estimated at:
10 counters ÷2 (retailing outlets counters) = 5 cleaners/day

The yearly total of fish cleaner fees is: 5 cleaners × 25 days/month×12 months×EC$10.0 = EC$15,000

The Fishermen’s locker rental fees are estimated to be EC$10/month for fishermen and EC$20/month for public. The locker of size L (6 m2) is rented at EC$12.0/month and that of size S (4 m2) at EC$8.0/month. The total yearly income is estimated to be EC$4,560.

Size L: EC$12.0/month×19 lockers×12 months = EC$2,736/year
Size S: EC$/ 8.0/month×19 lockers×12 months = EC$1,824/year

The operation of the mechanic shop will be entrusted to a private operator who will pay the rent. The yearly rent for the mechanic shop is estimated as follows:

EC$300/month *1×12 months = EC$3,600/year.

The meeting room will be rented at EC$174*1 per use. The frequency of use is assumed to be 3 times per month. The total income per year from the meeting room is estimated to be EC$6,264.

EC$174/use×3 times×12 months = EC$6,264/year.

The fuel charge is assumed to be 1.5% of the gasoline or diesel oil price.

The gasoline supply quantity is estimated as follows.

20 liters×4 cases×14 boats （operating boats/day in average）×25 days/month×12 months＝336,000 liters÷3.8 （gallon）＝88,421 gallons/year×EC$10.20/gallon×1.5% = EC$13,528

The diesel oil supply charge is estimated as follows.
1,000 liters×3.5 boats（operating boats per week on average）×52 weeks = 182,000 liters÷3.8（gallon） = 47,895 gallons/year×EC$10.00/gallon×1.5% = EC$7,184

The total fuel charge is estimated: EC$13,528＋EC$7,184 = EC$20,712.

Thus, the total yearly income is estimated to be EC$237,878.

(2) Expenditure

The personnel cost in this Project is estimated to be EC$78,000 per year. The cost is calculated by reviewing the personnel cost in the existing fisheries centers.

- Facility manager （one person） EC$2,000/month
- Market assistant （one person） EC$1,600/month
- Secretary （one person） EC$1,300/month
- Maintenance staff （one person） EC$1,600/month

The yearly personnel cost is estimated:
EC$ (2,000+1,600+1,300+1,600)×12 months = EC$78,000/year

The yearly cost for security is estimated at EC$26,400, when contracted out to a security service company: EC$2,200/month*1×12 months = EC$26,400/year

The electricity charge is estimated to be EC$56,867 per year including the power charges for the ice-making machine, the cold storage and the lighting equipment in the Center, and the charge will be shared by the Fisheries Division and the Center at a rate of 1:9, thus, the amount of EC$51,181 will be borne by the Center.

The yearly total of water charges is estimated assuming that water available from the public water service will be used. The yearly water consumption charge from the public water service is estimated to be EC$4,063, which will be shared by the Fisheries Division and the Center at the ratio of 1 : 9, thus, the amount of EC$3,657 will be borne by the Center.

The maintenance fee is estimated to be EC$2,800/year*1 for electric bulb change and simple repair of the facilities. The incidental expenses/others including marketing/promotion fee, telephone charges, expenses of consumable items and training fee is estimated to be EC$25,000 per year. The depreciation reserve for the ice making machine and cold storage is estimated to be EC$46,200/year using the 13-year straight line depreciation method (10 million yen for ice making machine + 14 million yen for cold storage equipment =24 million ≒ EC$600,000×0.077 = EC$46,200/year).

Thus, the yearly total expenditure will amount to EC$233,238.

(3) Annual Operating Budget of Portsmouth Fishery Center

An estimated annual profit of 4,640 EC$ is expected, which can maintain sustainable operations and management of Portsmouth Fisheries Center.

Table 2-24 shows the Annual income and expenditure of Portsmouth Fisheries Center.

Table 2-24: Annual income and expenditure of Portsmouth Fisheries Center

| INCOME | | |
|---|---|---|
| Item | Breakdown | Amount (EC$) |
| Fish landing charge | 80,000kg/year(Annual fish landing excluding self-consumption) ÷0.45kg×EC$0.25/lbs | 44,444 |
| Berthing fee | Small fishing boat under 25 feet<br>55 boats×25EC$ /boat×12months＝16,500<br>Large fishing boat over 25 feet<br>14 boats×40EC$ /boat×12months＝6,720 | 23,220 |
| Fish venders fee | 10 counters×25 days/month×12 Months×EC$10.0/counter/day | 30,000 |
| Cold /chilled room charge | 42,000kg/year÷0.45kg×3 days×EC$0.12/lbs | 33,600 |
| Ice sales<br>Ice for distribution<br>Ice for large fishing boats | <br>208,000kg/year÷0.45kg×0.5（ice ratio）×EC$0.23/lbs<br>13,000kg/year÷0.45kg×0.5（ice ratio）×EC$0.23/lbs | <br>53,156<br>3,322 |
| Fish cleaners fee | 5persons×25day×12 Months ×EC$10.0 | 15,000 |
| Fishermen's locker rent<br>Locker（Large）<br>Locker（Small） | <br>EC$12/Month×19 lockers×12 Months<br>EC$ 8/Month×19 lockers×12 Months | <br>2,736<br>1,824 |
| Mechanic shop rent | EC$300/Month×12 Months | 3,600 |
| Meeting room charge | EC$174/use××3 times /month12 Months | 6,264 |
| Fuel charge<br>Gasoline<br>Diesel | <br>20lt×4 cases×14 boats×25days/month×12Months÷3.8 ×EC$10.20/gl×1.5％<br>1,000lt×3.5boats/week×52weeks÷3.8×EC$10.00/gl×1.5％ | <br>13,528<br>7,184 |
| **Total income** | | **237,878** |
| EXPENDITURE | | |
| Item | Breakdown | Amount (EC$) |
| Salary/wages | 1 person×EC$2,000/月×12 Months（Manager）<br>1 person×EC$1,600/月×12 Months（Market Assistant）<br>1 person×EC$1,300/月×12 Months（Secretary）<br>1 person×EC$ 1,600/月×12 Months（Maintenance staff） | 24,000<br>19,200<br>15,600<br>19,200 |
| Security | EC$2,200/month×12 Months | 26,400 |
| Electricity | （EC$194＋7,180 kWh×EC$0.633/kWh）×12 Months×90％ | 51,181 |
| Water | （EC$20＋27,000gl×EC$0.0118/gl）×12 Months×90％ | 3,657 |
| Maintenance fee | EC$2,800/year | 2,800 |
| Incidental expenses / others | Marketing/promotion, Telephone charge, Consumerable items, Training etc. | 25,000 |
| Depreciation Reserve | | 46,200 |
| **Total expenditure** | | **233,238** |
| **Annual Profit** | | **4,640** |

## 2-6 Other Relevant Issues

### (1) Removal of existing facilities at the Project site, ground levelling and removal of wrecks

Existing walls and structures on the Project site (the former land of Social Security board), such as

the present fishermen's lockers, a wreck (steel ship, approximately 20m long x 3m wide) at 3 metres depth where the landing jetty is to be constructed (approximately 100m from the shore) and a stranded ship in the area of the planned jetty mounting must be removed as soon as possible. In particular it is essential that the wrecks be removed before the construction of fish landing jetty starts. The Dominican side has promised to remove the wrecks and it has been confirmed that urgent procedures for its removal are in progress during Draft Basic Design study. The landing jetty is the most important construction component in this Project, and if the construction does not start as scheduled, this could have a negative impact on the entire construction process. Therefore, it is hoped that removal of the wrecks will be completed at the earliest opportunity.

(2) Reservation of temporary site

The Project site comprises the former land of the Social Security board and an area to the west of the existing vegetable market. These two pieces of land are both cramped and, except for the land to be used for the planned structures, there is virtually no spare ground. Therefore, the Dominican side should reserve a temporary yard in the neighbourhood of the site that can be used to store piles and other construction materials and where a temporary field office can be erected.

(3) Transmission of warnings and other safety-related information to users of existing facilities during the construction period

As the vegetable market cannot be closed during the construction period, the storage areas for construction materials and routes for the transportation of these materials shall not obstruct the access to the vegetable market. In addition, in the sea area in front of the Project site, not only fishing boats but also pleasure craft such as yachts and cruisers may frequently come close to the offshore jetty construction area, and the safety of these craft must be ensured during the construction period through clear indication of the construction area. To this end, the Dominican side should be exhaustive in giving warnings and other safety-related information to users of nearby facilities and operators of local boats, informing them of off-limit areas in the construction site and implementing traffic control as necessary when construction vessels and vehicles are coming and going.

# CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

## 3-1 Project Effect

| Present situation, and problems | Measures taken in the Japanese Assistance | Direct effects, extent of improvement | Indirect effects, extent of improvement |
|---|---|---|---|
| As there is no jetty facility to berth in Portsmouth, large fishing vessels have to transfer the catch to smaller boats at sea and small fishing boats must be beached to land their catch. Fishermen are force to sell fish on the boat or on the beach under the sun. They have problems with efficiency and safety in fish landing as well as hygienic way of selling of fish. | Construction of a fish landing jetty | The provision of a jetty will enable large fishing vessels to moor and land their catches directly without the use of barges, giving fishermen greater convenience and safety. The time needed to land the catch will be shortened from the averaged 150 minutes at present to 50 minutes, a saving of approximately 100 minutes.<br>Small fishing boats will also be able to land their catches more hygienically at the jetty than on the beach. | 1) Increased landings can be expected to produce an increase in the fishermen's income.<br><br>2) More effective use of the catch and an increase of the catch volume will bring about an increase in distribution quantity of fresh fish, which will contribute to the replacement of imported meats with domestic seafood.<br><br>3) The implementation of the Project will bring benefits to as many as 13,000 residents of the area around Portsmouth (St. John District, St. Peter District and St. Joseph District), including the fishermen who use the landing sites covered by the Project. |
| Keeping the landed fish being stored in an appropriate state are difficult due to the lack of ice-making and cold storage facilities at Portsmouth, the distribution center of area. Fish have to be sold at a reduced price or even discarded, making post-harvest loss of the catch. | Provision of ice-making / cold storage facilities | Supply of ice and cold storage of fish by the provision of ice-making and cold storage facilities in Portsmouth will make it possible to keep freshness of fish from catching to selling. The rate of discarding the catch, currently stands at 20%, can be lowered. | |
| Currently, fishermen have to return the beach in time for the shopping hours of consumers, making the fishing operations somehow inefficient by staying shorter time in the fishing grounds. Consumers who want to purchase fish should go to the beach to wait for the fishing boats to return and then buy fish in unhygienic conditions from the beached fishing boat directly exposed to the sun. Fishermen and consumers are both forced to accept inconvenience of fish distribution due to absence of the enclosed fish handling facility. | Provision of fish retailing shops | At the fish retailing counters in the Fisheries Center, fish can be sold at all times in hygienic condition, providing greater convenience to consumers. Fishermen will no longer be constrained by the time they must return to beach, and will be able to extend the time for fishing operations to twelve hours from the average of nine hours at present. This will increase the volume of the annual landings at Portsmouth, which recorded 100 tons in 2007. | |

## 3-2 Recommendations

### 3-2-1 Recommendations

(1) Applying the experiences gained from the existing Fisheries Centers

The Fisheries Centers in Roseau and Marigot, that was construction in 1995 and 2003 respectively through Japanese grant aid cooperation, have been maintained and managed by the joint operation of the Fisheries Division and the fisherman's organization. While the operation of Roseau Fisheries Center is scheduled to be transferred in the near future to totally independent operation by the Fisheries Cooperative, in the case of the Marigot Fisheries Center, the facility was being run by the Fisheries Division as of 2008, and it can be said that the transfer of the operation to the Fisheries Cooperative is not necessarily going according to the plan. However, the experience gained by the Fisheries Division from the operation, maintenance and management of these facilities since establishment are valuable and should be applied to the operation of the Fisheries Center in Portsmouth. It is important that lessons learned and experience gained in running the two existing Fisheries Centers be reflected on the establishment of the management system and operational regulations for the Fisheries Center in Portsmouth. For this reason it will be necessary to make the technology transfer be carried out by the personnel having experience of administrative know-how in the operation and management of the existing Fisheries Centers. Also, the training of the personnel at the existing Fisheries Centers will be effective, who will be assigned for the maintenance and management work in the Portsmouth Fisheries Center.

（2） Establishment of the management structure and cooperation system

The Portsmouth Fisheries Center will be managed jointly by the Fisheries Division and a fisherman's organization and will be run independently by the operating income from fish landing charges, fish vendors fees, cold/chilled room charges, ice sales, fishermen's locker rents, etc. However, in Portsmouth there is no established fishermen's organization including fisheries cooperative at present, though the local fishermen's group are trying to form a cooperative. The Fisheries Division, together with NAFCOOP, should give powerful support to the group in organizing a cooperative. The Division should also set up the linkage for the management of the Center with the St. Peter Fisheries Cooperative that is already active, and the Capuchin Fisheries Cooperative (provisional name) that in 2008 was in the process of applying for registration. The establishment of the management structure must be completed before the facilities will become ready for use, which shall function as the core organization for the joint management of the facilities.

Furthermore, in order that the fisherman's organization to start and continue independent operation of the facilities, it is essential to ensure that the fees from the use/rent of the facilities, ice sales etc.,

must be collected from the users. Until now, the catches have been landed on shore and fishermen have to sell fish directly on their boats or on cart in unhygienic conditions under the sun, however with the advent of this project, the distribution system will be completely switched to the new system, whereby the fish are landed on the jetty and are sold in the fish retailing shops after passing through the fish processing room. The new system will indisputably improve the quality of the catch and thus bringing higher added value to fish, which justifies collection of fees from the users of the facilities.

For this to be functioned smoothly, the Fisheries Division should invite the local fishermen for paying the charges by establishing a cooperative relation.

### 3-2-2 Technical Cooperation and Tie-up with Other Donors

With regards to the operation and management of the Portsmouth Fisheries Center, a long and valuable record of achievement and experience has been gained through the operation and management of the similar existing Fisheries Centers in Roseau and Marigot, and it is planned that the lessons learned and know-how gained through the operation of these existing Fisheries Centers will be passed on to the operation and management system and management regulations of the facility. Thus it will be perfectly possible for the facility to be managed under the present management system of Dominica and with the guidance of the necessary staff, and there is judged to be no need for technical cooperation or a tie-up with other donors.