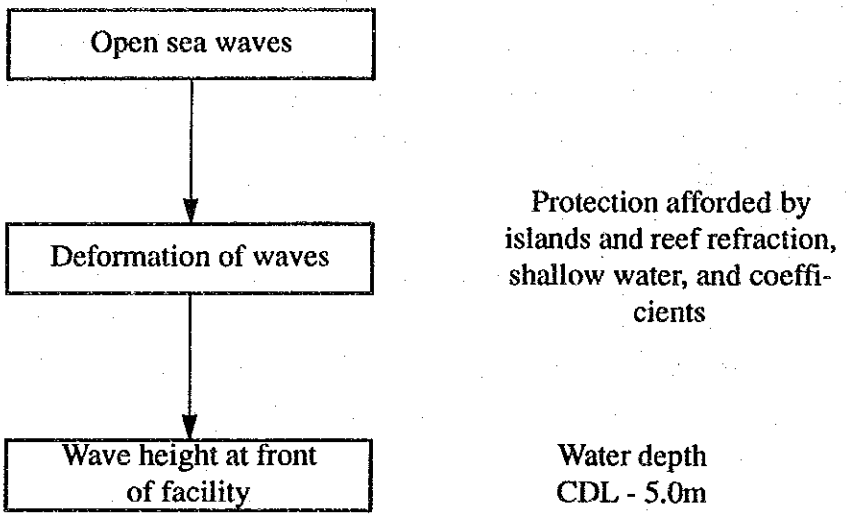


(3) Current Velocity

According to the results of the environmental survey conducted at time of the basic design survey, the maximum current velocity at the Roseau project site will be 18.8cm/sec for northwestern currents, and 10.1cm/sec for southern currents. However, evaluation of actual measurements of historical current velocities yields a maximum current velocity of 50cm/sec for the said area.

(4) Sea Level Variation

Although sea level, by astronomical tides, varies from 0.7m to a low of -0.1m (C.D.L. = Chart Datum Level = L.L.W. -0.3m), sea navigation chart indicates a maximum height (H.H.W.L.) of +0.6m and a minimum height (L.L.W.L.) of +0.2m, which, even during periods of flood tide, yields a low tide level difference of 40cm. However, in designing the marine structures, a maximum sea level elevation of +0.6m induced by atmospheric low pressure during hurricane conditions will be taken into account.

(5) Seismic Activity

Although, with the exception of extremely small quakes, no earthquakes exceeding the threshold of human sensation have occurred in Dominica over the preceding 50 years, there are, according to observation records, on the order of several small earthquakes of magnitude 5 or less that occur each year. The design of structures in Dominica is based on the seismic intensity coefficient compiled in a draft submitted at the first Caribbean Earthquake Engineering Conference in 1978 are numerous (the Commonwealth of Dominica with a seismic intensity level of 0.2, was designated as belonging to Zone

B). However, according to *Seismic Risk Maps in the World* (by S. Hattori), a seismic intensity coefficient between 0.05 and 0.10 inclusive is sufficient; thus, for this project, a coefficient of 0.10 has been employed.

(6) Movement of Sea Bottom Sediments

Of the aforementioned environmental conditions, in addition to the nature of the soil on the sea floor, factors effecting upon the movement of sediments on the sea floor include the current velocity, the origin of the waves and sediments, the topological gradient of the sea floor, and the shape and location of structures as designed to protect such movement. Special caution must be paid with respect to the movement of sediments on the sea floor (yearly variation of sea floor topology) when constructing marine structure near the front side of the project site (seaward side). The movement of sediments on the sea floor is categorized into two types: desedimentation (scoring) and sedimentation (siltation). Because such facilities as the mooring area, breakwater, and wharf are for the convenience of fishing vessels, the location and layout thereof must be selected to minimize the effects of the waves, as well as to prevent siltation of sediments on the sea floor. Furthermore, if the sea floor terrain, which forms the foundation for the structures, is potentially subject to scoring, a supplemental means of preventing scoring is required. In this study as well, survey of the sea floor terrain of the project site was performed by dividing the survey terrain into a 5m x 10m grid. The bottom sediments were then examined by conducting boring and sampling surveys at two locations, while, concurrently, the morning/evening tides and the current velocity prevailing in the area at the front side of the project site (30m offshore) were measured over an admittedly short, two-day period. Coincidentally, the British consultants (Scotts and Bertline) investigated the movement of bottom sediments in the surrounding waters, including those of the project site, as preparation for building a coastal seawall, which is adjacent to the site of this project. Accordingly, while comparing the aforementioned measurements to these past data, the yearly variation and the impact on bottom sediment movement of the completed marine facilities at the front side of the project site are collected and analyzed. First, the movement of bottom sediments in these waters during periods of normal weather conditions is described in the following sections.

1) The primary source of sediment is the Roseau river. These sediment originate in soil eroded from inland areas during flooding which are therefrom carried to the sea. A secondary source is aggregate rocks from the southern-facing cliffs; these are carried out to the ocean floor by storm waves during times of high winds and hurricanes.

2) When the river is deluged, sand and gravel that has accumulated on the river mouth are swept out to sea. Once in the sea where the current is slow, they settle. Particles whose diameter is small remain suspended in the ocean for a longer time than gravel (which settle in the nearby waters), and they are carried to the open sea before settling.

3) Because the prevailing swells originate from the south, they move the bottom sediment northward (toward land). These swells meet the Roseau river at an oblique angle, forming at the river mouth a shoal consisting of sand, gravel, and cobbles. However, the shape of this shoal changes greatly when the river floods or there are a series of high swells.

4) The gravel and cobbles that are currently settled at the front face of the tide embankment are the result of high waves on June 4, 1989, and the section of tide embankment that has been destroyed is assumed to be the result of flood erosion at some earlier time.

5) On the Pottersville shore on the northern side of the river mouth, the portion of fine and coarse sand is high, while pebbles and aggregate stone are numerous on the southern side of the old Roseau jetty. The long sandy beach on the northern side of the river is the result of sand from the river being swept there by the prevailing waves from the south. The occasional northwesterly swells serve to modify the shape of the sandy beach on northern side of the river mouth. A maximum encroachment of 1.5m in height over a time span of six months has been recorded.

6) The southern end of the project site, where the slipways for small fishing boats are planned to be located, forms a beach with grass. This indicates that this beach has been comparatively stable in recent years.

7) On the southern side of the mouth of the Roseau river, the aforementioned area is the only one where a sandy beach remains. The fact that there is no sand on the southern side of the old Roseau jetty indicates that it blocks drift sand coming from the long beach to the south of this jetty. The water depth at the front edge of the jetty is, at 5m, rather deep, and the nearby current is not strong enough to move the bottom sediments or cause drift sand. As can be discerned from historical bottom sediment and boring survey, a portion of the surface layer in the region offshore from the front side of the project site has been silted by sand. At present, although the water appears to be too deep for the action of the current and/or waves to carry away this bottom-lying sand during times of normal weather conditions, because it is likely to be carried further out to sea by the action of storm waves, any construction of marine structures on the foundation afforded by this layer of bottom-lying sand would require anti-scoring measures.

8) Comparison of the results of the survey of the planned project site in 1989 with those of this survey revealed the change in the topology of the sea floor described below.

8.1) On the front side of the tide embankment, during this four-year period the front edge of the gentle slope advance out to sea (maximum 10m), and the offshore sea bottom slope lessen from approximately 1:2~1:2.3 to 1:2.7. In contrast, the front edge of the tide embankment is said to have undergone scoring of a maximum of 2m during the four-year period from 1985 to 1989. Although anti-scoring sheet-pile has been driven into the front edge of the embankment, the site survey revealed that this sheet-pile is now exposed. From this, it can be stated with some certainty that, even at present, the face of the sheet-pile is preventing scoring below the level of its top level. From the above, one can recognize that, although the area on the front side of the tide embankment is near the river mouth and the area near the wall does undergo some scoring, the steep slope portion of sea bottom has a tendency to become shallow. To safeguard the mooring area for fishing vessels in this area, a breakwater with submerged groin must be placed on the side along the river mouth to prevent sedimentation of the mooring area when flooding of the Roseau river occurs and to divert the sediments discharged from the river mouth to the depths of the open sea. In addition, because the front faces of any breakwater or wharf constructed in these waters that is parallel to the shoreline is liable to undergo scoring, suitable anti-scoring measures that are appropriate to the depth of the water are required.

8.2) Although, as pointed out in Section 6) above, on the leeward sideof the old Roseau jetty, the sandy beach area between the old Roseau jetty and the tide embankment is relatively stable, the slope in the area where the water depth exceeds 5m has steepened from 1:3~1:3.3 to 1:2.3 over the past four years, revealing a tendency for it to erode with increased distance from the jetty. Accordingly, the construction of marine structure in this area as well requires the application of anti-scoring measures for the front side of the barrier proper. However, the results of the survey conducted by the British consultants indicate that, in the greater portion of this area (the southern side of the old jetty), only high waves or extraordinarily large swells are able to move the sediments lying on the sea bottom to the front side of the coastal sea wall due to the fact that the sediments are comprised of cobbles and aggregate stone, and thus aside from the occurrence of such cases, the area is stable. In fact, the current Bay street expansion work revealed that the old (removed) road sea wall, said to have existed for 80 years, had suffered little scoring.

4-1-3 Examination of Structural Design Standards

(1) Design Standards

Because no technical standards exist within Dominica, acceptable international technical standards were applied.

In Dominica, BS and ASTM standards are generally co-applied to source materials for steel and concrete. For this plan, the following standards, which either meet or exceed the aforementioned standards, were applied.

① Design codes for port and harbor buildings: The National Fisheries Association (company)

② Technical standards for port & harbor facilities in Japan (1980): The Overseas Coastal Area Development Institute of Japan

③ Road paving standards: Japan Highway Institute

④ Soil testing methods: Soil Engineering Institute of Japan

⑤ Standard specifications for concrete: Civil Engineering Institute of Japan

⑥ Japan industrial standards (JIS): Japan Standards Association

(2) Design load

Based on soil analysis, the dead weight of material as used for the design load was determined, and the calculated values tabulated in Table 4-4. Either from the dredged material or soil from mountain sides can be used as the fill soil; however, if dredged soil is used, care must be exercised to use only soil that has been sieved to remove pebbles and crushed rock which are greater than 50mm in diameter.

Table 4-4 Weight of Material (After Compaction)

Type	Density (ton/m^3)		Internal friction angle	Remarks
	In air	In water		
Dredged soil (after compaction) Sea bottom soil	1.90	1.00	40°	In case of sand only 1.6/0.85 TDN/m3
Reclamation soil (Filling sand)	1.80	1.00	35°	
Backfill material (not more than 70mm)	2.10 (1.80)	1.24 (1.00)	35°	Sand (≤2mm) not more than 15%
Bearing capacity	1 ton/m^2 (slipway, jetty, wharf)			

4-1-4 Design criteria for facilities and equipment

(1) General

In the Commonwealth of Dominica, from the higher-order comprehensive plan embracing the entire nation to the approval of construction start for single-unit structures, administration of construction, including site plans, is performed by the Economic Development Unit of the Ministry of Finance and Development in conjunction with the Ministry of Communications and Works. Notwithstanding the fact that the administrative head of this plan is the Ministry of Agriculture, Lands, Fisheries, and Forestry, who formulated said plan in cooperation with the aforementioned associated ministries and agencies, approval of the final design must be obtained from the Economic Development Unit prior to opening construction tendering. In addition, with respect to compliant technical standards, although differing along lines formed by construction, equipment, manufacturing, etc., essentially, all work shall be in compliance with Caribbean codes applicable to the said area as well as applicable British and/or Japanese standards.

(2) Disaster Prevention

A facility plan safe enough to withstand natural disasters such as hurricanes and violent downpours shall be implemented. With regard to fire prevention measures, the required equipment, satisfying Japanese domestic standards, shall be included in the above.

(3) Water

Water will be supplied through the use of waterworks provided by the publicly-administered Dominica Water and Sewerage Company Limited (DOWASCO). To ensure uninterrupted continuance of the supply water pressure required for the facilities and to prepare for temporary suspension of water supplies, a ground-level water storage tank and an elevated water tank shall be set up. With regard to wastewater, although public sewage lines managed by the said water works company have been laid, the wastewater they carry is discharged directly to the river and sea without any treatment. Under this project, the wastewater will first pass through a purification tank, then it will be directed to the existing public sewage lines to be discharged into the Roseau river at the river's mouth. Furthermore, the outlets of existing sewage lines that currently discharge their load into the sea in front of the project site will be sealed so that sewage is not introduced into the waters directly in front of the site.

(4) Electricity

Electric power is to be supplied by the Dominica Electricity Services Limited (DES), and three-phase, four-line 400 and 240V, 50Hz power will be utilized. It is possible to supply 11kV of power to the project site. Either IEC (International Electrical Code) or BS (British Standard) shall be applied to the electrical equipment. The situation regarding electrical generation and distribution in Dominica is relatively stable, but, to prepare for the worst case, an emergency power supply for the refrigerated storage unit and the cold storage unit shall be installed. The drop line shall extend to the transformer by Dominica side, and the Japanese side shall deploy the lines from the low voltage side of the transformer.

4-2 Establishing Facility Standards

With a view to establishing standards for the facilities, civil engineering related standards will be established based on the particular dimensions and the number of fishing vessels that will use the facilities as design criteria; and standards for land-based facilities will be established based on the quantities of catch and handling as design criteria.

4-2-1 Vessels Using the Facilities

The vessels that will use the facilities provided for in this project are described below.

(1) Small Fishing Boats

The small fishing boats that will use the facilities of this plan are divided into two groups.

1) Vessels that will be transferred from Pottersville — They will be operated using facilities such as slipway with boat ramp and the fishermen's lockers as their base of operations.
2) Vessels that cruise in from Newton, Pottersville and nearby fishing villages — They will have temporary use of facilities to perform such tasks as offloading their catch and procuring supplies.

These fishing boats are wooden canoes and keelboats. The major dimensions of these vessels are approximately as follows; large canoes — overall length: 3.5m to 5.0m, draft: 0.3m to 0.5m; keelboats — overall length: 4m to 6m, draft: 0.3m to 0.6m.

In this project, the standard size of small fishing boats that has been established as the facility design criteria is as follows:

Small fishing boats :

Overall length : 6.0m

Overall width : 1.5m

Draft : 0.5m

(2) Large Fishing Boats

The large fishing boats are tuna long-line fishing boats, whose adoption is being promoted by the Fisheries Development Division (FDD). At present, in addition to the one training vessel belonging to the FDD, commercial fishermen own seven vessels of this type. Although the dimensions of individual vessels differ, using the vessel owned by the FDD as the reference vessel, the major dimensions of large fishing boats that have been established as the facility design criteria are as follows:

Small fishing boats :

Overall length : 14.0m

Overall width : 4.5m

Draft : 1.8m

4-2-2 Number of Fishing Vessels Using the Facilities and Facility Standards Based Thereon

(1) Number of Fishing Vessels Using the Facilities

The number of fishing vessels that will use the facilities provided for by this project are as follows.

1) Small Fishing Boats

Fishing boats transferred from Pottersville: Priority will be given to the transfer of fishing boats from Pottersville, which is designated as a part of the commercial port area, to the north of the mouth of the Roseau river. The number of small fishing boats to be transferred approximately 30, accounting for about half of the fishing boats in the said area.

Fishing boats from nearby fishing villages that will be granted temporary use of the facilities: Fishing boats that cruise in from nearby fishing villages and offload directly onto the site provided for in this project will be chiefly fishing boats from Newtown. Their numbers are estimated as approximately 70.

2) Large Fishing Boats

As per the estimate stated in the previous chapter predicting that the number of fishing boats would increase, the number of large fishing boats has been determined to be 15.

(2) Mandatory Facility Standards

Based on the number of fishing vessels, the mandatory standards for the facilities have been derived as described below.

1) Fish Landing Wharf For Large Fishing Boats

To meet the large fishing boat operating conditions described in Section 3.2.5, the effective extension of the fish landing wharf in consideration that 15 large fishing boats would be proportionally operated.

Number of fishing boats	:	15
Average period of trips per vessel	:	3~4 days/time
Trips per year	:	1080 (6 voyages/vessel/month x 12 months x 15 vessels)
Vessels calling and offloading at port	:	5 vessels/day (1080 vessels/year ÷ 250 days/year = 4.5 vessels/day)

Setting the berthing ratio of fish landing wharf to 3 cycles/day, the number of required berths (N) is 2. Adopting a required wharf length (berth length) as 1.2 times the overall length (ℓ)of a fishing vessel, the effective wharf extension is calculated as follows.

Effective wharf extension $L = 1.2\ell \times N = 34m$

2) Service Wharf for Large Fishing Boats

Satisfying fishing boat operating conditions identical to those of the fish landing wharf, the effective length of the service wharf is calculated as follows.

Number of fishing boats per day	:	5
Berthing ratio	:	5 vessels/day
Number of required berths	:	1
Effective wharf length	:	L = 1.21 x 1 = 17m

3) Mooring wharf for large fishing boats

Assuming the interval until the next fishing trip to be two days, moorings for 10 vessels are planned. If the vessels are to tie up vertically, the required effective length of mooring wharf is as follows.

Effective wharf length : L = 0.5B x 10 = 67m

4) For Small Fishing Boats

a) Slipway and Boat Ramp

The slipway and boat ramp value is calculated under the assumption that 30 small fishing boats will be using the facility. A boat ramp will be established at the rear of the slipway.

Length of slipway	:	45m
Depth of slipway & boat ramp:	:	15m

b) Fish Landing Wharf

The fish landing wharf is targeted for use mainly by small fishing boats from nearby fishing villages that come to offload directly. The number of vessels using this facility is as follows.

Fishing boats from Newtown:	:	69

Fishing boats from Pottersville:	:	36 (boats not transferred to the project facilities)
Total	:	105

The daily operating ratio of these fishing boats is 60%; in other words, the number of boats using this facility each day is approximately 60 vessels per day, assumed that 12 fishing trips/month/vessel would be made.

Berthing cycle	:	= Landing operating time/landing time of one boat = 10hr/20min = 30 boats
Effective wharf length	:	= (Number of boats/berthing cycle) x boat length x 1.15 = 60 boats/30 boats x 6m x 1.15 = 14m

c) Fisherman's Lockers

The fisherman's lockers will mainly be for the aforementioned 30 vessels (fishermen) that will be transferred from Pottersville.

Although, one fisherman's locker will, in principal, be provided for each fisherman, a 20% increase in the number of lockers has been established since some fishermen are co-using one fishing boat. The structural dimensions of the lockers shall be similar to those which the Fisheries Development Division constructs and maintains with WFP funds for local fishing villages.

4-2-3 The Fish Handling Capacity And Facility Standards

In Chapter 3, projections of fish catch the handling and distribution system of the catch were examined. In accordance with the above, the fish handling capacity of the project facilities is determined as follows. The details and standards of the facilities and equipment for receiving, processing, preserving, distribution, and sales of the fish were established based on this planned handling capacity.

(1) Projected Fish Handling Capacity

The processing and storage capacity of fish in this project were studied from the aspect of distribution in the previous chapter, and the results thereof presented in Fig. 3-5. In accordance with these results, the distribution pattern and volume of fish landed directly and the quantity of fish delivered indirectly to the facilities in this project are determined in this chapter.

1) Quantity Delivered to the Project Facilities

a) Fish landed directly from large fishing boats : 4,050kg/day

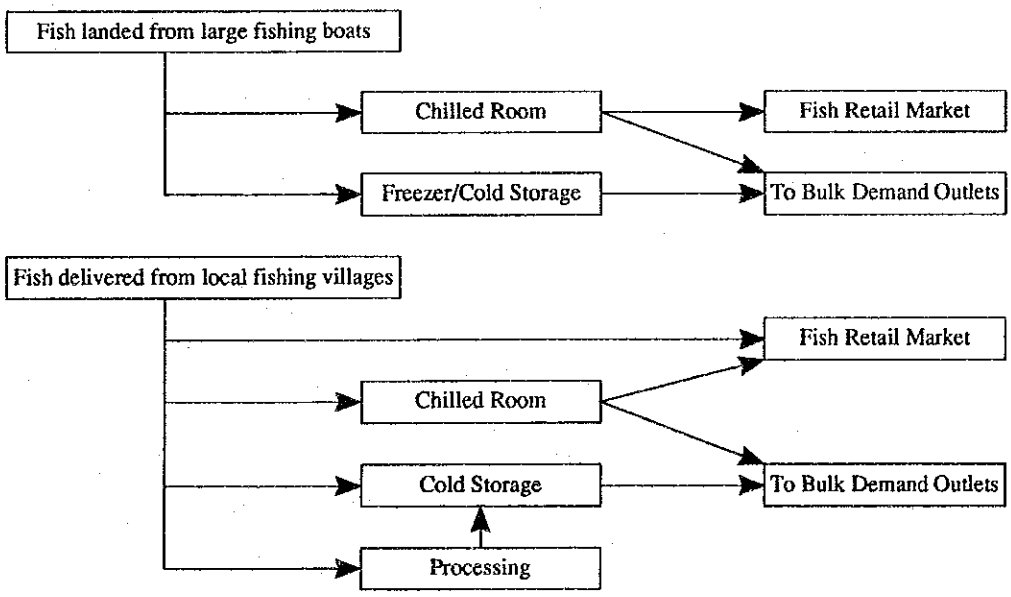
b) Fish delivered from local fishing villages : 3,180kg/day

(includes fish landed by small fishing boats as well)

The total quantity of catch delivered to the facilities provided for in this project is 7,230kg/day.

2) Quantity of Fish Processed, Preserved and Marketed

After landing or delivering to the complex, fish are cleaned and weighed, and either are sent to the fish retail market or shipped chilled or frozen to distributors serving bulk demand outlets such as supermarkets. A portion of the small-sized fish is returned for processing.



The fish that is landed directly by large fishing boats will be stored in chilled room and shipped the same day (or next market day) to the fish retail market within the Complex or the outlets serving bulk demand.

This quantity will be approximately 1,800kg/day (approximately 45% of the quantity of fish landed from large fishing vessels). The other approximately 2,200kg/day will be frozen and shipped to bulk demand outlets in frozen condition.

Approximately 1,300kg/day of the fish delivered from local fishing villages (40%) will be sold at the fish retail market. In addition, out of the remaining 1900kg/day, half (950kg/day) will be processed and the other half (950kg/day) will be chilled or frozen to ship to the bulk demand outlets. Examination of the flow chart previously presented in Table 3.5 reveals that 1) catch sent directly to the fish retail market, 2) catch delivered during non-market business hours, and 3) catch shipped to bulk demand outlets will account for 20%, 50% and 30% of the total, respectively.

(2) Fish Processing Facilities and Equipment Standards

Based on the processing methods and quantities of fish, the required specifications and standards for facilities and equipment are described below.

1) Ice Making Plant

Although ice is indispensable to promote commercial fishing and fish distribution, currently, ice-manufacturing facilities that are able to supply a sufficient quantity of ice for commercial fishing do not exist in Dominica, and Dominica cannot receive ice supplied from the outside. Accordingly, as an indispensable item for the facilities provided for in this project, an ice-making machine will be set up. The necessary quantity of ice by sources of utilization are as follows.

(a) For transporting fish from local fishing villages

Fish : Ice = 2 : 1

Ice volume = 3,180kg/day x 50% = 1,590kg/day

(b) For storage of fresh fish inside cold storage

Fish : Ice = 4 : 1

Ice volume = 4,029kg/day x 25% = 1,005kg/day

(c) For fish processing

Fish : Ice = 1 : 1

Ice volume = 954kg/day x 100% = 954kg/day

(d) For attached retail market

Fish : Ice = 2 : 1

Ice volume = 2,487kg/day x 25% = 622kg/day

(e) For supply to large fishing boats

Fish : Ice = 1 : 1

Ice volume = 900kg/day x 5 vessels = 4,500kg/day

The total volume of ice requirement will be 8,671kg/day. Accordingly, the ice-making capacity will be 9 tons/day of ice.

The type of ice to be used will be flaked ice, which is easy to handle and acts as a highly effective cool out. Although the use of plate ice for the fishing boats was examined, it was decided to use flaked ice throughout in consideration of the following points: 1) Since flaked ice is mostly in Dominica and in the nearby countries, the local fishermen are familiar with this type of ice; 2) From a mechanical standpoint, flaked ice machine employs a simple mechanism, and is less likely to break down than the plate-ice making machine that's compressor more frequently turns on and off; 3) The operating cost, including the maintenance cost, is comparatively inexpensive; 4) The larger vessels takes 3 ~ 5 day trip that is comparatively short period; and 5) From the aspect of replacement of parts and maintenance, using a single type of machine instead of differing types is more advantageous.

2) Blast Freezer

Approximately 2,200kg/day of the fish catch landed from large fishing boats is frozen and shipped: Large-sized fish such as tuna, however, cannot be frozen adequately in cold storage. To remedy this situation, a blast freezer will be provided. Room structure and cooling method will be identical to those employed for cold storage, which is described in the next section 3). The shelves will be placed such that the chilled air from the refrigeration unit circulates sufficiently within the room, and fish will be stacked thereon in rows. The blast freezer will have the ability to freeze approximately 2,200kg of large-sized fish per day.

3) Cold Storage

Cold storage is required to preserve surplus fish — fish that is not sold on the same day as received, and to enable it to be shipped according to demand. The capacity of cold storage will be designed to keep approximately 30 tons of fish, including fish received from local areas, frozen and processed fish, for a period of approximately 10 days.

With regard to structure, general installation practices and prefabricated insulation panels will be employed for this cold storage. The chilled air from the refrigeration unit will be able to circulate adequately, and space sufficient for sorting the fish and for entering and exiting the room will be provided.

4) Chilled Room

Chilled room will be provided to store fish temporarily. To receive fish from fishing boats and from local areas, even during non-market operating hours a chilled room is necessary either to store fish for a short time period (2 ~ 3 days) and sold as fresh fish, or to be processed. To provide this capability, a chilled room will be provided. The chilled room will have a capacity to receive 4 tons per day, equivalent to 50% of fish from local areas and 60% of fish from large fishing boats per day. The stored fish will be delivered within 2 to 3 days after reception, thus, the capacity of this chilled room will be approximately 10 tons.

The structure shall be the same as that described above for the cold storage, taking into consideration the circulation of chilled air, fish sorting requirements, and room entry/exit operations.

5) Fish Processing Area

Fish processing will consist chiefly of fillet processing of mixed catch fish such as flying fish and chunk and block cutting of large frozen fish; the work space and equipment required for these operations will be provided.

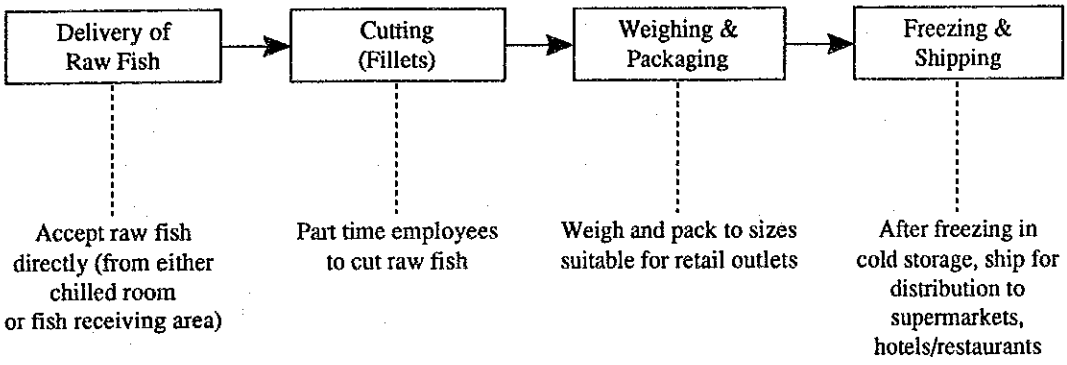
Processing will follow the work flow depicted in the below figure, and the quantity of fillets processed per day will be approximately 950kg. Chunk and block cutting of frozen fish shall be approximately 1,100kg per day.

Based on the ability of one person to process 60kg of fillets each day, 16 female employees will be placed, and 2 persons will be provided for weighing and

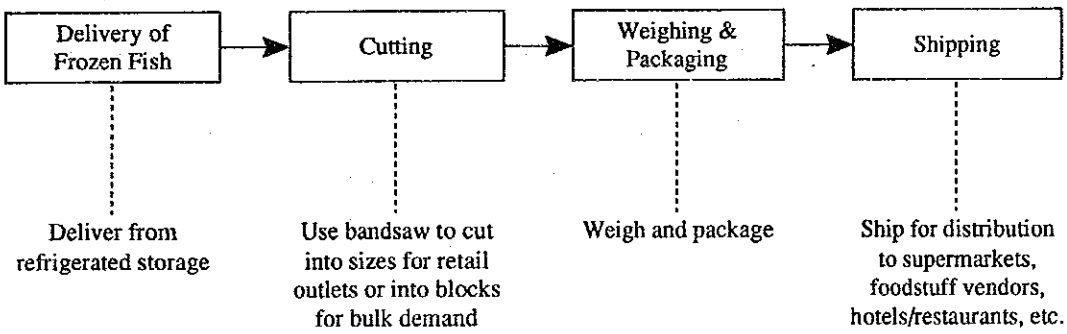
packaging operations. The work table, water faucets, scales, and vacuum packing machine required for these operations will be provided.

For frozen fish block and chunk cutting operations, one person will be placed for cutting, and two persons shall be placed for weighing and packaging. Power bandsaw, a work table, scales, and a vacuum packing machine shall be provided.

Fillet Processing



Sliced Tuna Processing



6) Fish Receiving Area

Work space for performing receiving, cleaning, and weighing of fish landed from fishing boats and delivered from local fishing villages, as well as that required equipment and machinery such as scales and fish containers will be provided. There will be three to four workers.

7) Fish Retail Market

The fish retail market within the Complex will be a facility for performing retail sales of fish to ordinary consumers. Its aim is to supply and sell fresh fish everyday inside a hygienic facility to the residents of the Roseau area.

This facility will sell approximately 2,500kg of fresh fish per day (approximately 1,300kg from fish delivered from other regions and 1,200kg of fish landed from large fishing boats). Based on the ability of one vender to handle 100kg to 200kg of fish per day, 15 venders will be placed. To perform these operations, sales stalls, fish cutting counters, faucet-equipped sinks supplying potable water, and wastewater disposal equipment will be provided. Space sufficient to accommodate the movement of an average of approximately 120 to 200 persons per hour and 300 to 500 persons per hour during the peak time, based on 1,000 to 1,500 buyers per day, will be provided.

A shop shall be provided in the fish retail market for selling processed frozen fish such as frozen fillet and sliced tuna.

8) Fish Waste Treatment Plant

Post-processing of fish waste left over from initial processing is required. It is anticipated that the waste will be processed into fish meal and be put to good use as feed for poultry, etc. Because of the low daily quantity of fish waste (approximately 1,000kg per day) and the fact that the fish meal are targeted for use in the domestic market, the treatment method and equipment ratings will be simple, compact treatment.

Treatment will be carried out by heat-drying and pulverization, and the equipment specifications will accommodate approximately 500kg of raw processed material per day.

4-2-4 Support Facilities For Commercial Fishing Activities

The commercial fishing operation support facilities are designed to streamline and facilitate the operating of fishing vessels. The main facilities providing this function are the offloading wharf and the mooring wharf/boat landing slipway, and these will be as specified in the previous chapter. This chapter describes the facilities for the supply of such items as fuel, ice, and water; and repair facilities for the maintenance of boat engines and the like.

(1) Supply Facilities

1) Fuel Supply

Equipment to supply diesel fuel oil for large fishing boats and gasoline for outboard engines of small fishing boats will be provided.

Storage tank capacity:

Diesel fuel oil	:	Approx. 10kl (2,000 l/vessel x 5 vessels/day)
Gasoline	:	Approx. 3 kl (50l/vessel x 100 vessels x 0.6)

Supply ports will be provided on the service wharf and near the boat ramp area.

Dominica side shall purchase and install the fuel storage tanks and dispensers with the cooperation of the currently operated petroleum company.

2) Water Supply

The faucets for supplying water will be provided on the service wharf for large fishing boat and near the boat ramp area for small boats. The water supply volume will be approximately 400l/vessel x 5 vessels/day for the large boats, and 10l/vessel x 60 vessels/day for the small boats.

3) Ice Supply

In particular, a supply of ice is indispensable for large fishing boat operations. The ice used by these fishing boats will be supplied from the ice making plant provided for in the facility plan. Although the specifications for the ice making plant are as have been described previously in Section 4-2-3, based on the assumption that the quantity of ice used will be the same as the quantity of fish caught, the ice plant is to supply approximately 900kg per vessel to 5 vessels each day, and, thus, the capacity to supply 4.5 tons per day for fishing boat use will be provided.

(2) Workshop

A workshop will be set up to provide maintenance and repair services for fishing boat engines. Necessary machinery and tools required to furnish the principal services — the maintenance and repair of outboard engines — will be provided.

4-2-5 Bus Terminal

To facilitate access to the resident-use fish market, a minibus terminal, which will serve as the legs of ordinary residents, will be included as one of the facilities provided for in this plan.

At present, approximately 500 minibuses are registered in Dominica, and most depart from and arrive in Roseau. Of these, 90% are routed toward the northern or eastern regions of the island, while the remaining 10% proceed to the southern end of the island. The peak operation times of the minibuses lie in three time periods: 1) from 7:30 to 9:00, 2) from 12:30 to 15:00, and 3) from 16:30 to 18:00; virtually all minibuses operating at these times are carrying passengers to Roseau. Accordingly, to accommodate this pattern, the bus terminal specifications have been established to satisfy the conditions and requirements listed below.

Total number of minibuses	:	Approx. 500
Buses arriving or departing Roseau	:	Approx. 450 (90%)
Operating rate	:	75%
Number of units operating each day	:	337
Total daily peak operating time	:	4.5 hours (270 min)
Average stop time at terminal	:	15 min
Number of trips/day/unit	:	3
Number of units normally standing by at terminal:	:	56 (of which, about 50% will use the bus terminal.)

4-2-6 Fishery Management and Training Related Facilities

Facilities related to the fishery management and training are to provide a base of operations for the Fisheries Development Division (FDD) with a view to strengthening and expanding activities such as administration of commercial fishing, promotion/implementation of development plans, and strengthening of training and extension services for fishermen.

At present, the FDD is using one corner of a shared government office building; however, the area is extremely small, and, with insufficient space to accommodate the current employees — to say nothing of accommodating required future increases in the number of employees — employees are being dispersed to offices other than the shared government office building, impeding upon the activities of other offices. To remedy this situation, in addition to staff offices for the FDD, facilities and equipment to enable

resource management, experimental research, fishermen instruction, and the like will be provided.

1)	FDD	:	The number of personnel assigned to the FDD is planned to be increased to 22 persons in the near future. A fisheries staff office and a fisheries development advisor's room will be allotted sufficient space to accommodate this number.
2)	Data processing room	:	A room for processing various types of fishery-related data and preparation of statistics, it will be allotted space sufficient to accommodate 3 statisticians.
3)	Laboratory	:	A room for inspecting and testing fish freshness and processed product quality, necessary laboratory equipment will be provided, and the room will be allotted space sufficient to accommodate three to four persons performing analyses and testing.
4)	Training-meeting room	:	A room for training regionally-assigned instructors and instructing/educating fishermen, it will be allotted space sufficient to accommodate approximately 30 persons and the performance of short training courses and simple operations.
5)	Fishermen's cooperative's	:	A room for conducting such activities as fostering fishermen's cooperatives and providing administrative instruction and management, it will be allotted space sufficient to accommodate a staff of 10 to 12 persons.

4-3 Basic Plan

4-3-1 Site Plan

In selecting the site, based on considerations of the required size and functional layout of each facility, the ground surface area required for the facilities was able to be secured, while limitations and restrictions imposed by the surrounding environment (topographical conditions, location of existing structures, road transportation conditions, etc.) have been clearly ascertained and understood. The height of the rear end of the site grounds and the level of the road will be 2.5m above sea level, and access to the project facilities will be unobstructed.

On the north side, the land encompassed by this project boarders the left bank of the Roseau river; on the south, it extends along the sea approximately 150m and is enclosed by the newly-built ferry terminal, which has served to strengthen the old Roseau jetty; at its rear, it borders a two-lane coastal road (Bay street), along which the DEXIA headquarters office and the Roseau market are located. The distance from the tip of the new Roseau ferry terminal to the coastal road is 60m, and the distance from the tip of the reclaimed land to the road is a narrow 30m.

As previously analyzed, the distance from the edge of the coastal road to the 5m equivalent depth line is only 60m, on the bottom slope 1 : 10, then the slope drops off sharply to 1 : 2.7 in the direction of the open sea. Although, from a technical standpoint, it is possible to build marine structures in water exceeding 5m in depth, from a financial aspect, it is sorely lacking in feasibility. In order to place on the project site suitably sized facilities required to accommodate the needs of Dominica, in addition to the usage pattern of the fishing vessels, environmental conditions such as the wind, waves, movement of bottom sediments, the sea bottom topology and the like were considered. The site plan of the facilities was determined to be as presented Fig. 4-1. Thus, the surface of the sea encompassed by the plan was divided into three, roughly equal areas: the northern side near the river, which has been allocated as an mooring area for the large fishing boats; the front side of the central section, which has been allocated as an fish landing wharf for large fishing boats and land for on-shore facilities (surface area of land to be reclaimed is approx. 2,700m^2); and the southern third, which has been allocated to facilities for small fishing boats. Thus, because the southern mooring area for the small fishing boats lies leeward of the new ferry terminal, the bottom sediments will become a stable sandy beach area, with no possibility of sediment siltation or scoring, even during extreme weather conditions. However, although measures must be taken to fix the fishing boats to the boat ramp by means of rope, etc. during heavy storms that occur roughly once each year, because the deployment of a breakwater on the front side of this mooring area would be injurious to the use of the facilities during periods of normal weather conditions, thus it cannot be recommended. In the large ship mooring area on the north side, a north breakwater to protect it against the drift of sand from the river mouth are required, it protects against the prevailing waves and swells from the south as the breakwater. Furthermore, for the convenience of the fishing boats within the mooring area, the existing tide embankment must be removed, and a new wharf built toward it's rear side.

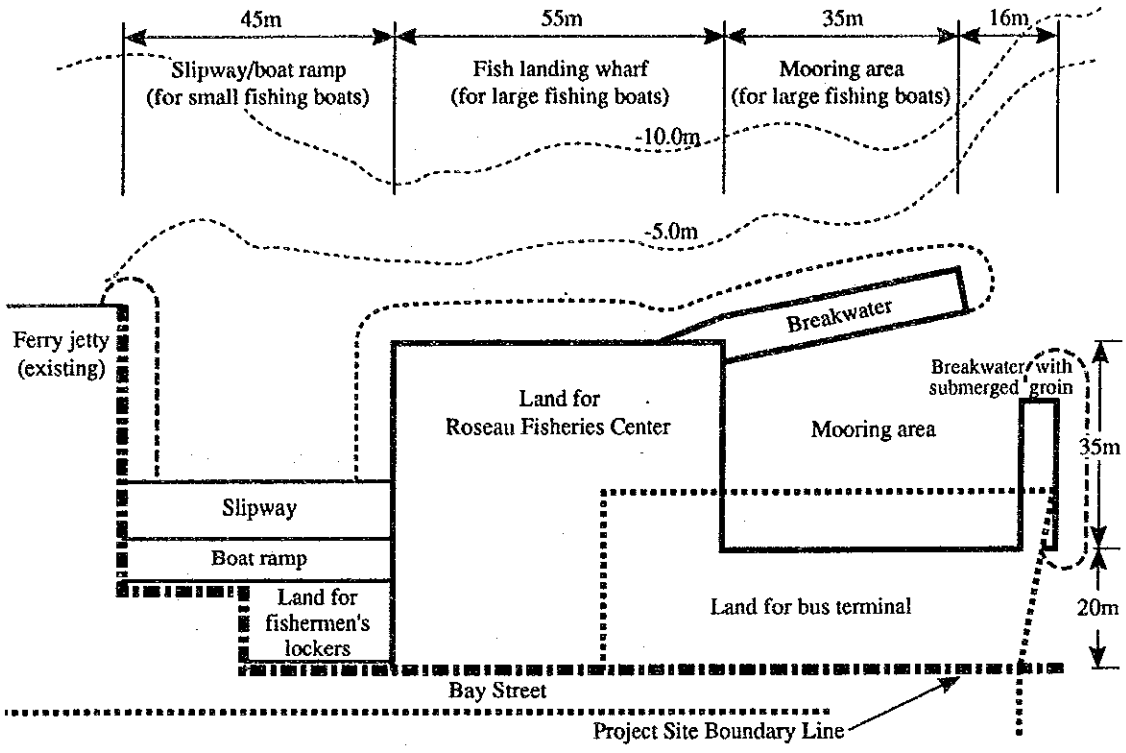


Fig- 4-1 Site Plan for Marine Structures

At present, on the front side of the Bay Street that runs alongside the project site, the sea wall work financed through British aid is continuing (its completion is planned up to Sept. 1993). On the land side of this sea wall (a 20m wide section), there is a three-lane road for two-way traffic, a parking lot, and a promenade. The completion of this construction will shift most of the road traffic traversing north/south through the city of Roseau to this the Bay street, thus, it is anticipated, will greatly relieve traffic congestion within the city. The project site lies on the extension line of the Bay Street, and, therefore, it should prove to be extremely advantageous for accessing the site, including access by minibuses, which serve as the residents' legs. Although the Bay Street narrows to become a 6m wide one-way road before reaching the project site, because this road is to the access road onto the site for the minibuses, area for a pedestrian sidewalk must be allocated so that pedestrians do not obstruct the traffic passing thereon.

4-3-2 Civil Engineering Facility Design

A description of the civil engineering facilities required for implementation of this plan is provided below.

A. Mooring area for large boats

① North/breakwater with submerged groin

② West breakwater

③ Mooring wharf

④ Mooring area (partially dredged, with removal of a demolition of the existing tide embankment)

B. Fish landing wharf for large boats

⑤ Landing wharf/apron/backfill behind apron

C. Facilities for small fishing boats

⑥ Landing wharf/apron

⑦ Slipway/boat ramp

⑧ Land preparation for fisherman's lockers

D. Others

⑨ Sidewalks

⑩ Replacement of underground conduits

⑪ Minibus terminal paving/wastewater work

⑫ Paving & drain work on central backfill section

(1) Placement and Configuration Of North Breakwater With Submerged Groin

The purpose of placing a breakwater alongside the river is to protect from northwesterly waves which occur roughly 14% of the year as well as to prevent sediments discharged from the mouth of the Roseau river during flooding from entering into and silting the mooring area.

The effectiveness of this barrier in preventing siltation of the mooring area by sedimates entering from the mouth of the river increases the further it is extended toward the open sea. However, if it extends out to sea further than the offshore breakwater that faces it,

the coastal current generated by the prevailing waves from the south is liable to cause drift sand to accumulate in the mooring area.

The results of simulation studies on the degree of tranquillity in the mooring area are presented in Fig. 4-2. If, to protect against the southerly waves which prevail approximately 82% of the year, the north breakwater is extended toward the open sea further than the location of the facing the west breakwater (Case 1), the reflection of waves off the north breakwater and the wharf inside the mooring area would amplify the height of the waves inside the greater portion of the harbor 1.25 to 1.5 times or more. Then, even if a wave height of 75 cm or less would prevail 96% of the year, this would reduce the effectiveness of the harbor's use by the large fishing boats.

In contrast, if the west breakwater is extended slightly and the north breakwataer retracted from its aforementioned extended position (Case 2), although, naturally, its shielding effectiveness against northwesterly waves is lessened, but the degree of tranquillity within the mooring area as a function of the prevailing southerly waves is 0.75 times or lower, a significant improvement over Case 1.

Assuming this scenario, since the water depth at the tip of the north breakwater is lower than 1.5 so that, in order to preclued the entry of sediments and gravel from the mouth of the Roseau river into the mooring area, thus, 2 will be adopted with extension of a submerged groin up to the depth of 2.5m.

(2) Structure of the Breakwaters

As the structure of the breakwaters, stone mound was rejected bedause the site covered by this project revealed that 1) the area in which the sea bottom on a gentle slope (1:10) is limited, while the deployed width of a stone mound would exceed 20m, significantly restricting the usable area on its inner side; and 2) quarring stones large enough (2~4 tons) to resist against the design wave height (2.5~4 .0 m) is difficult. Even though it is attractive from a financial standpoint, the decision went against this type of structure.

For this plan, the use of vertical-sided breakwaters were considered best, because this basin side of breakwater can be used as the mooring wharf. A comparison analysis was conducted on two typical sections of breakwaters, the sheet pile type and the gravity type, and the results of this analysis are summarized in Table 4-5.

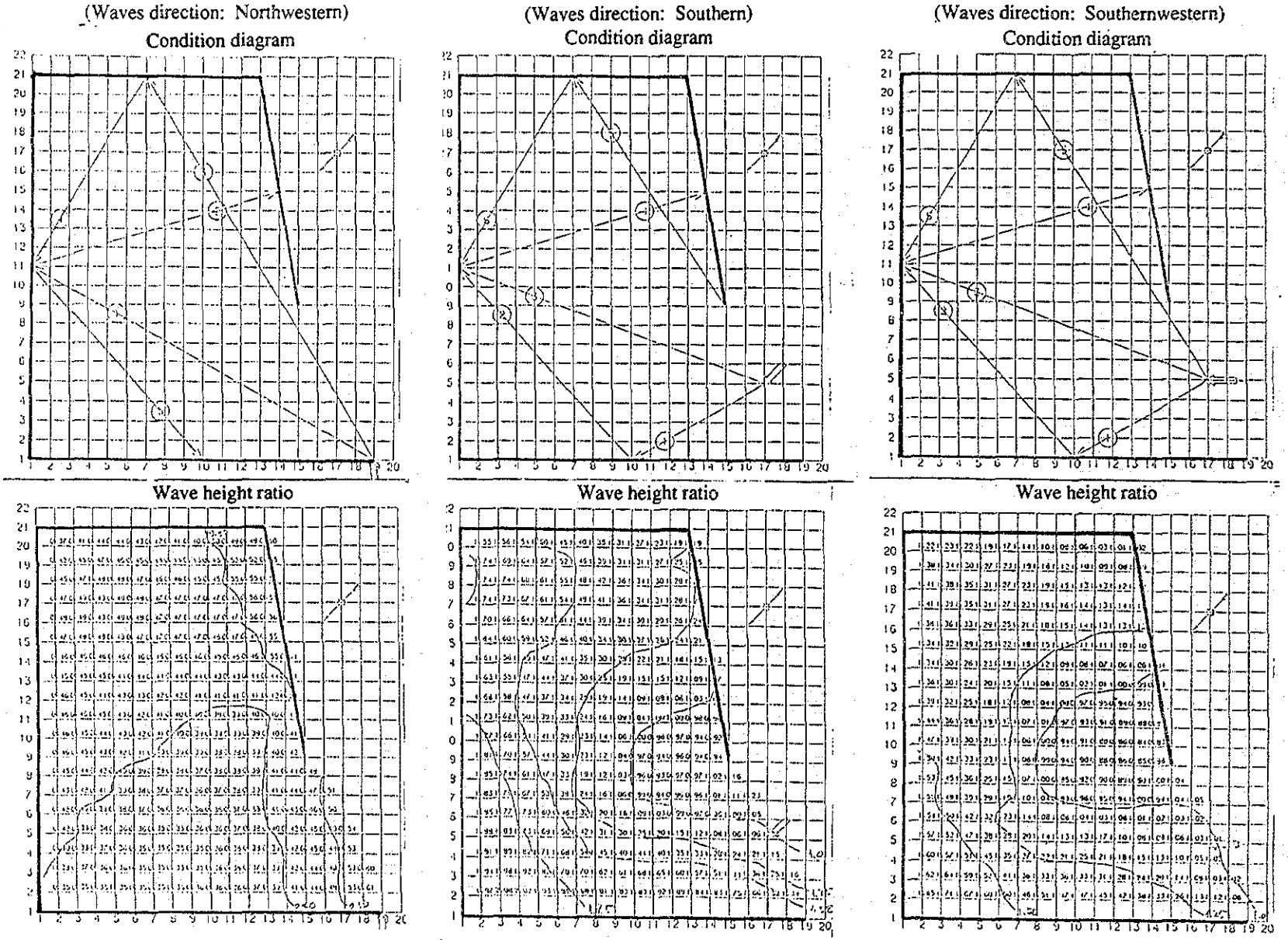


Fig. 4-2 Results of Simulation of the Degree of Tranquillity Inside the Mooring Area as a Function of the Placement of the Breakwaters (Case 1)

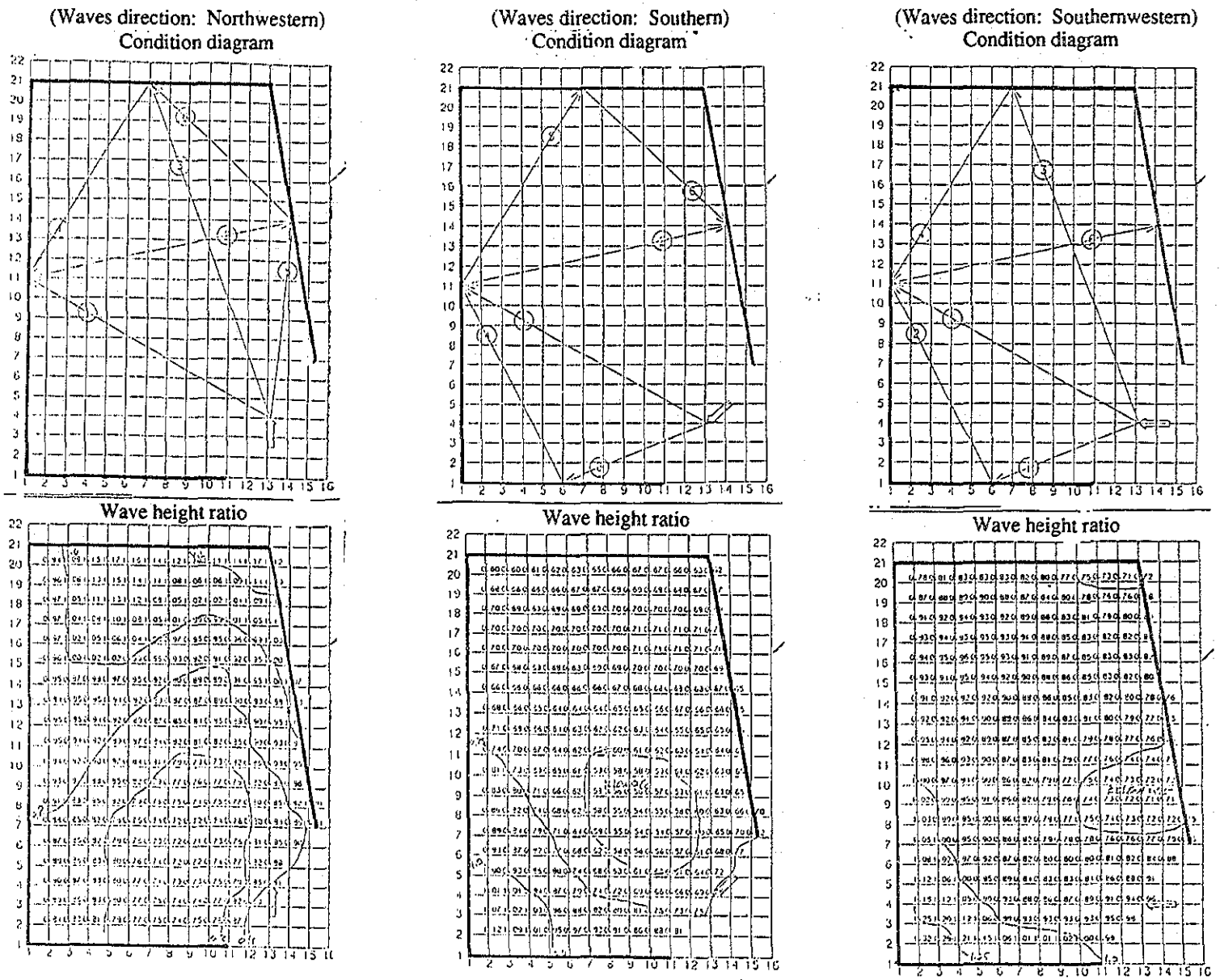


Fig. 4-2 Results of Simulation of the Degree of Tranquillity Inside the Mooring Area as a Function of the Placement of the Breakwaters (Case 2)

Table 4-5 Comparison of Two Types Of Breakwater Construction

Height: +3.0 m

Construction Method	Steel Pile	Concrete Block
Dimension	Width : 7m	Width : 10m
1) Specifications	Inside : SSP III/10m Outside : SSP VL/16m Tie-rods : ϕ25/2m Concrete/slab coping Sandfill Foot protection for anti-scouring apron	Inside : 1 .5m x 1.5m x 3m (6.75m^3) Outside : 1m x 1m x 4m (4m^3) Concrete/slab Backfill material Armor stone
2) Quantity of Material (per meter wall width)	Steel : 4.9 tons Concrete : 10.75m^3 Sand : 42m^3 Foot protection:(500kg) : 7m^3	Cast-in-place : 5.28 m^3 PC block : 24.70 m^3 Backfill : 55m^3 Stone : 24m^3 0.5~1 ton : 5 m^3
3) Unit Cost Indice (Direct construction cost) Local Procurement Rate	275/100 15%	330/124 80%
4) Remarks for Usage	Tends to become scoured, requiring scouring protection measures. (Reflected waves exist)	Possesses high durability Can be protected against scoring by rubble stone mound (Reflected waves exist)
5) Remarks for Construction	Can be constructed with light machinery in short time Can be used on steeply sloping sites Special care should be directed to the embedded boulders. (Requires supplemental construction methods)	Requires heavy duty crane Requires large yard for manufacturing Long construction period Unsuitable for use on steeply sloping sites

Provided sufficient construction time exists and a large, nearby production yard is available, even though construction costs are slightly high, concrete block, with its superior durability and high local procurement ratio, shall be recommended. However, if concrete block is used, juxtaposing the case in which the breakwater on the western side of the project site shall be built 55m offshore from the existing coastal road (L = 55m) to cause of the sea bottom slope drastically changes, from 1:10 to 1:2.7, around 60m offshore line (L = 60). Even in this case, it reveals the difficulty in both forming a rubble mound and in maintaining the concrete block for the long term. Furthermore,

moving the location of the breakwater toward the landward side, (L < 55 m) would require that the existing tide embankment (reclaimed) be cut back 10m in order to ensure the minimum required mooring area. Accordingly, although unsuitable for the conditions of the ground comprising the project site (due to the existence of boulder), it has been decided to employ the sheet piling construction method with its easy-to-secure physical stability, even though supplemental construction methods must be used (refer to the attached basic design chart).

Regarding the vertical height of the breakwater, to permit the over-topping of waves during periods of extreme weather conditions, a height of MHHW + 1.0H = 0.6m + 1.0 x 2.0m = 2.6m → 2.5m, as specified by the Japanese Port and Harbor Standards, will be employed for the shallow area on the northern side of the breakwater near the mouth of the Roseau river where the water depth is 2.0m or less. For the western side of the breakwater bordering the 5m depth line, where a little extra latitude is desired, a 3.0m height is to be employed (as per the Japanese Fishery Port Standards, MHHW + 0.6H = 0.6m + 0.6 x 4m = 3m). Moreover, as indicated in Section 4-1-2, "Environmental Conditions," the ground under structures located on deep, steeply sloping ocean bottoms tends to undergo scoring due to wave action. To prevent this, the seaward face of the sheet pile is to be protected by foundation stones. The weight of the foundation stones required for the design wave height of H = 5m is calculated based on the ratio of the foundation stone peak depth (h') to the water depth at the location of the sheet pile (h); i.e., h'/h = 2.5m/5.0m = 0.5, which, according to the Port and Harbor Standards, yields a figure of 0.5 tons/rock.

(3) Fish Landing Wharf For Large Fishing Boat s

According to the sounding survey of the sea bottom, even if a sheet pile-type wharf is deployed, the wharf front is restricted to the line L = 55m as located 5 or more meters landward of the 5m depth line, seaward of which a sharp transition of the sea bottom slope occurs, shifting from a gradient of 1:10 to one of 1:2.7. With the gravity-type concrete block construction, considering the need to ensure stability of the rubble foundation, the wharf line is restricted to L = 50m, a retraction of 5 more meters landward.

Table 4-6 summarizes the specifications and characteristics of the two types of wharf (sheet pile and gravity) suitable for the project site in terms of wharf construction. Considering the above points in addition to the constraints of the construction period, construction costs, and production yard, the sheet pile method will be employed for the landing wharf for large fishing boat.

Table 4-6 Comparison of Landing Wharf Formations

	Sheet-Pile	Concrete Block
1) Specifications	Sheet-pile :SSP-IVA/14m Tie-rods :ϕ 32/13m Retaining wall (concrete): 3.6 m Concrete/coping, apron: Backfill material	Block:1m x 1m x 4m Cast-in-place concrete/apron :5m Backfill material/filter sheet Rubble mound: Armor stone:
2) Quantity of material (per 1 meter width)	Foot protection for anti-scouring: Steel :2.7 tons Concrete :5.2m^3 Backfill :53m^3 Foot protection :5m^3	Cast-in-place :3.1m^3 PC concrete :14.4m^3 Backfill :26m^3 Rubble mound :10m^3 Armor stone :2 tons/5m^3
3) Direct construction cost rate Local procurement rate	(160)/100 55%	(197)/123 80%
4) Remarks for usage	Requires corrosion protection measures Subject to scouring (Reflected waves exist)	Possesses high durability Can be protected against scouring by rubble mound (Reflected waves exist)
5) Remarks for construction	Can be constructed with light machinery in short time Special care should be directed to boulders (Requires supplemental construction methods)	Requires heavy crane Requires a large yard for making concrete blocks Requires a long construction period Unsuitable on steeply sloping sites

Regarding the water depth in front of wharf and the vertical height of wharf, based on the natural conditions such as the waves and tides, as well as the draft and the bulwark of the large fishing boats that are to use the wharf (1.8m & 1m, respectively), a figure of -2.0m and +1.5m, respectively, has been deemed desirable. However, because the loading wharf is located in the open sea with no breakwater, as a measure to dampen waves during periods of extreme weather conditions, which occur at least once per year, the vertical height of wharf (apron section) is to be 2.0m high, and the height above sea level of the reclaimed land to its rear is to be 2.5m, with the height above sea level of the floors of the buildings to be + 2.7m; under the condition that + 3.0m parapet be built along the rear portion of the wharf apron. By way of comparison, the

height above sea level of the coastal promenade bordering the project site is 2.5m, and the vertical height of the sea wall is 3.6m.

(4) Slipway/Boat Landing

As previously indicated, on the southern side of the project site, as located on the leeward side of the new ferry terminal, bottom sediments is stable and is not subject to impact by the prevailing southerly waves, thus here has been selected as the location of the slipway/boat ramp to be used by the small fishing boats.

Regarding the slipway, considering the draft of the small fishing boats as per the Fishing Port Standards (-0.3m) and the tide variation (+0.2m ~ +0.6m), the water depth the vertical height and incline slipway at its front edge have been determined to be -0.5m+2.0m and 1:6 (15m width), respectively. Regarding the boat ramp, its width will be 5m, and it will slope upward at an incline of 1:10 from a +2.0m height bordering the slipway to a height of +2.5m at the its rear side.

4-3-3 Basic Policy Facility Design

Historically, Dominica has been strongly influenced by Britain, with many of the government and social systems taken from their British counterparts. Accordingly, building, transportation, and disaster prevention codes and standards related to the project facilities will be based on British standards. In the design of facilities, sufficient consideration will be directed to the meteorological conditions of Dominica (refer to Sec. 4.1.2).

① The wind speed to be employed for the building design will be the maximum wind speed during hurricane weather — 68m/sec.

② Because high heat and humidity persist during the summer season, shade and air circulation will be considered for the rooms in the facilities. The roof incline will be gentle so as to be able to withstand high winds.

③ Because the site upon which the project facilities will be built lies near the wharf, which, facing the open sea, is subject to waves, spray, and salt air, construction material of high durability will be used.

④ The principal structural material will be concrete. However, in consideration of hurricanes, the roofing material and the main building will utilize galvanized steel in their construction.

⑤ The equipment will utilize either highly-durable galvanized steel or aluminum. Wear parts such as fittings, air conditioning, electrical and sanitary fittings, and materials shall be composed of materials that are easy to obtain locally.

As these facilities span a complex and varied set of functions, layout of the facilities will be performed such that the smooth implementation of each function and accommodation of future expansion is assured. Open and clean, the fish market will be a facility at which townspeople can feel free to buy fish. Note, that, because gasoline and oils and fats may be stored in the fishermen's lockers, sufficient ventilation will be provided, and a firebreak will be placed between the road abutting the site and the facilities in the interests of arresting the spread of fire.

4-3-4 Facility Layout Plan

Due to restrictions and conditions imposed by the surroundings, the land area of the project site, including the water surface area, is limited to 9,300m^2 (155m wide x 60m long). Of this area, approximately 2,250m^2 (75m wide x 30m long) near the mouth of the Roseau river comprises the existing tide embankment (reclaimed land), and, the opposite side, approximately 2,000m^2 (80m wide x 25m deep) comprises a gravel beach; the front side of both these areas will become water areas.

In placing the project facilities, the layout plan will be formulated as described below, so as to allocate landing wharf and mooring areas for the fishing fleet and the required on-shore facilities (Roseau Fisheries Center, bus terminal, fishermen's lockers, etc.).

① Because, in the area of the project site, the water is comparatively shallow, so that it is easier to construct the west breakwater to protect against the prevailing southerly waves and the north breakwater to protect against the entry of sediments from the river respectively. A part of the existing tide embankment will be removed, and an area of roughly 1,750m^2 (50m wide x 35m long) will be allocated as the mooring area for large fishing boats.

② An area of approximately 1,400m^2 (55m wide x 25m long) in the central portion of the project site will be reclaimed, and a vertical-sided sea wall at its front side will be used as an landing wharf for large fishing boats. Located on this reclaimed land will be the facility that is positioned as the nucleus of this complex, the Roseau Fisheries Center. This Center will be conveniently located near where the large fishing boats will land catch, and it will provide for offloading fish from trucks delivering catch from fishing villages in other regions.

③ On approximately 1,350m^2 (45m wide x 30m long) of the gravel beach (covered by gravel) near the project site of the ferry jetty will be built a slipway and boat ramp for small fishing boats, as well as fishermen's lockers, and toilets/showers, with consideration directed to enabling ready fish landing access from the small fishing boats to the Roseau Fisheries Center.

④ The minibus terminal will be placed in front of the existing Roseau market in the area comprising the existing tide embankment, and consideration will be directed toward providing townspeople ready access to both the existing market and the Roseau Fisheries Center.

⑤ A minimum width of 6m (one-way, two-lane) will be allotted to the roadway (Bay St.) running to the rear of the project site so that no traffic congestion arises in the area surrounding the project site.

4-3-5 Architectural design

(1) Roseau Fisheries Center

The Roseau Fisheries Center will be a two-story building. The first floor will be the operations section, on which the fish handling/processing area, refrigeration facilities, fish market, and miscellaneous-use space will be located; the second floor will be the administrative section, where the offices of the Fisheries Development Division (staff room, advisors room, data processing room, laboratory), fisheries cooperative office, training/meeting room, etc. will be located. To effectively use the limited floor area of the building and to make clear the divisions between unrelated operations, in the operations section, the fish handling and processing area will be placed on the landing wharf side and the fish retail market will be placed on the bus terminal/city street side, and they will be connected to each other within the building.

Compressors and emergency-use electrical generators will be placed in a machine room. To provide a means of escape in case of fire, two outside stairways will be provided, at corners of the building. In addition, a balcony will be provided on the second floor to observe the fishing boats and fish landing operations. A rigid louver will be placed on the balcony handrail to help provide natural ventilation and shade.

① Floor area of each room

Handling/processing area	:	250m^2
Refrigeration facility:		145m^2

Fish market/lockers	:	272m^2
Fisheries staff room & Advisors room	:	190m^2
Data processing room & Laboratory	:	50m^2
Training/meeting room	:	74m^2
Fishermen's Cooperative office	:	55m^2
Toilet and others	:	188m^2

② Exterior finish

Roof	:	Galvanized steel roofing sheet 0.4mm thk on asphalt roofing sheet, glass wool board 50mm thk, plywood 5mm thk.
Eaves	:	Water-proof mortar, trowel trowel finish
Facia or Soffit	:	Trowel plastic on fair-faced concrete
Wall	:	Cement mortar steel trowel w/trowel plastic on concrete block. Trowel plastic on fair-faced concrete.

③ Door and windows

: Steel hanged door w/SOP
Steel swingout door w/SOP
Steel pipe shutter door w/SOP
Aluminum galousie window anodized

④ Roof sunshade

: Wood w/SOP

⑤ Stair

Floor	:	Cement mortar steel trowel w/non-slip nosing tile
Base	:	Cement mortar steel trowel H = 200
Wall	:	Fair-faced concrete w/trowel plastic
Coping	:	Cement mortar steel trowel finish

⑥ Balcony

Floor	:	Cement mortar steel trowel finish
Base	:	Cement mortar steel trowel H = 200
Wall	:	Fair-faced concrete block w/trowel plastic Fair-faced concrete w/trowel plastic
Coping	:	Cement mortar steel trowel finish
Sunshade	:	Wood w/SOP

⑦ Interior finish

a) Fish handling/processing area, Refrigeration facilities area

Floor	:	Cement mortar steel trowel finish w/hardener
Base		Cement mortar steel trowel H = 200
Walls, Column, Beam	:	Fair-faced concrete block w/AEP Fair-faced concrete w/AEP Fair-faced concrete

b) Fish market

Floor	:	Cement mortar steel trowel finish w/hardener
Base	:	Cement mortar steel trowel H = 200
Walls, Column, Beam	:	Fair-faced concrete block w/AEP Fair-faced concrete w/AEP
Ceiling	:	Exposed roof frame
Equipment	:	Concrete sink and counter

c) Lockers for Fish Retailers

Floor	:	Cement mortar steel trowel finish w/hardener
Base	:	Cement mortar steel trowel H = 200
Walls, Bean	:	Fair-faced concrete block w/AEP Fair-faced concrete w/AEP
Ceiling	:	Fair-faced concrete
Partition	:	Wood panels w/SOP

d) Toilet and showers

Floor	:	Ceramic mosaic tile on cement mortar
Walls	:	Ceramic wall tile on cement mortar
Ceiling	:	Plywood 5 thk w/VP

e) Machine room, Generator room

Floor	:	Concrete steel trowel w/hardener
Base	:	Cement mortar steel trowel H = 200
Walls,	:	Fair-faced concrete block
Column, Beam		Fair-faced concrete
Ceiling	:	Fair-faced concrete

f) FDD office, Advisor's room, Staff room, Data analysis room, Laboratory, Fisheries Cooperatives office, Training/Meeting room

Floor	:	Vinyl tile on cement mortar
Base	:	Vinyl H = 100
Wall	:	Fair-faced concrete block w/AEP
Column		Fair-faced concrete w/AEP
Ceiling	:	Rockwool board 9 thk w/wood suspension
Partition	:	Plywood 12 thk both side, SOP finish on wood frame

g) Toilet, Galley

Floor	:	Ceramic mosaic tile on cement mortar
Walls	:	Ceramic wall tile on cement mortar
Ceiling	:	Plywood 5 thk w/VP

h) Storage

Floor	:	Cement mortar steel trowel finish
Base	:	Cement mortar steel trowel H = 200
Wall	:	Fair-faced concrete block
Column		Fair-faced concrete
Ceiling	:	Fair-faced 5 thk
Partitions	:	Plywood 12 thk both side, SOP finish on wood frame

(2) Workshop

The workshop will be located near the slipway/boat ramp. It will serve mainly as a workplace for repairing outboard engines and be also used for fisherman training. A small storage will be annexed for storing spare parts, etc.

① Exterior finish

Roof	:	Concrete steel trowel finish on asphalt waterproofing sheet
Wall	:	Cement mortar steel trowel w/trowel plastic on concrete block Trowel plastic on Fair-faced concrete

② Interior finish

Floor	:	Cement mortar steel trowel w/hardener
Wall	:	Fair-faced concrete, concrete block
Ceiling	:	Fair-faced concrete

(3) Fishermen's Toilets/Showers

① Exterior finish

Roof	:	Concrete steel trowel finish on asphalt waterproofing sheet
Wall	:	Cement mortar steel trowel w/trowel plastic on concrete block Trowel plastic on Fair-faced concrete

② Interior finish

Floor	:	Cement mortar steel trowel
Wall	:	Concrete block w/AEP Fair-faced concrete w/AEP
Ceiling	:	Fair-faced concrete

(4) Fishermen's Lockers

Fishermen's lockers will be provided facing the slipway/boat ramp.

① Exterior finish

Roof	:	Concrete steel trowel finish on asphalt waterproofing sheet

Wall : Cement mortar steel trowel w/trowel plastic on concrete block
Trowel plastic on fair-faced concrete

② Interior finish

Floor	:	Cement mortar steel trowel
Wall	:	Fair-faced concrete
Ceiling	:	Fair-faced concrete
Booth partitions	:	Wood flash panel w/SOP

(5) Exterior Attached Facilities

Other facilities to support the functions of the Roseau Fisheries Complex will be placed along the perimeter of the Fisheries Center. Partition walls will be used to divide each facilities and machine.

Finish

Wall : Cement mortar steel trowel w/trowel plastic on concrete block

4-3-6 Structural Design

In consideration of durability, the Roseau Fisheries Center will be constructed with reinforced concrete. No piling shall be applied for foundation. In consolidation to uneven settlement, the bearing capacity of the soil shall be 5.0 tons/m^2. Types of footing will be mat foundation, or spread foundation, and foundations shall be connected by rigid footing beams. The other facilities will be of reinforced concrete block construction using reinforced concrete.

All cement, steel reinforcing bars, and steel are imported products. The compressive strength of concrete is generally 210kg/cm^2. Deformed steel reinforcing bars shall be used, and the yield strength shall be more than 345 KN/cm^2 generally used in Japan. Design standards will be referenced to CUBIC units.

The seismic activity factor used will be applied as UBC Zone 2. The base shear coefficient is K = 0.075. The design wind speed will be 150mph (68m/sec).

4-3-7 Facility Design

(1) Water Supply Equipment

The facilities on the project site can be supplied with water by the Dominica Water Supply and Sewerage Co. Ltd. (DOWASCO) through water lines. Dominica is rich in water resources, and utilizes the gradients of the mountainous areas to supply virtually all households with water by means of water lines. The water supply situation is exceedingly good, and there are absolutely no problems foreseen in terms of either water shortages or quality (water is potable). All water required for the planned facilities will be supplied by DOWASCO.

① Calculation of water use

a) for domestic use

Fishermen	20 persons/day x 70ℓ/person	= 1,400ℓ/day
Sales clerks	15 persons/day x 70ℓ/person	= 1,050ℓ/day
Administrators	30 persons/day x 50ℓ/person	= 1,500ℓ/day
	Subtotal :	3,950ℓ/day → 4m³/day

b) for washing

Fish washing	9.7 tons of fish/day x 0.3	= 2,910ℓ/day
Processing	0.78 tons of fish/day x 2.0	= 1,600ℓ/day
Floor cleaning	600ℓ/hr x 0.5hr x 6 faucets	= 1,800ℓ/day
Fish market	100ℓ/counter x 15 counters	= 1,500ℓ/day
	Subtotal :	7,810ℓday → 8m³/day

c) for ice manufacturing 10,000ℓ/day → 10m³/day

d) for cooling water 90 frozen tons x 13ℓ/min • tons x 60min x 24hr = 33,700ℓ/day → 34m³/day

e) for fishing boat use (large fishing boats) 400ℓ/vessel x 5 vessels/day = 2,000ℓ/day → 2m³/day

Total : 58m³/day

② Storage water capacity

For the purpose of maintaining water supply system, the water supply is cut off once a week for roughly 8 hours each occurrence. Because a large quantity of water will be used irrespective of the time of day, 50% of the water required for a single day must be stored. Accordingly, the water storage capacity will be 29m^3 (58m^3/day x 50%).

③ Water supply system

After water collected in the water reservoir tank has been pumped up to the elevated water tank, it will be supplied by gravity feed to the facilities.

Water reservoir tank	:			
	Capacity	:	29m^3	1 set
	Dimensions	:	3.0m (L) x 3.0 (W) x 3.5m (H)	
	Material	:	FRP	
Elevated water tan	:			
	Capacity	:	3.6m^3	1 set
	Dimensions	:	1.5m (L) x 1.5m (W) x 2.0m (H)	
	Composition	:	RC const., height: 12m, column: 500 x 500mm	
Water pump	:			
	Pipe diameter	:	32mm	2 sets
	Pump capacity	:	100ℓ/min	
	Head	:	15m, 1.5kW	

(2) Wastewater Treatment Facility

Sewage and domestic wastewater will be shunted from source points indoors, collected in gutters outdoors, and directed to a purification tank. From there, it will be discharged into the Roseau river at or below the final effluent quality (BOD: 20ppm). The inner organs of the greater portion of the fish will be processed onboard before the boats make landing. Accordingly, because cleaning water used in the fish handling and processing area will incur little contamination from fish body liquids, etc., direct

discharge of this water into the ocean poses no threat. Furthermore, only the cleaning water will be discharged; i.e., processing scraps such as meat and bone will be removed before discharging.

Purification tank	1 set
Purification method	Contact aeration
Composition	FRP construction
Processing capacity	4.3m^3/day
In-line wastewater pump	2 sets
Line diameter	50mm
Pump capacity	100ℓ/min
Head	5m, 0.75kW

(3) Sanitary Facility

Both the toilets and showers of the Roseau Fisheries Center and for the fishermen will be provided with chamber pots, sinks and showers. Two LPG tanks (20 pounds) will be provided for the work table installed in the quality inspection room.

(4) Ventilation Facility

The Fisheries advisor's room located on the second floor of the Roseau Fisheries Center will be equipped with air conditioning equipment (window-mount type, 2,000kcal/hr, 1,000W, AC230V, single phase), and the other rooms will be equipped with ceiling fans (ϕ1,200mm, 60W), the number therein to be reckoned according to the size of the corresponding room. In addition, a ventilating fan (400CMH, 3mmAq, 90W) will be provided.

(5) Electrical Facility

Because the refrigeration facilities are included in the project, a power source supplying both 230V single-phase and 400V three-phase (for motive power) electricity is required. Although the power situation in Dominica is comparatively stable, to prepare for the worst case, an emergency-use generator (30kVA) will be provided to operate only the cold storage The electrical power requirements are reckoned as shown below.

	Maximum Electrical power	Mean Load	Rated Electrical power
a) Refrigeration	115kW	70%	80.5kW
b) Water pumps	4.5kW	30%	1.4W
c) Illumination & others	37.6kW	Illum: 70% Outlets: 20%	14.0kW
Totals :	157.1kW (196kVA)		95.9kW (120kVA)

As per the above, a total of 120kVA (50Hz — single-phase 230V; three-phase 400V) of power will be dropped to the facility. Electricity will be supplied by shunting a voltage from the 11kV distribution line running alongside the road on the north side of the site, and laying wire on site in underground conduit.

(6) Fire Extinguishing Facility

To be prepared for the outbreak of fire, 24 fire extinguishers (gasoline fire extinguishers containing 3.0ℓ of liquid) will be installed inside the buildings, and three fire hydrants will be installed outside the buildings.

(7) Fuel Supply System

Equipment to supply gasoline and diesel fuel to fishing boats using the Roseau Fisheries Complex and the tanks therefor will be installed. Note that, if a fixed minimum amount of fuel is used, the oil company contracting the site, Texaco, plans to install the fuel supply system free of charge. (Note, however, this does not include foundation work.)

Gasoline Tank	:	2,000 I.G. (6' (ϕ) x 10.9' (L)) Buried underground	1
Diesel Fuel Tank	:	3,000 I.G. (6' (ϕ) x 18' (L))	1
Supply Equipment	:	For gasoline, for diesel fuel pump, valve, gauges, dispensers, corrosion-resistant	1 set each

(8) Refrigeration facility

The design of the refrigeration facility to be co-installed in the Roseau Fisheries Complex will be performed based on the following design criteria and conditions.

1) Design Criteria

① The outside air temperature, humidity, and water temperature of the supply water has been established to be 30°C, 70%, and 25°C, respectively.

② In consideration of the limited construction period and future expandability, the chilled room, cold storage, and ice storage shall be of pre-fabricated construction.

③ With regard to the compression method, in consideration of the comparatively large scale of this equipment and simplification of maintenance, an open-type compressor-mounted condensing unit will be employed.

④ With regard to type of the condenser, a water-cooled condenser will be employed. Although using water to cool the compressor requires large amounts of cooling water, because Dominica is rich in water and its water supply situation is exceedingly favorable, the water-cooled method is most effective for the comparatively large-sized refrigeration facility provided for by this project.

⑤ With regard to the defrosters, because, for the blast freezer, an electric heater type defroster would be extremely large, and because the water supply situation in Dominica does not pose a problem, the spray method will be employed. For the chilled room, cold storage and ice storage, because the defrosting equipment is simple, an electric heater defroster will be employed.

2) Ice Plant

Daily production capacity	:	9 tons
Ice type	:	Flaked ice
Cooling method	:	Freon 22 direct expansion dry method, drum cooling
Refrigerant condensation method	:	Water cooled
Source water type	:	Pure water
Water temperature	:	25°C
Ice storage capacity	:	$30m^3$ x 2 rooms
Actual weight of stored ice	:	15 tons x 2 rooms

(Main Equipment)

Ice maker	:	Drum-type aluminum construction (4.5 tons/day)	2 units
Condenser unit for ice maker	:	Open-type single-stage reciprocating multicylinder compressor mounted condensing unit	2 units
Cooling capacity	:	32,000kcal/hr at et -20/ct 35°C	1 set
Motor power	:	18.5 kW	
Cooling tower	:	40RT	
Ice storage	:	Pre-fabricated with insulation panels	
Dimensions	:	4,500 (W) x 7,200 (D) x 2,500 (H) (mm)	
Insulation panel	:	Locally foamed rigid urethane, 100mm	
Surface material	:	Galvanized steel sheet, anodized finish	
Door	:	Double-sided	

3) Blast Freezer

Daily freezing capacity	:	2.5 tons (20 hours)
Target fish	:	Yellowfin tuna, swordfish, etc.
Temperature	:	-25°C (final room temperature)
Cooling method	:	Freon 22 direct expansion dry method, drum cooling
Refrigerant condensation method	:	Water cooled
Defrosting method	:	Water spray
Water temperature	:	25°C
Freezer room capacity	:	$85m^3$

(Main Equipment)

Freezing condenser unit	:	Open-type two-stage reciprocating multicylinder compressor mounted	1 unit
Cooling capacity	:	35,000kcal/hr at et -35/ct35°C	
Motor power	:	30kW	
Condenser	:	Floor mount, self-stand, spray defrost	1 unit
Cooling area	:	750m^3, fin pitch: 12mm	
Number of fans	:	3	
Piping materials for refrigerant circulation	:		1 set
Cooling tower	:	50RT	1 unit
Defroster water tank	:	Buried concrete tank, approx. 4 tons	1 unit
Freezer room	:	Pre-fabricated with insulation panels	
Dimensions	:	3,600 (W) x 7,200 (D) x 3,500 (H) (mm)	
Insulation panel	:	Locally foamed rigid urethane, 100mm	
Surface material	:	Galvanized steel sheet, anodized finish	

4) Cold Storage

Capacity	:	40 tons
Target fish	:	35,000kcal/hr at et -35/ct 35°C
Inner temperature	:	-20°C
Cooling method	:	Freon 22 direct expansion dry method, drum cooling
Refrigerant condensation method	:	Water cooled
Defrosting method	:	Electric heater
Size of storage	:	90m^3

(Main Equipment)

Freezing condenser unit	:	Open-type single-stage reciprocating multicylinder compressor mounted	1 unit
Cooling capacity	:	18,000kcal/hr at et -30/ct 35°C	
Motor power	:	15kW	
Condenser	:	Ceiling suspended, electric heater defrost specification	1 unit
Cooling area	:	200m^2, fin pitch: 10mm	
Number of fans	:	4	
Piping materials for refrigerant circulation	:		1 set
Cooling tower	:	20RT	
Cold storage	:	Pre-fabricated with insulation panels	
Dimensions	:	3,600 (W) x 3,600 (D) x 2,500 (H) (mm)	
Insulation panel	:	Locally foamed rigid urethane, 100 mm	
Surface material	:	Galvanized steel sheet, anodized finish	

5) Chilled Room

Storage capacity	:	10 tons
Target fish	:	Mixed catch (flying fish, halfbeak, etc.)
Inner temperature	:	0°C
Cooling method	:	Freon 22 direct expansion dry method, unit cooler
Refrigerant condensation method	:	Air cooled (air cooled condenser)
Defrosting method	:	Electric heater
Size of storage	:	30m^3

(Main Equipment)

Condenser unit	:	Air-cooled unitary body unit	1 unit
Cooling capacity	:	3,000kcal/hr at r0/ct30°C	
Motor power	:	2.2kW	
Installation method	:	Pre-fab through-wall unitary body	
Chilled room	:	Pre-fabricated with insulation panels	
Dimensions	:	3,600 (W) x 3,600 (D) x 2,500 (H) (mm)	
Insulation panel	:	Locally foamed rigid urethane, 100mm	
Surface material	:	Galvanized steel sheet, anodized finish	

(9) Fish Waste & Garbage Treatment Facility

With respect to preservation of the environment surrounding the Roseau Fisheries Center in the area provided for in this project, processing of fish waste treatment originating in the project facilities is essential, and required equipment shall be installed therein.

At the fish loading and processing area, small fish fillet processing, frozen tuna chunk/block cutting is performed. The wastes (head, bone, buts, meat scraps, etc.) will be collected in a basket, and treated by fish waste treatment plant to end up as fish meal. This fish meal will be made available to domestic poultry farmers at an inexpensive price. In addition, it is reckoned that large quantities of plastic bags, waste paper, etc. will be used in the market environs. Of this waste, burnable refuse will be disposed of in an incinerator that is planned to be installed in the complex, and non-burnable refuse will be placed in garbage depots to be collected by existing garbage collecting trucks operated by Dominica.

1) Fish Waste Treatment Plant

The amount of fish waste originating from the project facilities are forecast to amount to approximately 1,000kg per day. To process this quantity, the following equipment will be installed.

Processing capacity	:	500kg/session (4 hours)
Number of processing sessions per day	:	2 (total: 8 hours)
Treatment method	:	Simple batch type, dry and sterilized with burner

2) Incinerator

Daily amount of garbage (general waste)	:	Approx. 100kg
Daily operating time	:	4hr
Hourly treatment volume	:	Approx. 25kg
Required capacity	:	$0.35m^3$
Type	:	Smoke consuming

4-3-8 Equipment Plan

(1) Basic Policy

① To achieve the project objectives and perform the functions of each facility, necessary equipment appropriate for local needs and the technical level of the users will be selected and supplied.

② With regard to spare parts, because time is required to procure parts, sufficient stock of spare parts will be planned in order to eliminate machine maintenance related problems.

③ In consideration of the distance and freight cost of shipping from Japan, of simple equipment and materials, such as fish boxes, will be procured from the United States, Canada and other nearby developed nations.

(2) Fish Marketing Equipment

Fish marketing equipment include those required for receiving fish from local fishing villages, offloading fish at the Roseau Fisheries Complex, sorting, processing, and vending. Specifically, the following equipment are required.

① Fish containers

Fish containers are employed to temporarily preserve fish caught by local villages, for transport to Roseau, for handling, processing and preserving fish, for offloading fish from fishing boats, and for loading ice to fishing boats. Accordingly, fishing containers shaped for easiest use with respect to these operations, and with sufficient capacity as well, will be selected.

(a) For fishing villages (temporary preservation)

Based on the single year catch landed by the local fishing villages as presented in Table 3-1, the total yearly catch and the average daily catch of fishing villages in 1996 has been projected as tabulated below.

Fishing Village	(A) 1992 Fish Catch (tons)	(B) 1996 Fish Catch Forecast (tons)	(C) Average per day (kg)
Scotts Head	211.9	307	1,279
Fond St. Jean	60.3	87	362
Marigot	62.2	90	375
San Souveur	68.0	99	413
Portsmouth	149.7	217	904
Bioche	105.0	152	633
Mahaut	77.8	113	471
Colihaut	62.2	90	375
Newtown	154.2	224	933
Vielle Case	29.2	42	175
Anse de Mai	23.8	35	145
Stowe	23.8	35	145
Calibishie	13.0	19	79
Salisbury	18.4	27	113
Atkinson	23.8	35	146
Pottersville	71.3	103	429
Capucin	11.8	17	71
St. Joseph	10.7	16	67
Layou	11.8	17	71
Coulibistrie	18.8	27	113
Castle Bruce	10.7	16	67
Penville	8.6	12	50
Petite Soufiere	16.1	23	96
Totals:	1243	1,803	

Notes: (B) = (A) x (the 1996 fish catch forecast ÷ the 1992 catch) = (A) x (1,803 tons/1,243 tons)

(C) = the average daily amount with market open 240 days/year = (B)/240

For installation to local fishing villages, the following two kinds of fish containers will be introduced.

Insulated fish container (L)	:	Capacity	:	680ℓ
				(Size: approx. 120 x 108 x 92 (cm))
		Fish volume	:	Approx. 337kg
				(Fish to ice ratio = 1:1)
Insulated fish container (M)	:	Capacity	:	230ℓ
				(Size: approx. 105 x 60 x 70 (cm))
		Fish volume	:	Approx. 110kg
				(Fish to ice ratio = 1:1)

It is estimated that approximately 42% of the fish caught in local fishing villages will be transported to the Roseau Fisheries Complex. Fishing boats based in Pottersville and Newtown land fish directly to the Fisheries Complex, and, therefore, no fish containeres for transport use will be needed at these two places. The fish containers will be distributed based on the values under (C) in the table above in accordance with the criteria presented in the listing below.

(C) Value (catch/day/village)		Type and number of fish containeres (per village)
200kg or less	:	(M) x 1
200~500kg	:	(L) x 1
500~1,000kg	:	(L) x 2
1,000kg or more	:	(L) x 2

The tabulated listing below presents the fish container to be distributed to each village.

Fishing Village	Fish Boxes (Type x Number)	Fishing Village	Fish Boxes (Type x Number)
Scotts Head	(L) x 3	Calibishie	(M) x 1
Fond St. Jean	(L) x 1	Salisbury	(M) x 1
Marigot	(L) x 1	Atkinson	(M) x 1
San Souveur	(L) x 1	Capucin	(M) x 1
Portsmouth	(L) x 2	St. Joseph	(M) x 1
Bioche	(L) x 2	Layou	(M) x 1
Mahaut	(L) x 1	Coulibistrie	(M) x 1
Colihaut	(L) x 1	Castle Bruce	(M) x 1
Vieille Case	(M) x 1	Penville	(M) x 1
Anse de Mai	(M) x 1	Petite Soufiere	(M) x 1
Stowe	(M) x 1		
Totals : Inslated fish container (L) : 12 Insulated fish container (M) : 13			

(b) For transport (For transport from local village to Roseau by insulated truck)

Fish container: 60l (79 x 46 x 28 (cm))

Fish to ice ratio = 2:1, (30kg fish + 15kg ice)

Quantity transported per time

(3,180kg/day x 2 days/time) ÷ 30kg = 212 → 220 boxes

(c) For temporary stock in complex (Stored in chilled room)

a) For three-day stock

Insulated fish container 230l (105 x 60 x 70 (cm))

Fish to ice ratio = 4:1, (180kg fish + 45kg ice)

Quantity stored: 1,823kg ÷ 180kg = 10.1 → 10 boxes

b) For one-day stock
Plastic fish container: 140ℓ
Fish to ice ratio = 4:1, (108kg fish + 27kg ice)
Quantity stored: 3,413kg ÷ 108kg = 31.6 → 32 boxes

c) For temporary stock within complex (before processing or placing fish in freezer)
Insulated fish container: 680ℓ (120 x 108 x 92 (cm))
Fish to ice ratio = 1:1, (337.5kg fish + 337.5kg ice)
Quantity processed: (1,620kg+ 945kg)÷ 337.5kg = 7.6 → 8 boxes

d) For hauling ice to fishing boats
Plastic fish container: 60ℓ (79 x 46 x 28 (cm)) contains 45 kg of ice
Quantity of ice per vessel = 900kg/voyage ÷ 45kg = 20.0 → 20 boxes

e) For retail store use
Plastic fish container: 60ℓ (79 x 46 x 28 (cm)) contains 45kg of ice
Fish to ice ratio = 4:1, (36kg fish + 9kg ice)
Quantity handled per day : (636kg ÷ 36kg = 17.6 → 20 boxes
(Does not take into account the portion offloaded from insulated trucks)

Fish box totals:	Insulated fish container	:	680ℓ	28 boxes
	Insulated fish container	:	230ℓ	10 boxes
	Plastic fish container	:	140ℓ	32 boxes
	Plastic fish container	:	60ℓ	260 boxes

② Insulated trucks (For transporting catch)

To facilitate operations such as loading and unloading of fish from/to trucks, the transport of fish catch from the local fishing villages will be performed using 60ℓ plastic fish containers. Based on the road network of Dominica, the country can be divided into the following regions, and an insulated truck for collecting fish will be provided to each region.

(I) South-western region : The coastal region from St. Joseph, Layou in the north to Scotts Head, Font St. Jean, Petite Savane in the south, including the capital Roseau.

(II) North-western region : The coastal region from Marne Rackete in the south to Capucin via. Portsmouth in the north.

(III) North-eastern region : The coastal region from Marigot in the south to Vielle Case in the north.

(IV) South-eastern region : The coastal region from Castle Bruce in the north to La Plaine to the south.

As explained in the previous-chapter, provided that the about 42% of the total catch would be transferred from rural fishing villages to Roseau, the required volume of fish to be collected from each region are estimated as shown in the table below.

Region	1996 Catch (tons)	Average Catch per Day (kg)	Qty Destined for Roseau (kg/day)
(I) South-eastern region	552	2,300	970
(II) North-western region	530	2,209	940
(III) North-eastern region	221	916	380
(IV) South-eastern region	173	722	300

(Note) Out of the south-eastern region, catches at Pottersville an Newtown are not included in the above table, since those would be directly landed at Roseau Complex.

Based on the fish volume to be transported to Roseau given in the above table, necessary size and number of insulated trucks are defined as follows.

Region	Qty per trip (kg/day)	Capacity and Quantity of Insulated trucks
(I) South-eastern region	970	2 ton truck x one
(II) North-western region	940	2 ton truck x one
(III) North-eastern region	380	2 ton truck x one
(IV) South-eastern region	300	2 ton truck x one

(Note) Max. loading capacity of the trucks.

2 ton truck : Fish 1,000 kg + ice 500 kg

1 ton truck : Fish 400 kg + ice 200 kg

③ Hand carts

Hand carts will be used to transport fish and ice within the Roseau Fisheries Complex. They will be of stainless steel construction to prevent rusting.

Hand carts	For fish handling/processing area	90mm (L) x 600mm (W)	5
	For fish market	900mm (L) x 600mm (W)	5
Hydraulic type hand carts	For hauling ice to fishing boats	1,500kg load	2
	For transporting insulated fish containeres	1,200mm (L) x 750mm (W)	2

④ Scales

Scales will be used to weigh fish carried to the complex's fish handling and processing area, to weigh fish after processing and packaging, and for use in the market by fish market clerks for selling fish by weight.

Platform scale	0 ~ 200 lbs		2
Suspended spring scale	0 ~ 200 lbs		2
Top-pan spring scale	0 ~ 20 lbs	For venders	15
		For processing	3

⑤ Fish processing equipment

The following equipment will be introduced to process fish at the complex's fish handling and processing area.

Bandsaw	For cutting frozen tuna		1
Vacuum packaging machine	For plastic wrap packaging of fillets and tuna blocks		1
Work table	0 ~ 20 lbs		3
For weighing and packaging	0.9m (L) x 2.0m (W) x 0.8m (H)	For processing	2
For fillet processing	1.5m (L) x 4.0m (W) x 0.8 m (H) w/processed scrap sink		

(3) Laboratory equipment

Because most of the fish handled at the Roseau Fisheries Complex is either fresh or frozen and is mainly migratory pelagic fish such as tuna and flying fish, instruments required for inspecting the freshness and quality of the catch will be introduced. These instruments will all be installed in the laboratory on the second floor of the Roseau Fisheries Center. It is planned that reagents and other materials required for inspection will be procured by Dominica. In addition, three staff members of the Fisheries Development Division who have already acquired inspection techniques will be assigned thereto.

① Instruments for chemical analysis

	Inspection Item	Required Instruments
Freshness	K-value	K value meter, 1 unit
	VBN (Volatile Basic Nigrogen)	Conway's unit, 1 set; Incubator, 1 unit; Titrator, 1 unit; Spectrophotometer, 1 unit
	pH value	pH meter, 1 unit
Toxic chem.	Mercury (in tuna)	Mercury analyzer, 1 unit
Water quality	Temperature, pH, dissolved oxygen, Turbidity, Conductivity	Water quality checker, 1 units
	Salinity	Salinometer, 1 unit
Nutrition	Crude protein content	Kjeldahl nitrogen analyzer, 1 unit

② Instruments for bacterial inspection

	Inspection Item	Required Instruments
Bacteria	Total number of bacteria, E. coli, etc.	Incubator, 1 unit; autoclave, 1 unit; Hot-air sterilizer, 1 unit; Colony counter, 1 unit; Biological microscope, 1 unit
Parasites	Anchor worm, etc.	Stereoscopic microscope, 1 unit

③ Instruments for physical inspection

Inspection Item	Required Instruments
Temperature at center of fish body (large-sized frozen fish)	Thermistor thermometer, 1 unit; Electric drill, 1 unit

④ General instruments and devices (for preparation before inspection)

Analytical balance, 1 unit; Electric top-pan balance, 1 unit; Blender, 1 unit; Homogenizer, 1 unit; Meat chopper, 1 unit; Centrifuge, 1 unit; Magnetic stirrer w/hot plate, 2 units; Refrigerator, 1 unit; Water purifier, 1 set, Hot plate, 1 unit; Cooking table, 1 unit; Lab. tables, cabinets, carts, and glass wares, 1 set.

(4) Workshop Equipment

As workshop equipment, 1) hand tools for repair of fishing gear, and 2) tools for maintenance and repair of outboard engines will be introduced and set up in the workshop located within the Roseau Fisheries Complex. This workshop will be operated by three certified outboard engine mechanics already attached to the Fisheries Development Division, for maintenance of engines entrusted by fishermen, as well as for utilizing as a fisherman training facility.

① Hand tools for repair of fishing gear

Hand presser, wire cutters, scissors, etc.	2 sets each

② Tools for repair of outboard engines

General hand tools	2 sets
Special tools	1 set

Electric drill, grinder, hydraulic press, battery recharger, pipe bender, chain hoist, arc welder, air compressor, spark plug tester, etc.

(5) Education and Training Equipment

These equipment will be employed for cooperative's activities, technical training and various extension service activities in the fields of fishing technique, mechanical engineering, and others to educate key personnel of the local fishing villages. These tools will be set up in the training/meeting room on the second floor of the Roseau Fisheries Center, and will be managed and used by the Fisheries Development Division

① Diving instruments

Diving apparatus (two-person set), underwater camera, etc.	1 set

② Audio-visual instruments

Video set, overhead projector, movie projector, etc.	1 set

③ Vehicle for extension services (four-wheel drive) 1 unit

(6) Communications and Data Processing Equipment

In the interests of performing regular and stable collection and distribution of fish caught by local fishing villages, a scheme to maintain close contact between the Roseau Fisheries Complex and the insulated trucks must be implemented. By clarifying the type and quantity of the day's catch before it is received by the complex, the market operators can prepare for receiving, which is considered to be helpful in preserving freshness. In addition, close contact between the extension service car and the Fisheries Development Division can also be performed to more effectively instruct the fishermen.

At present, the Fisheries Development Division possesses only one data processing machine (an older model which is down much of the time), and cannot deal adequately with processing the increasing quantity of data. Under the backdrop of a projected sharp expansion in development of Dominica's fisheries once the Roseau Fisheries Complex is completed, in order to enable effective use of this data, the provisioning of required devices is critical to effect the collection and processing of the large quantities of data with a limited number of personnel.

①	VHF radio	For installation in Roseau Fisheries Complex	1 set
		For installation in vehicles	5 sets

② Data processing equipment

a)	For information exchange with the headquarters of the Agriculture Ministry and OECS	1 set
b)	For fisheries development planning (For comprehensive collection of related data)	1 set
c)	For fishery resource analysis	1 set
d)	For preparation if fishery statistics	1 set
e)	For site use (portable)	1 set

③	Copying machine	To produce statistical resources, etc.	1 unit
④	Facsimile machine	For exchange of information with the Ministry's HQ office, OECS, etc.	1 unit

4-4 Implementation Plan

4-4-1 Implementation Policy

(1) Basic Policy

The implementation plan of this project will to be established based on the basic principles listed below.

① Utilize local labor and supplies/equipment to the maximum possible extent.

② Be mindful of the surrounding environment.

③ Maintain close ties with the local community to prevent trouble from occurring.

④ Respect the culture and traditions of the concerned country.

(2) Scope of Works

The scope of works in this project is presented below.

① Securing of the land for the project

② Construction of facilities for the Roseau Fisheries Complex

③ Procurement of equipment required for the said complex

④ Provisioning of services accompanying execution of the above works and construction supervision.

⑤ Performing the required arrangements and obtaining of necessary permissions related to the execution of the above work.

(3) Obligations of the Governments of Dominica and Japan

The obligations of both nations with respect to the performance of this project are presented below.

[Responsibilities of the Government of Dominica]

① Securing of planned construction area and removal of obstacles from area to be used, including the water area

② Backfill work on planned land

③ Provisioning of a guary site for collecting stones to be used for construction and provisioning of a concrete- block construction yard

④ Exemption from customs clearance and import tariffs on resources and equipment used for this project

⑤ Exemption of Japanese nationals from all taxes and fiscal levies imposed on them while providing resources, equipment and services for the said construction

⑥ Exemption from project authorization/approvals required by persons and/or organizations associated with Japanese nationals in the pursuit of this project, and obtaining and granting of other privileges

⑦ Effective maintenance and operation of facilities constructed by the Grant Aid Program

[Responsibilities of the Government of Japan]

① Procurement of all resources, equipment and labor required for said construction

② Performance of surface (sea and inland) transport of imported resources and equipment required for construction, and bearing of export insurance fees

③ Provisioning of consulting services such as the preparation of detailed design assistance in tender operations and management, construction supervision, and the like

4-4-2 Matters Important to Execution of the Project

With regard to marine structure work, occasional high waves and/or swells from the open sea may impinge upon the harbor during the hurricane season from July to December, and care must be exercised thereto. The stone to be used for foot protection of the wharf and breakwater, which face the open sea, must be large; this stone will have to be broken up through the use of dynamite, as well as sorted and transported, requiring caution be directed to the safety of the surrounding residents.

With regard to the onshore facilities work, because temperature and precipitation greatly affect the quality of concrete, to prevent the temperature of recently-poured concrete from exceeding a fixed value (35°C) 1) temperature control of material (cement, sand, gravel, water), 2) temperature control of concrete while casting, and 3) temperature control and anti-drying measures (water spraying)during curing of concrete are required. When pouring concrete outdoors, rainwater repellent measures are required.

Because construction materials are to be imported from other nations, a large yard is required for storage of construction materials and repair of heavy machinery, processing of steel reinforcing bars, manufacturing of concrete blocks. Because of the difficulty in allocating this yard on the project site, the use of government owned land in Canefield or a site near the opposite bank of the Roseau river is required.

4-4-3 Plan for Supervision Of Construction Work

After signing of an agreement for consulting services with the government of Dominica, consultants will conduct an on-site survey and holding discussions with the Government of Dominica. Once these are completed documents such as detailed design drawings, structural calculation reports, bill of quantities, specifications, etc., will be drafted. Upon completion of a tender document, a contractor will be selected through the proper procedures, i.e. approval of detailed design, tenderer pre-qualification, tendering, tender evaluation.

After conclusion of construction contract, the consultants will perform in Japan a check of shop drawings submitted by the contractor, monitoring of manufacturing of construction parts and materials, witnessing of quality testing of equipment and materials, and packing inspection before shipment. Concurrent with site construction start, consultants will be dispatched to conduct coordination, supervision of construction work, and quality monitoring/inspection.

4-4-4 Procurement of Equipment/Materials

Materials required for the facilities for the project facilities include construction material: sand, aggregate, armor stone, cement, brick, steel (steel reinforcing bar, bailing wire), and building material: roofing materials, blocks, bricks, paint, glass, sanitary appliances, piping, etc. Of which sand, aggregate, stone, bricks and blocks can be locally procured, but imported materials will have to be used for the remainder. Similar public works projects in the said nation (sea wall construction, government office construction) are making steady headway, so that no significant problems in procuring the required construction materials are anticipated through the consecutive planning of associated work.

With regard to heavy machinery and the transportation method thereof, because the type and number of machines that can be procured on site are limited, they must be imported from neighboring countries; these shall be procured domestically only if such procurement is unavoidable.

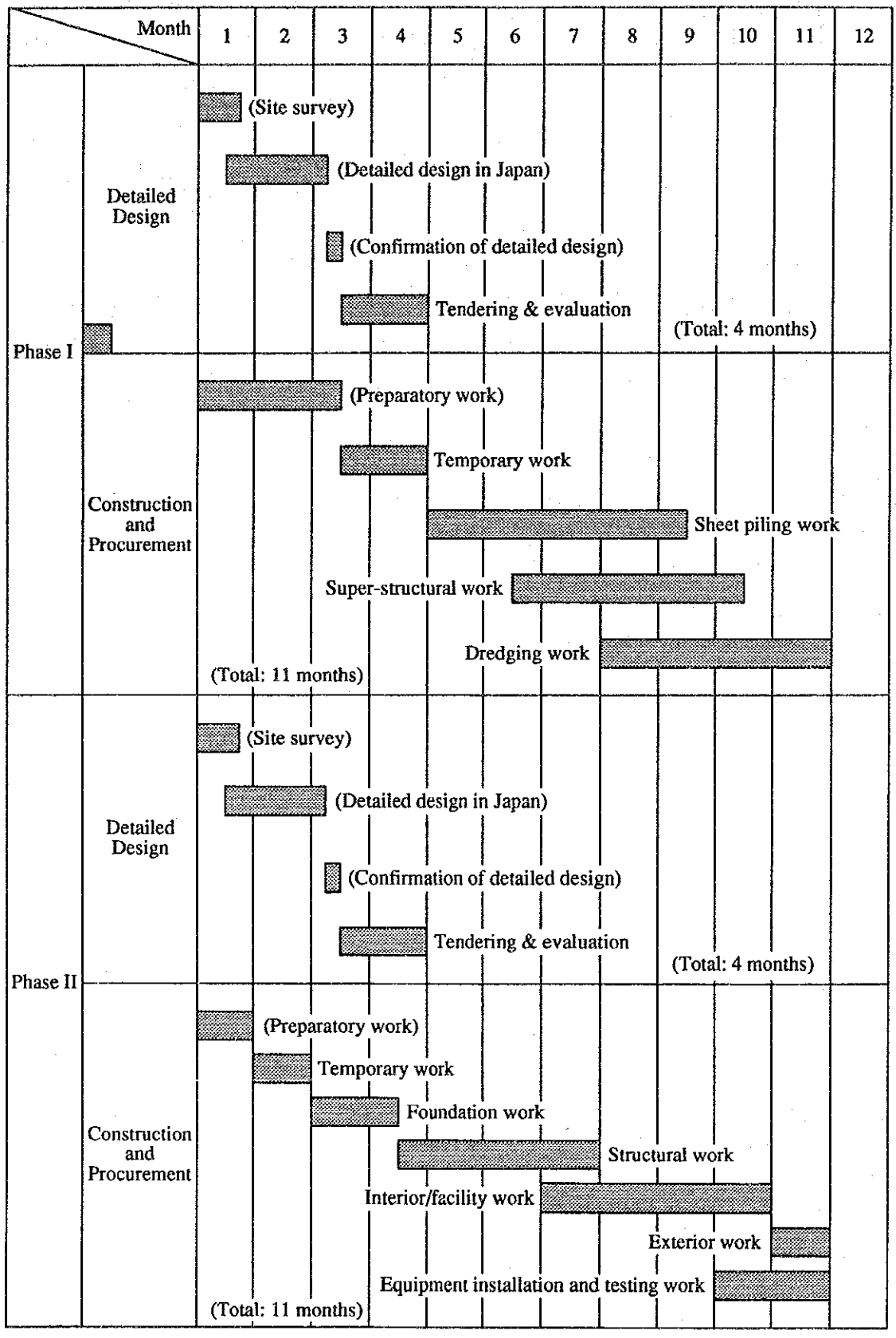
4-4-5 Implementation Schedule

Implementation of this project shall be performed in two phases; Phase I: Civil work; and Phase II: Architectural work. The actual time required for each is tabulated below, and the work schedule is presented in Table 4-7.

(in months)

	Execution design	Operation & procure-ment of equipment	Total
Phase I: Civil work	4	11	15
Phase II: Architectural work	4	11	15

Fig. 4-7 Project Implementation Schedule



4-4-6 Costs to be Borne by Dominica

①	Site backfill work	EC $ 160,000
②	Power & water supply	EC $ 30,000

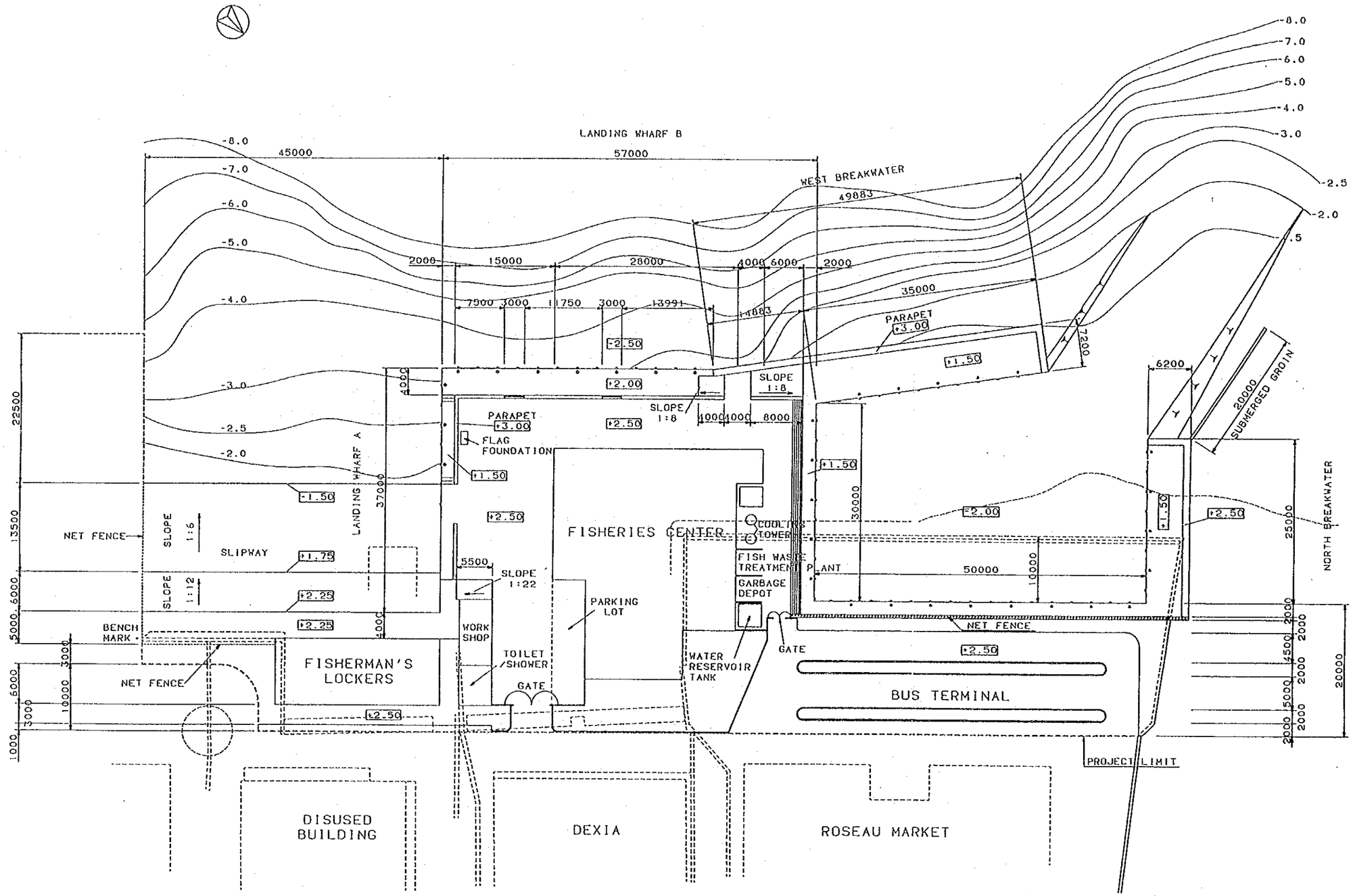
4-5 Environmental Impact and Countermeasures

The fisheries is a means of production which maintains close ties to the natural environment. Because the environment of the fishing grounds greatly influences the success or failure of this project, sufficient attention was directed to this point during formulation of the plan.

Based on the promotion and introduction of large fishing boats and improvement of existing fishing boats, this project is targeted to increase the catch more than two-fold by 1996, from an estimated 1992 catch of roughly 1,250 tons to approximately 2,775 tons in 1996. Data concerning fishery resources in the waters of Dominica are virtually nonexistent. At present, the OECS is conducting a survey of fishery resources of all nations in the eastern Caribbean sea. Turning to Dominica, most of the country's fish catch is migratory fish, making the estimating of fish stocks a difficult task, and the reaching of unconditional conclusions impossible. However, according to the Dominican fishermen, the size of tuna is extremely large, and the schools of smaller migratory fish, such as flying fish and mackerel, are large as well. Thus, it is thought that there is still plenty of surplus stock.

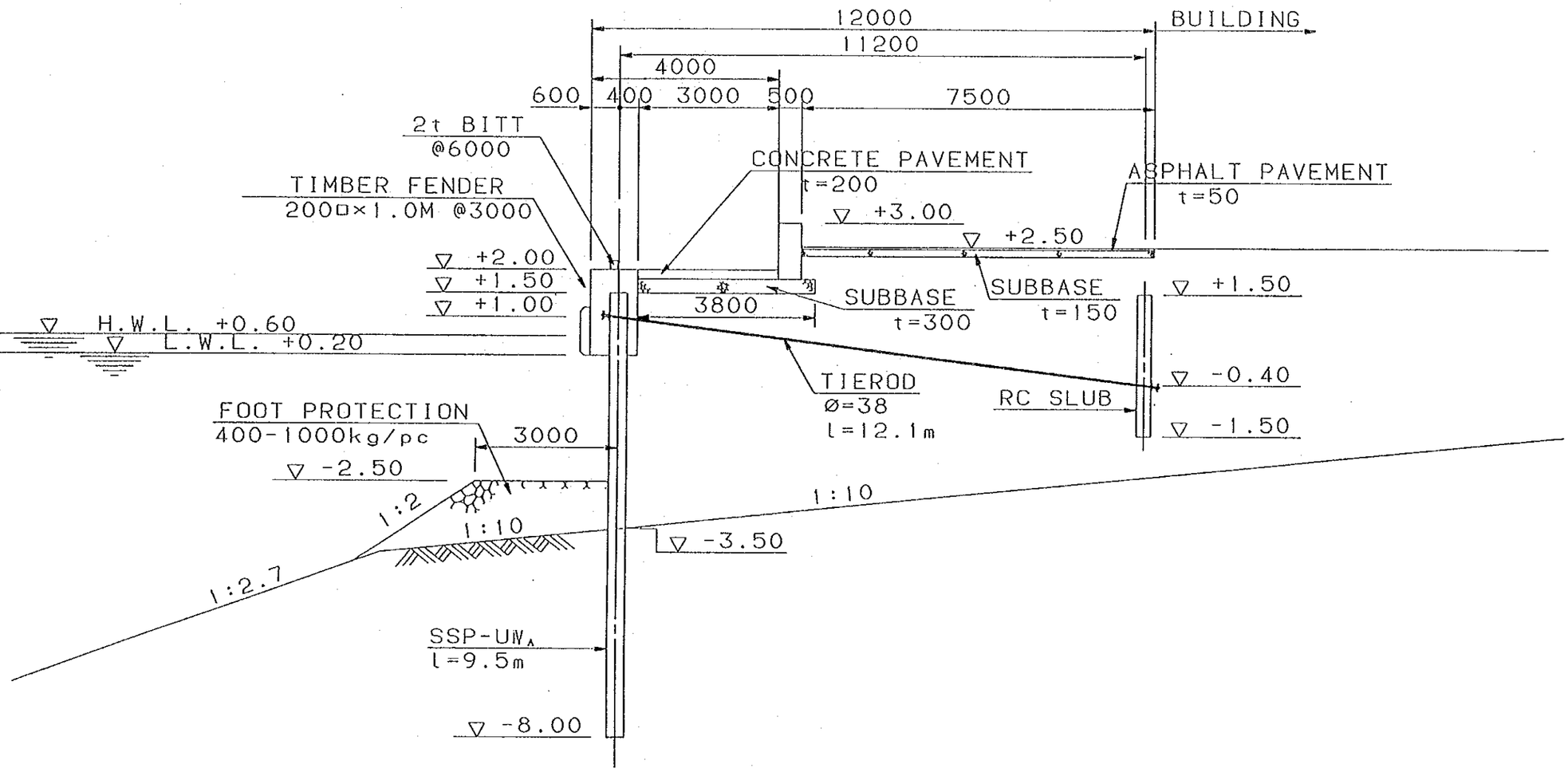
Although the project site is to be partly extended through site back-fill, a survey of the sea bottom in the area to be extended revealed no coral or other immobile fauna, and the grass vegetation was meager; thus, it was concluded that this work would exert little impact on the environment.

The structures to be built will be planned to blend in harmoniously with the surrounding environment. To be more specific, stand-by generators and compressors, to be set up in the Roseau Fisheries Center are to be low-noise, low-vibration models. Furthermore, garbage and fish waste will be disposed in an incinerator/fish waste treatment each day to prevent the appearance of flies, mosquitoes, and other harmful insects. A purification tank to maintain a wastewater BOD of 20ppm or lower, satisfying the water quality standard, will be set up. The purified water will be discharged into a public sewage pipe, from where it will be discharged into the mouth of the Roseau river on the side nearest the project site, eliminating worries of wastewater from these facilities polluting the sea or river.



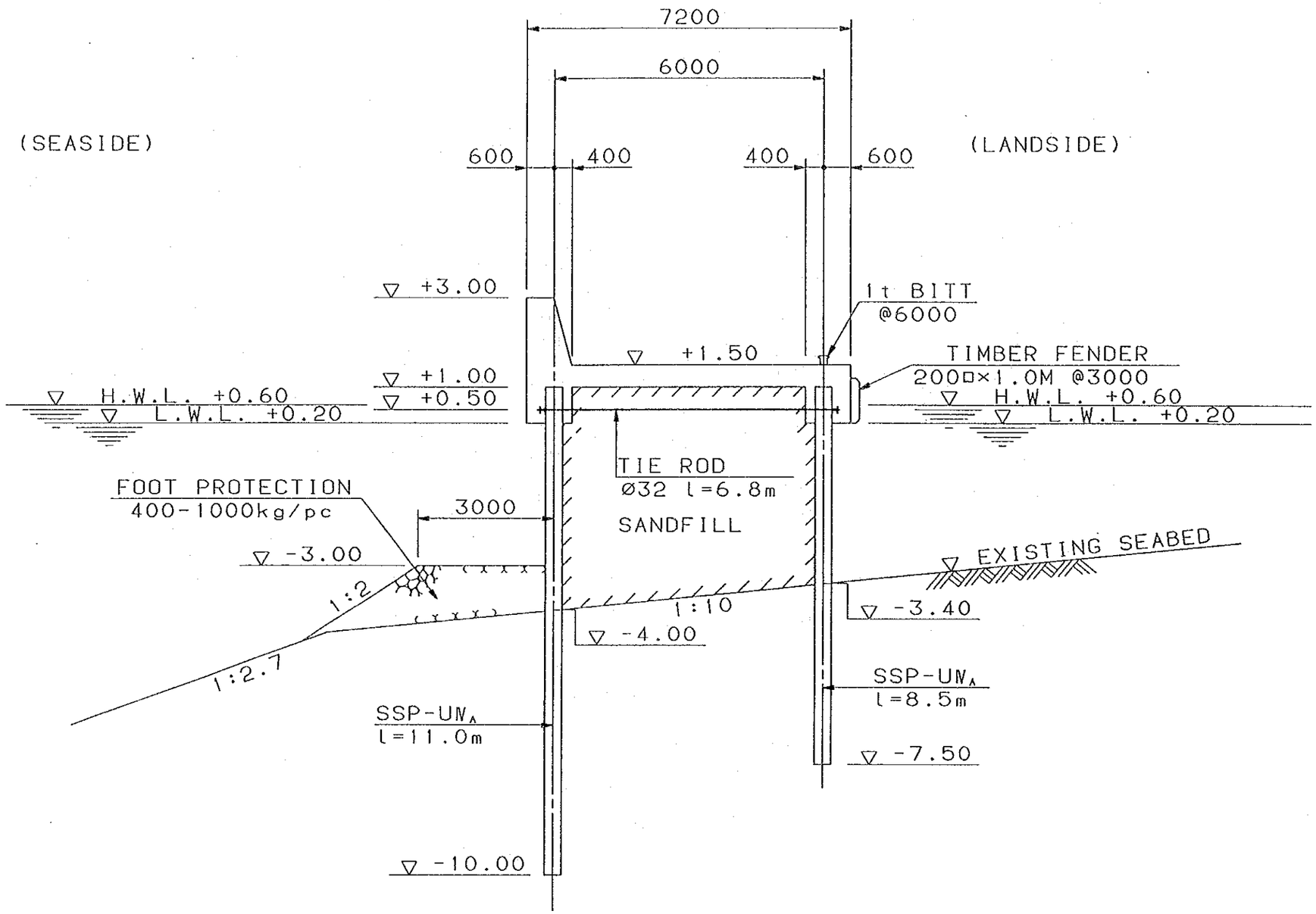
GENERAL PLAN
S=1:600

DRG.NO. C-001



LANDING WHARF (SECTION B)
S=1:100

DRG.NO. C-003

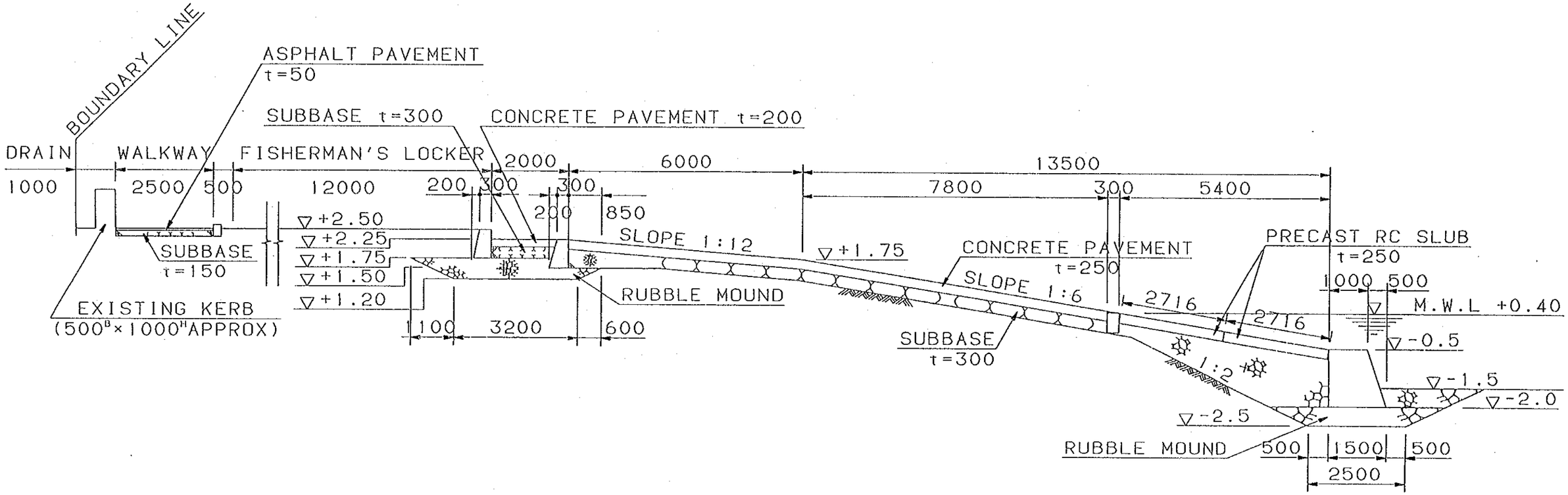


WEST BREAKWATER

STEEL SHEET PILE TYPE TYPICAL SECTION

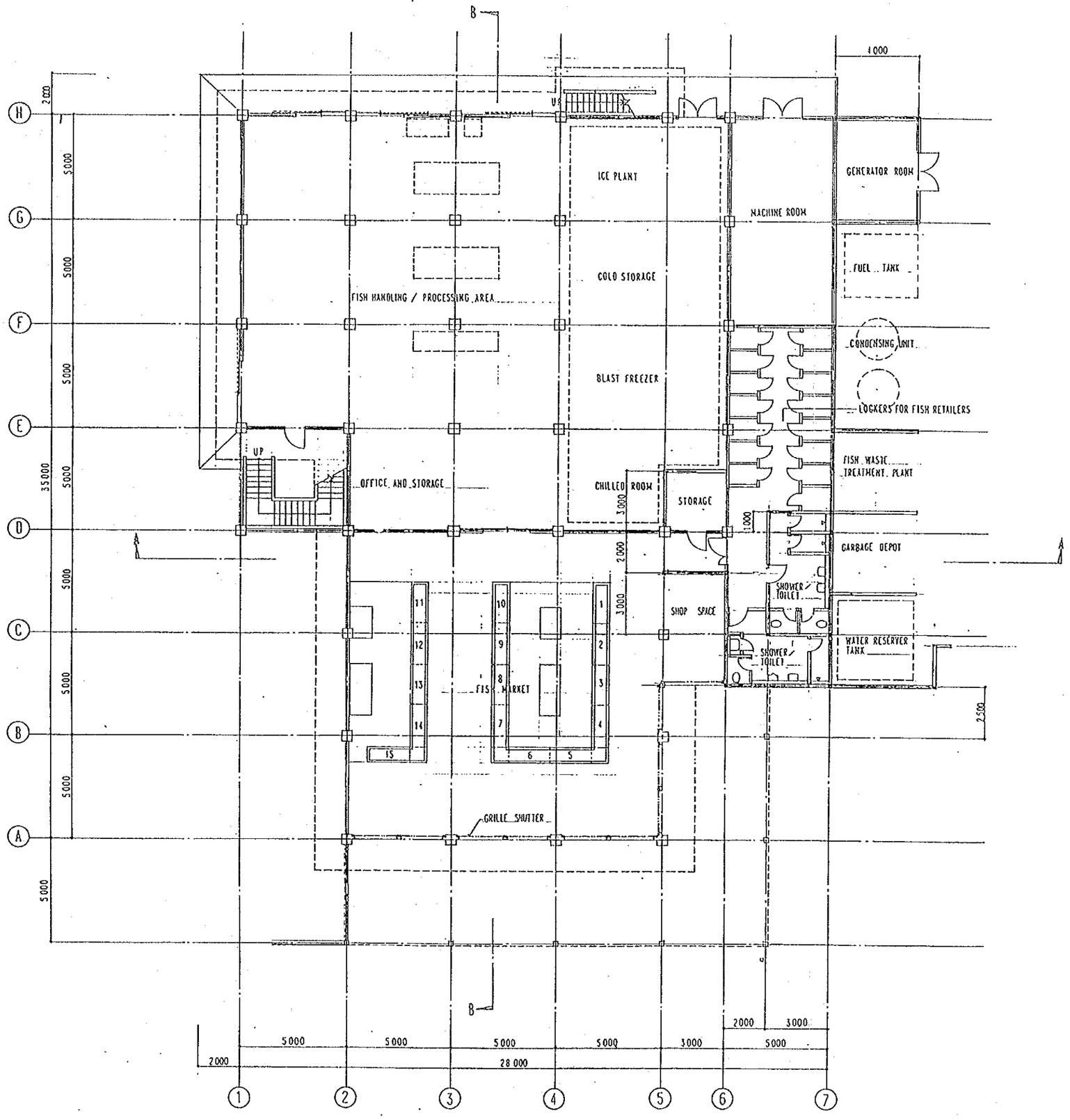
S=1:100

DRG.NO. C-006



SLIPWAY
S=1:100

DRG.NO. C-009

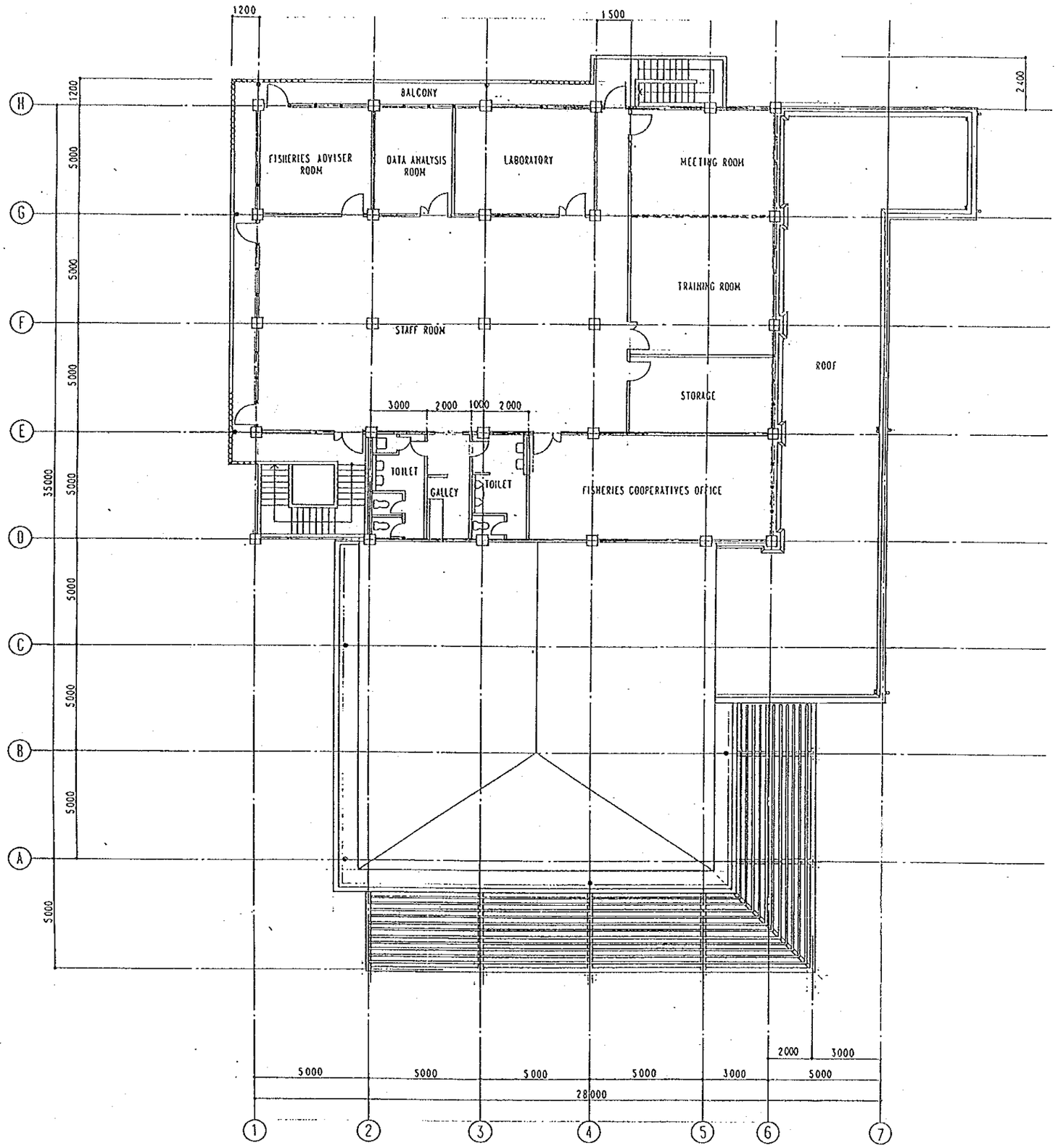


GROUND FLOOR PLAN

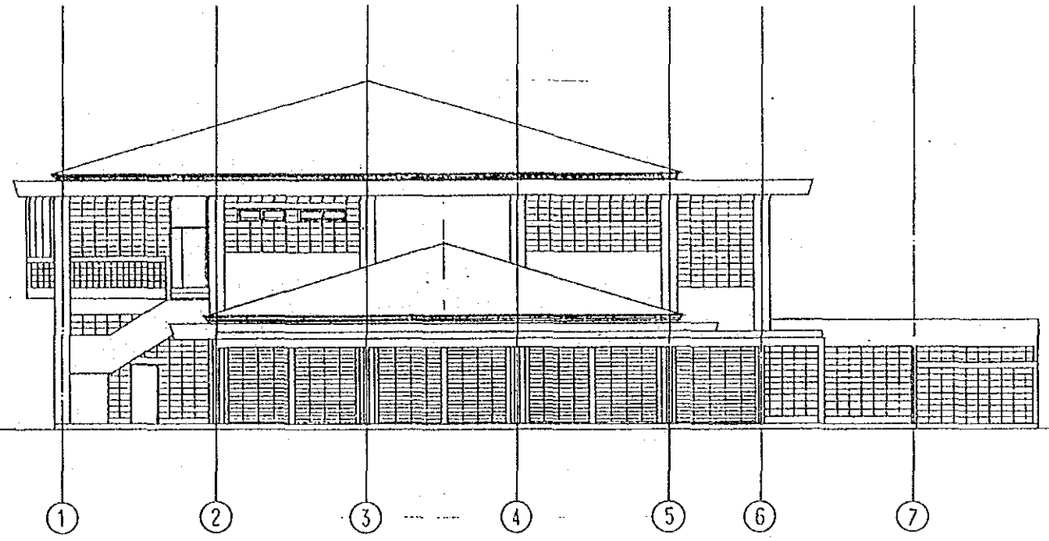
ROSEAU FISHERIES COMPLEX

ROSEAU FISHERIES CENTER

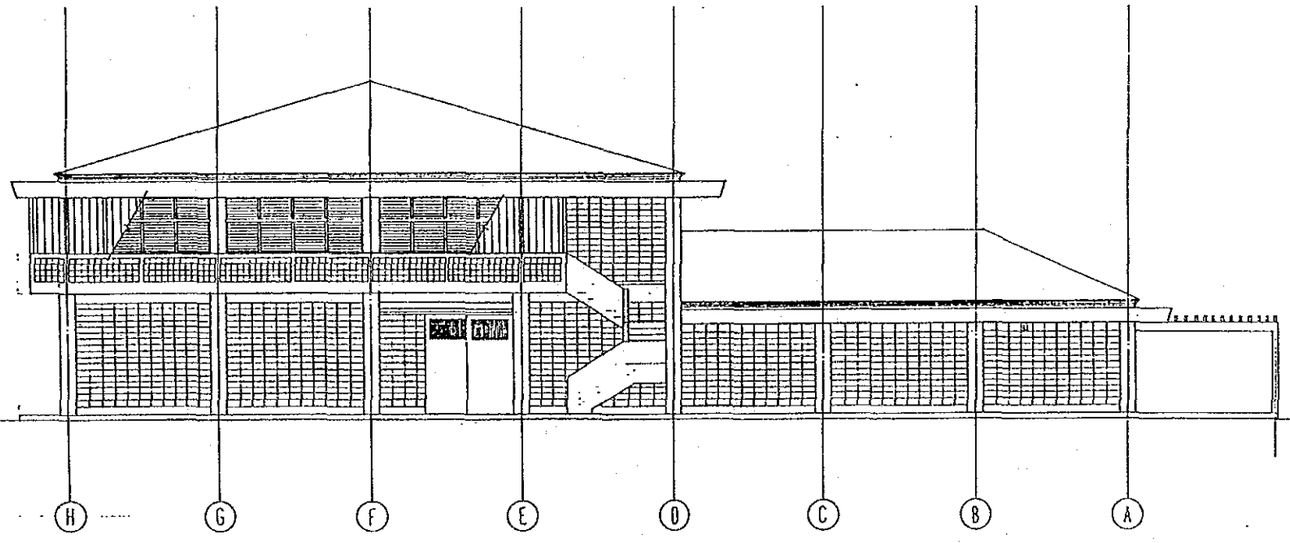
GROUND FLOOR PLAN



FIRST FLOOR PLAN



LINE A ELEVATION

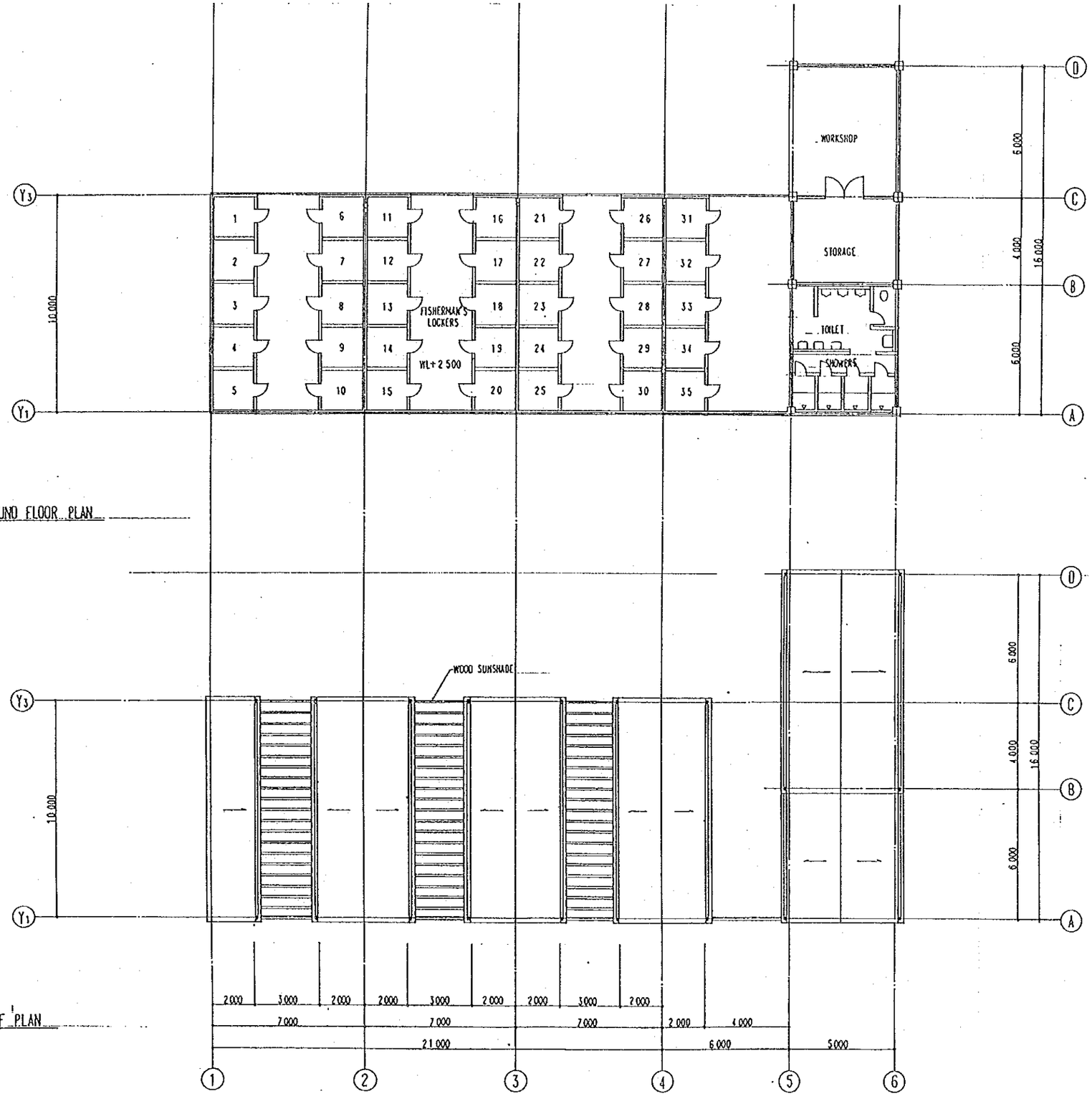


LINE 1 ELEVATION

ROSEAU FISHERIES COMPLEX

ROSEAU FISHERIES CENTER

ELEVATION-1



GROUND FLOOR PLAN

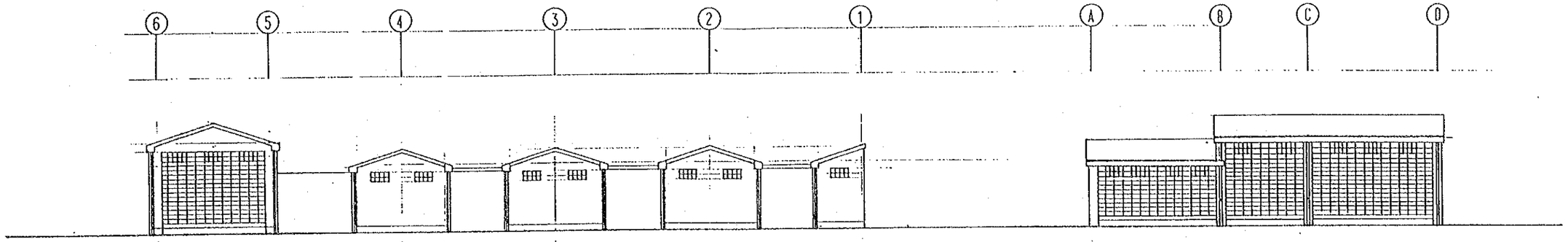
ROOF PLAN

ROSEAU FISHERIES COMPLEX

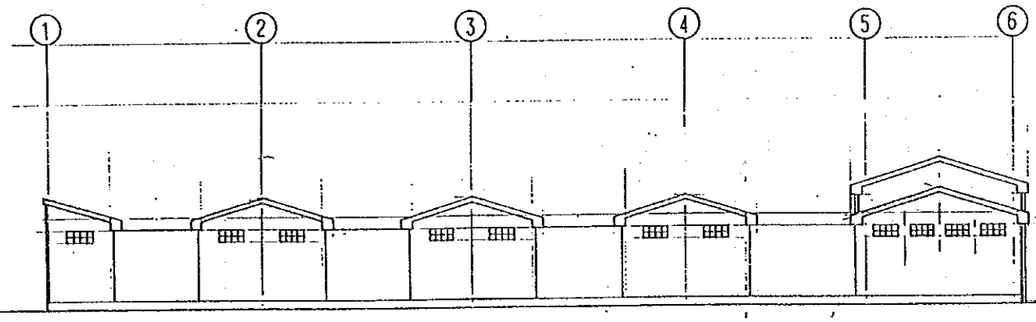
FISHERMAN'S LOCKERS / WORKSHOP

GROUND FLOOR PLAN

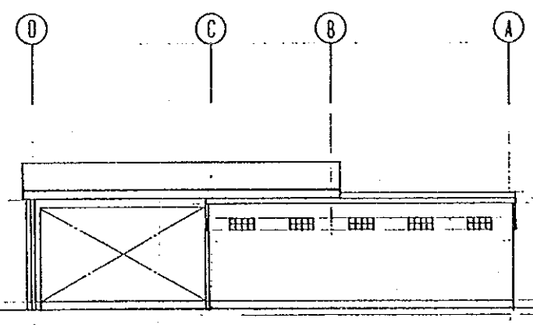
ROOF PLAN



LINE D ELEVATION

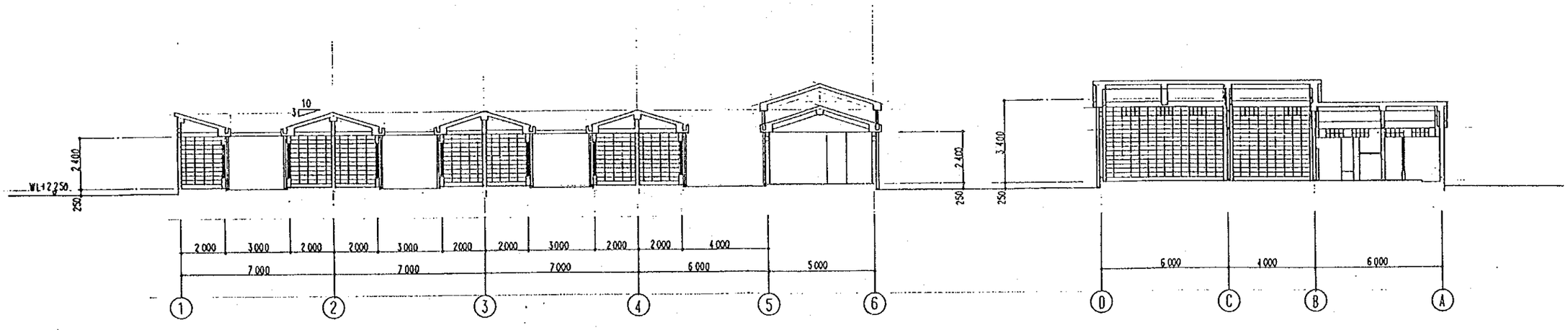


LINE 6 ELEVATION



LINE A ELEVATION

LINE 1 ELEVATION



A-A SECTION

B-B SECTION

ROSEAU FISHERIES COMPLEX

FISHERMAN'S LOCKERS / WORKSHOP

ELEVATION / SECTION

CHAPTER 5 PROJECT BENEFITS AND CONCLUSIONS

5-1 Benefits of project implementation

Current situation and problems	Measures put forth by this project	Project benefits
In order to increase the supply of food to the population, reduce the food import bill and improve socioeconomic level of the fishermen, the fisheries development is required. However, the following problems constrain its development. 1. Due to lack of fishing facilities such as harbors and landing facilities, safe and efficient fishing activities cannot be performed. Furthermore, modernization of fishing boats, fishing gears and methods is limited. 2. Due to inadequacy of fish marketing system and facilities, distribution and marketing of fish catches have been hindered. 3. Facilities required for development, instruction and administration of the fishery sector are inadequate. This has obstructed support activities such as appropriate fishery management, technical training, and extension services to fishermen.	With the need to upgrade fishery infrastructural facilities, ranging from catching to marketing, at each fish landing place, the area that is most populated, the capital city Roseau and its surrounding area, has been selected as the first priority area, and the Roseau Fisheries Complex, having the following functions is planned to be constructed. 1. Fish landings and safe moorings of the fishing boats 2. Collection, preservation and distribution/sales of the catch. 3. Support for fishing boat operation such as supply of fuel, ice and water for the fishing boats, and engine maintenance 4. Post-harvest technological development and quality control 5. Fisheries Development Division's base of activities for technical training and extension services to fishermen.	Centered on the Roseau Fisheries Complex, this project aims to improve the efficiency of commercial fishing activities, expand the distribution of catch and strengthen training and instruction programs with the aim of promoting the fishery development. 1. With making the large fishing boats alongside wharf, fish landing and loading of fishing requisites will be smoothly conducted and their operation efficiency will be improved. This will also promote the introduction of large fishing boats. Small fishing boats, based in Pottersville, Newtown and other nearby fishing villages, can offload their catch directly to the fish market, thus facilitating the selling of their catch. 2. The establishment of an appropriate fish receiving system with the use of refrigeration facility, and the improvement of fish collection methods will increase the quantity of fish sent from local fishing villages to Roseau. Further, it will be possible to store surplus fish when the catch is large, so that the catch will be used more efficiently. This will raise the fishermen's intention to increase the catch and activate their fishing operation. 3. Through the opening of a fish market equipped with suitable facilities on the prime consumption area, both the quality and quantity of fish sales will be upgraded. 4. The activities of the Fisheries Development Division will be facilitated, leading to more effective training and technical extension services for fishermen.

5-2 Conclusions and Recommendations

Lack of fisheries facilities and inadequacy of fish marketing facilities and system restricts the development of the fishing industry of Dominica. To develop the fisheries sector, the following measures are needed.

1) Expansion of fishing capacity through modernization of the fishing boats and introduction of new and efficient fishing gear and methods
2) Promotion of fishing boat modernization through the upgrading of fish landing and port facilities, and streamlining of fishing activities
3) Promotion of fish marketing through the improvement of the related facilities.
4) Strengthening execution of development services and extension activities through the structuring of a base of activities for the Fisheries Development Division

To effect the above, designating the Roseau area as the first priority, this project is to construct the Roseau Fisheries Complex with direct objectives, this is, the upgrading of fishing and marketing facilities and the restructuring of the Fisheries Development Division's base of activities. In view of the need to upgrade fishing villages and fish landing facilities nationwide, the decision to designate the Roseau area — the most populated and high consumption area— as the first priority for upgrading fishing facilities has garnered high marks. Not only do the project facilities focus on fishing and fish marketing activities performed in Dominica, but they greatly benefit regional areas in Dominica as well by effecting such advances as promoting the invigoration of local fishing villages through the distribution of the fish catch. Thus, the execution of this project is expected to bring about the benefits described above.

However, sound operation and management of the project facilities are indispensable toward realizing these benefits, and support and cooperation are needed not only from the project executing agency, but from all departments of the government of Dominica. To permit implementation of the project to be even more smooth and to produce even greater benefits, we would offer the following suggestions.

1) In the fish marketing aspect, operation and management ability, such as fish collection and sales, market management, operation and maintenance of facilities. are required. In consideration of the above, the project calls for DEXIA (*D*ominica *Ex*port/*I*mport *A*gency), which is experienced in operating markets, to

be designated as the operating body, although the government of Dominica is examining the establishment of a new agency under its jurisdiction to operate the facilities provided for in this project. It is a move realistic measure that DEXIA conducts the management and operation of the marketing facilities by establishing a fish market division as a section of DEXIA, an organization possessing personnel experienced in market operation and management, and allowing them to be in charge of operations, rather than establish a new agency. Naturally, prior to the opening the project facilities, DEXIA has to establish a fish market division under the general manager, which would deploy operations staff possessing excellent administrative and management skills and a technical staff for operation and maintenance of the facilities. Of course, as stated earlier, in order to smoothly effect these operations, including budget allocation, it is essential to provide the comprehensive support and cooperation of the immediate supervising authorities as well as the entire government of Dominica.

The fisheries management and education activities will be directly managed and operated by the Fisheries Development Division, which will perform a variety of duties.

Under supervision and instruction afforded by the Fisheries Development Division, the slipway/boat ramp and the fishermen's lockers will be directly managed by a fishermen's cooperatives, which will be organized by the fishermen who use these facilities as their base of operations.

2) Speedy distribution of the fish catch from local landing places to consumption areas is required to encourage fishermen to catch more fish and to invigorate their production activities. To this effect, as one of its mainstays, this project promotes the transport of fish caught in local fishing villages to the major consumption area, including fish collection and marketing to be performed by the market operating body (DEXIA), who will operate the facilities of the Roseau Fisheries Complex. These collection and marketing activities provide the local fishermen, who possess no transport and sales capabilities themselves, an opportunity to sell their catch fresh. In particular, they will make it possible to sell surplus fish when the catch is large, at which times the catch heretofore had to be abandoned as there existed no means to sell it.

How the collection of fish from the local regions is carried out directly determines the success or failure of the market operation. Accordingly, the implementing authorities for this project must formulate and establish a fish collection and marketing system in consideration of the following points.

Preparation of the locally-based fish collection and sales systems:

Although the DEXIA will dispatch insulated trucks to collect the catch from local fishing villages, the collection from individual fisherman with disparate landing schedules requires a tremendous amount of time and efforts, leaving little prospect of fulfilling the operation as called for in this project. A system must be established whereby, at each landing site, a fish collection center is set up, each fisherman carry the fish to the center, and the trucks collect the fish kept in the centers. However, DEXIA alone will not be sufficient to create this collection and transport system, nor would it be adequate to operate it even if the system is put in place.

To overcome this difficulty, a local fish collection agency is indispensable at each fishing village or landing site to work in close collaboration with the Roseau Fisheries Complex. It is, therefore, essential to create and promote the cooperative-based fish collecting and marketing system in each village or landing site.

For this purpose, he Fisheries Development Division and the DEXIA must employ the training that uses the project facilities and on-site instruction to train and educate fishermen's cooperatives or fishermen's group in specific terms on matters ranging from the cooperative-based fish collection and sales to fish preservation methods and accounting system.

Establishment of sales:

Along with the ensuring regular supply of fish from the Roseau Fisheries Complex by the formation of above mentioned systems for collecting fish from the local fishing villages, the establishment of adequate sales channels are also required. Fish retail outlets and wholesalers should be steered toward buying their fish to sell through the Roseau Fisheries Complex and, to implement this, it would be necessary to establish some regulations and rules on fish-marketing as well.

The expansion and development of the function as central market:

The Fisheries Development Division of the government of Dominica plans for the fish market operating body of the Complex to buy fish from the fishermen and sell the fish by themselves. Performing completely cash-based transactions under conditions that reveal the amount of each transaction would rule out the

possibility of being able to collect the catch from the fishermen. Accordingly, considering the collection of the fish, transactions at each landing place must be conditioned upon a fixed-price purchasing system. However, while still in the earlier stages of organizing the locally-based fish collection and sales system mentioned above, beginning with the local fish collecting and marketing bodies (cooperatives, etc.) purchasing from the fishermen is unworkable from both Standpoints of financial and management ability. Because of this, it is necessary to begin the fish collection system with a condition that the market operating body (DEXIA) purchases fish on cash bases from fishermen through their fish collection centers for a certain period.

In this operating mode, with the large quantity of fish that it will handle, DEXIA can not overlook a fact that it will bear the greatest share of risk in the fish transaction. In order to cope with this matter, in the future, DEXIA should introduce a system of consignment sale, that is, the local fish collection bodies such as fishermen's cooperatives will send the fish on consignment to the Complex and settle accounts with local fishermen after the fish is sold, while DEXIA's role will be to receive the fish on consignment to sell to retailers and large consumers and to settle accounts with the local fish collecting bodies after the transaction. This will serve to eliminate the sales risk from DEXIA and make it enable to concentrate on management of the fish market of the Complex as its main duty. DEXIA will introduce systemize an auctioning and tendering trading systems to sell the received fish.

This consignment system would not be easily accepted by fishermen in the beginning because they have to deliver their catches with deferred payment, yet they do not know how much they can receive. It could be, however, accepted and prevailed along with strengthening the cooperatives and giving incentives such as advance payment and fuel with credit. This system will contribute to eliminate unjust practice of fishermen having no choice but to sell their catch at landing sites and give fishermen fair prices reflecting supply-demand condition and quality of fish to sell. It is also anticipated that the beneficial influence of quality of fish on price will induce fishermen to preserve freshness of fish, thus improving quality of fish. This in turn will have an effect of increasing the supply of high quality fish for the people.

In order to implement this system, the market of the Complex needs to be positioned to perform the role of a central, wholesaler tying together the fishermen with the consumer market through fostering fishermen's cooperatives

and establishing sales channels from the market to fish vendors and large consumers.

APPENDIX 1 MEMBERS OF THE SURVEY TEAM

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I. Field Survey Mission

Team Leader	Mr. Akihiro MAE	Assistant Director, Office of the Overseas Fisheries Cooperation, Overseas Fisheries Division, Fisheries Agency
Grant Aid Planner	Mr. Shuji ONO	Second Basic Design Study Division, Grant Aid Study & Design Department, Japan International Cooperation Agency (JICA)
Facilities Designer/Architect	Mr. Masato ARAYA	Overseas Agro-Fisheries Consultants, Co. Ltd. (OAFIC)
Coastal Fisheries Development Planner	Mr. Kazumi IIDA	ditto
Port Civil Planner/Natural Condition Surveyor	Mr. Mamoru NAMAKI	ditto
Facilities Engineer	Mr. Junichiro MORI	ditto
Equipment Planner/Cost Estimate Engineer	Mr. Hiroshi FUKAO	ditto

II. Draft Report Explanation Mission

Leader	Mr. Akihiro MAE	Assistant Director, Office of Overseas Fisheries Cooperation Overseas Fisheries Division, Fisheries Agency
Project Coordinator	Mr. Naoki KAMIJYO	Second Project Management Division Grant Aid Project Management Department, JICA
Facilities Designer	Mr. Masato ARAYA	Overseas Agro-Fisheries Consultants, Co., Ltd.
Coastal Fisheries Development Planner	Mr. Kazumi IIDA	Ditto

APPENDIX 2 ITINERARY OF SURVEY TEAM

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I. Field Survey

No.	Date	Schedule
1	June 8 (Tue.)	Tokyo - New York Departure (NH010)
2	9 (Wed.)	New York - Dominica Arriving at Dominica via Saint Martin (CO237/LI505)
3	10 (Thu.)	Dominica Meeting with local geological survey agents. Discussion with the representatives of the Dominican Government (from the Ministry of Economics and Finance, Ministry of Agriculture, Lands, Fisheries and Forestry, and Ministry of Communications and Works). Visiting the Roseau Project site.
4	11 (Fri.)	Dominica Discussion with the representatives of the Dominican Government (from the Ministry of Economics and Finance, Ministry of Agriculture, Lands, Fisheries and Forestry, and Ministry of Communications and Works). Courtesy call to the Minister of Agriculture, Lands, Fisheries and Forestry. Courtesy call to the Prime Minister (attendance to the luncheon party given by the Prime Minister). Joint meeting with related ministries (explanation of and discussions on the gratuitous system).
5	12 (Sat.)	Dominica Visiting the Roseau Market. Fishing village survey (in the western area). Discussions on details of natural condition survey.
6	13 (Sun.)	Dominica Meeting among the Mission members and preparation of the minutes of discussion (draft).
7	14 (Mon.)	Courtesy call to the Vice Minister of Agriculture, Lands, Fisheries and Forestry. Installation of tide level and current meters (at Roseau). Fishing village survey (in the southern area).
8	15 (Tue.)	Visiting DEXIA and discussions. Discussions with the person in charge of facility planning, the Economic Development Bureau. Discussion on and signing of the Minutes of Discussion. Dinner party given by the chairman of the Mission.
9	16 (Wed.)	Dominica - P.O.S. Two team members leaving Dominica for Port of Spain. Two team members visiting the Embassy of Japan in Trinidad. Fishing village survey (in the eastern and northern areas). Moving tide level and current meters (Roseau to New Town)
10	17 (Thu.)	P.O.S. - New York Two team members leaving Port of Spain for New York via Saint Martine. Two team members visiting the Sea Wall Project Office and collecting data. Data collection at the Ministry of Communications and Works. Hearing survey at the Traffic Bureau. New Town fishing village survey and Roseau market survey.
11	18 (Fri.)	Dominica Two team members leaving New York. The person in charge of facility planning leaving Japan. Fishing boats operating status survey (small long-liners, etc.). Discussion with the representatives of the Dominican Government (from the Ministry of Economics and Finance, Ministry of Agriculture, Lands, Fisheries and Forestry, and Ministry of Communications and Works).

No.	Date	Schedule
12	19 (Sat.)	Dominica Two team members back to Tokyo. The person in charge of facility planning joined with them. Removal of tide level and current meters. Discussion with the representatives of the Dominican Government (from the Ministry of Economics and Finance, Ministry of Agriculture, Lands, Fisheries and Forestry, and Ministry of Communications and Works).
13	20 (Sun.)	Dominica Discussion among the Mission members.
14	21 (Mon.)	Dominica Roseau market facility survey and hearing survey on operations. Construction and civil engineering conditions survey (Port Bureau, Water Supply Public Corporation, Power Supply Public Corporation, oil companies, Telegraph and Telephone Public Corporation, Traffic Bureau, Fire Defense Agency, etc.) Marine product circulating condition survey (importing agents, wholesalers, etc.) Fishery related facility survey (ice making and cold-storage facilities, port facilities, etc.)
15	22 (Tue.)	Dominica Hearing survey at DEXIA. ditto
16	23 (Wed.)	Dominica ditto Discussion with the three representatives of the Dominican Government on the detailed contents of materials and equipment.
17	24 (Thu.)	Dominica ditto
18	25 (Fri.)	Dominica ditto and the person in charge of materials and equipment and their cost estimation leaving Dominica (LI346/BW426)
19	26 (Sat.)	Dominica Fishing village survey (in the south-eastern area).
20	27 (Sun.)	Dominica Arrangement of data, discussion among the Mission members, and the person in charge of materials and equipment and their cost estimation arriving at Tokyo (NH009).
21	28 (Mon.)	Dominica Reporting the outline to the Ministry of Foreign Affairs. Discussion with the Manager, Economic Development Bureau. Reporting the outline to the Minister and Vice Minister of Agriculture, Lands, Fisheries and Forestry and a luncheon party.
22	29 (Tue.)	Dominica Reporting the outline to and the final confirmation with the Prime Minister, Cabinet, and relevant government agencies (the Ministry of Agriculture, Lands, Fisheries and Forestry, Ministry of Communications and Works, and Ministry of Foreign Affairs).
23	30 (Wed.)	Dominica - New York Discussion with the Fishery Development Bureau. Leaving Dominica for New York via Antigua (LI346/BW426).
24	July 1 (Thu.)	New York - Leaving New York (NH009)
25	2 (Fri.)	Back to Tokyo

Note: Representatives of the Dominican Government:

1) Mr. Cary A. Harris - Manager, Economic Development Bureau, Ministry of Financial Development
2) Mr. Maurice Charles - Chief Engineer, Ministry of Communications and Works
3) Mr. Nigel Lawrence - Adviser to Fishery Development, Ministry of Agriculture, Lands, Fisheries and Forestry

Schedule of Natural Condition Survey:

Site	Roseau	New Town
1) Geological survey by core boring	June 20 to 23	–
2) Sea bottom geology survey	June 14	June 17, 18
3) Land geology survey	June 20	June 16, 17
4) Tide level and current survey	June 14 to 16	June 16 to 19

II. Draft Final Report Explanation

No.	Date	Schedule
1	Sep. 6 (Mon.)	Tokyo - New York
2	7 (Tue.)	New York - Dominica Arriving at Dominica via Saint Martin Submitting and explanation of the report to the representatives of the Dominican Government (from the Ministry of Economics and Finance, Ministry of Agriculture, Lands, Fisheries and Forestry, and Ministry of Communications and Works.) Schedule control
3	8 (Wed.)	Courtesy call to the Prime Minister and submitting and Explanation of the report. Courtesy call to the Minister of Agriculture, Lands, Fisheries and Forestry and submitting and explanation of the report. Discussion with the representatives of the Dominican Government (from the Ministry of economics and Finance, Ministry of Communications and Works.)
4	9 (Thu.)	Supplement survey of project site Meeting with Traffic department and Dominica Taxi Association, Explanation of the plan, ask for cooperation
5	10 (Fri.)	Courtesy call to the Ministry of Communications and Works, submitting and explanation of the report. Courtesy call to the Ministry of Foreign Affairs, submitting and explanation of the report. Submitting and explanation of report to Dominica Export Import Agency Discussion with the Ministry of Agriculture, Lands, Fisheries and Forestry, Ministry of Communications and Works
6	11 (Sat.)	Discussion with the representatives of the Dominican Government (from the Ministry of Economics and Finance, Ministry of Communications and Works.)
7	12 (San.)	Dominica Meeting among the Mission members
8	13 (Mon.)	Submitting and explanation of the report to the Ministry of Economics and Finance
9	14 (Tue.)	Dominica - Barbados - P.O.S Report to the Japanese Embassy at Trinidad and Tobago
10	15 (Wed.)	P.O.S. - New York
11	16 (Thu.)	Leaving New York
12	17 (Fri.)	Back to Tokyo

APPENDIX 3 LIST OF INTERVIEWEES

APPENDIX 3 LIST OF INTERVIEWEES

I. Field Survey

Prime Minister		Dame Eugenia Charles
Ministry of Agriculture, Lands, Fisheries and Forestry	Minister	Hon. Maynard Joseph
	Permanent Secretary	Felix Gregoire
	Chief Technical Officer (Agriculture)	Dr. Don Robinson
	Fisheries Development Advisor	Nigel Lawrence
	Fisheries Officer	Harold Guise
	Fisheries Extension Officer	Algernon Philbert
	Fisheries Extension Officer	Norman Norris
	Fisheries Extension Officer	John Robin
Ministry of Finance and Development (Economic Development Unit)	Development Coordinator	Cary A. Harris
	Chief Physical Planner	Raphael Francis
Ministry of Communications and Works	Minister	Hon. Alleyne Carbon
	Chief Technical Officer	Maurice Charles
	General Manager (Port Authority)	Milton Green
	Accounting Officer (Port Authority)	Bermoit Dardouille
Ministery of Foreign Affairs	Minister	Hon. Brian Alleyne
	Permanent Secretary	Iudith Pesteiner
Prime Minister's Office	Traffic Controller (Traffic Dept.)	Felix Augustine
Dominica Water and Sewerage Company Limited (DOWASCO)	General Manager	Dawian C. Shillingford
	Chief Engineer	Patrick Martin
Dominica Electricity Services Limited	General Manager	Rawlins Bruney
Cable and Wireless Dominica	Commercial Manager	Telford C. Shillingford
Dominica Export Import Agency	Chairman	Desmond B. Carlisle
	General Manager	Hanna Clarendon
	Manager (Roseau Market)	Felix St. Jean
TEXACO West Indies Limited	Marketing Assistant	Vincent L. Titre Jr.
Scotts & Bertlin	Project Manager (Roseau Sea Wall Project)	Tony Burnett
Chinese Mission	Captain / Master fisherman	Tso Hon Juei
Embassy of Japan in Trinidad and Tobago	Ambassador	Mitsuru Eguchi
	First Secretary	Takashi Suzuki
	Second Secretary	Kenichi Namimatsu

II. Draft Final Report Explanation

Prime Minister		Dame Eugenia Charles
Ministry of Agriculture, Land, Fisheries and Forestry	Minister	Hon Maynard Joseph
	Permanent Secretary	Felix Gregoire
	Chief Technical Officer (Agriculture)	Dr. Don Robinson
	Fisheries Development Advisor	Nigel Lawrence
Ministry of Finance and Development	Financial Secretary	G. Williams
	Development Coordinator, Economic Department Unit	Cary A. Harris
Ministry of Communications and Works	Minister	Hon. Alleyne Carbon
	Chief Technical Officer	Maurice Charles
Ministry of Foreign Affairs	Minister	Hon. Brian Alleyne
Traffic Department, Prime Minister's Office	Traffic Controller	Felix Augustine
Dominica Export Import Agency	Chairman	Desmond B. Carlisle
	Head Market Support Services Department	Gregoire Thomas
Dominica Taxi Association	Secretary	Ferdinand Hampton
TEXACO West Indies Ltd.	Marketing Representative	Vincent L. Titre Jnr.
Embassy of Japan in Trinidad and Tobago	First Secretary	Takashi Suzuki
	Second Secretary	Kenichi Namimatsu

APPENDIX 4 MINUTES OF DISCUSSION

MINUTES OF DISCUSSION
BASIC DESIGN STUDY
ON
THE PROJECT FOR COASTAL FISHERIES DEVELOPMENT
IN THE COMMONWEALTH OF DOMINICA

In response to the request from the Government of the Commonwealth of Dominica, the Government of Japan decided to conduct a Basic Design Study on The Project for Coastal Fisheries Development (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Commonwealth of Dominica a study team headed by Mr. Akihiro MAE, Assistant Director, the Office of the Overseas Fisheries Cooperation, Fisheries Agency, and is scheduled to stay in the country from June 9th to June 29th 1993.

The Team held discussions with the officials concerned of the Government of Dominica and conducted field surveys at the study area.

In the course of discussions and field surveys, both parties have confirmed the main items descried on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Roseau, June 15th, 1993

Akihiro MAE
Leader,
Basic Design Study Team,
JICA

Cary A. Harris
Development Coordinator,
Economic Development Unit,
Ministry of Finance and Development

Nigel Lawrence
Fisheries Development Advisor,
Fisheries Development Division,
Ministry of Agriculture, Lands, Fisheries and Forestry

ATTACHMENT

1. Objectives of the Project

The objectives of the Project is to improve vessel provisioning, unloading and handling conditions of fishery products and to distribute the products in good quality.

2. Project Site

The Project site is located at Roseau, the Commonwealth of Dominica.
(The Project area and site map are attached as ANNEX - I.)

3. Executing Agency

Responsible Agency : Ministry of Agriculture, Lands, Fisheries and Forestry
Implementing Agency : Fisheries Development Division (F.D.D.)
Dominica Export Import Agency (DEXIA)

4. Items requested by the Government of the Commonwealth of Dominica

After discussions with the Basic Design Study team, the following items were finally requested by the Dominican side.

Fish Market Complex in Roseau

(1) Fish Marketing Facilities
- Fish handling area, fish market area with retail stalls
- Ice making plant, freezer, cold storage
- Office, storage, lockers for fish retailers
- Wharf, embankment
- Vehicles for fish transportation and extension services
- Marketing equipment (fish containers, weighing scales, hand carts, etc.)
- Mini-bus terminal with passengers shelter
- Other equipment (fish waste treatment equipment, incinerator, standby generator)

(2) Facilities for the Fisheries Development Division's activities
- Office with data analysis equipment
- Training/meeting room with educational equipment
- Marine mechanic workshop with equipment
- Laboratory with equipment (for fish quality assurance and processing)

(3) Facilities for Improvement of Fishing Environment in Roseau
- Slipway with boat ramp, fishermen's lockers, net loft and cooperative's office

The final item of the Project will be decided after the detailed studies in Japan.

5. Japan's Grant Aid Program

(1) The Government of Dominica understood the system of Japanese Grant Aid explained by the team.

(2) The Government of Dominica will take necessary measures, described in ANNEX II, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

6. Technical Assistance

The Government of Dominica has intention to submit an official request to the Government of Japan through formal channel for extending technical assistance in a form of despatching an expert for fisheries development.

7. Schedule of the Study

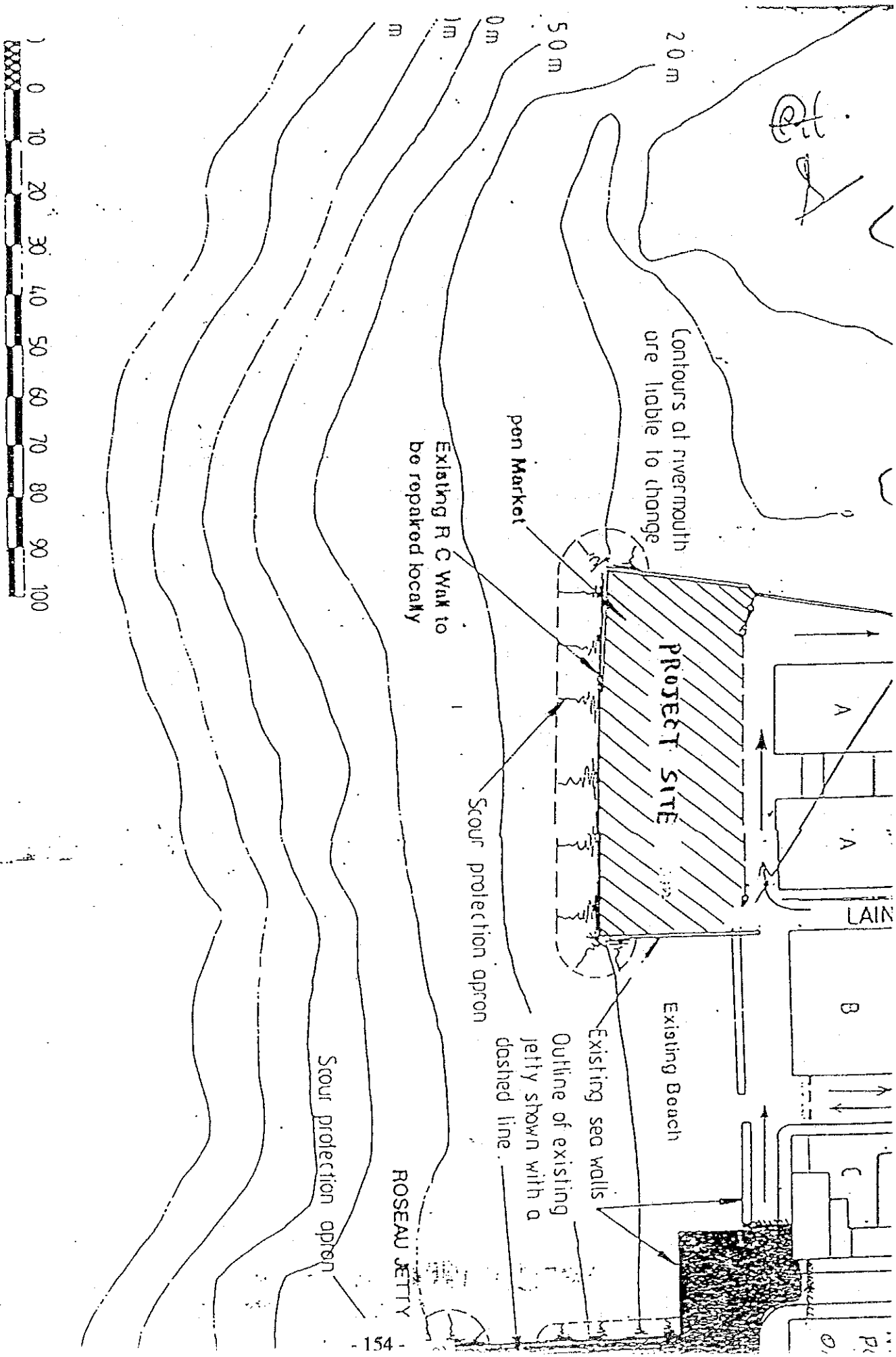
(1) The consultants will proceed to further studies in Dominica until June 29th, 1993.

(2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents at the beginning of September, 1993.

(3) In case that the contents of the report is accepted in principle by the Government of the commonwealth Dominica, JICA will complete the final report and send it to the Commonwealth of Dominica by the end of October, 1993.

ANNEX - 4

PROJECT AREA AND SITE LOCATION MAP



ANNEX - II

Necessary Measures to be taken by the Commonwealth of Dominica
in case Japan's Grant Aid executed

1. To secure the sites of the Project.
2. To clear, level and reclaim the sites prior to commencement of the construction.
3. To provide electricity, water supply, drainage, sewage, tele-communication and other incidental facilities to the Project site.
4. To bear commissions to the Japanese foreign exchange bank for banking services based upon the Banking Arrangement (B/A).
5. To exempt taxes and duties all materials and equipment bought for the Project at port of disembarkation.
6. To take necessary measures to assist in the customs clearance of the material and equipment brought in for the Project at the port of disembarkation.
7. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contract such facilities as may be necessary for their entry into Dominica and stay therein for the performance of their work.
8. To maintain and use properly and effectively the facilities constructed and equipment under the verified contracts.
9. To bear the cost of any additional works and equipment outside the scope of the Project as defined in the project document unless otherwise agreed by both parties.
10. To coordinate and solve any matters related which may arise with third party and inhabitants living in the Project area during implementation of the Project.

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY

ON

THE PROJECT FOR COASTAL FISHERIES DEVELOPMENT
IN THE COMMONWEALTH OF DOMINICA

(CONSULTATION ON DRAFT FINAL REPORT)

In June 1993, the Japan International Cooperation Agency (JICA) dispatched the Basic Design Team on the Project for Coastal Fisheries Development (hereinafter referred to as 'the Project'), to THE COMMONWEALTH OF DOMINICA, and through discussions, field survey and technical examination of the results in Japan, JICA has prepared the draft final report of the study.

In order to explain and to consult the Dominican side on the components of the draft final report, JICA sent to Dominica a study team, which is headed by Mr. Akihiro MAE, Assistant Director, Office of Overseas Fisheries Cooperation, Fisheries Agency, and scheduled to stay in the country from September 7th to 14th, 1993.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Roseau, September 13, 1993

Akihiro MAE
Leader
Draft Final Report Explanation Team
JICA

Cary A. HARRIS
Development Coodinator
Economic Development Unit

Nigel LAWRENCE
Fisheries Advisor
Fisheries Development Division

Morris CHARLES
Chief Technical Officer
Ministry of Communications, Works and Housing