NO

BASIC DESIGN STUDY REPORT

ON

THE PROJECT

FOR

ARTISANAL FISHERIES DEVELOPMENT

IN

SAINT CHRISTOPHER AND NEVIS

MAY 2005

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of Saint Christopher and Nevis, the Government of Japan decided to conduct a basic design study on the Project for Artisanal Fisheries Development and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Saint Christopher and Nevis a study team from August 16 to October 10, 2004.

The team held discussions with the officials concerned of the Government of Saint Christopher and Nevis, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Saint Christopher and Nevis from February 5 to 16, 2005 in order to discuss a land acquisition for the project, and from April 9 to 20, 2005 in order to discuss a draft basic design, and as this result, the present report was finalized.

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

I wish to express my sincere appreciation to the officials concerned of the Government of Saint Christopher and Nevis for their close cooperation extended to the teams.

May, 2005

Seiji KOJIMA
Vise-President
Japan International Cooperation Agency

May, 2005

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Artisanal Fisheries Development in Saint Christopher and Nevis.

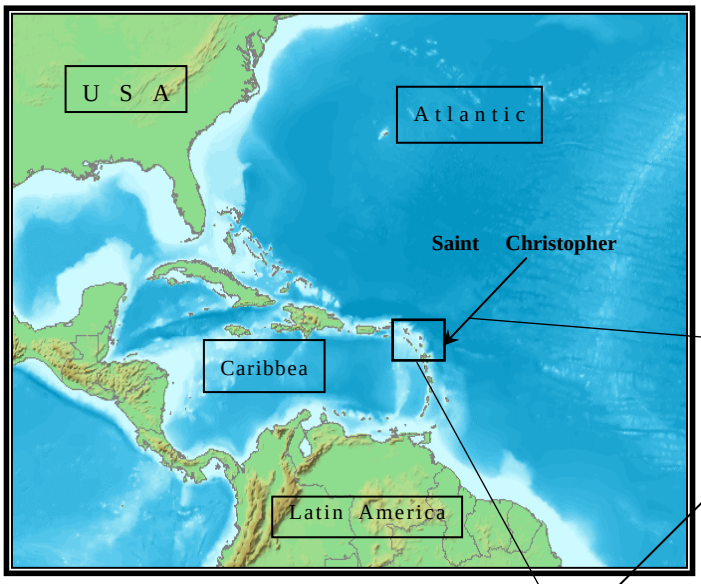
This study was conducted by ICONS International Cooperation Inc., under a contract to JICA, during the period from August, 2004 to May, 2005. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Saint Christopher and Nevis and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

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

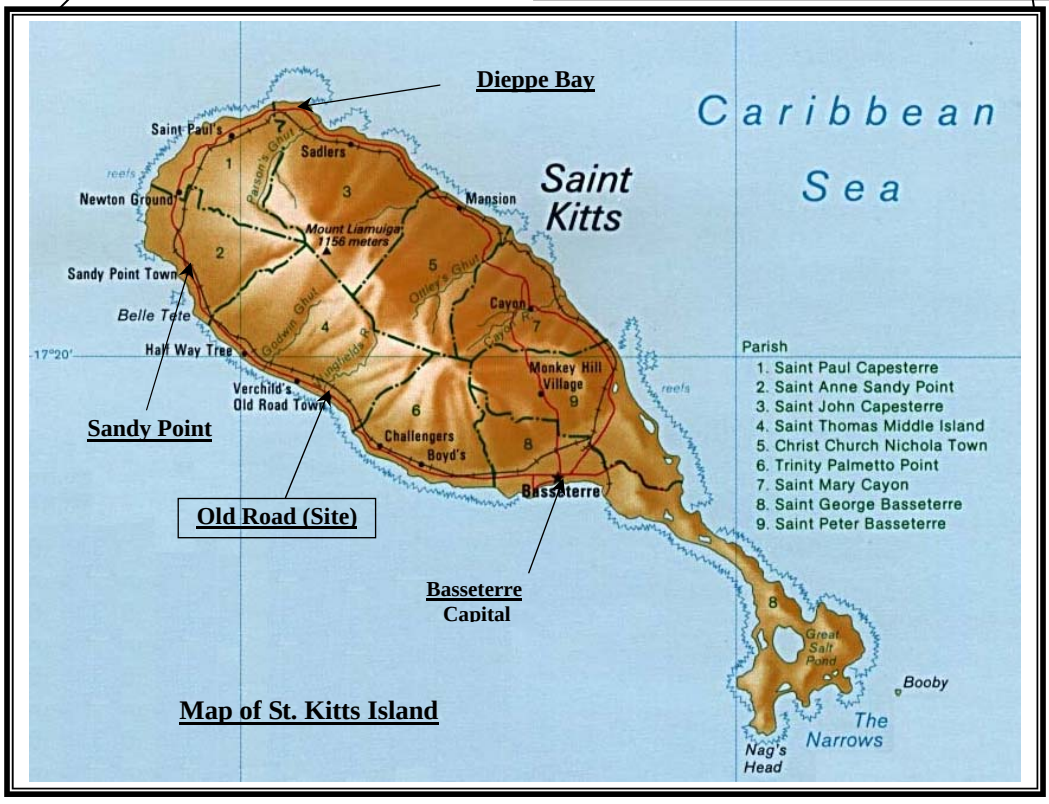
Very truly yours,

Mamoru KONDO
Chief Consultant,
Basic design study team on
the Project for Artisanal Fisheries Development
ICONS International Cooperation Inc.

Map of Saint Christopher & Nevis and Location of the Project Sites



Location of Saint Christopher and Nevis



THE PROJECT FOR ARTISANAL FISHERIES DEVELOPMENT PERSPECTIVE

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Abbreviations

BE	Basseterre East
BFC	Basseterre Fisheries Complex
BW	Basseterre West
CARICOM	Caribbean Community
CC	Camps Challengers
CFC	Community Fishery Centre
CO	Connery
CUBiC	Caribbean Uniform Building Code
DB	Dieppe Bay
EC$	East Caribbean Dollar
EEZ	Exclusive Economic Zone
FAO	Food & Agriculture Organization
GDP	Gross Domestic Product
GH	Godwin Halfway
NEMA	National Emergency Management Agency
NG	Newton Ground
OECS	Organization of East Caribbean States
OL	Old Road
SMMC	Saint-Kitts Sugar Manufacturing Company
SP	Sandy Point

Summary

Summary

Saint Christopher and Nevis (hereinafter referred to as “SCN”) belongs to the Leeward Islands in the Eastern Caribbean Sea and is composed of the two volcanic islands of St. Kitts and Nevis. The country has a population of approximately 46,000, Gross National Income (GNI) of US$ 321 million and per capita GNI of US$ 6,880 (2003). With exports standing at US$ 70 million and imports accounting for US$ 194 million, SCN is faced with a major trade deficit of US$ 124 million.

The major industries of SCN are agriculture, fisheries and tourism with the economy especially dependent on tourism in recent years. In the agriculture sector, the main crop of sugar is losing its international competitiveness due to recent international trends and no major growth can be expected in future. In regard to tourism, this has been hard hit by damage caused by a succession of large-scale hurricanes, including destruction of the Port Zante tourist pier in the capital Basseterre by Hurricane Lenny in November 1999, and the 9/11 terrorist attacks (2001) in the United States (a sharp drop of the number of tourists, -24% in 2000 and -36% in 2002 compared with previous year respectively, in the aftermath of the hurricane and terrorist attacks). As a result, the national economy faces a harsh situation and the government regards diversification of the industrial structure and improvement of the food supply self-sufficiency through the development of alternative domestic sources to imported foods, including fishery products, to be the most important and pressing economic issues at present.

Development Plan in the fisheries sector is formulated in accordance with a policy of sustainable use of fishery resources in the EEZ of SCN. Priority is given to the integration and improvement of fish landing sites, the introduction of appropriate type of fishing boats and the training of fishermen on fishing techniques, etc.

Fresh fish and shellfish produced by local artisanal fishermen are increasingly significant not only in terms of providing a source of protein for citizens and improving the domestic food self-sufficiency but also in terms of constituting an important tourism resource for the hotels and restaurants. The fisheries sector on St. Kitts Island has largely developed as coastal artisanal fisheries which is frequently at the mercy of weather and ocean conditions. In this environment, it is difficult to secure a stable supply of local fish and shellfish and there are major fluctuations in terms of freshness and quality. Largely due to these problems, the domestic fish production is not sufficient to satisfy the domestic demand, including hotels and restaurants in the tourism sector, etc. The fisheries sector accounts for just 1.0% of national GDP whereas imported fishery products have a volume of 1.5 times higher than domestic production. The delayed support for coastal fisheries is one of the factors behind the country’s dependence on imported foodstuffs. The Government of SCN aims at improving the self-sufficiency of fishery products which currently stands at a meager 30 to 40% through the promotion of coastal artisanal fishery. To do this, it needs to win the confidence of consumers by improving the quality of local fish and shellfish and also establishing a quality management system to keep track of fishery products at each stage of production, distribution, retailing and consumption. The establishment of such a setup will make

it possible for locally produced fish and shellfish to be supplied to general consumers and also to tourists at hotels and restaurants, etc. with a high degree of confidence. Moreover, this kind of setup could lead to a saving of foreign currency due to the import substitution of fishery products, thereby resulting in improvement of the international balance of payments and contributing to the national economy. The facts that 92% of the fishing boats in SCN are small vessels of less than 30 feet in size which have difficulty operating in rough weather conditions or further offshore water and that the fishing grounds are concentrated along a narrow coastal shelf indicate the pressing need for the development and promotion of coastal artisanal fisheries for the sustainable use of offshore fishery resources. Meanwhile, as ice for the fisheries sector can only be obtained at the Basseterre Fisheries Complex (BFC) in the capital, the use of ice is practically impossible in local areas, causing such problems as deterioration of the freshness and post-catch losses.

There is a concrete plan designed to overcome these problems and this plan gives priority to the integration and improvement of fish landing sites which are presently scattered throughout St. Kitts Island, the introduction of appropriate type of fishing boats and the training of fishermen on fishing techniques, etc.

Against this background, the Government of SCN formulated the "Project for Artisanal Fisheries Development" aimed at improving the fishery facilities at three main sites on the island to consolidate the distribution system for fishery products in view of the development and effective use of the country's fishery resources in a sustainable manner and requested the Government of Japan's provision of grant aid for the Project. In response to this request, the Government of Japan decided to conduct a necessary study and entrusted the JICA to dispatch study teams to SCN to conduct the following activities.

Preparatory Study	: 3rd to 22nd February, 2000
Basic Design Study	: 16thAugust to 10th October, 2004
Study to promote acquisition of land identified by the Basic Design Study	: 5th February to 16th February, 2005
Explanation of the Draft Basic Design Study Report	: 9th April to 20th April, 2005

During the Preparatory Study, the Study Team checked the conditions of the fisheries sector and the distribution system for fishery products in the domestic market of SCN and also examined the propriety of the proposed project sites and the necessity for the implementation of the Project under Japan's grant aid scheme. Based on the findings of the Preparatory Study, the Study Team made three further visits to SCN to conduct a field survey for the Basic Design Study, the study to promotion the acquisition of land identified by the Basic Design Study and to explain the Draft Basic Design Study Report. Through these on-site studies and analysis work in Japan, the Study Team examined the background and contents of the Project, natural conditions, facility maintenance system and conditions of the local construction industry, etc. and then planned the contents and scale of the Project shown in the tables below as appropriate for a grant aid project of the Government of Japan.

Table 1 Scale and Contents of the Planned Facilities

Civil Facilities			
Facility	Contents (Scale, Specifications and Use, etc.)	Quantity	Remarks
1. Boat yard (Construction of wave-dissipating block type seawall and boat yard)	Wave-dissipating seawall: length 97m Artificial concrete blocks Boat yard: concrete paving 69.2m (L) x 15.2m (W)	1 set	
2. Jetty (for fish landing)	Concrete slab type jetty with steel pipe pile Required length 36 m, water depth 1.0m	1 set	
3. Slipway	Concrete block type slipway 25m (L) x 5.0m (W) Fishing boat pulling equipment; Truck with crane as a towing vehicle (Common use)	1 set	Gradient 1:10

Building Facilities				
Facility	Project Scale and Contents			Remarks
	Floor Area (m^2)	Number of Buildings	Contents	
1. Community fishery centre building	230	1	Total 230m^2, RC concrete rigid frame structure, two-story, RC concrete tile roof	
1) Fish handling space	88		Fish handling area, weighing area, cooling boxes (for ice) storage area, ice making plant area, etc.	
2) Office	35		Administration office	
3) Meeting room	59		For technical guidance and dissemination, fishermen's training and meetings, etc.	
4) Sanitary room	16		Toilets, showers, pantry	
5) Storage spaces	6			
6) Staircase, etc.	26			
7) Other facilities	—		Ice making plant, Drainage and sewage facility (toilets, shower, fish processing), Water tank, External lightings	
2. Fishermen's locker building	40	3	Total 120m^2, reinforced concrete block single-story building, concrete tile roof For fishermen: 20 compartments, 58m^2 Communal area: 13m^2 Toilets and showers: 6m^2 Corridor, etc.: 43m^2	

Table 2　Scale and Contents of Planned Equipment

Name	Specifications	Quantity	Remarks
1. Insulated boxes (for ice)	Capacity 750 l, material FRP, Type: with cover and drain plug	2 units	
2. Truck with crane	Payload: approx. 3 tons Engine type: diesel, approx. 4,700 cc Mounted crane: 0.7 tons x 4.5 m	1 unit	For carrying fish and ice and lifting and lowering of fishing boats, etc.

In the event of the Project's implementation under Japan's grant aid scheme, the Project is expected to require 18 months to complete, including the time required for the detailed design. The estimated project cost is ¥673 million for the Japanese side and approximately ¥2.4 million for the SCN side.

The Old Road Community Fishery Centre is expected to require EC$ 221,000/year (EC$ 1 = ¥41.03; October, 2004) to meet the maintenance cost. It is assumed that this cost will be met by revenue from the fish handling fee, ice sales and charge for the use of such facilities as fishermen's lockers and the jetty.

As the implementation of the Project is expected to achieve a number of positive effects described below, the implementation of the Project as a grant aid project of the Government of Japan is considered to be appropriate and meaningful.

(1) Direct Effects

1) Safe and efficient preparations for fishing and shortening of time for fish landing works (with the construction of fish landing jetty)

As there is currently no jetty at the Old Road site, the lowering of fishing boats when going fishing and their lifting on their return are conducted in the breaker zone. As the fishing boats greatly roll due to the waves in this zone, the said works which last for 30 to 45 minutes are quite dangerous. With the construction of the landing jetty, safe and efficient lowering and lifting works lasting for some 10 minutes per boat will become a reality.

2) Integration of landing sites for effective and efficient fish distribution and marketing

As there has been no proper landing site in the Old Road area up to the present, landings of the catch of artisanal fishing boats are conducted at three beaches and the landing and subsequent distribution of the catch after landing are conducted in a disjointed manner. With the implementation of the Project, there will be a centralized landing site, enabling much more effective and efficient distribution and marketing.

3) Improved freshness and quality of catch through supply of ice and arrangement of fish handling area

With the introduction of the new Old Road Community Fishery Centre and ice plant, etc., ice which is

currently difficult to obtain will be readily available for fishing activities and the distribution of fish. Moreover, because of the availability of a fish handling area where the landed catch can be washed, weighed, sorted and shipped in a hygienic manner, the freshness and quality of the landed catch as well as fish at the distribution stage will be significantly improved.

4) Avoidance of disasters through availability of safe boat yard

At present, when a hurricane warning is issued, all available fishermen are mobilized to pull the fishing boats to the far side of the beach or roadside to prevent them from being washed away. However, the beach at Old Road is narrow and short and the width of the access road to the beach is as narrow as 3.5 m, making the evacuation of fishing boats to safety difficult. With the introduction of a boat yard and slipway under the Project, safe and swift evacuation of fishing boats to the boat yard which will not be affected by the violent waves caused by a hurricane will substantially reduce the risk of fishing boats being washed away and damage to fishing boats by violent waves.

5) Thorough repair and maintenance for fishing boats and gear

At present, the narrow beach at the landing site makes it difficult to repair fishing boats or to prepare and repair fishing gear near the landing site. Repair works are, therefore, currently conducted at the place with some distance from the landing site. With the construction of the Old Road Community Fishery Centre under the Project, the newly created boat yard can be used to maintain, inspect and, if necessary, repair fishing boats and gear at the boat yard, making proper maintenance much easier.

(2) Indirect Effects

1) Increased demand and improved quality of fishery products

The implementation of the Project will establish a fish distribution system using ice. The resulting improved freshness and quality of fishery products will greatly improve the confidence of consumers in these products as food, increasing the general demand for fishery products. In addition, the switch of tourist hotels and restaurants from imported fishery products to local fishery products will facilitate the process of import substitution.

2) Promotion and development of artisanal fisheries

The effective use of the new facilities constructed under the Project in accordance with the policy of sustainable use of fishery resources will stimulate coastal artisanal fisheries on the island while the improved fishing techniques will contribute to the artisanal fishermen’s income generation and the development of fisheries throughout SCN.

The following recommendations are made for the effective utilization of the new facilities and equipment which will be constructed or provided under the Project.

(1) Assignment of personnel

For the effective use of the new facilities constructed under the Project to achieve the project objectives, it will be necessary for the Department of Fisheries, SCN to make the best use of the experience it has obtained during the two years of operation of the Basseterre Fisheries Complex (BFC), to establish a system to manage the new CFC-OL in collaboration with the direct beneficiaries of the new facilities, i.e. fishermen, fishermen's cooperative and other relevant bodies and to assign appropriate personnel for this purpose.

(2) Maintenance of civil engineering facilities

As a problem concerning the civil engineering facilities, it is forecast that the waves caused by a hurricane may scour the sediment around the slipway, making repair work every time such scouring occurs necessary. In view of the frequency of hurricanes in recent years, it is possible that minor repair work will be required approximately five times a year. Accordingly, it will be necessary to establish a support system with the Ministry of Public Works and Port Authority in advance to ensure that the said work is promptly conducted.

(3) Securing of budget

As all of the facilities and equipment have their own lifespan, requiring their renewal at some point in the future, it will be important to retain part of the revenue from the project-related facilities in a special reserve fund for this purpose. Accordingly, it will be necessary for the Government of SNC to plan and secure the necessary budget for facility and equipment maintenance and renewal.

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Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Background of the Request

Although Saint Christopher and Nevis (hereinafter referred to as SCN) once relied heavily on agriculture (sugar cane cultivation) and tourism, the contribution of the agricultural sector has recently fallen from 10% to less than 2% due to the fall in the international price of sugar. Tourism, another principal industry, has been hard hit by damage caused by a succession of large-scale hurricanes and the 9/11 terrorist attacks (2001) in the United States (a sharp drop in tourist numbers, -24% in 2000 and -36% in 2002 compared with previous year respectively, in the aftermath of the hurricane and terrorist attacks). Consequently, the Government of SCN considers the diversification of its industrial structure and improvement of self-sufficiency in food supply by developing alternative domestic sources to imported foods to be the most important and pressing issues at present.

In order to achieve these objectives, in particular to improve the self-sufficiency of food supply, recent national development plans from the mid-1990s onwards have positioned fisheries as an important development sector and, focusing on the sustainable utilization of fisheries resources in the country's EEZ, efforts have been made to enhance and strengthen fisheries administration, starting with organizational reform including the elevation in status of the Fisheries Management Unit (FMU), which had been a subordinate agency of the Ministry of Agriculture, to the Department of Fisheries in March 2004. The Department of Fisheries is now striving to build up fisheries infrastructure, improve traceability through enhancing fisheries products distribution systems, and vigorously disseminate and promote fishing technology and fish processing technology.

In order to support the advancement of these fisheries development policies, the Government of Japan previously implemented the Project for Construction of the Basseterre Fisheries Complex (hereinafter referred to as the "BFC") as fisheries grant aid in 2000/2001 (Phase I: 381 million yen, Phase II: 546 million yen) and has also provided technical cooperation for disseminating fishing technology and fish processing technology through fisheries experts belonging to the JICA Project for promoting the sustainable utilization of marine resources.

Against this background, in order to realize further development of the fisheries sector, the Government of SCN compiled the Artisinal Fisheries Development Project, intended to build fishery facilities at three sites on St. Kitts Island, as the second step following the construction of the BFC, and requested the Government of Japan to provide grant aid for its implementation. In response to this, the Government of Japan dispatched the Preparatory Study Team (February 2004) to confirm the necessity, appropriateness and urgency of the project, and the Team proceeded to check basic items such as the project contents, operating conditions of existing facilities, situation regarding distribution of fresh fish and shellfish on the island, the basic concept of the requested facilities (scale and status), the order of priority of the requested sites, the scope of the assistance, etc.

In the Basic Design Study for the Project, upon carefully examining the necessity, appropriateness and urgency of the request based on the above conclusions, as well as investigating appropriate project contents from the viewpoint of grant aid and the scope of cooperation, it was decided to implement the Basic Design Study on

the facilities and equipment that will be required.

The original request for the Artisinal Fisheries Development Project of the Government of SCN is outlined below.

1-2 Outline of the Request

As the second step following the Project for Construction of Basseterre Fisheries Complex (BFC) in FY 2000 and FY 2001, the present Project aims at building and improving basic fisheries infrastructure facilities at main fish landing sites on St. Kitts Island, thereby precisely addressing such urgent tasks of SCN as diversification of the industrial structure and improvement of the fish supply self-sufficiency through the substitution of imported food and further promotion of local fisheries.

To achieve such project objectives, it will be necessary to newly construct such basic fisheriy facilities as a jetty, boat yard and slipway, etc. at three main landing sites (Old Road (OL), Sandy Point (SP) and Dieppe Bay (DB))on St. Kitts Island and also to strengthen the links between these sites and the BFC facilities. The request made by the Government of SCN consists of the components listed below for each site. During the Preparatory Study, discussions were held with a view to replacing the construction of a breakwater/seawall at the OL site with the construction of a jetty. Moreover, in regard to the priority of the three sites, it was found to be difficult to determine the priority between OL and DB while the priority of SP was lower than that of the other two sites. It was finally agreed to narrow down the Project to the OL landing site alone at the basic design stage as shown in the requested contents, agreed contents after discussions and the results of the Basic Design in Chapter 2.

Table 1-1 Main Components of the Requested Project

Contents of the Original Request (according to the request of the Government of SCN)		**Contents following the Preparatory Study (according to the Study Report)**		**Remarks**
Item	**Quantity, etc.**	**Item**	**Priority * Note**	
(1) Old Road Community Fisheries Center		(1) Old Road (Priority A)		
1. Boat yard (truck-loaded crane)	1	**1. Boat yard**	**A**	
2. Fishery complex (ice plant and cold storage, community room, toilets, showers, 300m^2)	1	2. Breakwater (including mooring quay)	C	
3. Fishermen's lockers (10 compartments)	1	**3. Jetty**	**B**	
4. Water supply and drainage system	1	**4. Slipway (including landing equipment)**	**A**	
5. Breakwater and mooring jetty	1	**5. Work area (including ice boxes, toilets and showers)**	**A**	
		6. Ice plant and cold storage	C	
		7. Fishermen's lockers	C	Confirm necessity
		8. Water supply and drainage system	B	

Contents of the Original Request (according to the request of the Government of SCN)		Contents following the Preparatory Study (according to the Study Report)		Remarks
Item	**Quantity, etc.**	**Item**	**Priority * Note**	
(2) Sandy Point Fishing Community		(2) Sandy Point (Priority B)		
1. Access ramp way (with breakwater)		1. Slipway	C	
2. Boat yard (with winch equipment)		**2. Landing equipment (utilizing existing slipway)**	B	
3. Fishermen's lockers (16 compartments)		**3. Boat yard**	**B**	
4. Water supply system (with water storage tank)		4. Fishermen's lockers	C	Confirm necessity
5. Toilets and showers		**5. Water supply and drainage system**	**B**	
6. Work shed			**B**	

Contents of the Original Request (according to the request of the Government of SCN)		Contents following the Preparatory Study (according to the Study Report)		Remarks
Item	**Quantity, etc.**	**Item**	**Priority * Note**	
(3) Dieppe Bay Fishing Community		(3) Dieppe Bay (Priority A)		
1. Pier (steel pipe piles, for mooring and fish landing) W 2m, L 60m, T 20m	1	1. Multi-purpose pier	C	Request for slipway (fishermen)
2. Fishery complex (with community room and workshop)	1	**2. Jetty (for fish landing)**	**B**	
3. Fishermen's lockers (20 compartments)	1	**3. Work area (including ice boxes, toilets and showers)**	**B**	
4. Water supply system (with water storage tank)	1	4. Fishermen's lockers	C	Confirm necessity
		5. Water supply and drainage system	**B**	

* Note: Priority C following the Preparatory Study indicates items that will be excluded from the Project for having low cost effectiveness following discussions with the SCN side. When narrowing down the contents of the request, effectiveness in terms of ameliorating fisheries issues in SCN was treated as the prime criterion for assessment.

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Project Goal

As the second step following the Project for Construction of the Basseterre Fisheries Complex (hereinafter referred to as the "BFC") in 2000 and 2001, the Project aims at further development of the artisanal fisheries sector through the basic infrastructure improvement at major landing places on St. Kitts Island, by properly dealing with various tasks including the diversification of industrial structure, which is recognized as an urgent task of the Government of St. Christopher and Nevis (hereinafter referred to as "SCN") and the improvement in the self-sufficient supply of fishery products as an alternative to the influx of imported food.

In order to accomplish the above-mentioned goal, the Government of SCN formulated the "Artisanal Fisheries Development Project" to upgrade fishing facilities at three (3) sites (Old Road, Sandy Point and Dieppe Bay) and requested the Government of Japan to provide a grant aid for the implementation of the Project.

2-1-2 Basic Concept of the Project

Although SCN once relied heavily on agriculture (sugar cane cultivation) and tourism, the contribution of the agricultural sector has recently fallen from 10% to below 2%. Tourism, another principal industry, has been hard hit by damage caused by a succession of large-scale hurricanes and a sharp drop in tourist numbers in the aftermath of the terrorist attacks in the United States. Consequently, the Government of SCN considers the diversification of its industrial structure and improvement in self-sufficiency in food supply by developing alternative domestic sources to imported foods to be one of the most important issues at present.

Since the fishing industry on St. Kitts Island has evolved from traditional coastal artisanal fishery, the fishery resources of the country are utilized directly by the St. Kitts people. The coastal artisanal fisheries sector therefore contributes significantly to self-sufficiency in food supply and employment at present, and further expansion in this contribution is expected through sustainable utilization of fishery resources for such purposes as such as exports, earning of foreign currencies and import substitution. In addition to the expansion in exports of lobsters and conches, the Government of SCN aims at developing a well-balanced fisheries development by improving the quality of fish harvests through the development of the fisheries infrastructure at major domestic landing sites and by increasing a supply significantly while reducing post-harvest losses.

However, local people engaged in fisheries are actually compelled to engage in a number of different jobs such as seasonal labor in the sugarcane industry as well as labor in the fisheries, agriculture or construction work. Therefore, it is necessary to respond to the consumer demands by increasing the number of full-time fishermen and also by training distributors and processors of fresh fish. Furthermore, in order to stabilize fishery production, introduction of measures to protect the assets of fishermen who shoulder fishery production is

imperative. These measures include the prevention of fishing boats being washed away or damaged by hurricanes.

The Government of SCN has adopted such developmental goals as (1) sustainable utilization of fishery resources, (2) stabilization of the fish production, (3) improvement in distribution of fishery products, and (4) safety of fishermen at sea, etc. in line with the basic policies of expanding contribution by the fisheries sector to the national economy and promoting employment. The basic design of the Project intends to clarify the status of the Project in an overall strategic development of the fisheries sector in SCN and also to determine the project contents, specifications and scale necessary for the promotion of continuous development of fisheries in the coming years based on the full recognition of the need for balanced development of fisheries throughout SCN, while taking the actual conditions of the coastal artisanal fisheries described earlier into consideration. The basic concept of the Project is described as follows.

Table 2-1 Basic Concept of the Project

<table>
<tr><th>Development Objectives / Components</th><th>(1) Sustainable & effective utilization of fishery resources</th><th>(2) Stabilization & efficiency of fishery production</th><th>(3) Improvement in fishery product distribution & establishment of traceability</th><th>(4) Ensuring safety of fishermen at sea</th></tr>
<tr><td>① Modernization of coastal fishery (Integration of landing sites)</td><td></td><td>◎
Basic infrastructure development at major local landing sites</td><td>◎
Ice & fish network (Ensuring freshness through the most economical method) Network management</td><td>◎
Base facility development (CFC)</td></tr>
<tr><td>② Development of fishery environment (Protection of assets such as fishing boats & gears, hygienic fish handling)</td><td></td><td>◎
Fish handling space, Fishermen's lockers, slipway and fishing boat lifting/launching equipment</td><td>◎
Fish retailing space (Effective utilization of fish handling space)</td><td></td></tr>
<tr><td>③ Development and introduction of appropriate fishing boats (Safe operations, utilization of offshore migratory fish resources)</td><td></td><td>◎
Jetty for fish landings</td><td></td><td></td></tr>
<tr><td>④ Promotion of fishery resources management (Conservation of resources such as lobsters & conches, effective utilization of undeveloped resources)</td><td>◎
Catch data control</td><td colspan="3">◎ ◎ ◎
Community space (dissemination of skills, lectures, PR activities)</td></tr>
<tr><td rowspan="3">Contents of the Project
(A) CFC facilities development (*1) (Requested 3 sites)
(B) Business creation mainly at BFC (fish collection & ice distribution) (*2)</td><td colspan="4">← (A) To develop basic infrastructure at major landing sites on the island following the example at the landing site in the capital (Integration) →</td></tr>
<tr><td>Catch data management & improvement in accuracy, creation of a base to disseminate management knowledge on fishery resources by the Dept. of Fisheries</td><td>Development at major landing sites on St. Kitts Island</td><td>Improvement in fish distribution (establishment of traceability and network) centering around the BFC facility in Basseterre, the capital</td><td>Improvement of base safety watch of fishery operations inshore and offshore St. Kitts Island</td></tr>
<tr><td colspan="4">← (B) To develop an ice distribution & fish collection undertaking under collaboration with the existing BFC facility. →</td></tr>
</table>

Note: The symbol ◎ in the table indicates a target under the Project.

*1: CFC (Community Fishery Centre) (Planned facility under the Project)

*2: BFC (Basseterre Fisheries Complex) (Existing facility)

2-1-2-1 Contents of the Request

The table below shows the "Results of discussions at the Preparatory Study (February 2004)" and the "Mutually agreed contents at the Basic Design Study (August 2004).

(1) Mutually agreed contents at the Basic Design Study

(1)-1 OL: Old Road Town Fishing Community (Priority: A)						
Preparatory Study (February 2004)			Revised Point	Basic Design Study (August 2004)		
Requested Component		Priority		Requested Component		Priority
1	Boat yard facilities	A		1	Boat yard facilities	A
2	Breakwater	C *1	Excluded			
3	Jetty	B *2		2	Jetty (for fish landing)	B
4	Boat lifting equipment	C	Included in slipway			
5	Slipway	A *3		3	Slipway (includes boat lifting/ launching equipment)	A
6	Fishing complex	C	Excluded			
7	Work shed	A *4		4	Community Fishery Centre building (includes water supply & drainage system, toilets & showers)	A
8	Ice plant, cold storage	C	Insulated boxes	5	Insulated boxes (for ice)	A
9	Toilets & showers	B	Included in item 4			
10	Fishermen's lockers	C	Priority change C → B	6	Fishermen's lockers	B
11	Water supply & drainage system	B	Included in item 4			

Note) *1: Since scouring or sedimentation is anticipated, the breakwater is excluded due to increased maintenance cost.
*2: For fish landing.
*3: Fishing boat lifting/ launching equipment will be included.
*4: The fishing complex is revised to work shed in the preparatory study.

(1)-2 SP: Sandy Point Fishing Community (Priority: B)

Preparatory Study (February 2004)			Revised Point	Basic Design Study (August 2004)		
Requested Component		Priority		Requested Component		Priority
1	Slipway	C	Excluded			
2	Boat lifting equipment (existing slipway is utilized)	B		1	Boat lifting/ launching equipment (existing slipway is utilized)	B
3	Boat yard	B		2	Boat yard	B
4	Winch	C	Included in Item 1			
5	Fishermen's lockers	C	Priority C → B	3	Fishermen's lockers	B
6	Water supply & drainage system	B	Included in Item 4			
7	Toilets & showers	B	Included in Item 4			
8	Work shed	B *1		4	Community Fishery Centre building (includes water supply & drainage system, toilets & showers)	B
				5	Insulated boxes (for ice)	B

Note) *1: Including a space to store insulated boxes.

(1)-3 DB: Dieppe Bay Fishing Community (Priority: A)

Preparatory Study (February 2004)			Revised Point	Basic Design Study (August 2004)		
Requested Component		Priority		Requested Component		Priority
1	Steel pile pier for boat mooring fish landing (for fishing boats)	C	Excluded			
2	Jetty	B *1		1	Jetty (for fish landing)	B
3	Fishing complex	C				
4	Work shed	B *2		2	Community Fishery Centre building (includes water supply & drainage system, toilets & showers)	B
5	Toilets & showers	B	Included in Item 2			
6	Fishermen's lockers	C	Priority C → B	3	Fishermen's lockers	B
7	Water supply & drainage system	B	Included in Item 2			
				4	Insulated boxes (for ice)	B
				5	Slipway	C

Note) *1: For fish landing
*2: The fishing complex is revised to work shed in the preparatory study.

(2) Implementation System of the SCN Government

(Competent Agency, Implementing Agency)

① Competent Agency

The responsible agency for the entire Project is the Ministry of Housing, Agriculture, Fisheries and Consumer Affairs (Hereinafter referred to as "MHAFCA").

② Implementing Agency

The implementing agency of the Project is the Department of Fisheries of MHAFCA under control of the MHAFCA.

(3) Project Sites

Project sites are major landing places on St. Kitts Island and are the following three locations. As for the priorities for sites discussed and confirmed in the basic design study, Old Road (OL), Sandy Point (SP) and Dieppe Bay (DB) were evaluated as "A", "B" and "A" respectively.

① Old Road (OL)

Located 8km from Basseterre, the capital of SCN, at the central position along the island's southwest coast

② Sandy Point (SP)

Located approximately 16km from Basseterre, the capital, at the island's northwest end

② Dieppe Bay (DB)

Located 20km from Basseterre, the capital, at the island's north end

(4) Project Management

① Personnel Plan

The Basseterre Fisheries Complex (BFC) opened in January 2003 conducts primary processing of fish, wholesaling, fish retailing, ice production and the sales. The total number of personnel as of September 2004 is eleven (11) persons including a manager. The breakdown is one (1) manager, one (1) secretary, one (1) person in charge of maintaining the facility, four (4) fish processors, one (1) casher, one (1) sales person and two (2) cleaners. At the time of the field survey, one fish processor's post was vacant and three processors were carrying out the work. Community Fishery Centre (CFC) under the Project in general will receive an ice from the above-mentioned BFC or other CFCs and ship part of the catch exceeding local consumption to the BFC.

The CFC with independent ice making equipment will help the smooth distribution of perishable fish and shellfish by supplying ice to other CFCs through a network, depending on the situation of catch in each area. With regard to fish for local consumption, fish and shellfish will be sold after primary processing including scraping off of scales and removing of gills and internal organs, and these activities will be conducted by fishermen, women in fishery households and fish retailers.

Accordingly, new personnel required will include one manager and one secretary-cum-accountant to be appointed by the Department of Fisheries and full-time and part-time workers conducting routine business activities, cleaning and maintenance. In the written request, employment of seven (7) persons is planned for each site as shown below. However, effective utilization of the CFC facility should be encouraged through (i)

promotion of collaboration with the BFC facility as much as possible, (ii) assignment of work handling ice making equipment to the person responsible for BFC's ice making plant maintenance and (iii) active participation of members of fishermen's cooperatives to the running of the new facility.

Table 2-2 Personnel Plan

Project Site (Priority of Site)	Manager	Workers		Remarks
		Full-timers	Part-timers	
1. Old Road (A)	2	2	3	7 persons
2. Sandy Point (B)	2	2	3	7 persons
3. Dieppe Bay (A)	2	2	3	7 persons
Total	6	6	9	

Note) Of the three requested sites, two sites are priority "A" out of which the Old Road site will be the subject site to the Project.

② Budget

The Department of Fisheries administrates the CFC facilities by obtaining governmental budget in a similar manner as the BFC. As shown in the following table, the FY2003 budget for the Department of Fisheries was equivalent to 440% of the previous year's budget. Such massive increase was caused by the introduction of a new fund by the Government of SCN for smooth operation of the BFC facility. The FY 2004 budget was only 38% of the previous year's budget, showing a sharp drop. When compared with the FY2002 budget, however, it was still equivalent to 167% of theFY2002 budget, implying a steady growth of budget size. As the maintenance cost of the BFC facility is incorporated in the budget of the Ministry of Public Works, Utilities, Transport and Posts, it does not fall under the jurisdiction of the MHAFCA and the Department of Fisheries of the said ministry.

Table 2-3 Budget of the MHAFCA and the Department of Fisheries

Responsible Agency	Budget (EC$)			Remarks
	2004	2003	2002	
MHAFCA	4,380,545	5,176,483	4,347,187	MHAFCA; Ministry of Housing, Agriculture, Fisheries and Consumer Affaires
Department of Fisheries, MHAFCA	441,098	1,155,757	264,151	

Source: Ministry of Finance, St. Christopher and Nevis

(5) Status of the Project

As indicated in the following basic policies for the fisheries sector, the status of the Project in, for example, the national development plan, is classified as a project to be preferentially promoted. The Project Design Matrix (PDM) of the Project is shown after the basic policies of the fisheries sector described next.

Basic Policies for the Fisheries Sector

Through the effective utilization of the limited fishery resources, perishable fish and shellfish are supplied to people in a stable manner for the improvement of nutritive intake.
At the same time, the sustainable utilization of these fishery resources is promoted.
To be more specific, landing places scattered across the island will be integrated and improved, appropriate types of fishing boats will be introduced, appropriate fishing techniques will be disseminated to fishermen and training on such techniques will be provided.

Project Design Matrix (PDM)

Project Title: Artisanal Fisheries Development Project

Target Sites: Old Road (OL), Sandy Point (SP) and Dieppe Bay (DB) in St. Kitts Island

Target Groups: Fishermen and fisheries-related persons, personnel of the Department of Fisheries

Preparation: At the Basic Design Study

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Fisheries on St. Kitts Island are further developed.	・Fishermen's incomes on the island increase. ・Business operations at fishermen's cooperatives are revitalized. ・Imports substitution and local consumption of fresh fish are encouraged.	・Statistical materials national economy ・Annual report of the government (Ministry of Agriculture) ・Statistics on imports and exports	
Project Purpose The catches on St. Kitts Island are increased and a fish storage system and distribution system by the BFC is strengthened.	・The number of fishermen on the island increases. ・The number of dealers in fresh fish increases. ・The traceability increases. ・Tourism such as hotels and restaurants increases.	・Report on fisheries census ・Annual report of the Department of Fisheries ・Statistics on transport	・Fisheries development policy of the government is maintained. ・Imported marine products do not increase.
Outputs Landing facilities, etc. are improved at major landing sites (Old Road: OL, Sandy Point: SP and Dieppe Bay: (DB) in St. Kitts Island.	・The accuracy of catch data for St. Kitts Island improves. ・Ice is widely used. ・Quality of harvest improves and amount of fresh fish sold increases (post-harvest losses drop.) ・Labor used for lifting and launching fishing boats is alleviated so that accidental damage associated with the operations is reduced. ・Fisheries incomes increase.	・Fish production data of the Department of Fisheries ・Report from CFC facilities to the Department of Fisheries ・Annual report of fishermen's cooperatives utilizing CFC facilities	・A stable distribution network of fresh fish within the island is secured. ・The demand for marine products on St. Kitts Island does not decrease significantly.
Activities At 3 major landing sites of Old Road (OL), Sandy Point (SP) and Dieppe Bay (DB) on St. Kitts Island, fundamental fisheries infrastructure facilities are developed. A distribution system for perishable fish and shellfish is established on the said island under close collaboration with business activities conducted by the Basseterre Fisheries Complex (BFC) facilities opened in January 2003.	Inputs Japanese side (Requested contents: As confirmed in the basic design study) （1） Old Road (OL) (Priority: "A") ・Boat yard, slipway (including fishing boat lifting equipment), Community Fishery Centre building (including fish handling space, water supply and drainage system, toilets and showers, etc.), jetty (for fish landing), insulated boxes for ice, fishermen's lockers （2） Sandy Point (SP) (Priority "B") ・Fish boat lifting equipment (existing slipway is utilized), boat yard, fishermen's lockers, Community Fishery Centre building (including fish handling space, water supply and drainage system, toilets and showers, etc.), insulated boxes for ice （3） Dieppe Bay (DB) (Priority "A") ・Jetty (for fish landing), Community Fishery Centre building (including fish handling space, water supply and drainage system, toilets and showers, etc.), fishermen's lockers, insulated boxes for ice, slipway (including fishing boat lifting equipment) Undertakings by the recipient country 1) To secure budget for facilities maintenance 2) To arrange personnel in charge of management of landing facilities 3) To secure land and clear/level the sites 4) To secure necessary personnel by constructing a management system in collaboration with the existing BFC (Basseterre Fisheries Complex) and to facilitate the involvement of organizations such as fishermen's cooperatives in the Project.		・Equipment and materials necessary for construction are procured and transported smoothly (without interruption to commercial harbor facilities due to natural disasters or strikes of port workers). Pre-conditions ・Fishermen on St. Kitts Island do not oppose the overall plan and the introduction of grant aid project.

Note: In principle, the selection of a project site(s) is based on the priority ranking "A".

2-1-2-2 Examination of the Requested Contents

The main purpose of the request is to establish a Community Fishery Centre (hereinafter referred to as the "CFC") together with basic fishery infrastructure including a jetty for fish landing, slipway (including fishing boat lifting/ launching equipment) and fishing boat storage area (boat yard) for use during bad weather such as hurricanes and storms at three major landing sites of Old Road (OL), Sandy Point (SP) and Dieppe Bay (DB) on St. Kitts Island with a view to establishing a distribution network of fresh fish and shellfish on the island through close collaboration with the BFC (Basseterre Fisheries Complex) which is located in the capital and was opened in January 2003.

The contents of the said request represent the outcome and problem areas which were clarified in the preparatory study of February 2004 and the basic design study implemented between August and October of the same year and, then, were partially corrected and modified through discussions with the parties concerned in the Government of SCN and fishermen's cooperatives to review the components of the initial request.
These components of the initial request are outlined below. As mentioned in the basic concept of the Project, close collaboration with business activities at the existing BFC facilities is extremely important along with improvement of CFC facilities [items (1) to (3) below]. The ice distribution business and the fish collection business described in item (4) are expected to achieve such collaboration.

(1) Old Road (OL)
Fishing boat storage place (boat yard), jetty, slipway with fishing boat lifting equipment, CFC building (water supply and drainage system, toilets and showers), insulated boxes and fishermen's lockers
(2) Sandy Point (SP)
Slipway with fishing boat lifting equipment, boat yard, fishermen's lockers, CFC building (water supply and drainage system, toilets and showers) and insulated boxes
(3) Dieppe Bay (DB)
Jetty, CFC building (water supply and drainage system, toilets and showers), fishermen's lockers, insulated boxes and slipway
(4) Basseterre Fisheries Complex (BFC: existing facilities)
The BFC will distribute ice to the CFC where supply of ice is insufficient and collect fish for the purposes of supporting CFC businesses in the above-mentioned areas and boosting main business activities at the BFC. In addition, it will collect catch data. In order to promote collaboration with the BFC through independent business activities at CFC facilities, pick-up trucks suitable for transporting fish, shellfish and ice by using insulated boxes will be allocated at each CFC facility. (St. Kitts side has requested this vehicle strongly.) In addition, based on the experiences of the BFC, the preparation of guidelines for an operation network between the above-mentioned three sites and the BFC, the collection and preparation of statistical data on the catch, and guidance on such network will be considered as parts of the Project when necessary.

Moreover, as fishery production and distribution and sale of perishable fish and shellfish will be stimulated through the construction of the above-mentioned CFC facilities, amount of ice manufactured and stored on St. Kitts Island will become insufficient. Improvement in the freshness of catch in developing nations is a major issue for artisanal fisheries development. Since the 1950's, the Food and Agriculture Organization (FAO) has advocated the utilization of "ice" as the most economical method. Although the Department of Fisheries has been actively recommending the use of ice to fishermen even on St. Kitts Island, sufficient results have not yet been achieved due to a shortage in ice making plant.

Under these circumstances, a request for the improvement in ice making plant was made by the SCN side. The capacity of ice making machine (flake ice) at the BFC is currently limited with only a single machine producing 750 kg of ice per day. Therefore, a stable ice supply system is urgently needed through the introduction of multiple ice making plants. The examination results by requested site and component are described next.

(1) Old Road (OL)

Old Road (hereinafter referred to as "OL") is an old town with a long history and is located approximately 8km from the capital city of Basseterre. At present, eleven (11) landing places on the island are being integrated into four (4) following the completion of the BFC. Given the planned integration of two neighboring landing sites (Camps-Challengers: CC and Godwin Halfway: GH) to OL, the numbers of fishing boats and fishermen at the project site are set to be as follows.

- Number of registered fishing boats: 41 (number of fishing boats in operation: 24)
- Number of registered fishermen: 64 (number of full-time fishermen are approximately 50 persons; two to five persons per boat, however, except for gill net boats, the number of fishermen on most fishing boats is two persons and the average number of fishermen per boat is two.)

Although a majority of local fishing boats is less than 20ft long (Class II), there appears to be a gradual shift towards bigger boats of less than 30ft long (Class III). Consequently, the Project will mainly feature these 30ft Class III type fishing boats. The principal dimensions of fishing boats are either 30ft in total length × 8ft in breadth × 1 to 1.5ft in ship draft or 20ft in total length × 6ft in breadth × 1ft in ship draft. In order to ensure the safety of fishing boats at sea, there should be a deck and a sufficiently large void space to gain buoyancy. Because of these requirements, the size of fishing boats is shifting from 20ft to 30ft.

Meanwhile, the fishermen's cooperative in OL does not have its own office. The business activities of the fishermen's cooperative should be supported and stimulated under the Project by utilizing some of the Project facilities for technical training and meetings. Fish for local consumption is sold by women of fishery households or fishermen themselves at roadside. To improve this situation, a fish handling space where a water supply and drainage system is provided should be introduced and part of this space should be effectively utilized for retailing of fish. Since the site is located along the island's trunk road, it is expected that many passer-bys buy fish there. Smooth access to the site and a parking space for ordinary shoppers who are not in

the fishery-related business should be provided.

For the site selection, three candidate sites were compared and examined. As a result, both sides agreed that the existing landing site should be effectively utilized by incorporating it into the Project and that shortcomings of the candidate sites 1 and 2 (single access and dead end) should be addressed. It was decided that a draft site layout integrating these two sites would be examined in order to secure multiple accesses. Compared with these two locations, the candidate site 3 does not have any advantage and was excluded from the scope of examination.

Since the site at OL is directly exposed to the open sea, the impact of waves cannot be ignored. In addition, since the project site is sandwiched between two steep rivers, the East River and Wind Fields River on east and west, there is the impact of river water during heavy rain. However, at the present time most of the water does not flow into the rivers an intake pond was constructed as the water source for the water service in the metropolitan area. Water exceeding the intake volume occurs only during the rainy season, so there is no impact on the facilities under the Project. In the future, if this source of water is changed, the impact of river water may cause the occurrence of drifting sand, accretion sand or erosion, so that sufficient countermeasures for the rivers should be taken by the SCN side. The seaside at the OL site, as mentioned already, directly faces the open sea and the narrow continental shelf drops steeply offshore and there is no reef. As a result of the estimation of waves and measurement of depth and shallowness, bank protection, a jetty and slipway of necessary and sufficient strength should be planned in consideration of cost efficiency. In order to minimize damage from waves, practical wave-protection boards (steel and removable type) suited to wave conditions should be constructed at the entrances of wave-eliminating breakwater, jetty and slipway. Since there is a restaurant facing the sea on the east side of the OL site, and since the existing site is used for sea-bathing by local residents and children, waste disposal facilities for the primary processing of fresh fish (removal of scales, gills and internal organs) and waste water from toilets and showers should be met the specifications of local standards, intentions and needs. The examined contents for each component are described below.

1) Boat Yard

The purpose of boat yard is to protect fishing boats and gear which are vital to fishermen. All fishing boats are towed up onto the shore during a hurricane warning.

They are stored behind the landing area or near the end of roads (normally there are many roads in the vicinity near the beach) in order to prevent them from being dragged out to sea by huge waves. However, only approximately 20m of beach exists at OL, so it is quite difficult to accommodate fishing boats over 20ft in length. Also there are no alternative methods used during emergencies such as hurricane warnings, so operations are inefficient and involve towing fishing boats using tractors, backhoes, or pick-up trucks over many hours. Meanwhile, smaller 20ft fishing boats must wait until all the larger 30ft boats have been pulled.

Although it is unnecessary to cover all the forty one (41) registered fishing boats, for the twenty four (24) fishing boats currently in operation, there is an urgent need for adequate and secure boat yard space for

efficient storage of fishing boats.

2) Jetty for Fish Landing

According to the 1995 census, the contribution of fishery production of OL in the St. Kitts Island is 25% which is 1st ranking, surpassing 20% for Dieppe Bay (DB) and Basseterre East (BE: landing place at BFC) respectively.

As mentioned earlier, since the continental shelf is narrow and facing the open sea, if waves occur during rough weather, the breakwater zone is 40m to 50m from the shore line so that fishing boats cannot be moored near shore. Accordingly, operations to tow fishing boats onto the beach and out to sea for fishing are taken on a daily basis. As a matter of course, manpower is also utilized for other work outside hurricane warnings. Depending on the size of the boat, at least six (6) to eight (8) persons gather to complete the work. When towing up, the bottom and keel of the boats are frequently damaged from debris on the beach, so operations require much labor and the close attention of fishermen. Since the fishermen dislike these operations, during extended periods of calm seas some fishing boats are moored to buoys located at 50m to 70m. However, we observed only two fishing vessels. Depending on wind and wave conditions, most veteran fishermen secure their boats on a small sandy beach near the breakwater along the east side of the coastal road. Fishermen in OL actually soak themselves in seawater during operations when sailing out for fishing, returning to port and unloading. The body of the boat shakes during rough weather; and if waves come in from the Caribbean Sea, regardless of good or bad weather, there is a fear of overturning or submergence at the breakwater zone near the shore, so it is extremely dangerous. Moreover, much labor and time is required to unload catches while soaked in water and the fishing operation time is restricted. This creates difficult conditions to the point that work cannot be completed. Such circumstances should be urgently addressed.

3) Slipway (including fishing boat lifting equipment)

At present, OL does not have boat lifting equipment. The access road only creates a natural slope to the existing beach. The slipway is designed for the purpose of conducting safe and efficient operations to tow fishing boats onto shore and out to sea. The major purpose of the slipway is to pull up fishing boats during a hurricane warning and at time of repair. Since accretion of sand and erosion resulting from lateral currents should be taken into account, the slipway should be a permeable structure so as not to obstruct the current or be suitable for oceanographic and geographical conditions.

And marine structures in the sea require higher construction cost and also maintenance expenses after completion of construction works. Therefore, the more economical and cost effective plans should be examined such as extending the slipway to the east beach from the boatyard in parallel to the coast line.

4) Community Fishery Centre (CFC) Building

(including water supply and drainage system, toilets and showers)

At present, there is no fishery facility at all in OL and there is no office of the fishermen's cooperative. Systematic activities face difficulties, and there is no public market so fishermen, the women of fishery

households, and other local women must sell fish along the roadside. Generally speaking, fish must be sold before the day is over, so the portion that exceeds local consumption is sold at Basseterre, the capital. The number of days of operation along the Caribbean Sea side throughout the year is greater than that on the Atlantic Ocean side, so that the past contribution of OL accounts for 25% in the annual catch. However, as mentioned above, water is rarely utilized in the primary processing of fish (removal of scales, gills and internal organs) and such waste is often left behind on the spot. This has a detrimental affect on the surrounding environment from a sanitation point of view. Due to the street condition, there is no good site nearby to establish fishing facilities, so the beach area from the existing landing place should be improved so that suitable facilities for fishery production can be created.

The primary purpose of the CFC building in OL is to provide a clean place for fish handling, where the catch can be weighed and sorted, a primary processing space to remove scales, gills and internal organs, a space for temporary storage of fish to be shipped to BFC facilities in the capital Basseterre, a place for temporary storage of ice, retailing to local consumers, an office and sanitation zone, meeting rooms and warehouses, etc. Furthermore, appropriate measures for disposal of waste water at the facilities should be taken in accordance with local criteria.

5) Insulated Boxes (for Ice)

Fishermen on St. Kitts Island not only at Old Road (OL) but at other sites are sufficiently aware that the utilization of ice is indispensable for maintaining the quality of the catch. However, in order to obtain ice, they have no choice but to purchase flake ice (750kg produced per day, started in 2002) at the BFC facilities in the capital Basseterre which began operations in January 2003, or block ice (400kg produced per day, started in 1959) at the sugarcane company (SMMC), or ice on the market. And OL is located far from the capital Basseterre so it is extremely difficult, even for fishermen with their own vehicles, to go to BFC to purchase ice every day for their fishing operations.

Daily fishing is dependent on the weather so it is impossible to fish without ice purchased the day before for storage for temperature control.

Although some fishermen make ice with a freezer for business use, it is not a very economical method. The life of a freezer stocker is extremely short. Due on such conditions, ice storing equipment is crucial to facilities under the Project, and is a key component in the control of daily operations.

Alternatively, ice making and storing equipment has been requested. The site at OL is close to the capital Basseterre and ice must be effectively utilized at each site through mutual lending with the coordination efforts of the BFC. This is important when considering the distribution system for perishable fish and shellfish for all of St. Kitts Island. In order for the BFC to ensure a stable supply of ice to OL, the capacity of ice manufacturing should be improved in order to prevent fishermen in OL from “begging for ice” against BFC and the Department of Fisheries. Accordingly, the volume of ice necessary for OL and the BFC should be secured for a single zone (“BFC + OL” zone).

But the ice making capacity of BFC is not satisfying the ice demand in the capital Basseterre area, therefore,

new ice making plant at OL is indispensable.

6) Fishermen's Lockers

At present, there is no fishermen's locker at the landing site in OL. As mentioned earlier, the number of registered fishing boats is forty one (41) and the number of fishing boats in actual operation is twenty four (24). Gill net fishing gear for coastal schooling fish is temporarily piled up on the beach or loaded onto landed boats.

However, to prevent theft of fishing gear used for repairs, these should be appropriately stored in fishermen's lockers.

The average annual operation ratio of fishing boats is approximately 60% (r = 24 boats ÷ 41 boats = 0.58), the number of days of operation is five (5) to six (6) per week. In favourable weather, the ratio for the Caribbean Sea side reaches two hundred fifty (250) to three hundred (300) days annually which is a high ratio. Consequently, the space for storing fishing gear and outboard motors, at least for the number of fishing boats actually in operation, should be provided. In addition, a water tank for testing of outboard motors, vices and grinders (manually operated) for simple repairs of spear gun lances for dive fishing are needed near the fishermen's lockers. At the present time, a simple arrangement of stones along the seaside is used; so it is better to keep them in a place commonly accessible by all fishermen.

The fishermen's lockers at the BFC are in the shape of two hexagons combined. Except for two sides used for toilets and showers, two rooms each for a total of twenty (20) rooms are arranged along the other ten (10) sides. The number of registered fishing boats in Basseterre East (BE: named as the landing site located at existing BFC) is one hundred four (104) as of September 2004, which is significantly inadequate. However, this is reflected by the temporary integration of relatively large-sized fishing boats (Class III or IV: 20 to 30ft or 30 to 40ft) at each place on the island because the BFC facilities site was the first to be improved. Therefore, the number of fishing boats in actual operation at the BFC base throughout the year is less than half. When the existing ten (10) fishermen's lockers are combined, there are thirty (30) rooms in total. In the case of the BFC, this corresponds to the number of fishing boats owned by full-time fishermen who are in active throughout the year. Accordingly, as a matter of course the number of fishermen's lockers at the project site in OL does not necessarily apply to 100% of the registered number. The necessary number is decided by the column of the scale setting.

(2) Sandy Point (SP)

Sandy Point (SP) is evaluated to be relatively lower than other two sites in the degree of priority for the Project at this time. Consequently, a definite project will be a future issue. Hereinafter, major items are described.

SP is located in approximately 6km northwest from OL on the road encircling St. Kitts Island. The project site

is located in Fig Tree Village which is on the inner branch line from the town centre of SP. In a similar manner as OL, SP faces the open sea which faces severe conditions due to the direct impact of waves. Its population is the second largest after Basseterre, the capital. The number of fishing boats and fishermen in SP are as follows.

- Number of registered fishing boats: 31 (number of fishing boats in operation: 18)
- Number of registered fishermen: 47 (similarly as OL, the number of crew per single fishing boat is two persons and the number of full-time fishermen is approximately 36.)

The breakdown of the registered fishing boats is 13 boats of less than 20ft and 18 boats of less than 30ft with a trend towards the larger size. Accordingly, the Project will cover 30ft boats. Most fishing boats are a similar size as OL. In order to secure the safety of crews at sea, a deck should extend along a single-bottomed boat and include void spaces in order to maintain buoyancy. This is a problem not only for 20ft and 30ft types but also is a common problem in local communities.

The office of the fishermen's cooperative is located near the centre of a long sandy beach extending for approximately seven hundred (700) meters. There is no other structure nearby so it has been a target for theft several times in the past. The office is utilized for gatherings local or events. Although the landing site in SP is away from the urban center, it is included as a project site for the regional development of northern St. Kitts Island.

The sugarcane field on the north side is currently under construction and is being converted to a golf course as part of a tourist resort development project. Consequently, if the tourist resort development project is completed, a fresh fish and shellfish market will be newly created, so supplying of fish to the tourist industry as well as local consumption will be made possible and a market to meet the scale of the fishery can be secured. In the site selection two locations have been proposed. One is in Fig Tree Village. In the written request, Fig Tree is superior in every respect; therefore the Project will plan for Fig Tree. Since this site is directly exposed to the open sea, the impact of waves on land facilities such as buildings cannot be ignored. The sandy beach changes continuously due to the wave action from hurricanes and tropical storms. Based on the measurement of depth and shallowness, the continental shelf is so narrow that the site is classified to have severe natural conditions.

The construction of the jetty is a local need, however since the jetty was destroyed and disappeared as a result of the previous hurricane, it is very difficult to construct only a jetty without firstly securing calm waters. Furthermore, sand movements are so severe that countermeasures against accretion and erosion are needed when constructing a breakwater and wharf. If large-scale marine civil engineering facilities are built at this site, it is greatly anticipated that the probability and scale of damage will also be severe. From the viewpoint of risk management, it would appear that this site is not a good choice, at least for the time being. However, if the above-mentioned tourist resort development project is completed and suitable economic effects are forecasted, underlying possibilities may surface at that time. As described earlier, the facilities constructed under the Project will include boat lifting equipment, a place to store fishing boats (boat yard), and fishermen's lockers,

etc. These facilities should be separated as much as possible from the frontal and back shores for safety against waves through the construction of appropriate shore protection. In addition, drainage culverts and water channels from villages in the hinterland traverse the proposed site, so measures for these also should be taken. As described earlier, this area is subject to tourist resort development, so there is a possibility that traffic volume along waterfront roads that access the project will increase significantly. In implementing the Project, these points should be sufficiently taken into account. In order to minimize damage from waves countermeasures against waves breaking the tide embankment and existing slipway are crucial.
Furthermore, in a similar manner as OL, the sandy beach at the project site is a beach resort for local residents and children during favorable weather and calm seas; therefore in constructing facilities, sufficient consideration should be taken when positioning discharge outlets for waste water drainage. The importance of maintaining the sandy coastline is common concern throughout St. Kitts. And in particular, the primary processing of fresh fish (removal of scales, gills and internal organs) and waste water drainage of toilets and showers should meet local criteria and needs.

(3) Dieppe Bay (DB)

Dieppe Bay (DB) is located at the northern end of St. Kitts Island approximately 7km from SP and approximately 20km from the city of Basseterre. On the island's circular road, DB is on the halfway from Basseterre, the capital, going clockwise westward via OL and SP or anti-clockwise via Conaree (CO). When a French religious group first landed at DB in 1915, they built a church which is now utilized as a tourist resort hotel. In addition, there are Methodist and Anglican churches, making DB one of St. Kitts most historic towns on the St. Kitts Island along with OL and SP.

Although DB is affected by the Atlantic Ocean, its natural conditions surrounded by wide reefs make it one of the best landing sites on the island. However, the conditions on the Atlantic side are more severe than that on the Caribbean side where OL and SP are located. The annual number of days of fishing operation at DB is much less than OL or SP. This is because fishing boats are smaller and sea worthiness is inferior. Consequently, an appropriate type of a fishing boat should be introduced for offshore fisheries development suitable for large migratory fish in the Atlantic. At the present time, most fishing boats have outboard engines. In order to secure the safe operation and to promote the effective utilization of offshore marine resources, economical fishing boats with a deck and inboard diesel engine are necessary. In the case of the facilities under the Project, it is necessary to take into consideration that the size of fishing boats will be larger in the future. The number of fishing boats and fishermen in DB are as follows.

- Number of registered fishing boats: 48 (number of fishing boats in operation: 22)
- Number of registered fishermen: 72 (approximately 45 full-time fishermen)

Although most fishing boats in DB are less than 20ft (Class II) boats, as mentioned above, since conditions in the area are more severe than on the Caribbean side, the boats tend to be less than 30ft (Class III) in length.

Accordingly, the Project will cover 30ft boats. Although there is no fishing boat with inboard engine at present as described earlier, they are scheduled to be introduced in the future.

The fishermen's cooperative in DB has an office building which is currently utilized for local gatherings and as a warehouse. Since this building is located on the mountain side of the circular road approximately 200m away from the landing site under the project, the building cannot be utilized as a business office for the Project from a geographical point of view. In addition, the fishermen's cooperative is under the supervision of the Ministry of Housing, Agriculture, Fisheries and Consumer Affairs (MHAFCA) of the Government of SCN. Accordingly, the Department of Fisheries takes charge of fisheries-related technical guidance and dissemination of business. Consequently, to support the daily activities of the fishermen's cooperative through the effective utilization of fishery resources by sufficiently providing technical training or guidance under the jurisdiction of the Department of Fisheries, some of the CFC facilities at this time should be utilized effectively. In addition, with respect to local fish consumption, women in fishery households and fishermen carry out fish sales at the side of the road in similar manner as OL and SP. So it is also important to secure a place to sell fish at the CFC facilities.

In the site selection, the project site and the possibility of a transfer of land on the east side were considered. In conclusion, the place currently utilized by fishermen even on the same reef is close to channels that lead to the open sea, and are very calm waters. If land on the east side is to be utilized, it will be necessary to fell palm trees and break down the coastal bluffs. Therefore, the conditions of the existing requested site are superior. With respect to the site selection at DB, the consent of St. Kitts side was obtained as mentioned above. Furthermore, although the DB site is a long-pending accumulated sandy beach, as described earlier, the site is protected by the natural reefs so it is not directly affected by the waves. However, in the event of large ocean swells (long wavelength) resulted from hurricanes at high tide, the water exceeds the natural reefs in some areas, so the ground on which facilities are constructed should be higher.

Fishing boats in SP are always pulled up onto the beach due to the constant change in wave conditions; whereas, normally those in DB are tightly moored to the existing marine buoy and fixed land piles. However, since most fishing boats are of an open-type single-bottom structure, some boats have sunk due to water leak in the bottom or are flooded with water resulting from squalls. Periodical and routine inspections and maintenance are therefore important. Accordingly, boat lifting equipment and slipway facility to pull up fishing boats during a hurricane warning and to move them to safe storage places plays an important role. In the layout of the overall facilities, the raising of ground level to combat against abnormal water levels, the jetty level and the level for building construction should be taken into account.

The jetty and slipway invites accretion of sand and erosion, so sufficient measures should be taken. Based on the results of a bathymetric survey and estimation of wave conditions, a jetty and slipway of necessary and appropriate intensity should be planned. Since the raising of the ground level is also an effective step for drainage within the lot, this should be taken into account together with the establishment of drainage channels from the neighboring areas on the inland side of the project site. In addition, in the overall layout, consideration should be given to the providing of a buffer zone for the tourist resort hotel "Golden Lemon Inn"

neighboring to the west.

(4) Examination of the Site Priority and the Implementation Plan

As described above, the SCN's Artisanal Fisheries Development Project has made a request for three locations of Old Road (OL), Sandy Point (SP) and Dieppe Bay (DB) as the proposed sites for implementation of the Project. The priority of sites and components of each site are shown in the following table. The Project aims at realizing the stable collection of processed fish necessary for fishery businesses at BFC by furthermore strengthening the close coordination between existing BFC facilities and CFC (Community Fishery Centre) facilities which in principle are to be improved under the Project.

In accordance with the basic concept, items compared and evaluated, on-site conditions, management, technical level and potentiality, etc. were examined through a comparison and evaluation.

Table 2-4 Priority of Sites

Site Name (Priority)	Features	Items for Examination				Comprehensive Evaluation
		Site Conditions	Management	Technical Aspect	Potentiality (SK side)	
BFC BE Basseterre East (Existing)	Started operations in January 2003. Severe marine conditions	Most important base (already improved) Severe natural conditions (○)	Management by the Dept. of Fisheries: Profitable balance due to major fish sales business. Shortage of raw fish for processing	Facility maintenance: Dredging by the Public Works, building and facilities by Dept. of Fisheries	It is positioned as an important base within the St. Kitts Island. Fishery business development at the BFC. Coordination with other CFCs	Existing facilities: ◎ Safe refuge place of fishing boats, base for peripheral fish landing places, increase in fish catches
CFC OL Old Road (A)	Conglomerate beach facing to the open sea, steep coastline and land topography	Severe natural conditions (△)	Fishermen's cooperative exists. (○) (Many fishermen who have affluent experience.)	Setting up of design conditions on jetty, slipway and shore protection facility and selection of construction method	Security of boat yard through shore protection and lot creation, enforcement of functions by constructing jetty and slipway	Old Road ○○○
CFC SP Sandy Point (B)	Sedimentary sandy beach, seasonal variations	Severe natural conditions due to sandy beach (×)	Fishermen's cooperative exists. (○)	Utilization of the existing slope road and boat lifting equipment (exclude any marine construction)	Improvement in the importance as the fish landing site through the resort development of hinterland	Sandy Point ○
CFC DB Dieppe Bay (A)	Sandy beach facing water zone within a coral reef lagoon	Relatively better natural conditions (◎)	Fishermen's cooperative exists. (○) (Many fishermen are in 20s and 30s)	Measures for abnormal tide level: Examination of the facility construction level (raising of the ground level)	Offshore fishery base: Effective for investment to such facilities, equipment as jetty, slipway and ice making plant	Dieppe Bay ○○

Note) Evaluation by comparing site conditions, etc. (results of the field survey at Basic Design Study):
BFC BE: ○ (Good), OL: △ (Not good), SP: × (Bad), DB: ◎ (Excellent)

Furthermore, in the above-mentioned basic concept the relevance from the viewpoint of the fisheries development policy of SCN, outcome of the BFC and effects expected through the implementation of the Project were collectively examined by categorizing the alternatives and basic matters in the definite implementation plan for the Project based on the current state of SCN. When compiling the definite implementation plan for the Project based on phased development involving tackling the policy of the basic design study, there are the following three plans.

① BFC ＋（OL+DB）plan : Plan to simultaneously develop two sites at OL and DB under the Project.

② BFC ＋（OL）plan : Plan to develop only one location at OL under the Project. (In this case, refer to the Note for prerequisite conditions below.)

③ BFC ＋（DB）plan : Plan to develop only one location at DB under the Project (same as above).

In the case of plans ② and ③, there is no change in the necessity and importance of the phased development in accordance with the SCN's Artisanal Fisheries Development Plan. Ultimately, it is necessary to support the creation of a coordination system through the contents demonstrated in ①. The difference between ② and ③ plans under this examination focuses on two points, urgency (such as securing a place to safely store fishing boats and gear during a hurricane) and the coordination effects with the BFC.

As described above, (a), (b) and (c) are indicated for ①, ② and ③ respectively as a comprehensive evaluation.

(a) Based on the synergy effects through the coordination with the BFC and the fish handling volume of the BFC, it is more advantageous than other plans.

(Note: Judgment made at conclusion of the Minutes of Discussions and results of discussions with SCN.)

(b) Compared with the above-mentioned (a) plan, the burden of the Department of Fisheries will surely be alleviated and an increase in handling volume of the BFC will be promoted. Of the matters compared and examined, if only one location is selected based on urgency and need, it is considered advantageous.

(Note: It is necessary to clearly explain to the Department of Fisheries in SCN and fishermen in DB and the parties concerned who are not subject to the first Project under this plan(b). The contents of the discussions by the BD study team include two locations as stated in M/D.)

(c) The burden on the Department of Fisheries will be less than that in the above-mentioned (a) plan and an increase in the handling volume of the BFC will be promoted. Of matters compared and examined, if only one location is selected it will be advantageous because the potential and shipping volume to BFC are greater than OL.

(Note: Same as the above-mentioned (b).)

In addition to the above-mentioned comprehensive evaluation, sufficient consideration should be given to the implementation schedule, construction volume and hurricanes. By regarding the "phased development" of a tackling policy to be fundamental, in order to obtain a steady outcome in the SCN's Artisanal Fisheries

Development Plan [development of the BFC + (OL) + (DB) + (SP) + (other major landing places)] through the "BFC outcome" and "competency of the Department of Fisheries to maintain BFC facilities" are also sufficiently evaluated, if we can firstly provide aid for (b) plan, it will the most purposeful and appropriate judgment for the time being.

Based on the above-mentioned results of the examination, we can fully understand the necessity and importance at each site in the comprehensive plan of the SCN's project. In due consideration of these results, by narrowing the site of the Project subject to the grant aid scheme down to only one location, for example Old Road (OL), the Project will develop in a phased manner based on results of the evaluation on the urgency and need at each site. Hereinafter, Old Road is described.

2-1-2-3 Basic Policy of the Project

Since fishing activities on St. Kitts Island have developed from traditional coastal artisanal fishery, it is an industry in which the national fishery resources are directly utilized by their own hands. The coastal artisanal fisheries sector therefore greatly contributes to food self-sufficiency and employment, and further expansion of its level of contribution is expected toward the economy of the nation through sustainable utilization of fishery resources such as exports, the acquisition of foreign currencies and import substitution.
In addition to the development of exports such as lobsters and conches, the policy of the Government of SCN is to promote a harmonious fisheries development policy by improving the quality of fish catches while developing the fisheries infrastructure at major domestic landing sites and by substantially increasing supply while decreasing post-harvest losses.
On the other hand, it is also compelled to engage in job diversification including seasonal labor in the sugarcane industry and labor in the fisheries, an agriculture or construction work. Therefore, it is necessary to respond to the diversified requests of the consumption market including general consumers and large-scale demand by increasing the number of full-time fisheries personnel and by training distributors and processors for fresh fish sales.
Consequently, preventive measures against washing away and damage to fishing boats during a hurricane are inevitable and should be taken. In such a manner, based on the results of an examination of the priority of the above-mentioned sites and definite implementation plans, the development of the fundamental elements of the fisheries infrastructure at major local landing sites is the most important task of SCN. A phased implementation in order to obtain a steady outcome of the Project will contribute to improvement of the current above-mentioned conditions.

As a result of examining need as a constituent component of the Project based on requested contents and results of discussions and examination, with respect to the landing site at Old Road (OL) where the degree of the urgency is high, the following facilities and incidental equipment and materials have been understood appropriate and will be included in the grant aid scheme.

Measures for each requested item to be taken under the Project are described as the basic policy of the Project.

As mentioned earlier, Old Road (OL) is one of four (4) major landing sites on St. Kitts Island and is an important base on the Caribbean Sea side second only to BFC. After improving the CFC facilities under the Project, the neighboring two (CC and GH) landing sites are scheduled to be integrated. However, the fishermen's cooperative in OL does not have an office, and women of fishery households and fishermen sell fish at the roadside through traditional methods. These circumstances require urgent attention. Since the shore at the OL site directly faces the open sea and is sandwiched between two steep rivers east and west, the site conditions are confirmed to be severe for the construction of fisheries infrastructure facilities. The design requirements for these natural conditions should be clarified and an optimum basic plan should be formulated. Accordingly, the following basic policy will be taken.

(1) Boat Yard (Yard creation by constructing wave-dissipating seawall)

On St. Kitts Island, fishermen are not the only ones but also all islanders are obligated to prevent disasters when a hurricane warning is issued. The National Emergency Management Agency (NEMA) also performs this task. It is extremely important for fishermen to protect fishing boats and gear, so the boat yard is indispensable as well as fishing boat lifting/ launching equipment and the slipway. The purpose of the Project is to support the activities of artisanal fishermen on St. Kitts Island. Accordingly, as mentioned above, fishing boats and gear should be pulled up onto the land and stored at the time of an emergency, by maintaining fishing operations throughout the year and by creating a sustainable operation system. During the basic design study, hurricanes raged throughout the month of September, hurricane "Francis", hurricane "Ivan" which struck the eastern Caribbean nations and Grenada, hurricane "Jean" which stormed off Saint Kitts and Montserrat, and hurricane "Lisa". Although St. Kitts Island was not directly hit, waves spreading across the ocean broke along the coast. Sand and soil on the seabed near the beach was washed up on the waterfront coastal road, and the coastal road near the BFC in the capital Basseterre was temporary closed. Likewise the waterfront road from the capital to Old Road (OL) was also partially damaged by cave-in or washed out from waves. Meanwhile, fishing boats engaging in coastal artisanal fisheries were pulled up onto the land whenever the Government issued a warning. Under these circumstances, the boat yard is understood to be an indispensable component of fisheries facilities at major landing sites on St. Kitts Island. Boat yard will be created by constructing wave-dissipating seawall on the beach at proposed Old Road (OL) sites.

(2) Jetty for Fish Landing

The landing site in OL faces the open sea and the width of the continental shelf is extremely narrow so that seaside facilities are directly affected by offshore waves. Under such conditions, local fishermen have utilized this landing site for a long period of time. As with other eastern Caribbean nations, in general the Caribbean side is not so often affected by the waves associated with hurricanes; as described earlier, the annual number of days of fishing operation is greater than that on the Atlantic side. From a statistical point of view, the number of days in which it is impossible to carry out fishing operations is estimated to be a few % annually. However,

if the site is once affected by waves from a hurricane or tropical storm (depression), the scale of damage increases substantially. Because of the risk, we can easily deduce that development of the basic elements of the fisheries infrastructure facilities have not progressed smoothly. With respect to the supply of perishable fish and shellfish within St. Kitts Island, before the construction of the BFC facilities, Old Road (OL) was positioned to be first ranking together with Sandy Point (SP) due to the seasonally large catch of coastal schooling fish.

Although the initial request was to construct fish landing quay facilities for combined use as a breakwater, as described above natural conditions are extremely severe, so the Project will have a difficulty to secure a calm water zone through the construction of a breakwater. Instead of this, the agreement reached is to construct jetty facilities for fish landing. It is understood that the ratio of operations for jetty facilities without securing a calm water zone through a breakwater, is lower due to the impact of swells and waves based on study cases of similar facilities.
Consequently, with respect to the ratio of annual operations based on past oceanographic conditions, the anticipated conditions were examined during discussions with local fishermen. As a consequence, at least one-third (1/3) of the time it is calm, one-third (1/3) of the time it is stormy, and during the remaining one-third (1/3) it is either case. Therefore, the view of the local fishermen is that approximately fifty (50) to sixty (60) percent of annual operation is possible.

Accordingly, the claim for short-term annual operation after completion of the Project is totally out of the question. However, possibility of long-term operation is expected to be higher, so there is sufficient support for the necessity and importance of fish landing jetty facilities under the Project. Since the project site is narrow and site conditions are severe due to the impact of waves, on-sea marine construction should be minimized wherever possible so that those plans involving both a slip way and jetty, and also an independent type jetty are to be examined.

It is necessary for the structure of the fish landing jetty to incorporate adequate wave protection measures. At the same time, from the viewpoint of cost effectiveness, steps for mitigating uplift pressure on the superstructure (removal of top cover, grating, etc.) shall be examined with a view to effectively securing strength to resist the design wave, and an economical plan shall be compiled with a view to minimizing maintenance costs following construction.

(3) Slipway (including fishing boat lifting equipment)
A slipway for lifting fishing boats is an essential piece of basic facility at major landing places on St. Kitts Island, so it is indispensable.
Hurricanes occur four (4) to ten (10) times annually. Of those, although the number of hurricane warnings differs greatly from year to year, there are always three (3) or four (4). In high frequency years it can reach six (6) to seven (7) times. On top of that, there has been a lot of abnormal weather in recent years and tends to

occur frequently particularly during certain seasons. Certainly, the weather is not bad three hundred sixty five (365) days a year, but loss from damage is significant which has compelled fishermen to discontinue their business because they cannot predict recovery. This is a serious problem for fishermen on St. Kitts Island.

Accordingly, a slipway is an important facility as the centerpiece of the Project and an indispensable component in fight to protect fishermen's assets.

However, as with the landing jetty, the harsh wave conditions on the site mean that it is necessary to conduct thorough examination into structure and strength. Since underwater structures entail expensive construction and maintenance costs, an economically effective plan shall be adopted by extending the slipway parallel to the beach line on the east side. For this reason, the slipway gradient shall be kept gentle at around 1:10 to enable landing and lowering work to be conducted manually; moreover, ample width (approximately 5 m) shall be secured to enable this work to be carried out in safety. From the viewpoint of protecting the bottoms of fishing boats, when carrying out such work, it will be necessary to design and procure dunnage made from appropriate locally procurable materials (square timber, logs, plastic, etc.). Furthermore, in order to assist manual activities, introduction of a crane-truck for use at the project facilities shall be examined. The truck with crane shall be used for removing and placing wave protection boards (steel and removable type) and the jetty concrete covering as well as for carrying fish and ice (the main activity).

The purpose of the slipway is for landing and lowering fishing boats. It will also be possible to perform landing and lowering work on the landing jetty using wheel crane and other large cargo handling equipment. In Japan too, at ports where it is difficult to construct jetties and slipways due to harsh ocean conditions, fishing boats are sometimes directly lifted out of the sea for safe storage. Structure and layout of the slipway shall be fully examined from the viewpoint of cost effectiveness, and the most economical and easy-to-use design for the Old Road (OL) site shall be planned.

(4) Community Fishery Centre (CFC) Building

(Including water supply and drainage system, toilets and showers)

Despite the somewhat vague expression "work shed" in the request, it can be interpreted to mean a roofed structure open in all directions. However, the important functions of fisheries activities are diversified and range from production, distribution and consumption. With regards the Community Fishery Centre (CFC) facilities suitable for the local meteorological and oceanographic conditions, marginal consideration should be given toward steps for wind breaking and summer heat in the development. Since the natural conditions of the site mean that it faces the seaside, measures for waves from hurricanes or stormy weather are crucial.

The CFC Building should be built as far away from the water's edge as possible. Due to the narrow lot of the Centre, under the Project the building will be a two-storied structure based on the layout of the entire site and line of flow.

As mentioned in the examination of requested components, from the viewpoint of function of the facilities under the Project, sanitary handling of the harvest is the most important issue. Therefore space of fish handling space will be a key part of the CFC facilities. This space should be effectively utilized as a multi-purpose area for washing, sorting, weighing and shipping of catch and as a place for fish sales to local consumers. Since

effective utilization of the facilities under the Project through the involvement of the local fishermen's cooperative at OL is an absolute requirement, the facilities are considered to be the centre of fishing activities in the local community and a waterfront development plan.

① Fish Handling Space

The current landing site is too narrow to sufficiently pull up fishing boats from the edge of the water. There is no cover to protect workers and the catch from the summer heat, so processing of the catch such as removal of scales, gills and internal organs is carried out in the open air while the catch is left in buckets. Fishery waste is discharged without processing and left for stray animals to consume. Since it is outdoors, not only the general public but also dogs, fowl, pigs and cats enter the landing place freely at their discretion. There is no standard with regards to the handling of perishable fish and shellfish for food. Consequently, in order to support local coastal artisanal fishermen, the fish catch should be shipped to the domestic tourist industry by firstly adding value, then by securing a space for fish handling space to control sanitary conditions. Only after this can the reliability of perishable fish and shellfish handling be ensured for local consumers. Accordingly, space for handling fish incidental to this site will be established within the CFC building.

② Office Space

The CFC facilities under the Project will be managed by the Department of Fisheries. The management of facilities is to be conducted by eight persons in total, one manager and accountant, three persons in the business department (measuring and recording of fish, consignment of ice, receiving and shipping of fish, etc.), one maintenance engineer for ice making plant, a cleaner and a guard (ice making engineer concurrently holds a post at the BFC). The manager, accountant, chief and assistant of the business department will be permanently stationed at the facilities, and a space for an office where at least three or four persons can work on reports or arrangements is also needed. In the case of a public fish market, the fish handling space should be monitored. For this reason, in many cases a special monitoring room is installed. However, the aim of the Project is to utilize the fish handling space at the CFC facilities at OL for multi purposes and there is a plan to have the smallest area possible area, so the office is to be combined into one location. Due to the narrow site lot, the office for the fishermen's cooperative will take up one meeting room as will be mentioned later. In principle, the space will be utilized as efficiently as possible.

③ Meeting Room

At present, there is no fisheries facility at OL. Although the fishermen's cooperative exists, there is no office. When the Department of Fisheries conducts training and classes on dissemination of fisheries skills and resources management, each time they must check the schedule of various halls and make special arrangements. Accordingly, a space where local fishermen gather to hold meetings, where information necessary for daily fisheries activities can be collected, a space where the secretariat can disseminate information from by the Department of Fisheries and where PR activities can be carried out is needed. Essentially it is preferable for fishermen's cooperative to take charge of managing the facilities; however, their record shows they have not obtained such experiences. Therefore, for the time being one corner of the meeting room will be utilized by the cooperative secretariat and prepare for the future management of the

CFC-OL facilities under the guidance of the Department of Fisheries.

④ Sanitary Space

A sanitary space (toilet and shower equipment) for fishermen will be provided at one of the fishermen's lockers, and will be separated from the ones for office clerks at the CFC Building. Public toilets will not be constructed, so this sanitary space will be accessible only to CFC-related personnel.

⑤ Storage Spaces

Storage spaces necessary for supporting the local fishing activities of local fishermen will be secured at the CFC facilities which will be the Centre of the local fishing activities. If storage spaces can not be appropriately arranged, equipment and materials will be left in the hallway, which may hinder the original facility functions to some degree. Therefore, the minimum storage space should be ensured by creating a good traffic flow of fish, people and vehicles.

(5) Insulated Boxes (for Ice)

The installation of ice making plant is to be considered and examined. However, if ice making plant cannot be independently owned from the aspects of maintenance and site conditions, ice necessary for daily fisheries activities should be distributed by the BFC (or other CFCs). In such case, insulated boxes will become a component replacing ice making plant for CFC facilities in OL, and is positioned to be extremely important.

Regardless of the existence of ice making plant, if the necessary volume of ice is stored within the fish handling space for easy utilization it will be convenient and effective for daily operations. Consequently, insulated boxes will be provided at the fish handling space.

If the CFC in OL depends on ice at the BFC, activities to deliver daily ice and to collect fish will be taken by the BFC. However, a one-sided dependency may spoil the independence of business activities at the CFC facilities in OL. Since independence is important when securing personnel for delivery of ice and collection of fish and when making vehicle arrangements, sufficient consideration should be given to management and operations.

Through this, in principle the Project aims at reinforcing the coordination system between both facilities by alleviating the burden on the BFC and maintaining the independency of CFC facilities.

(6) Fishermen's Lockers

The fishermen's lockers at the BFC facilities in the capital Basseterre have not been fully utilized, it is not simply because it has been unnecessary. In fact, they have not been smoothly utilized since initial operations began. However, it is extremely important for fishermen to moor their fishing boats and to store fishing gear at the activities base. Conventionally, ship-owners who were also fishermen had a place to store fishing equipment and materials, which was usually their home or a temporary shed. Consequently, if management of the entire facilities does not go well, the problem of crime prevention for fishermen's lockers may occur and they may not be effectively utilized. Sufficient necessity exists so that locker is an important component at CFC facilities at the landing site under the Project. Aside from the CFC building, toilets and showers used exclusively by fishermen will be established next to the fishermen's lockers.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

The requested Project is the second application for Japan's Fisheries Grant Aid from SCN. The Government of SCN fully understands this scheme through the implementation of the "Project for Construction of Basseterre Fisheries Complex (commonly known as "the BFC project") in FY 2001 and 2002.
Consequently, when formulating a basic plan for the Project, the focus will be placed on how to promote the close collaboration with activities using the BFC facilities built under the first grant aid and also how to effectively materialize further fisheries development.
Under these basic policies, the Projects will consist of five (5) components, i.e. business plan, layout plan, facility plan, implementation plan and local conditions, and each component will be planned in accordance with the principles described next.

(1) Business Plan
The BFC facilities in Basseterre, the capital, went into service in January 2003 and have steadily produced positive results in terms of their management. As mentioned earlier, these facilities were built under the first Japanese grant aid for fisheries and are full-scale fisheries infrastructure facilities built for the first time on St. Kitts Island.
It can easily be imagined that the first six months to a year from their opening was a process of trial and error due to the lack of previous experience as frequent changes of personnel took place in this period such as employment and dismissal of the BFC manager, appointment of a deputy manager and appointment of a new manager. Considering the operation of the BFC facilities began under the circumstances where hardly any precedence of applying the principle that beneficiaries would share the cost, i.e. the principle of benefit, and where local fishermen in the artisanal fisheries sector did not have any custom or experience of paying for ice despite their knowledge of effectiveness of ice for quality control of perishable fish and shellfish, the present level of BFC management can be said to have improved significantly.
The outcome of the BFC facilities in their hard aspect has been very clear and highly evaluated as they have offered a safer place for evacuation during hurricanes. It generally takes much longer to produce positive outcomes in the soft aspect such as establishment of new businesses compared to those in the hard aspect.
Despite difficult management conditions, one positive move made by the Government of SCN towards the development of businesses was the allocation of a fund for fish purchase, the main business of the BFC, to the FY2003 budget of the Department of Fisheries.
This fund used for fish purchase from fishermen has provided an opportunity for them to earn cash and has been recovered from the profit in fish sale, proving its effectiveness for the BFC's business operation. Business collaboration between the BFC and CFCs aims at further utilizing this fund and it is planned that the scope of funding using this fund covers the following businesses.

1. fish purchase and sales
2. Ice production and sales (distribution)
3. Facility and equipment lease and rental
4. Dissemination of Fisheries-related techniques/technologies (practical training and lectures with involvement of the fishermen's cooperative)
5. Fishery data collection (manager and data collectors at the Department of Fisheries)
6. Others (disclosure and publicity of fishery information on marine and fishery resources, fishing industry, distribution, processing and consumption)

(2) Layout Plan

The project site at Old Road (OL) directly faces the ring road at the southwestern part of central St. Kitts Island and its southwest side faces the Caribbean Sea. There are two access routes to the site.

The principal access route facing a 3.5m wide public road has a frontage of some 14m. Another route is an existing some 3.5m wide pubic road to the northwest of the site. In order to effectively utilize the small plot, two access routes will be introduced. The plot generally runs parallel with the southwestern coast and shows an inclination of one tenth towards the waterfront. The elevation of 2.5m at the toe of the sloped seawall will be adopted as the design elevation of the ground level for new buildings. The difference in elevation between the high point and the low point of the site is approximately 4m and the Community Fishery Centre building will be built on the current ground at a road side. By taking into account the coming and going of vehicles, landing of fishing boat for emergency evacuation and the line of flow from the sea, the jetty, slipway and the main access will be arranged in the straight line.

The main Community Fishery Centre building (fish handling space) will be built at the centre of the space along the main access route for convenience. The plan is to build this CFC building on the inland side in order to avoid damage by natural disasters such as hurricanes and to secure space for a boat yard and a car park at the centre of the site. In order to save space, three fishermen's locker buildings will be arranged on the land side of the lot parallel with the sea along the main passage of the site to provide good path lines to the boat yard and within the site.

Regarding the existing natural beach used for the landing of fishing boats, it was firstly planned to leave it as it is in the northwestern corner of the site but the decision was taken afterward not to include this area in the facility plan for fear of scouring due to waves caused by hurricanes.

(3) Facility Plan

As for the major facilities under the Project, in addition to the Community Fishery Centre (CFC) building, fishermen's locker building, fish landing jetty and slipway for landing of fishing boats, boat yard and car park for shoppers and business users will be constructed.

At present, there are small restaurants at the west end of this site. Although the public road leading to the beach separates these restaurants from the project site, consideration should be given to prevent disruption of their businesses after completion of the facilities. Because of the presence of this restaurant, the Project will not

newly create commercial spaces for small shops and others.

Materials that are easy to repair and maintain and are able to offer comfort will be used for paving at the site. From the viewpoint of durability, mainly concrete will be used for car park and site passage. Blocks with high wave-breaking effects will be used to the seawall. In addition, to facilitate the rapid lifting and landing of fishing boats when a hurricane warning is issued, as many outdoor lamps as possible will be attached to buildings and items that could hinder fishing boat landing operation such as independent posts will not be installed.

(4) Implementation Plan

For the formulation of an implementation plan, the full-scale cooperation of the SCN side is required. A close cooperation system with the Government of SCN should be created especially for clearing and leveling of the project site (felling and removal of some of the trees at the site), securing a place to store construction materials and equipment, securing an alternative route for the existing drainage channel, securing alternative land for fish landing as a safety precaution during the construction work, securing roads during the construction period, obtaining the understanding of residents in neighboring areas and requesting their cooperation.

Moreover, proper cleaning as well as safety control at the site and the surrounding access roads needs to be provided. In principle, civil engineering work such as the creation of the jetty for fish landing, seawall and foundation will be conducted first, followed by the construction work of the Community Fishery Centre (CFC) building and fishermen's lockers. When conducting civil engineering work and building foundation work, the neighboring deteriorated buildings should be taken into account and sufficient understanding and cooperation of the construction work should be obtained through the Government of SCN. Through careful examination of the candidate pits, soil of good quality and uniformity should be used for the foundation. In addition, to prevent long delays in work during the rainy and hurricane seasons, the entire work schedule and the contents of required work during the preparatory period will be discussed in detail with the SCN side.

(5) Consideration for Local Conditions

(Natural conditions, social environment and construction conditions)

1) Policy on Natural Conditions

① Due to high temperatures and humidity, ventilation and lighting (such as ventilation, lighting and shading from sunlight during the day) of each building should be sufficiently taken into account in the design of buildings.

② As mountains in the region of 900m to 1,100m exist on the St. Kitts Island, a reasonable amount of rainfall is observed throughout the year. However, the difference in rainfall between the rainy and dry seasons is large and, therefore, rainwater will be collected for various uses. In addition, effective utilisation of seawater for cleaning the bottoms of fishing boats, the jetty for fish landing and places which are not susceptible to salt corrosion.

③ As the project site faces the sea and is affected by briny air, building materials and equipment resistant to

salt will be used.

④ The design ground level at the site will be determined for easy drainage and avoidance of damage caused by flooding, taking the maximum wave height during hurricanes, etc. into consideration

⑤ To prevent coastal pollution from fisheries–related waste and waste water from the planned facilities, a waste water disposal system for its exclusive use by new facilities to be built under the Project will be created. In addition, solid waste such as gills, internal organs and fish scales must be collectively disposed of every day using garbage collecting vehicles instead of leaving them within the facilities or surrounding beach. Therefore, prior discussions with the health authority and the cleansing departments are necessary in order to avoid complaints from residents in neighboring areas.

2) Policy on Social Environment

① Beach of the project site is located at the centre of an urban area in Old Road and houses, clinics and offices, etc. are crowded along the island's ring road. For this reason, sufficient examination should be made together with the concerned parties of the implementing agencies, fishermen and local residents with respect to access to the site from the ring road. By planning the use of two access roads that enter the existing beach, accessibility to the site will be improved for effective utilization of new facilities. At the same time, local waterfront development will be promoted so that new facilities benefit the residents of Old Road.

② It is important to make sure that the appearance of new buildings will match the surrounding environment, construction materials, colour and design will carefully be determined. Since the project site is a town with long history where there are many stone masonry buildings, opinions of local residents will be reflected as much as possible. Although the ease of maintenance from a technical point of view is the most important consideration for new buildings facing the sea, an effect of new buildings as public facilities to the surrounding landscape will be fully considered.

3) Policy on Construction Conditions

① Mainly British and American regulations are used as the bases for laws, regulations and standards governing the design of architectural and civil engineering structures. In addition, there is the Caribbean Uniform Building Code (CUBiC) stipulated by Caribbean nations and the St. Kitts and Nevis Building Code in SCN is based on this CUBiC. For the construction of facilities under the Project, their design will be done in accordance with Japanese building and civil engineering design codes, while referring to the above-mentioned codes. With respect to the environmental standards for waste water drainage, etc., local standards will be applied as a result of discussions with the recipient government.

② With regards to installation of ice making machines, there are currently no regulations on the use of CFCs (Freon refrigerant) in SCN. Since there is a problem for the equipment maintenance when using a CFCs substitute or ammonia given the present technical level in SCN, R22 refrigerant of which use is accepted by the international community until 2020 will be used.

③ Local construction companies and oceanic civil engineering contractors do not have many skilled

engineers. The examples of past construction work suggest that engineers were recruited from neighbouring countries. It should be understood that this is a situation common to East Caribbean countries and the situation will be dealt with appropriately.

④ Although possible to locally procure such materials as sand, aggregates and soil, other materials including steels (for architectural and civil engineering structures) and tubes are dependent on imports. Accordingly, a locally available quantity is not always adequate. While locally available materials will be used as much as possible under the Project, materials which are difficult to procure locally will be procured from either Japan or a third country after comparing and examining the procurement cost.

⑤ Policy on effective utilization of local contractors, materials and equipment:

Local construction companies in SCN have much experience in public work and their use as subcontractors will be considered. Consideration will also be given to active employment of local workers.

2-2-2 Basic Plan

2-2-2-1 Examination of Design Conditions

(1) Fisheries on St. Kitts Island

In the fishing industry on this island small-sized wooden boats are mainly utilized. Boats of length twelve (12) to twenty (20) ft, and twenty (20) to thirty (30) ft account for more than 90%.

There are four (4) major fishing methods, ①surrounding gill net fishing (net fishing) for coastal pelagic fish, ②trolling fishing for coastal migratory fish, ③fishing by diving for conches and lobsters, and ④hand line and trap fishing for coastal reef fish.

According to fishery data for the past five years, compared with 250,000 pounds (approximately 110 tons) of coastal pelagic fish (gill net fishing) for an average year, the outstanding catch for 2001 was 524,000 pounds (237 tons). In contrast, compared with 300,000 pounds (approximately 130 tons) of hand line and trap fishing for reef fish in an average year, the catch for 2001 was 90,000 pounds (more than 80,000 in 2000) which is not good. Of one hundred nine (109) fishing vessels in operation, eighty eight (88) boats are used for hand line and basket fishing (81% of total) which is the leading fishery and subject to demersal fish resources. And by carefully observing the transition in data for the catch, the harvest of 2002 and 2003 recovered to approximately 300,000 pounds (approximately 130 tons). According to the results, it is important to control the future fisheries by converting to other fishing methods. With respect to the annual change by month, the number of days in operation generally decreases between August and November due to the deterioration of oceanic conditions. Moreover, because of demand during the tourist season the number of sailing days tends to increase between December and May.

Hereinafter, "Annual Fish Catch by Fishing Method (1999 – 2003)" and "Monthly Fish Catch by Month (2003)" on St. Kitts Island are listed as Table 2-5 and Table 2-6.

Table 2-5 Annual Fish Catch and Fishing Method (1999 – 2003)

(Unit: 1,000lbs)

Fishing Method	1999	2000	2001	2002	2003
① Coastal Pelagic Fish (Gill Net Fishing)	255.9	250.7	524.0	289.7	195.6
② Coastal Migratory Fish (Seine Fishing)	49.2	63.5	67.2	95.8	75.5
③ Conches (Fishing by diving)	113.8	116.6	102.6	78.6	96.5
④ Reef Fish (Hand Line & Trap Fishing)	164.1	85.2	90.3	316.8	294.4
Total	583.0	516.2	784.2	773.7	662.5

Source: Fish Catch Statistics FMU St. Kitts

Table 2-6 Monthly Fish Catch (2003)

(Unit: 1,000lbs)

Month / Fishing Method	1	2	3	4	5	6	7	8	9	10	11	12	Total
① Coastal Pelagic Fish	32.9	21.1	19.0	11.3	23.5	17.5	5.7	10.1	6.9	12.5	20.1	15.0	195.6
② Coastal Migratory Fish	6.1	7.8	4.5	8.2	5.5	11.5	2.1	7.7	6.6	2.7	5.8	6.5	75.5
③ Conches by diving	5.4	8.6	6.1	5.8	13.4	7.0	10.6	9.6	9.2	7.3	6.8	6.2	96.5
④ Reef Fish (Hand Line & Trap Fishing)	13.6	26.2	28.7	15.3	10.3	12.7	29.4	39.5	31.8	32.5	30.5	23.3	294.4
Total	58.2	63.7	58.4	40.8	52.8	48.8	48.0	67.1	54.7	55.0	63.4	51.2	662.5

Source: Fish Catch Statistics FMU St. Kitts

Although there are eleven (11) landing sites on St. Kitts Island, the four main sites include three sites under the Project (OL: Old Road, SP: Sandy Point, and DB: Dieppe Bay) and Basseterre East (BE) in the capital. Seven locations classified as others neighbor the four major landing sites and are scattered across the island. At the present time, one year since the completion of the Basseterre Fisheries Complex (BFC) in the capital, the surrounding four (4) sites of Conaree (CO), Frigate Bay (FB), Limekiln (LK) and Market (BW) in the capital have been in active at the base of BE where the BFC facilities are located. Consequently, if three locations are constructed at this time, of the remaining three sites, Camp Challengers (CC) and Godwin Half Way (GH) can utilize the Community Fishery Centre (CFC) facilities in Old Road (OL), and the remaining site of Newton Ground (NG) will be integrated into Sandy Point (SP).

Since there is very little natural beach along the Atlantic and north shores, Dieppe Bay (DB) is a place where fishermen from neighbouring towns and villages gather, and is used as a base for the surrounding area. And for future, coastal fisheries activities will be continued through the development of necessary facilities.

(3) Flow of Fresh Fish on St. Kitts Island

Table 2-7 Flow of Fresh Fish

Item	BFC (BE & other)	OL	SP	DB	Total
Fishery Production Share (%)	45% *	25%	10%	20%	100%
Annual Production (ton)	157.5	87.5	35.0	70.0	350 tons
Average Daily Production (kg)**	525	291.6 → 300	116.6 → 120	233.3 → 230	1,175kg (100%)
Local Retailing (kg)	125	100	80	80	385kg (32%)
Others (kg)	400	200	40	250	790kg (67%)
Of those, shipment to the BFC	125	50	—	75	250kg (22%)
Transactions with Others	275	150	40	175	540kg (45%)

Note: * BE before completion of the BFC facilities was one of 11 sites on St. Kitts Island and its share was approximately 20% the same as DB. Due to the completion of the BFC facilities, the number of fishing boats landing at the BE site has increased, so its fishery share has also increased rapidly.

** The number of days in operation is regarded to be 300 days annually.

(4) Weather Conditions

SCN is located in anti-cyclonic (high pressure) and equatorial convergence zones (ECZ). Easterly winds blow continuously at six (6) to thirteen (13) knots (3 to 6.5m per second). Accordingly, the humidity is relatively stable, which is approximately 75% throughout the year. Weather data prior to 1998 was destroyed due to damage caused by hurricane "George" in 1998. Although the hurricane season is said to fall between June and November, hurricanes usually form from August onwards. Hurricane "Lenny" in November 1999 formed near the centre of the Caribbean Sea and moved eastward opposite to the usual course inflicting tremendous damage on the East Caribbean and other nations. Generally speaking the Caribbean Sea is calm so there are many fishing communities and the fisheries are prosperous in comparison with the Atlantic Ocean side. However, after witnessing a hurricane take such an abnormal course, it is necessary to adequately take into account the impact of recent unusual weather conditions and trend when building fishing facilities.

1) Rainfall, Temperature and Humidity

Table 2-8 Weather Data by Month on St. Kitts Island (2001 to 2003)

2001								
Month	**Rainfall (mm)**	**Temperature (℃)**	**Humidity (%)**	**Temperature (℃)**				**Wind Velocity (m/sec)**
				Average Maximum	**Maximum**	**Average Minimum**	**Minimum**	
1	41	26.1	72	28.1	29.9	22.5	19.4	8
2	29	25.7	71	28.6	29.4	22.4	19.7	12
3	19	26.3	73	29.3	30.0	22.9	19.6	8
4	62	26.4	72	29.3	30.4	23.2	21.1	9
5	10	28.0	74	30.5	31.6	24.9	23.2	9
6	75	28.6	73	31.0	31.8	25.6	23.3	9
7	259	28.2	77	30.3	31.4	25.5	23.0	10
8	177	28.6	78	30.6	31.3	25.1	23.4	11
9	88	28.7	77	30.8	31.7	25.3	22.8	8
10	167	28.0	79	31.3	32.0	21.1	21.1	10
11	74	27.1	76	29.7	30.8	23.0	19.0	6
12	268	26.3	79	28.7	30.0	23.5	19.0	10
Annual Average	**106**	**27.3**	**75**	**29.9**	**30.9**	**23.8**	**21.2**	**9**

2002								
Month	**Rainfall (mm)**	**Temperature (℃)**	**Humidity (%)**	**Temperature (℃)**				**Wind Velocity (m/sec)**
				Average Maximum	**Average Maximum**	**Average Minimum**	**Minimum**	
1	55	26.1	76	28.7	29.7	23.3	22.1	11
2	42	25.7	71	25.5	29.5	21.6	18.0	11
3	49	26.3	72	28.4	30.4	24.2	22.0	10
4	71	26.5	76	29.0	30.1	23.8	20.9	10
5	22	27.8	73	30.5	31.2	23.3	22.5	12
6	73	28.4	75	30.6	31.1	26.1	21.6	17
7	114	28.4	76	30.9	31.9	23.6	22.6	10
8	85	28.9	75	30.7	32.6	25.4	22.8	9
9	38	29.0	75	31.3	32.5	26.1	23.5	9
10	119	28.4	76	32.1	32.5	23.0	23.4	7
11	64	27.9	77	30.4	32.6	25.3	20.6	8
12	96	26.7	75	29.8	30.9	28.6	21.7	8
Annual Average	**69**	**27.5**	**75**	**29.8**	**31.2**	**24.5**	**21.8**	**10**

2003								
Month	**Rainfall (mm)**	**Temperature (℃)**	**Humidity (%)**	**Temperature (℃)**				**Wind Velocity (m/sec)**
				Average Maximum	**Average Maximum**	**Average Minimum**	**Minimum**	
1	41	26.6	74	30.2	30.5	24.4	20.1	8
2	53	26.4	74	29.0	30.3	23.8	21.6	10
3	26	26.6	70	29.9	30.8	23.3	20.0	8
4	66	27.3	72	29.9	30.8	24.9	21.7	8
5	28	27.8	71	30.5	31.6	25.0	23.4	9
6	92	28.2	74	29.1	31.4	25.7	22.6	11
7	33	28.7	74	30.3	32.1	25.4	24.0	11
8	44	29.0	74	31.9	33.2	26.9	24.2	9
9	49	29.4	74	31.4	33.7	26.0	22.9	8
10	170	28.7	75	31.2	32.5	25.2	22.8	7
11	264	27.0	84	29.7	31.0	25.4	21.2	7
12	226	26.6	79	28.6	30.5	23.0	17.8	9
Annual Average	**91**	**27.7**	**75**	**30.1**	**31.5**	**24.9**	**21.9**	**9**

Source: Meteorological Station at St. Kitts International Airport

2) Wind Direction and Velocity

Data on wind direction and velocity over five years between 1999 and 2003 are indicated below. As a result, it is clear that 90% of the winds blow from the east and northeast.

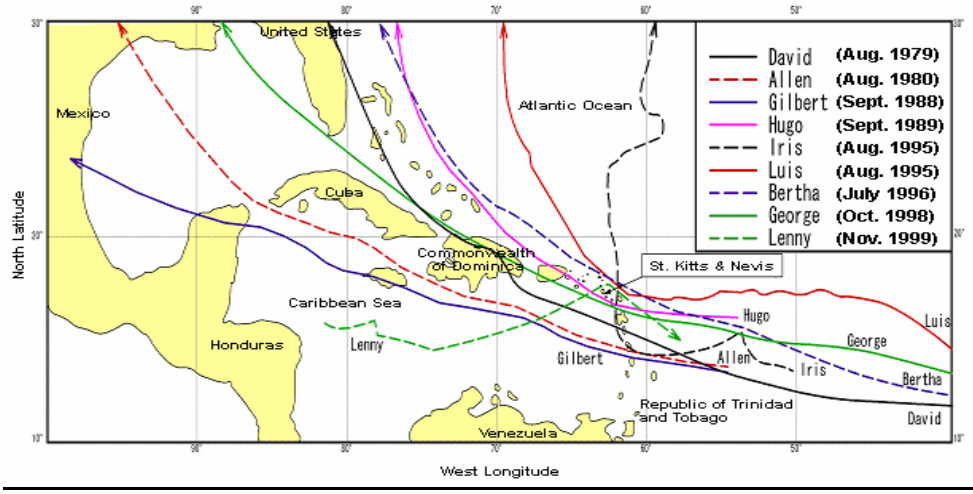
Table 2-9 Frequency of the Occurrence by Wind Direction & Velocity (1999 to 2003)

Wind Direction	Wind Velocity Class (Wind Force)					Total Frequency (%)
	1(1 to 3kt)	2(4 to 6kt)	3(7 to 10kt)	4 (11 to 16kt)	5 (17 to 21kt)	
North	0.22%	0.38%	0.38%	0.22%	—	1.2%
Northeast	0.66%	4.77%	19.62%	15.29%	0.05%	40.3%
East	1.15%	5.97%	30.41%	12.11%	0.11%	49.7%
Southeast	0.05%	2.25%	1.26%	0.44%	—	4.0%
South	0.44%	1.10%	0.82%	0.00%	—	2.3%
Southwest	0.11%	0.77%	0.60%	0.00%	—	1.4%
West	0.05%	0.38%	0.11%	0.00%	—	0.5%
Northeast	0.00%	0.16%	0.00%	0.11%	—	0.2%

Source: Meteorological Station at St. Kitts International Airport

3) Hurricanes

Hurricane tracks are shown as follows. Only recent large-scale hurricanes have been included in the following figure. St. Kitts Island is located at high latitude and falls within the hurricane path for East Caribbean nations, which are strongly affected by these violent storms. Hurricanes “George” in October 1998, “Jose” in October 1999 and “Lenny” in November of the same year caused extensive damage to coastal areas.



(Prepared based on Tropical Cyclone Data 1886 – 1999)

Figure 2-1 Hurricane Tracks

4) Earthquakes

The Islands of the West Caribbean including St. Kitts Island belong to the Caribbean tectonic seismic zone (earthquake belt).

Although seismic damage is rarely observed, in 1974 an earthquake magnitude 7.1 (October 8, Greenwich Mean Time 09:50, epicenter west of Antigua at latitude 17.3°N and 62.0°W longitude, depth 47km) was felt east of the St. Kitts Island. Despite some slight damage to the Leeward Islands, no damage was reported on St. Kitts. Montserrat located approximately forty (40) nautical miles southwest of St. Kitts and Nevis is situated in a younger inner volcanic arc belonging to the West Indies Islands, as is St. Kitts, and volcanic activity occurred in 1996 and 1997. The airport on the island of Antigua had to be closed because volcanic ash reached it on the hurricane current. Accordingly, with respect to seismic countermeasures, in addition to the present conditions and local building standards, the design should include a comprehensive examination of the cost effectiveness, etc.

(5) Oceanographic Conditions

1) Tides

There are no tidal harmonic constants at Port Zante and at other ports in the vicinity. Consequently, the local tidal harmonic constants and the planned tidal level were calculated through a tidal harmonic analysis from observations over thirty (30) days during the field survey for the basic design study.

Highest High Water Level (HWL)	: ＋1.05m
Mean High Water Level (HWL)	: ＋0.40m
Mean Water Level (MWL)	: ＋0.15m
Mean Low Water Level (LWL)	: －0.10m
SK Official Mean Sea Level (MSL)	: ＋0.00m

2) Waves

It is crucial to understand the waves in the planning and designing of structures at sea. The project site at Old Road (OL) is a landing place that faces the open Caribbean Sea, which experiences extremely severe oceanographic conditions and offshore waves. OL has experienced great damage and the breakwater during construction was destroyed in the past. Despite the site conditions, St. Kitts Island is a small island surrounded by the Atlantic Ocean and Caribbean Sea. Since there is no wave data important to the basic design of the Project, based on meteorological data which is collected for forty nine (49) years, waves from hurricanes considered to have the greatest affect on the three Project sites were estimated. The results of the wave estimation for the frontal waters are shown in the following table and conform to the fact-finding surveys of the local sites.

Table 2-10 Estimated Extreme Wave by Wave Direction by Return Period

Wave Direction	RP 10 years		RP 30 years		RP 50 Years	
	Wave height (m)	Cycle (s)	Wave height (m)	Cycle (s)	Wave height (m)	Cycle (s)
SE	4.4	7.7	6.4	9.2	7.2	9.8
SSE	3.8	7.3	5.8	8.7	6.8	9.5
S	3.3	6.9	5.5	8.5	6.5	9.2
SSW	2.9	6.6	5.1	8.2	6.1	9.0
SW	2.8	6.5	4.5	7.8	5.4	8.4
WSW	2.8	6.5	4.2	7.6	4.9	8.1
W	2.0	6.0	3.7	7.2	4.6	7.9
WNW	2.0	6.0	3.7	7.2	4.6	7.9

3) Flow Structures

The flow was observed by installing a tidal current measuring instrument (INTEROCEAN S4) 1m above the seabed over sixteen (16) days at the Project site of Old Road (OL). The height was set for appropriate measurement of flow direction and velocity. The results are shown as follows. OL flow in the southeast direction is ebb tide of less than 0.15m/s and flow in the northwest direction is high tide at less than 0.20m/s. The flow runs roughly along the coastline.

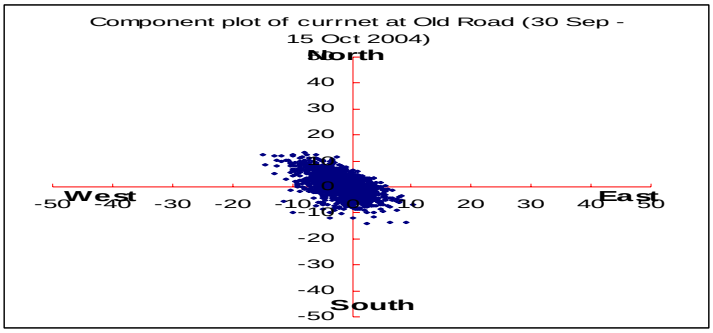


Figure 2-2 Current at OL

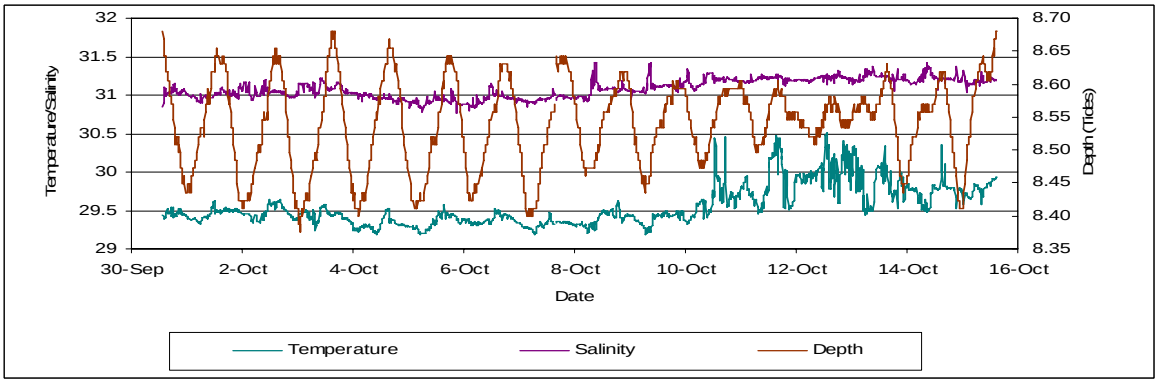


Figure 2-3 Tide Level, Temperature & Salinity

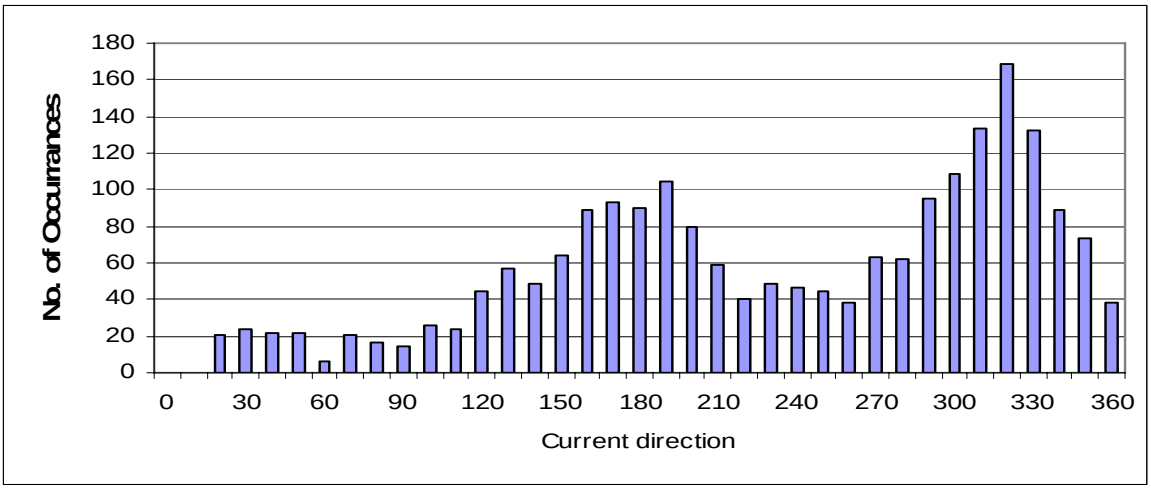


Figure 2-4 Coastal Current Distribution at Old Road

4) Coastal Deformation

As the result of the tidal current survey, very little post tidal flow is observed. However, as the coast at Old Road (OL) faces to the open sea the influence of waves during a hurricane should be taken into account. When constructing the jetty and seawall, in order not to retard the flow in an offshore direction, they should not project significantly in relation to the surrounding coastline.

2-2-2-2 Scale Setting

In accordance with an examination of the above-mentioned requested components and basic policy of the Project, the grounds for establishment of scale with respect to the Project at Old Road (OL) are described below.

Old Road (OL) is one of four (4) major landing sites within the island, and is an important base on the Caribbean Sea side. In the case of establishing the scale of the Project, the design will be based on the assumption that neighboring two locations (CC and GH) are to be integrated. Meeting space that can be effectively utilized by the OL fishermen's cooperative, retail space for local consumption, and space for hauling up, storing and accommodating of fishing boats during a hurricane warning will be appropriately decided in the overall layout. In addition, since the coast at the OL site faces directly to the open sea and is surrounded by two steep rivers to the east and west, the site conditions are severe. An optimum plan draft will be formulated and proposed by clarifying the design requirements for these natural conditions.

(1) Boat Yard

For the boat yard, the minimum space required to store twenty four (24) fishing boats presently in operation at Old Road (OL) during a hurricane warning will be created. The space required for maintenance and inspection during normal period will be also be secured.

Table 2-11 Target Fishing Boats at OL

Fishing Boat Type (Class Standards)	Number of Vessels	Principal Dimensions		Remarks
		L × B × d (ft)	L × B × d (m)	
Class I (Less than 12ft)	1	11 to 12ft × 4ft × 0.4ft	3.3 to 3.6m × 1.2m × 0.12m	All fishing boats have outboard engines.
Class II (Over 12ft & less than 20ft)	12	18 to 20ft × 6ft × 1.0ft	5.4 to 6.0m × 1.8m × 0.3m	
Class III (Over 20ft & less than 30ft)	10	26 to 30ft × 8ft × 2.0ft	7.8 to 9.0m × 2.4m × 0.6m	
Class IV (Over 30ft & less than 40ft)	1	36 to 40ft × 10ft 2.0ft	10.8 to 12.0m × 3.0m × 0.6m	
Sub-total	24			

Note: The mean breadth (weighted average) for 24 target fishing boats at OL is 2.0m as shown below.
Ba = (1.2 × 1 + 1.8 × 12 + 2.4 × 10 + 3.0 × 1)/24 = 49.8/24 = 2.075

1) Space Required during a Hurricane Warning

・Target Fishing Boat Model: Based on Class II and Class III, the length to be "L＝9.0m" and breadth to be "Ba = 2.0m" on average.

・Space for 24 boats in one row: 11m in width（= 1.15 × 9.0m）, 72m in length (= 24 boats × (1.5 × 2.0m))

In the overall site layout, a space for 17 boats stowed transversely on the west side of the jetty（17 × 3m = 51m） and space for 7 boats stowed longitudinally between the 17 boats mentioned above and the fishermen's lockers on the east side (7 × 3m = 21m) will be created. In addition, handling space necessary for pulling fishing boats in and out will be secured separate from the area for direct storage of fishing boats. So that more

than the half the number can be easily brought in and taken out, an efficient layout for storing fishing boats will be prepared. In a similar manner, towing operations by the crane-truck for pulling fishing boats in and out should be taken into consideration so that the entrances to the jetty and to the slipway on the east corner space of the boat yard will not be included as a space for storing fishing boats.

2) Space required for Maintenance and Inspection during Normal Time

In a similar manner, the Project will cover twenty four (24) fishing boats at OL. Since maintenance inspections of each fishing boat should be conducted once a year, the following required space will be secured.

・Space required for maintenance and inspection during normal time: 2-boat portion (= 24 boats ÷ 12 months) is estimated.

Countermeasures against wave breaching during a hurricane will be taken for the boat yard through a wave-dissipating seawall. Wave protection boards of steel and removable type will be provided at the entrance openings to the jetty and also to the slipway, respectively. The protection boards should have sufficient strength so that lashing/ tightening equipment should be installed as necessary. The handling of installation and removal of the wave protection boards shall be done by the crane-truck which to be used commonly for the fish distribution and other services of the Community Fishery Centre at OL.

(2) Jetty for Fish Landing

As a result of the field survey, as mentioned above the planned number of fishing boats landing at Old Road (OL) is twenty four (24) in total. Although the number of fishing boats in operation at OL as a registered landing site is forty one (41), as was mentioned earlier the number of fishing boats in the basic design of the project is to be twenty four (24), including fishing boats scattered throughout neighboring fishing communities. With respect to the requested functions of the jetty, landing and preparation and breaks (resting) will be taken into account. For landing and preparation, time for mooring sideways along the pier will be short; whereas, the resting of the boats will be moored headways. Since all boats are used for day operation, the daily landing time is from 9:00 a.m. to about 6:00 p.m. Since there is no waterway sign, fishing boats should return to port before sunset. Almost half the fishing boats land fish between noon and 3:00 p.m. The average number of fishing boats landing each hour is two (five in maximum), so nine (9) to fifteen (15) minutes are required for fish landing and preparation for fishing. The fish landing jetty shall be efficiently used by the fishing boats as many as possible. Therefore, preparations before going fishing may be conducted during resting at the jetty. Then the average time required for fish landing per boat is determined as 0.15 hours (9 minutes). The number of fishing boats lying near the jetty is estimated to be twelve (12) which is half the number of twenty four (24). Since the remaining twelve (12) fishing boats are expected to utilize the place after landing and preparations, overlapping (repetition) will be avoided. In addition, with respect to the breadth of fishing boats currently in operation, 2.0m of weighted average will be applied.

The required extension of the jetty will be obtained as follows. The necessary water depth is considered to be 1.0m and the size of the jetty will be decided. In the case of calculating the required jetty extension, the wave

breaking zone should be excluded. In addition, approximately 2.5m in width will be secured for operation space on one side similar to other local facilities. And taking outrigger dimension of approx. 5.7m in width for a wheel-crane which will be used for lifting/lowering fishing boats from the jetty into consideration, the jetty of 6m in width will be secured.

Table 2-12 Calculation of Required Extension of Jetty

Purpose: i	Required Extension: Lji	Required Extension per boat: Lb (or Ba)	Number of Boats for Standard Utilization per Day: Ni	Rotational Frequency of berth: r	Time per boat: Pt	Time Feasible to utilize: Mo
① Landing & Preparation	10.7 to 12.4	Lb = 8.97 to 10.35	24	20	0.15	3.0
② Resting	26.4 to 36.0	Ba =2.2 to 3.0	12	1	16	16
Sub-total	32.1 to 48.4					

Calculation Formula

Lji = (Ni/r) × Lb (or Ba)

Lji: Required extension of jetty

Lb: Required extension for mooring sideways per boat 1 = boat length L (m) × marginal length (1.15)

Ba: Required extension for mooring headways per boat = boat length B (m) × marginal breadth (1.5)

Ni: Number of fishing boats utilized daily

r: Rotational frequency of berth

Mo: Feasible landing time

Pt: Utilization time per boat

L = (24/20) × (1.15 × (7.8 to 9.0m) + 12boats × ((1.1 to 1.5)×2.0m)

= 2 × (8.97 to 10.35m) + 12boats × 3.0m

= 37.1 to 48.4 (m) → 36m in total including approx. 15m on each side and 6m on the front end

The substructure of the jetty may be constructed using the steel pipe pile method (or earth anchor method), whereas, the superstructure may be constructed using two methods, steel work and concrete work. In addition, compared to the steel pipe pile method, a steel sheet-pile type pier (jetty) was examined. Accordingly, three plans in total for the structure were compared and examined. From the comparison and examination, the steel sheet-pile type structure seems to have advantages, but it is concluded that it will not be practical because of much construction costs in view of cost-effectiveness. Therefore, a steel pipe pile type jetty with minimum extension in length required is selected as the most appropriate construction plan. The detailed explanation will be included in the context of the basic plan.

(3) Slipway (including fishing boat lifting equipment)

Materials for the local fishing boats of less than 20 to 30ft vary and include wood, fiber reinforced plastic

(FRP) and aluminum alloy. The reason for this, due to the frequently purchases of secondhand boats, in the case of manufacturing at the local site there is no drawing, and materials utilized lack uniformity and quality. In due consideration of such matters fishing boat weight including the boat hull and outboard engine (2 units) is estimated to be approximately 1.5 to 2.5 tons. This conforms to the weight of a 33ft class FRP ship in Japan. However, gross weight varies greatly depending on the principal dimensions, horsepower of the outboard engine, and hull of each fishing boat. For example, in the case of a wooden hull, water content increases so that weight tends to increase as well. Consequently, the class is assumed to be 1.5 to 2.5 tons and lifting equipment will be planned accordingly.

The slipway should be curved as much as possible like the upper side a parabola. However, since the slipway size is small the upper end of the ramp slope should be linked by a circular arc. By taking the difference of the levels of breakwater (seawall), boat yard and the levee crown of the jetty into account, major specifications and dimensions such as necessary angle of inclination will be decided. Consideration should be given so the angle will not be excessive; it should remain within the scope of operations so that fishing boats can be naturally lifted and launched.

The steel pipe-pile method and steel sheet-pile type method for the substructure and a concrete method and steelwork jacket method for the superstructure will be included in the examination. However, in the case of the slipway, steelwork in the submersion and dry parts will form an oblique line and become longer from the viewpoint of anticorrosion countermeasures, so the same conditions as the jetty cannot be applied. In the case of the sheet-pile type method, there are two plans for the slipway; one is to unite it into one body and the other is to separate it from the jetty.

As a result of comparing and examining these two plans, the plan to unite it into one body with the jetty is deemed to be advantageous than the separate plan from the viewpoints of construction volume and cost. However, a plan of one body of slipway and jetty requires bigger initial construction costs and also maintenance costs after completion of construction works, because of the worse sea conditions. Therefore, it is concluded that there is no plan to extend a slipway into the ocean in view of cost-efficiency. As a result, the slipway will be arranged on the east end of boat yard extending to the beach in parallel to the coast line. This choice is evaluated as appropriate and practical in view of maintenance of the slipway after completion of construction works. Further details are described in the context of the basic plan.

(4) Community Fishery Centre (CFC) Building

(including water supply and drainage system, toilets and showers)

A fish handling space, office room, sanitary zone, meeting room, and storage space will be created in the Community Fishery Centre (CFC) building. Fish handling space includes large insulated boxes for ice, small insulated boxes for fish and handling space which can be utilized as a multi-purpose space for shipping to BFC and trading of fish. In addition, after operations are completed, it can be utilized as a space for fish retailing to general local consumers. Due to the shape of the lot at the site, the position of the structure will be limited. A two-storied building will be examined and will include a meeting room.

・Annual production on St. Kitts Island: 350 tons

・Annual average contribution at OL: 25%

(According to the statistical data of Department of Fisheries on St. Kitts)

・Annual fish production at OL: 87.5 tons

・Fish handling at OL facilities: 300kg average per day, 820kg maximum

(High fishing season is between November and May)

According to the sampling survey, the maximum daily production over the past three years on St. Kitts Island was 3,320kg as of December 8 (Saturday), 2001. Similarly, the average production over ten (10) days during the peak months of November and December in 2003, which was the maximum for a consecutive two-month period over the past three years, is 1,215 kg. Based on these values, by taking the degree of contribution of OL and seasonal increase in harvest of coastal pelagic fish into account, the maximum and average handling amounts will be decided as mentioned above. The maximum is obtained as shown below.

r = 3,320/1,215 = 2.73

q = 300×2.73 = 820 (kg)

Small insulated boxes to store 25 to 30kg of fish will be approximately 160ℓ with outside dimensions 0.5 × 0.5 × 1.0m. For 300kg fish, ten (10) boxes of this size are necessary. However, this is the minimum quantity. In the peak fishing season, this will grow two to three times. In such a manner, as shown below the total area needed for constructing the CFC facilities will be approximately 218 m^2.

① Fish handling space	88m^2
② Office room zone	35m^2
③ Meeting room	59m^2
④ Sanitary zone	16m^2
⑤ Warehouse and other	20m^2
Total	218m^2

Hereinafter, the grounds for establishing the scale of each space are described.

① Fish Handling Space

When creating fish handling space in accordance with the Japan's fishing port planning guide (compiled by the Japan Fishing Ports Association), the area required for fish handling and measuring, space for insulated boxes (for ice) and ice making plant is estimated to be 54m^2 (= 20＋9 + 4＋21) in total. In addition, traffic flow from the office, meeting room and accessibility between each working space are also important. So the required area including the facility layout and passageways is estimated to be approximately 88m^2.

(a) Area required for fish handling

$S = N/(R \times a \times P)$

S: Required area (m^2)

N: Planned handling amount per day (kg) 300 to 820kg

P: Unit area handling amount (kg/m^2) 27kg/ m^2

R: Rotational Frequency (time/day) 1.0 time/day

a: Occupancy ratio (space efficiency) 0.6

S = (300 to 820kg)/ (27kg/ m^2 × 1.0 time/day × 0.6)

= 18 to 50 m^2 → Approximately 20 m^2

This is the area required for handling an average catch of 300kg per day divided into insulated boxes. As mentioned above, the catch is anticipated to be two to three times greater in the peak fishing season. Therefore, daily rotational frequency will be increased by increasing the handling amount per unit area.

Item	Area (m^2)
Catch (Box)	5.0 （= 10 boxes ×（1.0m × 0.5m）/box）
Fish handling	16.1 （= 1.4 × 11.5）
Total	21.1 → Approximately 20 m^2

(b) Area for Measuring (weighing)

Item	Area (m^2)
Weighing scale	0.25 （= 0.5 × 0.5）
Chair/desk for recording	0.6 （= 0.6 × 1.0）
Measuring operations	7.8 （= 3.0 × 2.6）
Total	8.65 → Approximately 9 m^2

(c) Area for Insulated Boxes (for ice)

Item	Area (m^2)
Cooling box (for ice)	2.42 （= 1.1 × 1.1 ×2）
Operation space	2.0
Total	4.42 → Approximately 4 m^2

(d) Area for ice making plant

Item	Area (m^2)
Ice making plant	9.0 （= 3.0 × 3.0）
Space for handling	9.0 （= 3.0 ×3 .0）
Delivery space	3.0 （= 3.0 × 1.0）
Total	21.0 → 21 m^2

(e) Passageways and others 34 m^2

② Office Room Zone

An office room for managing the CFC facilities at Old Road (OL) will be utilized mainly by three persons, a manger, accountant and chief of the business department. Other staff will utilize a meeting room on the second floor (part of the room will be used by the secretariat of the fishermen's cooperative) so exclusive space will not be created. Since the office room will be minimally designed, in determining the area per person for a manager and two clerical staff, the following area of approximately 35m^2 will be necessary.

Position	Standard m^2	Number of persons	Area m^2		
Manager	15 to 25	1	15 to 25		
Clerks	4.5 to 7	2	9.0 to 14		
Passageways, etc.			9.8		
Total		3	33.8 to 48.8	→	Approximately 35 m^2

③ Meeting Room

Space for a meeting room where half (25 persons) of the approximately 50 local fishermen (64 registered members) can hold meeting will be secured. Eight (8) desks of width 1.8m (3-person) will be arranged.

The area will be approximately 60m^2 including hallways. Space for the secretariat of the fishermen's cooperative as requested by local fishermen will be approximately 19m^2, so one corner of the meeting room will be utilized by three persons, the president, chairman and accountant.

④ Sanitary Zone

A sanitary zone for concerned parties who will utilize the CFC building, fishermen's lockers, the jetty and slipway facilities will be secured. Public toilets, etc. will not be installed. Depending on the usage conditions of similar facilities, with respect to the size and specifications, the site will be improved minimally and in a necessary manner.

Accordingly, the sanitary zone will include three space in the CFC office room (one each for men and women), in the meeting room (used by both women and men), and for fishermen at the fishermen's lockers (for men).

⑤ Storage and other spaces

Various functions and spaces that meet fishery conditions are provided at the fishery facilities which are common to other states not only to SCN. If storage space is not appropriately arranged, materials and equipment will be left in passages and hinder some functions. Therefore, by carefully considering the traffic flow for fish, people and vehicles, the minimum, necessary area can be secured in the overall layout of fish handling space, office room and meeting room, etc.

(5) Insulated Boxes (for Ice)

With respect to a capacity of insulated boxes, an average of 600kg per day will be necessary at OL. The ratio between fish and ice is estimated to be 1:1. Assuming that ice boxes of 750ℓ (approximately 1 cubic meter) are frequently utilized in the Caribbean region, the quantity will be decided based on a capacity ratio of 0.4.

Usage	Fish Volume	Ice Volume		Remarks
For fisheries	300kg	300kg		Target
For retail	100kg	100kg		Target
For shipment	200kg	200kg		Target
General demand	0	0		Not target
Total	—	600kg	→	2 units are required (= 600kg/(750ℓ × 0.4 × 1kg/ℓ)

(6) Fishermen's Lockers

Fishermen's lockers will be used for storing outboard engines, fishing gear (such as hand lines, trolling gear, spear and diving equipment), materials and fishing implements (such as mooring equipment for fishing boats, fuel, lubricant oil tanks, repair materials and tools) and for fishermen's clothing.

Although the number of fishing boats currently in operation is twenty four (24), the number of existing fishermen's lockers is zero. Therefore, the Project will provide twenty (20) equivalent to 85% of the 24 total fishing boats now active. An explanation is given below.

Necessary number of fishermen's lockers: N rooms
Number of registered fishing boats at OL: 41 boats
Number of fishing boats actually in operation at OL: 24 boats
Number of the existing fishermen's lockers: 0
Ratio of number of fishing boats actually in operation/registered: 50～60%

N = 41 × (50 to 60%)－0
= 20 to 25 → 20 as mentioned at left

Area per fishermen's locker is estimated to be as follows.

Classification	Area (Size)	Quantity
OL Project	3.2m^2 （= 1.8 × 1.8）	20

(7) Ice Making Plant and Storage

Fish handling volume at the CFC facilities at OL is a little less than ninety (90) tons on average annually. The entire catch at the project site is sold to consumers, hotels and restaurants through fishermen, women of fishery households, fish retailers and BFC passing by the CFC facilities. Since there are no brokers or wholesalers on the St. Kitts Island, in order to improve the freshness and quality of perishable fish and shellfish in the future, the training of distributors is a concern.

Although the BFC's ice production capacity is 0.75tons per day and 225 tons per year (=0.75ton/day x 300

days/year), the demand of ice in the Basseterre, capital, is 315 tons so annual shortage of ice is approximately 90 tons (=315 tons- 225 tons). It is important to response to the ice demand at each fish landing site for the smooth distribution of perishable fish on the St. Kitts Island. Under the circumstances, ice making plant is to be newly installed under the project.

Table 2-13 Number of Fishing Boats in Operation and Catch in the OL District

Fishing Type	Number of Fishing Boats by Class				Unit Catch (Department of Fisheries, St. Kitts)		Notes
	I Less than 12ft	II Less than 20ft	III Less than 30ft	IV Less than 40ft	Scope of catch (lbs)	Kg conversion (Kg/day & vessel)	
1. Coastal pelagic fish (Net) 1 vessel			1		Average 500lbs/day, peak fishing time is between March and August, October and November, almost half the catch is between December and February.	226.8kg/day & vessel	
2. Offshore demersal fish (hand line) 2 vessels			2		100～250lbs/day February to April is off season (None)	45.4 to 113.4kg/ day & vessel	
3. Offshore pelagic fish (trolling) 6 vessels		5		1	1,000lbs/week August to November is hurricane season, off season (None)	75.6kg/day & vessel	
4. Shore fish (traps, diving) 15 vessels	1	7	7		150～300lbs/week Same throughout the year	11.3 to 27.2kg/ day & vessel	
Sub-total 24 vessels	1	12	10	1			

Table 2-14 Change in Seasonal Catch (Daily)

Fishing Type	Transition the Daily Catch by Fishing Type and Month (kg/day)												
	Jan	Feb.	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Average
1. Net (1 Vessel)	113	113	227	227	227	227	227	227	227	227	227	113	198
2. Hand line (2 vessels)	33	0	0	0	33	33	33	33	33	33	33	33	24
3. Trolling (6 vessels)	113	113	113	113	113	113	113	0	0	0	0	113	76
4. Trap, diving (15 vessels)	43	43	43	43	43	43	43	43	43	43	43	43	43
Total 24 vessels	302	269	383	383	415	415	415	302	302	302	302	302	341
Fishing season	△	×	○	○	◎	◎	◎	×	×	×	×	△	

Note: High season ◎ Inter-phase ○ Low season △×

In the above table, the operation ratio of all fishing types is estimated to be 0.53 (= 1 × 1.0 + 2 × 0.6 + 6 × 0.5 + 15 × 0.5). Since all fishing boats sailing out during the high fishing season, this ratio is estimated to be 1.0 and the average value per day of 341kg is estimated to be 643kg. In a similar manner, the value 415kg during the high fishing season is expected to almost double to 783kg

Based on the catch of twenty four (24) fishing boats in operation at OL (annual average catch per day by fishing type for target fishing boats), the volume of ice necessary at the CFC facilities will be established as

follows by adding the required volume of fisheries ice.

Usage	Fish Volume (kg)	Ice Volume (kg)	Remarks
For fisheries	341 to 643*	300	Target (* As mentioned left due to large change in ice for fishing boats)
For local retail	100	100	Target
For shipment and distribution	200	200	Target
General demand	0	0	Not target
Total	---	600	

As described above, the volume of manufacturing ice is estimated to be approximately 0.6 tons per day. The difference in catch per day between the high fishing season and low season is approximately 1.3 times. As described in the following table, two plans, (A) 0.6 tons per production × 1 unit, and (B) 0.3 tons × 2 units were compared and evaluated. As a result of the examination, from a comprehensive point of view, (B) plan was judged to be favourable, so two ice making machines will be provided.

The project will also cover ice for fisheries, retailing and distribution. With respect ice type, in the case of ice for fisheries, there is an option to utilize plate ice. However, according to the utilization conditions at the local site, flake ice will be incorporated. As for the capacity of ice storage, considering that 0.4 tons is the average catch per day during most of the high fishing season, and 0.8 tons is the maximum catch, 1.2 tons which is the equivalent of a two-day portion of ice production volume is scheduled.

Table 2-15 Evaluation Between 1-Unit Plan and 2-Units Plan of Ice Making Machine

Item to be compared and evaluated	(A) Plan for 0.6 tons daily production × 1 unit	(B) Plan for 0.3 tons daily production × 2 units	Remarks
1. Initial Amount Invested	○ (0.98)	△ (1.00)	Figures in ( ) are comparison of amount for both plans.
2. Maintenance Cost	◎ (1.00)	◎ 0.8)	Same as above
3. Adjustment of Ice Volume in Low Season	○ Adjustment of operating time of ice manufacturing equipment	◎ Operating only 1 unit	
4. Maintenance Inspection Repairs	△ △ × (Complete stop)	◎ ◎ ◎ (Double safety)	
Comprehensive Evaluation	△	◎	

Note: Legend for evaluation symbols: ◎ Excellent, ○ Good, △ Normal, × Inferior

2-2-2-3 Basic Plan

(1) Civil Engineering Facilities Plan

1) Civil Engineering Design Requirements

① Applicable Standards

The civil engineering facilities in SCN follow the Caribbean Uniform Building Code (CUBiC). The Project will adopt these codes and the same or higher level of the following criteria.

- Guide on Facility Design of Fishing Port and Fishing Ground: Japan Fishing Port Association
- Standard Specifications for Concrete: Japan Civil Engineering Contractor's Association, Inc.
- Technical Criteria and Explanation of Port and Harbor Facilities: Japan Port and Harbor Association
- Geotechnical Soil Test: Japanese Geotechnical Society

② Tide Level

Based on the tidal level analysis, mean water levels are as follows.

Highest High Water Level (HWL)	:	＋1.05m
Mean High Water Level (HWL)	:	＋0.40m
Mean Water Level (MWL)	:	＋0.15m
Mean Low Water Level (LWL)	:	－0.10m
SK Official Mean Sea Level (MSL)	:	＋0.00m

③ Waves (Examination of Hurricane Surges)

As a result wave estimates over forty nine (49) years, offshore waves by direction were obtained. The project facilities are to be designed based on the extreme wave estimated with 30 years RP (Return Period). The results of wave analysis on the 4 spots around the jetty location planned, and wave height, cycle and length for the main direction are as follows.

Table 2-16　Wave Direction and Height at the Project Site

Offshore wave			A (depth1.9m)			B (depth2.2m)			C (depth2.2m)			D (depth3.5m)		
Direction	Height	Cycle	drm	H3	Ho'	drm	H3	Ho'	drm	H3	Ho'	drm	H3	Ho'
SE	6.4	9.2	202	3.81	3.23	202	3.80	3.26	202	3.64	3.17	200	3.38	3.18
SSE	5.8	8.7	204	4.55	3.85	204	4.54	3.89	205	4.34	3.77	203	4.03	3.78
S	5.5	8.5	208	5.13	4.33	208	5.12	4.38	208	4.91	4.25	208	4.57	4.28
SSW	5.1	8.2	211	5.14	4.39	212	5.10	4.43	212	4.96	4.34	213	4.63	4.38
SW	4.5	7.8	215	4.55	3.98	215	4.50	4.00	216	4.44	3.97	218	4.17	4.01
WSW	4.2	7.6	220	3.73	3.31	221	3.69	3.33	221	3.66	3.31	225	3.47	3.38
W	3.7	7.2	224	2.76	2.52	225	2.73	2.53	225	2.71	2.52	230	2.61	2.59
WNW	3.7	7.2	228	2.12	1.97	229	2.11	1.99	229	2.09	1.97	235	2.04	2.05

drm: Mean wave direction（degrees）、H3: Wave height（m）、Ho': Offshore wave height converted(m)
Note) A：Access bridge（depth1.9m）、B：Approx. 8m easterly from A (depth2.2m)、
C：Approx. 8m westerly from A(depth2.2m)、D: Ocean front of Jetty（depth3.5m）;Depth on the table is based on HHWL (Minus 1.05m when SK official MSL is adopted.)

④ Soil Quality

According to boring data from a soil survey, the quality of soil at the project site at Old Road (OL) is as follows.

Table 2-17 Soil Quality at Project Site

Depth from the Seabed	Layer Thickness（m）	Average N Value	Soil Type
0 to 4.0m	4.0m	20	Sandy soil (mixed with conglomerate clay)
4.0 to 5.5m	1.5m	25	Sandy soil (mixed with conglomerate clay)
5.5 to 7.0m	1.5m	30	Sandy soil mixed with conglomerate clay)
7.0m or deeper		50 or over	Sandy silt (mixed with conglomerate clay)

⑤ Seismic Forces

The Caribbean Uniform Building Code (CUBiC) is the criteria for general building structures. However, it has been determined that the basic concept of seismic load shown in Section 3 of Part 2 can be applied to civil engineering structures. Accordingly, the design seismic coefficients are to be calculated as follows.

V = K'W = (ZCIKS) W

Z: Area coefficient, 0.75 in SCN

C: ＝ 1/(15√T) is the coefficient considering the natural period of a structure (T). C = 0.12 here.

I: Coefficient of importance of a structure: I＝2.0 due to steel-pipe pile foundation concrete slab structure.

S: Coefficient by ground, which is also related to the natural period of a structure. 1.0 in here.

As estimated above, K'＝ ZCIKS ＝ 0.2

⑥ Jetty Utilization Requirements

- Total length of target fishing boat: 20 to 30ft
- Maximum draught of target fishing boat: 1.0m
- Approaching speed of fishing boat: 0.5m/sec
- Traction force of fishing boat: 1.0t/unit
- Loading load (at normal time) 5.0kN/m^2
- Loading load (at the time of an earthquake) 2.5kN/m^2
- Loading load(at the time of a hurricane) 0 kN/m^2

⑦ Unit Volume Weight, etc. of Utilized Materials

Unit weight and internal friction angle of utilized materials are described below.

Table 2-18 Unit Weight of Utilized Materials

Materials	Unit Weight (kN/m^3)	Internal Friction Angle	Remarks
Steel & Cast Steel	77.0		
Reinforced Concrete	24.0		
Concrete	22.6		
Cement Mortar	21.0		
Wood	7.8		
Sand or Gravel	18.0 (High Remaining Water Level)	35	Back-filling materials
	10.0 (Low Remaining Water Level)	35	Back-filling materials
Unscreened (pit-run) Gravel	18.0 (High Remaining Water Level)	30	Back-filling materials
	10.0 (Low Remaining Water Level)	30	Back-filling materials

⑧ Constants for Steel Materials Utilized in the Design

The constants for steel materials to be utilized in the design are as follows.

- Yong's Module: 2.0×10^5 N/mm^2
- Rigidity Module: 7.7×10^4 N/mm^2
- Possion's Ratio: 0.30
- Linear expansion coefficient: 12.0×10^{-6} /℃

⑨ Allowable Unit Stress

(a) Allowable Unit Stress of Steel Materials

Table 2-19 Allowable Stress of Steel Materials

Steel Type	Type of Stress Intensity	Normal Time (N/mm^2)
Steel Pipe Pile (SKK400)	Flexural tensile stress	140
	Flexural compressive stress	140
	Shearing stress	80
Steel Sheet Pile (SY295)	Flexural tensile stress	180
	Flexural compressive stress	180
	Shearing stress	100
For Structure (SS400)	Axial tensile stress	140
	Flexural compressive stress	140
	Shearing stress	80

(b)Allowable Unit Stress of Reinforcement

・Reinforcement Type: SD295A・B

・Allowable Tensile Stress in normal case: 176 N/mm^2

(c) Design Criterion Strength and Allowable Unit Stress of Concrete

・Design Criterion Unit Stress: 24 N/mm^2

・Allowable Flexural Compressive Stress 9 N/mm^2

・Allowable Adhesive Stress: 1.6 N/mm^2

In addition, the additional coefficient of allowable unit stress during an earthquake is estimated to be 1.50.

(d) Protective Covering

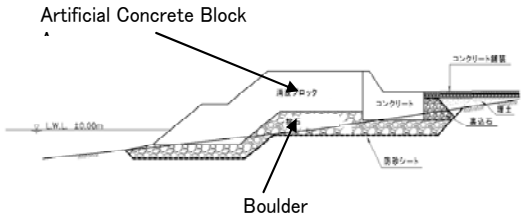
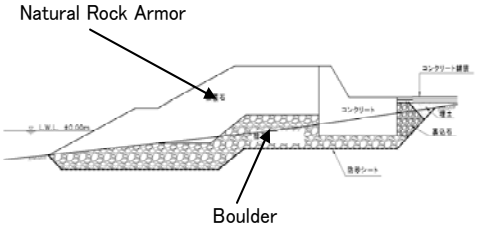
The pure protective covering in which reinforcements directly come in contact with sea water and which is washed by seawater or affected by severe ocean winds will be 10cm or greater.

2) Facility Plan (Facility construction method and structure)

① Seawall and Boat Yard

In order to protect the boat yard and buildings from high waves, a seawall is scheduled. With respect to the seawall type, wave-dissipating types, one using deformed concrete blocks and another with a natural stone covering were compared and examined as shown in the following table.

Table 2-20　Comparison of Seawall

Wave Dissipation Type		Artificial Concrete Block Armor	Natural Rock Armor
Standard section			
General consideration	Merit	- Reduction of weight by hydraulic stability of concrete block - Reduced wave reflection and run-up/overtopping, due to a high porosity ratio (50% air voids) within the armor, wave energy dissipation is greater - Minimized rocking and settlement - Saving construction cost than natural rock armor type, because of much small of revetment section. - Management of construction schedule is easer than natural rock armor type	
	Demerit	- Necessary import cement - Necessary concrete block formwork and production yard	- Difficulty of big size rock (7～10ton) in limited period - Difficulty of transport of big size rock - Low reduced wave reflection and run-up/overtopping -Large damage in case of erosion of toe area
Regional condition		- Concrete block yard is difficult in near project site, but also available within about 4 km distance area.	- Big size of armor rocks are difficult in limited period from quarry in St. Kitts. Therefore, necessary transport form Martinique or Nevis. - Domestic transport of armor rocks necessary by special tracks or barges. Moreover, installation armor rocks necessary big sized crane or crane barge.
Construction cost		100	150
Construction Period		- It takes time for concrete block production, but management is easy in preparation of adequate numbers of formworks	- Procurement of material schedule and management is difficult.
Evaluation		Recommended	

Consequently, the project will adopt the deformed concrete block covering. In due consideration of the importance of the back land, "2003 Guide on Port and Fishing Ground Facilities: published by the Japan Fishing Ports Association", based on the allowable overtopping wave flow ($m^3/s/m$), qa＝$0.01m^3$ will be set up.

Table 2-21 Overtopping Wave Flow ($m^3/s/m$)

Residences and public facilities, etc. are concentrated densely behind. Serious damage from overtopping waves and splashing is anticipated.	Approximately 0.01
Other important districts	Approximately 0.02
Other districts	0.02 to 0.06

Source: Guide on Port and Fishing Ground Facilities (FY2003)

The bank direction of the breakwater will be LWL-0.5m to limit deformation of the neighbouring beach by avoiding projection toward the beach side. The boat yard behind the breakwater will be paved by concrete for minimum maintenance after construction, and the bank drainage inclination will be 1%.

② Jetty for Fish Landing

The sea area for building the jetty at OL faces the Caribbean Sea and has little shelter. In addition, the seabed is steeply inclined. The site has extremely severe natural conditions and waves from the Caribbean Sea hit directly without any damping effect. For the jetty and slipway structures three plans were compared and examined, (a) a permeable steel-pipe pile concrete, (b) a jacket type steel jetty considering the impact of drift sand, and (c) a steel-sheet pile type pier (jetty) which combines the gravity and permeable design (uniting slipway into one body) as shown in the following table. Finally, the cobble beach next to the project site has no source of drift sand and is the beach line is only mildly eroded during a hurricane. Therefore, a steel-pipe pile concrete slab jetty with the advantages of permeable structure is judged to be the most effective from the viewpoints of cost effectiveness, construction time and maintenance on condition that the jetty length should be minimum and the position should be close to the beach as much as possible to reduce the wave forces of uplifting.

In case of that the jetty will have to be constructed at deeper water far from the beach beyond the wave breaking near shore waters, it is difficult to choose (a) steel pipe pile jetty because of bigger wave forces of uplifting. Those plans of (b) jacket type steel jetty, (c) steel-sheet pile type pier (jetty) combined with slipway into one body, will have to be adopted, but it is very difficult for the project to choose those plans because of a budgetary restrictions from the cost effectiveness.

③ Slipway

Since the construction site is directly exposed to the outer sea, wave conditions are harsh, and it has to be expected that around five hurricanes will strike every year. The slipway is an important facility for preventing loss and damage of fishing boats and quickly evacuating them to a safe haven. However,

judging from past experiences, the destructive force of waves in hurricanes and tropical storms is immense; and in these conditions, constructing a slipway that juts out to sea would lead to scouring. Accordingly, from the viewpoint of cost effectiveness, it is difficult to adopt this component as requested in the project.

In the project, at times of hurricane alert, since it will be necessary to evacuate fishing boats from the sea to the beach, and from the beach to the boat yard, a slipway connecting the beach to the safe boat yard shall be planned on the east side of the boat yard. The gradient of the slipway shall be set at around 1:10 to enable landing and lowering work to be conducted manually. The slipway shall be made from concrete and provided with the necessary wave countermeasures; however, since scouring cannot be avoided when hurricanes strike, maintenance will need to be implemented each time this occurs. Moreover, a crane-truck shall be included in the plan in order to mitigate the manual work.

Table 2-22 Comparison of Jetty and Slipway (1)

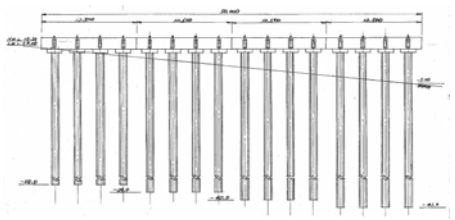
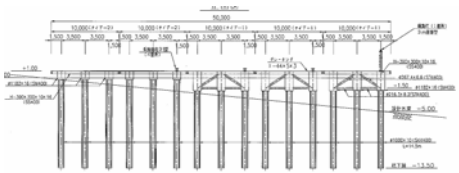
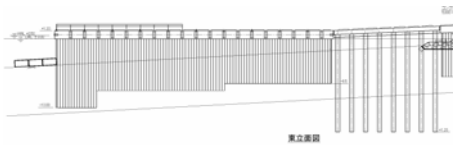
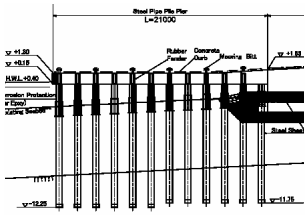
	Concrete Slab Jetty with Steel Pipe Pile	Steel Slab Jacket Type Jetty with Steel Pipe Pile	Jetty with Steel Sheet Type (including Slipway)	Steel Pipe Pile Pier (Concrete Cover Type)
General Section				
Merit	Concrete slab upper structure has no corrosion. Workability of fishing boat lifting and fish unloading is high on smooth surface of concrete slab Available concrete slab material in St. Kitts Minimum maintenance of concrete slab structure	Number of piles, diameter of pile and embedment depth of pile can be decreased against uplift force of wave by transmission through grating structure. Upper structure can be made high quality by shop assembly. Shop assembly of upper structure and pile driving of under structure can be progressed simultaneously. Thus, work schedule will be shortened. Grating slab structure is lighter and re-installed by unit, therefore, easy maintenance.	Stable against uplift force of wave without access bridge. Embedding of steel sheet pile can be shorten, therefore, easer driving pile Stability is high due to resist wearing of cobble/boulder and corrosion by steel pile structure and underwater concrete. Available concrete materials in St. Kitts Corrosion protection on steel sheet pile can increase stability.	Number of piles, diameter of pile and embedment depth of pile can be decreased against uplift force of wave by transmission through concrete cover structure. Available concrete slab material in St. Kitts Minimum maintenance of concrete structure
Demerit	Large number of piles with large diameter and embedment depth of pile are needed against uplift force of waves. Not realistic for about -40m embedment depth of pile because of more than 50 N-value of soil condition from -13m It is necessary underwater concrete works for part of concrete slab	Workability of fishing boat lifting and fish unloading is low on the surface grating structure. Corrosion protection is necessary for steel pile structure and grating. Cathodic protection of steel pile structure has to check every 5 to 10 years. Grating steel slab have to re-install every 5 to 10 years. Moreover, steel beam has to re-paint as maintenance work. High transport charge and long transport period of shop assembly are necessary. Crane of 100 ton class is necessary to install 20 tons weight of one upper structure unit. Steel net have to add for entering fishing boat under slab in low tide.	Sand bypass can be in access bridge only, because sheet pile structure cannot pass sea water. Access bridge structure is necessary for uplift force of wave. Maintenance and management of access bridge is necessary.	With hurricane warning, it is necessary to take off concrete covers on the pier in order to avoide dropping by uplift wave. It is sometimes difficult to moor to the pier because of the coming and going of the wave near beach and reflected wave.
Cost	208	227	167 (including Slipway)	100
Period	14 months	11months (Shop assembly and transport will take about 5 months)	7 months (including Slipway)	6 months
Evaluation				Recommended

Table 2-23 Comparison of Jetty and Slipway (2)

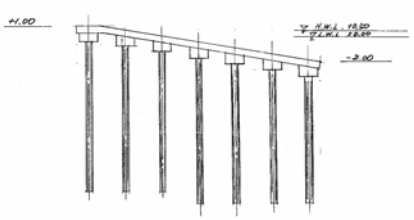
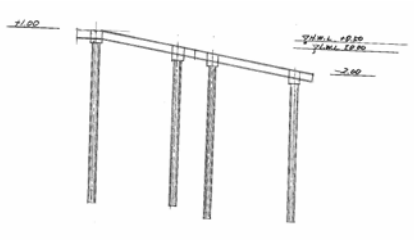
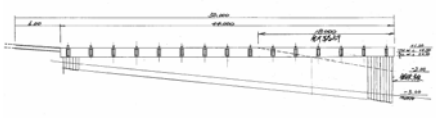
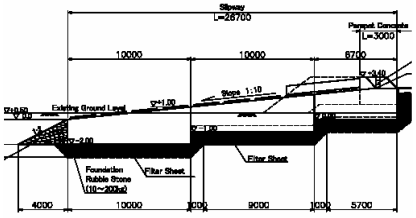
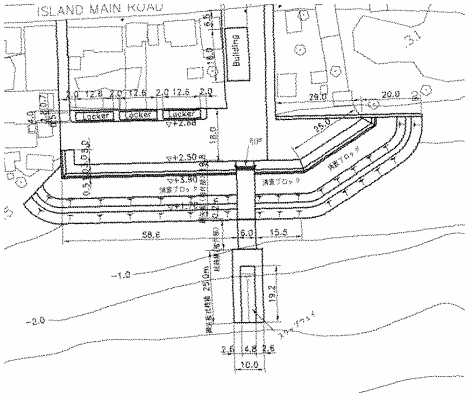
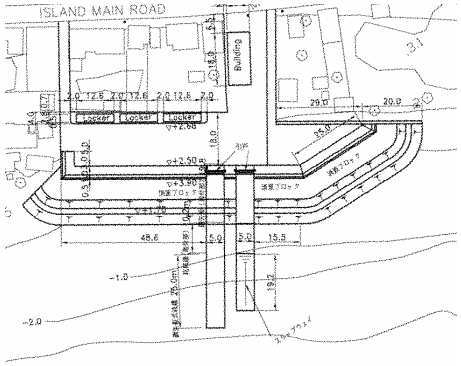
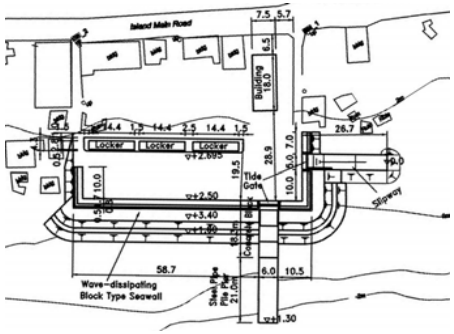
	Slipway with Steel Pipe Pile	Steel Slab Jacket Type Slipway with Steel Pipe Pile	Jetty with Steel Sheet Type including Slipway	Concrete Block Type Slipway
General Section				
Merit	Upper structure has no corrosion because it is a concrete slab Workability on smoothness of the surface of concrete slab is high Available concrete slab material in St. Kitts Minimum maintenance of concrete slab structure	Numbers of piles, diameter of pile and embedment depth of pile can be decreased against uplift force of wave by transmission through grating structure. Upper structure can be made high quality by shop assembly. Shop assembly of upper structure and pile driving of under structure can be progressed simultaneously. Thus, work schedule will be shortened. Grating slab structure is lighter and can be re-installed by unit, therefore, easy for maintenance.	Stable against uplift force of wave without access bridge. Embedment of steel sheet pile can be shortened; therefore, easier for pile driving work. Stability is high due to resistance wearing of cobble/boulder and corrosion by steel pile structure and underwater concrete. Available concrete materials in St. Kitts Corrosion protection on steel sheet pile can be increased for more stability.	Slope structure has no corrosion because it is concrete blocks Workability on smoothness of the surface of concrete slab is high Available concrete slab material in St. Kitts Minimum maintenance of concrete slab structure
Demerit	Numbers of pile, diameter of pile and embedment depth of pile are huge against uplift force of wave Not realistic for about -40m embedment depth of pile because of more than 50 N-value of soil condition from -13m Underwater concrete works are necessary for part of concrete slab	Workability on grating structure is low Corrosion protection is necessary for steel pile structure and grating. Cathodic protection of steel pile structure needs to be checked every 5 to 10 years. Grating steel slab have to be re-installed every 5 to 10 years. Moreover, steel beam has to be re-painted as maintenance work. High transport charge and long transport period of shop assembly are necessary. Crane of 100 ton class is necessary to install 20 ton weight of one upper structure unit. Steel net has to be added for entering fishing boat under slab in low tide.	Sheet pile structure cannot pass sea water through it.	It is necessary manpowered operation work for fish boat lifting from beach to toe of slipway. It is necessary to protection measures like wooden base in order to avoide damage of boat bottom by beach stone. It is necessary maintenance works of additional sand filling around slipway because of erosion of beach by hurricanes.
Period	About 7 months	About 5 months	7 months (including Jetty)	2.5 months
Total Cost (Jetty and Slipway)	283	300	167	100
Total Evaluation				Recommended

Table 2-24 Comparison of Jetty and Slipway (3)

	Jetty and Slipway Unified Type	Jetty and Slipway Separated Type (Part 1)	Jetty and Slipway Separated Type (Part 2)
General Plan			
Merit	Permeable type access bridge can be minimized yearly maintenance costs of sand sedimentation. Moreover, steel pipe piles of access bridge have corrosion protection and protection of existing cobble stone wearing. This structure also can be minimized maintenance cost more than 10 years. Location of offshore slipway is no damage from existing cobble stone wearing. Furthermore, gravity-type jetty structure doesn't have maintenance of corrosion. In the fishing boat lifting work, wing concrete structure outside slipway can be protected from west and east side wave. Also, wing structure can keep fishing boat on slipway. Wing structure can be used for scaffolding in fishing boat lifting. Jetty and slipway unified type is high construction workability with low cost and short work period. Stability is high because of long width.	Permeable type access bridge can be minimized yearly maintenance costs of sand sedimentation. Moreover, steel pipe piles of access bridge have corrosion protection and protection of existing cobble stone wearing. This structure also can be minimized maintenance cost more than 10 year. Location of offshore slipway is no damage from existing cobble stone wearing. Furthermore, gravity-type jetty structure doesn't have maintenance of corrosion. In case of fishing boat lifting and unloading works simultaneously, both works do not interfere with each other.	Permeable type pier can be minimized yearly maintenance costs of sand sedimentation. Moreover, steel pipe piles of access bridge have corrosion protection and protection of existing cobble stone wearing. This structure also can be minimized maintenance cost more than 10 year. Location of onshore slipway is no damage from existing cobble stone wearing. Furthermore, gravity-type jetty structure doesn't have maintenance of corrosion. In case of fishing boat lifting and unloading works simultaneously, both works do not interfere with each other.
Demerit	In rough wave condition, run-up wave through slipway will pass on the part of jetty. In case of fishing boat lifting and unloading works simultaneously, both works interfere with each other.	Double access bridges and land connection constructions have no merit and double cost. In the fishing boat lifting work, slipway cannot be protected from west and east side wave; therefore, it is very difficult for lifting in this condition. In fishing boat lifting works, there is no scaffolding both sides of slipway; therefore, low workability. Increases non sea water passing area Costly and long period	With hurricane warning, it is necessary to take off concrete covers on the pier in order to avoide dropping by uplift wave. It is sometimes difficult to moor to the pier because of the coming and going of the wave near beach and reflected wave. It is necessary manpowered operation work for fish boat lifting from beach to toe of slipway.. It is necessary to protection measures like wooden base in order to avoide damage of boat bottom by beach stone. It is necessary maintenance works of additional sand filling around slipway because of erosion of beach by hurricanes.
Cost	129	193	100
Period	7 months	12 months	7 months
Evaluation			Recommended

④ Boat Lifting Method

Fishing boat lifting will be carried out by utilizing the slipway. The facilities for lifting fishing boats will cover, in general, the following winch method, boat trailer method as shown in the table below.

The Old Road (OL) site directly faces the open sea and, moreover, there is almost no sandy beach for suitable for boat lifting operations. Consequently, this is designed for the purpose of not only for lifting up fishing boats for maintenance, inspection and repair during normal time, but also for refuge and rapid lifting during a hurricane warning.

Table 2-25 Comparison of Fishing Boat Lifting Methods

Lifting Method	Configuration	Evaluation
Wheel Crane Method	A special purpose wheel crane will be used to land and lower fishing boats from the landing jetty.	The midair weight of the target fishing boats is 1.5~2.5 tons, and a minimum crane reach of 4.5m will be required based on the boat width and jetty width. Since the lifting load when raising from the sea greatly varies according to wave conditions, an ample safety factor will be required. Assuming 1.5 times the midair weight, the necessary moment will be 16.9 t-m (=2.5 t x 1.5 x 4.5). Assuming further allowance, approximately 20t-m will be needed. Since hardly any of the target fishing boats have eye-plates and so on for raising, a sling and frame for directly wrapping and lifting hulls will be needed. In the future, if small-scale FRP boats become the standard, this will make lifting and lowering work easier. This is a matter for future examination.
Manual labor assisted by pulling/towing vehicle (Recommended)	Boats will basically be landed on the beach by manual labor, however, in order to save labor when landing in the boat yard, this manual work will be combined with towing by truck and crane on the slipway.	The manual work currently implemented at Old Road (OL) site shall basically be adopted for beach landing. Since storage on the beach entails risk of boats being washed away or damaged by waves during hurricanes, boats shall be raised from the beach to the boat yard via the slipway. The truck and crane, which is included in the project, shall be used for towing. Square timber, logs and other dunnage materials shall be used for reducing friction between the concrete surface and boat bottoms.
Winch Method	A winch is used to transfer boats to a storage place. A dolly, forklift or other transporting equipment should be prepared.	When hauling only with a winch, it is necessary to install the winch as close as possible to the slipway. However, based on the layout under the Project it would be difficult to adopt this method only through independent use because the distance to the slipway is long. It is better to include a trailer as well.
Boat Trailer Method	This method is used at BFC. It is possible to lift and transfer boats to a storage place, however, a hauling vehicle, space for turning, and slipway jutting out to sea are necessary.	Since it is necessary to have a slipway that protrudes into the sea, construction is difficult under the ocean conditions at Old Road site. This method cannot be adopted on coast that faces out to sea and where tranquil area cannot be secured. In the case of a simple structure slipway that doesn't meet wave requirements, there is a strong possibility of damage being caused by waves in excess of the design wave size when hurricanes strike. Even if such damage can be repaired and the slipway restored, since the resulting maintenance costs would be expensive, this method cannot be recommended in the project.

As described above, fishing boat lifting and lowering works in the project can either be implemented by the wheel crane method utilizing the landing jetty, or the method of manual labor assisted by pulling/towing vehicle which uses the slipway (moderate slope on the beach). However, the wheel crane is outside of the scope of the project cooperation and needs to be procured in St. Kitts.

When utilizing the slipway from the beach, the crane-truck that is targeted within the scope of cooperation shall be used as the towing vehicle. Moreover, as is stated in the table, regarding the dunnage for mitigating direct friction between the concrete surfaces and fishing boats bottom keels, it will be necessary for members of the fishermen's cooperative to contribute know-how and ideas.

(2) Building Facility Plan (including equipment)

1) Facility Layout Plan

The Old Road (OL) site is located on the southwest beach in the centre of St. Kitts Island facing the Caribbean Sea. Since access to the site is directly from the island trunk road, there is no major problem if appropriate measures are taken so that there should be no confusion when entering or leaving.

The site is located near the centre of Old Road (OL). In the neighbouring area, shops, churches, schools, an abandoned movie theatre and residences are concentrated together. There are two entrances to the site, both of which connect to the public road and are approximately 3.5m wide. In the layout, based on a relationship between traffic from the fish handling space, jetty and slipway at the Community Fishery Centre (CFC) building, a straight line along the site's east side from the main entrance (approximately 14m in width) was planned.

The space between the CFC building and each access road will be effectively utilized as a boat yard, preparing of fishing gear, a parking lot and community waterfront. The boat yard will be divided into west and east sections from the installation area of the jetty to store the existing twenty four (24) fishing boats.

Fishermen's lockers will be arranged on the west side of the boat yard. The other entrance will be effectively utilized in order to relieve traffic congestion in the town and within the site, so only vehicles for business use will be permitted to enter the yard through an appropriate design, such as a one way. A parking lot for shoppers for fish retailers is planned for along the trunk road.

2) Structure Plan

With respect to a structure method, a rigid reinforced concrete frame and masonry structure will be considered depending on the usage and scale.

The structure will be decided in due consideration of the following points.

- A large quantity of water is utilized at the fish handling space. Since each part of the space such as floor and walls is washed with water, the structure should be designed to accommodate water splashing.
- Due to the high temperature and humidity, the structure should be able to withstand the natural conditions such as salt damage and soil composition.

・ The structure should be easily maintained.

Public facilities on St. Kitts Island are generally built using reinforced concrete pillars, beams and a foundation, a concrete block structure for the walls, or concrete roof-tiles on wooden huts. In addition, some facilities are a steel-frame structure and the roof and walls are finished with galvanized iron sheets. Since various facilities under the Project are located in a coastal area, salt damage and maintenance have been taken into account, and the procurement of equipment and materials for ease of execution at the site will be examined. From examining the structure plan from this point of view, it was decided that a reinforced concrete structure will be used for the foundation, pillars, beams and roof of the Community Fishery Centre building and non-glaze roofing tiles will be applied to roof after patching with concrete and coating with asphalt. With respect to the fishermen's lockers, a reinforced concrete block structure will be used for the mat foundation (concrete). In a similar manner as the CFC building, roof tiles will apply to a concrete roof. This method is suitable when there are many walls and is durable enough from a structural and economic point of view.

① Design Standards and Codes, etc

The Saint Christopher and Nevis Statutory Rules and Orders No. 7 of 2000 and Building Regulations 2000 are the laws, regulations and criteria on building and structural design, and are mainly based on regulations of the United Kingdom and the United States. In addition, there is the Caribbean Uniform Building Code (CUBiC) stipulated by Caribbean nations. Facilities under the Project will be formulated under the Japanese building code with reference to the regulations stated above.

② Structure Overview

Table 2-26 Structure Overview

Classification	Superstructure	Substructure
Community Fishery Centre (Fish Handling Space included)	Main body: RC concrete frame structure Roof: RC concrete structure External wall : RC concrete wall Internal wall : Concrete blocks : Partial RC	Continuous Footing
Fishermen's Lockers (including commonly use space)	Main body: Reinforced concrete block structure Roof: RC concrete structure Internal wall : Reinforced concrete blocks	Continuous Footing

③ Design Weight, etc.

(a) Fixed Weight

The weight of structural materials, finishing materials and equipment are calculated respectively. Unit weight of basic materials for the main body is as follows.

Concrete: 22.6kN/m^3

Reinforced concrete: 24.0kN/m^3

Mortar: 22.0kN/m^3

Concrete blocks: (Block size 19 × 15 × 39cm) 10.0kN/m^3

(Note: Weight per unit area including filling concrete, masonry joint mortar and reinforcing steel)

(b) Loading Weight (Unit: N/m^2)

Table 2-27 Loading Weight

Name	For Slabs, Small Beams	For Pillars, Beams and Foundation	Earthquake
Roof	300	100	0
Office Room, etc.	3,000	1,800	800

(c) Wind Load

In due consideration of local hurricane conditions, the design will include an estimated wind speed of 60m/sec (2,250 Pa).

(d) Seismic Load

Since St. Kitts Island is located in the older or outer Caribbean Volcanic Arc, the design should be sufficiently anti-earthquake.

In accordance with the Caribbean Uniform Building Code (CUBiC), earthquake force is calculated as follows.

V = K'W = (ZCIKS) W

Z: Area coefficient of 0.75 for SCN

C: $=1/(15\sqrt{T})$, coefficient in due consideration of natural period (T) of structure: C = 0.12

I: Coefficient of importance of structure: general building, I=1.0

S: Coefficient by ground related to natural period of structure. 1.5

As estimated above, K'=ZCIKS=0.108.

(e) Major Structural Materials and Allowable Unit Stress

In the structural calculations, the following materials which are primarily standards (Japanese Industrial Standard) will be applied as performance requirements.

Table 2-28 Allowable Stress of Major Structural Materials

Material	Standard
Normal concrete	Fc18 to 21 (18 to 21N/mm^2) Non structural concrete 18 N/mm^2 Structural concrete 21 N/mm^2
Reinforcement	ASTM A615, Grade 60 equivalent

Salt damage to reinforcing steel is anticipated since concrete aggregates will be locally produced.

Therefore, salinity should be lower than the allowable value (equivalent to the Japan Architectural Standard Specifications: JASS 5-11 grade) by washing with water. In a similar manner, sufficient consideration should be given to the concrete blend and components.

3) Equipment Plan

① Water Supply System

Water will be supplied through a service pipe (1 inch in diameter) from a feed water pipe (4 inches in diameter) buried along the island's trunk road.

After comparing and examining two water supply designs, a "direct water service method" and "elevated water tank method", it was decided that the elevated water tank method will be used to supply water for the following reasons. Although the project site (OL) is located on a coastal area, and despite high feed water pressure and minimum pressure fluctuations, suspension in the water supply for about thirty (30) minutes usually occurs once or twice a month. If the tank method is adopted, so as long as there is water in the tank, a continuous supply of water should be possible.

Rainwater will be also utilized for various functions, and so rainwater tanks will be installed by the fishermen's lockers (3 rows).

Table 2-29 Comparison of Water Supply Method

Item	Direct Water Service Method	Elevated High Water Tank Method
1. Transition in feed water pressure	Varies according to pressure of main feed pipe	Almost fixed
2. Water supply during suspension of water service	Inability	Water remaining in water receiver tank and elevated water tank can be utilized.
3. Water supply during power failure	Unrelated	Water remaining in elevated water tank can be utilized.
4. Space for pump and roof-top Tanks	Unnecessary	Necessary
5. Comparison of equipment a) Water receiver tank b) Elevated water tank c) Pumps d) Pressure reducing valves e) Piping materials and sanitary fixtures	 Unnecessary Unnecessary Unnecessary Necessary Necessary	 Necessary Necessary Necessary Unnecessary Necessary
Evaluation	× Impossible to use during suspension of water service	○ Possible to use during suspension of water service (adopted)

Table 2-30 Required Water Volume

Service Zone		Unit Number : n	Unit water Volume : q	Service Hours : h	Daily Necessary Volume Q = n × q × h
1. Fish Handling Space at CFC	Fish handling	1 water tap	15ℓ/min	120min/day (= 15min/h × 8h/day)	1.8m^3/day (= 1 × 15 × 120)
	Floor cleaning	1 water tap	15ℓ/min	120min/day (=15min/h×8h/day)	1.8m^3/day (= 1 × 15 × 120)
2. Community Fishery Centre	Normal time (meeting time)	For 8 persons (25 persons)	100ℓ/person (20ℓ/ person)		0.8 m^3/day (= 8× 100/1000) (0.5 m^3/ day (=25 × 20/1000)
3. Fishermen's Lockers	Toilets and showers	For 6 persons	100ℓ/ person		0.6 m^3/day (=6 × 100/1000)
4. Ice Making Plant		0.6 tons daily produced			0.7 m^3/day (= 0.6/0.9) (Defrost overflow water is 0.1 m^3/day.)
Total					Normal time: 5.7 m^3/day (meeting time: 6.2 m^3/day)

Note: Utilized water volume (per unit): 8 to 16 ℓ/time for toilets, 24 to 60 ℓ/time for showers, 60 to 100ℓ/person for office and plant.

As described above, in the case of calculating the capacity of a receiver tank on the assumption of 40 to 60% of the required daily service water, it will be 3m^3 as follows.

Capacity of receiver tank = 6.2 m^3/day × 0.4 to 0.6 = 2.48 to 3.72 m^3/day

② Drainage System

Since the public sewerage system has yet been improved in SCN, generally the existing buildings must process miscellaneous waste water and sanitary sewerage independently using a septic tank. The installation criteria are prescribed in the building code. The drainage method for the Project will be a seepage or gravel filtering method for direct discharge into the sea. In the case of the Basseterre Fisheries Complex (BFC), although a method is used to filter bloody water at the fish handling space using a septic tank, this was changed to direct discharge into the sea due to blocking. With respect to the target facilities, although sea water circulation on the fore shore is favorable, the advantages from the standpoint of beach conservation should be taken into account. Accordingly, a waste water disposal system including drainage of the fish handling space is planned.

Waste water from toilets and showers will be jointly processed with drainage from a fish handling space using a septic tank. Water discharged from the septic tank will drain directly to the sea through permeable system. Local criteria for the septic tank system are of minimum standards, and so the structure is a simple two-tank aeration method.

Therefore, in due consideration of environmental conservation the better Japanese discharge criteria will be applied. Specifications for a joint processing tank will be selected based on the table listed above. In a

similar manner as the Basseterre facilities, the cleaning department at Old Road (OL) responsible for garbage collection will also handle solid waste disposal for the facilities.

Table 2-31 Drainage Discharge (daily) from the CFC Facilities

Service Zone	Daily Drainage Discharge Q ㎥/day			Quality of Drainage (ppm)
1. Fish Handling Space at the CFC	Fish handling	1.8	3.6	450
	Floor cleaning	1.8		200
2. Community Fishery Centre	Normal time	0.8	1.3	300
	Meeting time	0.5		
3. Fishermen's Lockers	0.6			300
4. Ice Making Plant	Defrost overflow 0.1			—
Total 5.6 → 30-person tank based on the left (5.6 × 5 times ＝ 28 to 30-person tank)				

③ Electrical Installation

The frequency of power failure during normal time is approximately two to three times a month. It recovers after approximately twenty (20) to thirty (30) minutes, that is generally in favorable conditions. However, during a hurricane, there is a possibility of a power failure for one to two days depending on the intensity of the storm.

In addition, voltages fluctuations may occasionally occur. Voltage distributed in the city is three-phase 400V and single-phase 230V. With respect to the initial power received, electric power will be directly fed into the Community Fishery Centre (CFC) building within the lot from the nearest electric pole and connected to an incoming panel installed in the office on the ground floor.

(a) Lighting and Outlet Equipment

For lighting, generally speaking natural lighting should be utilized whenever possible. For electric lights, long-life, highly efficient fluorescent and mercury lamps should be utilized as the light source.

Outlets will be installed in the correct locations for facility equipment and machinery.

(b) Telephone System, etc.

Pipes for telephone lines will be laid in three locations in total, one for the office room and two for the meeting room on the first floor of the building.

(c) In-house Broadcasting System

Due to the facility scale and crisscross pattern from west, east, north and south, distances within the lot including the jetty and boat yard, etc. will be long, so a broadcasting system will be installed for rapid communication and safe operations when lifting fishing boats during a hurricane warning.

Broadcasting equipment will be installed in the building office and speakers will be installed at the fish handling space and in the meeting room.

4) External works

(a) Pavement Plan

Concrete pavement will be applied to passageways within the lot and the boat yard (storage space for fishing boats, combined operations and parking lot) in line with the standard of general port pavement (200mm in thickness).

Public roads of approximately 3.5m in width on the east and west sides will be paved together with the lot passageways following construction. Asphalt pavement will be applied to the public roads. For cleanness, a garbage storage place will be finished with concrete for easy washing in water, and therefore sufficient inclination for drainage should be provided.

(b) Lot Drainage Plan

The lot slopes to the sea at approximately 3/100 inclination from the island trunk road. There is an existing waste channel on two public roads at the west and east sides of the lot. This will be modified into a U-shape gutter for discharge into the sea.

Rainwater from the north area of the lot and adjacent property and from overtopping waves will drain together into the above-mentioned U-shape gutter. In addition, scuppers will be installed on the breakwater wall at an interval of 3m for rainwater on the south side and overtopping waves. Scuppers on the lot will prevent flood water during heavy rain.

(c) Lighting System

Since the lot area is approximately 1,400m^2 (widest area approximately 55m north to south, approximately 100m east to west), seven (7) lights (mainly bracket lighting) will be installed. Floodlights will be installed on major passageways into the boat yard and the Community Fishery Centre (CFC) building.

(d) Exterior Fence

There is the difference in elevation (0 to 1.2m) on the adjacent property bordering the west, northeast and east sides of the lot. A concrete breast wall will be constructed in this area. The recipient government should be responsible for the fence on the top of the breast wall.

(e) Planting Space

Planting spaces will be provided for part (approximately 15m^2) of the space between the island trunk road and the Community Fishery Centre (CFC) building, the side (approximately 20m^2) and the border with adjacent east-side property. Planting should fall under the jurisdiction of the recipient government.

5) Security Equipment

For crime prevention, stainless-steel lattice grills will be installed on windows of the ground floor and windows on the terrace of the first floor similar to the BFC facilities. As for the key for the outside entrance,

from a management point of view an individual key system will be adopted with no master key.

6) Ventilation and Air Conditioning

Air conditioning system will be installed in the office and meeting rooms. Natural ventilation will be applied to the toilets and shower room. Natural ventilation and lighting should be utilized for various other rooms as much as possible, so consideration should be given to the installation of skylights and ventilation ducts (small windows will be installed for ventilation and lighting in the common storage of the fishermen's lockers).

7) Construction Materials Plan

Construction materials should be procured after fully examining the possibility of both imports and local procurement in due consideration of the following matters.

- The construction site faces the sea which is affected by salt damage.
- Temperatures and humidity are high throughout the year due to the tropical climate.
- Materials should be stain-resistant, easy to clean and sanitary because marine products (perishable fish and shellfish) are being handled.

① Roof

The general roofing materials at the local site are non-glaze roof tiles and galvanized-iron corrugated sheet. Although steel sheet is resistant against salt damage to some extent, it lasts for only four or five years and many buildings seem to develop leaks due to rusting bolts or nails. Non-glaze roof tiles will be used as roofing materials due to the strong ultraviolet light and salt damage, and due to their excellent appearance and durability. Non-glaze roof tiles will be applied to an asphalt roofing foundation after patching with concrete slabs.

② Exterior Finishing

Pillars and Beam Frame: After laying the concrete foundation, economic resin acrylic paint will be applied for easy maintenance.

Door Circumference for the front side: Only the circumference of door will be bordered with local stones. At the local site, many traditional masonry buildings still remain, so consideration should be given from a design point of view.

③ Interior Finishing

(a) Floors

The fish handling space will be utilized for cleaning, sorting, measuring and preparation for shipment. Consequently, an epoxy resin coating will be applied for durability and easy cleaning. To prevent stagnant water from collecting at the joint between the walls and floors and for easy draining, a curved surface 30mm in radius will be installed for easy cleaning. The office room on the ground floor will be

finished with clinker tiles (150mm square) with excellent durability and water resistance. Vinyl tiles will be installed on the steps and in meeting room of the first floor for easy cleaning and maintenance.

(b) Ceiling and Wall Finishing

The basic specifications for ceilings and walls include a durable coating on bare surfaces for easy cleaning and maintenance.

(c) Insulation Specifications

Styrofoam (50mm in thickness) will be tapped onto the roof slab when applying concrete. Fiberglass insulation (50mm thick) will be applied under the roof of the office and meeting rooms.

Ventilating holes will be installed between the roof and ceiling.

(d) Fixtures

Doors & sashes, etc.: Corrosion resistant aluminium alloy will be used along the edges. Lattices for crime prevention (stainless steel) will be installed on the windows of external wall on the ground floor and on the terrace side on the first floor.

Opening windows of external wall: Wooden hinged (locally used for hurricane and crime prevention)

Fishermen's locker doors: Wood will be used for durability and easy maintenance.

Table 2-32 Interior Finishing

	Rooms	Floor	Base	Wall	Ceiling	Notes
CFC Building						
	1.Fish handling space	Epoxy resin paint on concrete steel trowel	Ceramic tile 150×150mm H=1.8m	Acrylic paint on mortar steel trowel	Acrylic paint on concrete steel trowel Over ice plant: Acrylic paint on Calcium silicate board	
	2.Office	Clinker tile 200 × 200mm	Clinker tile H=100mm	Synthetic emulsion paint on mortar steel trowel H=200mm	Glass wool 50mm(24kg/m^3) on plaster board 12mm	Air-con
	3.Meeitng room	Vinyl tile on concrete trowel	Vinyl tile H=100mm	Synthetic emulsion paint on mortar steel trowel H=200mm	Glass wool 50mm(24kg/m^3) on plaster board 12mm	Air-con Sink part: Ceramic tile 150x150m/m (flexible board)
	4.Staircase	Vinyl tile on concrete trowel	Vinyl tile H=100mm	Synthetic emulsion paint on mortar steel trowel H=200mm	Acrylic paint on Calcium silicate board	
	5.Corridor (Ground Floor)	Epoxy resin paint on concrete steel trowel	Epoxy resin paint on concrete steel trowel H=200mm	Acrylic emulsion paint on mortar steel trowel H=200mm	Acrylic paint on Calcium silicate board	
	6.Toilet, Shower	Mosaic tile 50×50mm	Ceramic tile 100×100mm	Ceramic tile 100×100mm	Acrylic paint on Calcium silicate board Acrylic paint on Calcium silicate board	First floor: Water proof painting
	7.Panry	Epoxy resin paint on concrete steel trowel	Epoxy resin paint on concrete steel trowel H=200mm	Synthetic emulsion paint on mortar steel trowel	Acrylic paint on Calcium silicate board	Sink part: Ceramic tile 150x150m/m (flexible board)
Fishermen's Lockers						
	1.Toilet, Shower	Mosaic tile 50×50mm	Ceramic tile 100×100mm	Ceramic tile 100×100mm	Acrylic paint on fair faced concrete (repaired)	
	2.Locker rooms	Concrete steel trowel finish	Acrylic paint on concrete steel trowel H=200mm	Acrylic paint on mortar steel trowel	Acrylic paint on fair faced concrete (repaired)	

8） Special Equipment Plan

① Ice making plant

(a) Frame structure

Structure: Galvanizing steel frame

(b) Ice making machine

Quantity: 2 units

Planned ambient temperature: 33℃

Raw water type: spring water

Planned raw water temperature: 30℃

Electric power: 3-phase AC400Ｖ 50Hz

Ice making volume: 0.6 tons/day (0.3 tons/day × 2units)

Ice Type: flake

Place to be installed: steel platform on top of ice storage

Compressor: Approximately 5.5kw

Refrigerant: R－22

Condenser: air-cooled, copper alloy and salt resistant specifications (fins and tubes)

(c) Ice storage

Quantity: 1 unit

Ice storage volume: 1.2 tons

Planned ambient temperature: 33℃

Ice storage temperature: 0 to -5℃

Electric power: 3-phase AC400V 50Hz

Size: Approximately 2.4m (L) × 2.4m (W) × 2.3m (H)

Compressor: approximately 2.2KW

Refrigerant: R－22

Condenser: air-cooled, copper alloy and salt resistant specifications (fins and tubes)

Starter: Variable voltage starter

Insulation panel materials: salt resistant steel plate, 100mm thick or more of insulation

Accessories: inside thermometer, door heater, drain piping materials, draining board, weather board, etc.

② Spare parts

Spare parts will include tools and parts necessary for initial installation and adjustment.

(a) Ice making & Storage equipment

Major contents: refrigerant gas for installation work, refrigerating oil, tools for installation and

maintenance, spare parts for ice making machine and ice storage compressor, parts for control panels

9) Equipment Plan

Based on the contents of the Project, an equipment plan should be formulated in due consideration of the following matters.

- In order for the objectives of the Project and facility functions to be sufficiently displayed, equipment and specifications suitable for utilization of each piece of equipment, necessity and local technical level should be selected.
- By taking the procurement of consumables and spare parts into consideration, the quantity should be appropriate so as not to hinder the maintenance of equipment.
- Insulated box, etc. should be decided on the assumption of easy local procurement as a priority.
- As for the equipments such as tools of vice, grinder, and seawater pump for bottom cleaning of fishing boats, push carts, weighing scales, radio communication equipment, etc. there is no request, however, SCN side shall procure and utilize for the operation and management of the project.

① Insulated box (for Ice)

The specifications of insulated boxes will be as follows.

Quantity:	2 units
Volume:	750ℓ type
Specifications:	With cover and drain plug

② Truck with crane

The crane truck should be appropriate for daily services of transporting fish and ice, and for pulling fishing boats in and out using slipway, installation/removal of wave protection boards at the entrances of jetty and slipway, and removal/installation of concrete covers on the jetty, weight of which is 0.65tons and the number of covers are 36pcs, during and after a hurricane warning. Major specifications are as follows.

Quantity:	1 unit
Loading Weight:	Approx. 3tons
Vehicle Type:	Truck with cargo handling crane
Engine Type:	Approx. 4700cc diesel engine
Cargo crane, etc.:	2.9tons or more (0.7tons x 4.5m or more to be complied with)

(3) Results of Basic Design

The results of the examination on the basic design under the Project are as follows.

Table 2-33 Basic Plan

Old Road (OL) Community Fishery Centre Facility : CFC-OL		
Item	Contents	Notes
1. Boat Yard (Wave-dissipating block type seawall and boat yard)	Fishing boats 24 vessels (Concrete paved, partly asphalt paved) (In usual case the yard is to be effectively utilized for fishing gear assembly works, repairs and maintenance of fishing boat and parking lot for business visitors and shoppers, in-site passages.)	
2. Jetty (for fish landing)	Concrete slab type jetty with steel pipe pile Required extension approx.36m(=each 15mx2+front 6m) 6.0m width	
3. Slipway	(Include fishing boat lifting equipment) Concrete block type slipway Width 5.0m, Slope length 25.0m, Slope 1:10 Fishing boat pulling equipment : Truck with crane as a towing vehicle (Common use)	To be constructed between east end of boatyard and beach
4. Community Fishery Centre Building	(Include water supply, drainage, toilet and showers) 230m^2 2-storied building	
-1. Fish handling space	88m^2 Fish handling space, Weighing space, Insulated boxes space (for Ice), Ice making plant space and other necessary spaces such as passages included	
-2. Office	35m^2 Administration office×1 (Manager, Accountant, Business section chief, etc.)	
-3. Meeting room (Partly used for Fishermen's cooperative office)	59m^2 Used for the instructions and extension on the fishing techniques, meetings of fishermen's cooperative, trainings, etc.	
-4. Sanitary room	16m^2 Toilet, shower, pantry	
-5. Storage spaces	6m^2	
-6. Staircase, etc.	26m^2 (Include toilet at first floor)	
-7. Other facilities	Ice making plant, Drainage and sewage facility (Toilet, shower, fish processing), Water tank (Rain water), External lightings	
-8. Equipment		
① Insulated boxes(for Ice)	Insulated boxes : 750liter type, Quantity 2units	For ice
② Truck with crane	Payload : 3tons 1 unit Cargo crane : 2.9tons and more (0.7tons x4.5m and more) Note: Crane-truck is to be used during and after hurricane warning, for pulling fishing boats in and out, for installation/removal of wave protection boards at the entrances of jetty and slipway, and for removal/installation of concrete covers (0.65tons x 36pcs) on the jetty.	For fish & ice transportation; For fishing boats pulling in & out
5. Fishermen's Locker Buildings	120m^2 For fishermen 20 lockers 58m^2 Common use spaces 13m^2 Toilet & showers 6m^2 Passage, etc. 43m^2	

2-2-3 Basic Design Drawing

Basic Design Drawing: Old Road Community Fishery Centre (CFC-OL)

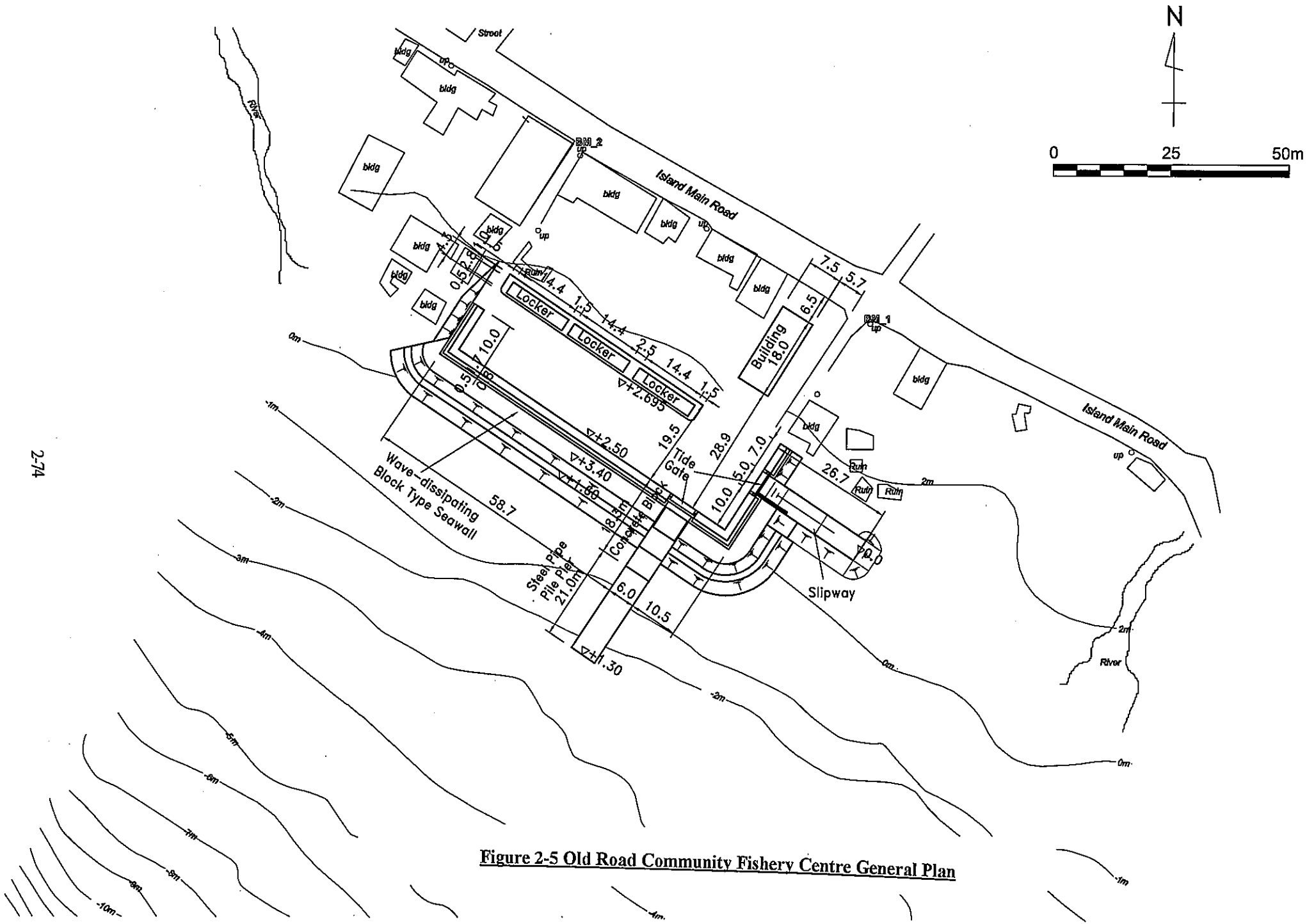


Figure 2-5 Old Road Community Fishery Centre General Plan

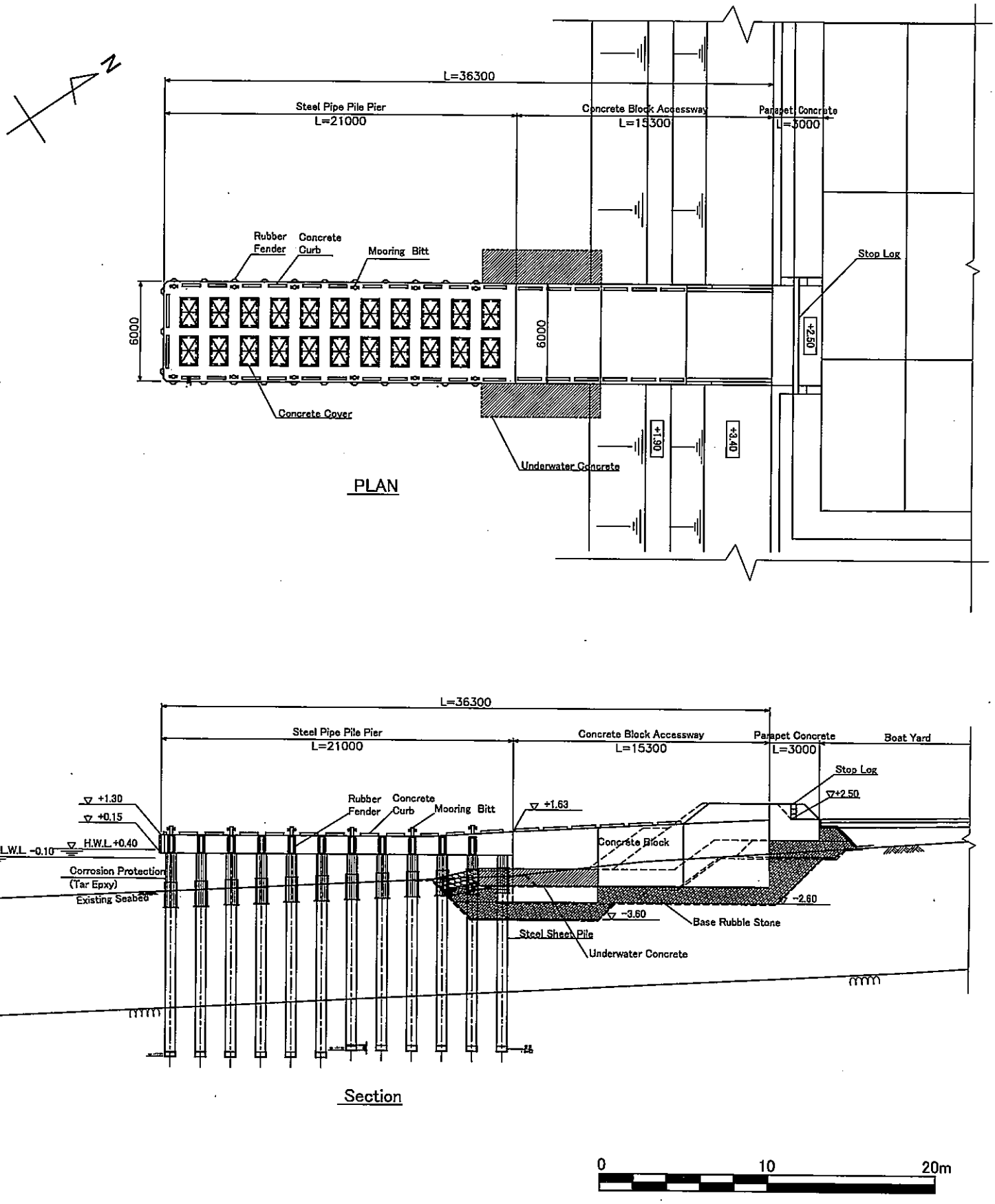


Figure 2-6 Steel Pipe Pile Type Pier & Concrete Block Access way Plan and Section

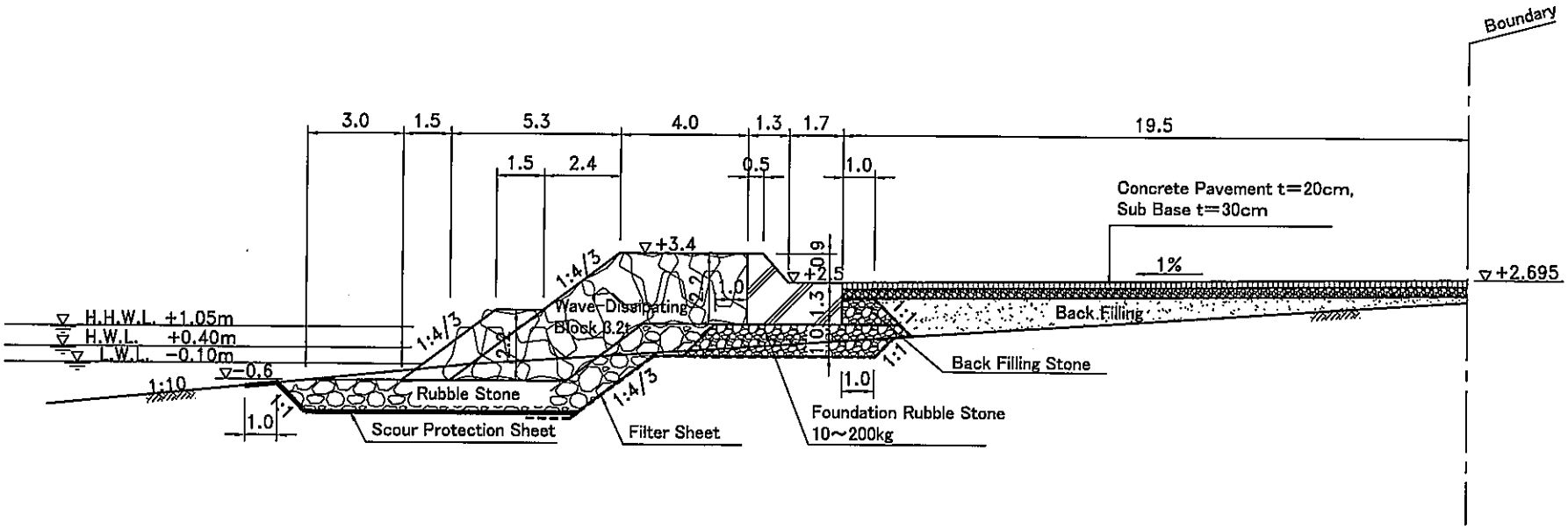


Figure 2-7 Wave-Dissipating Block Type Seawall and Boat Yard Section

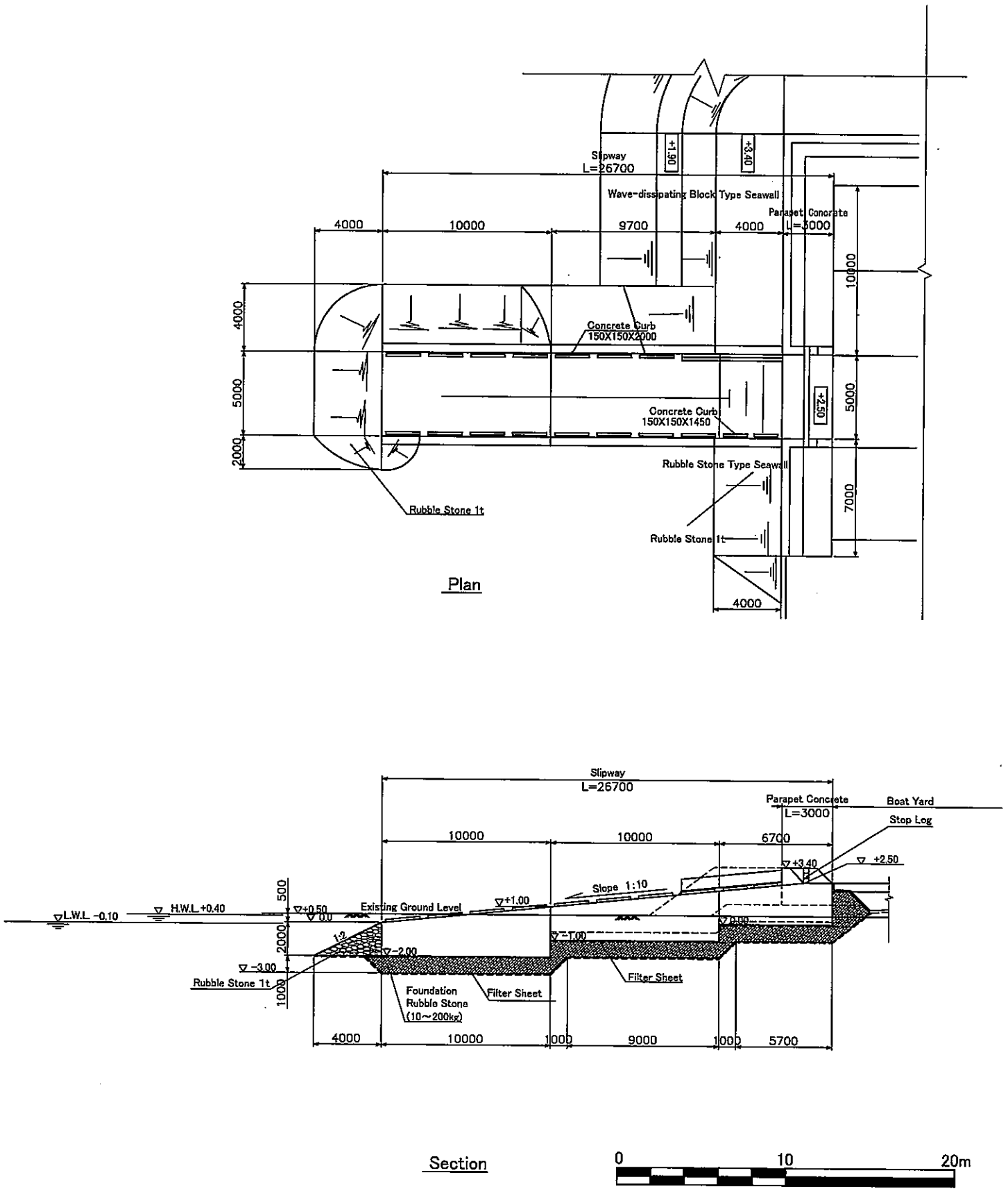


Figure 2-8 Slipway Plan and Section

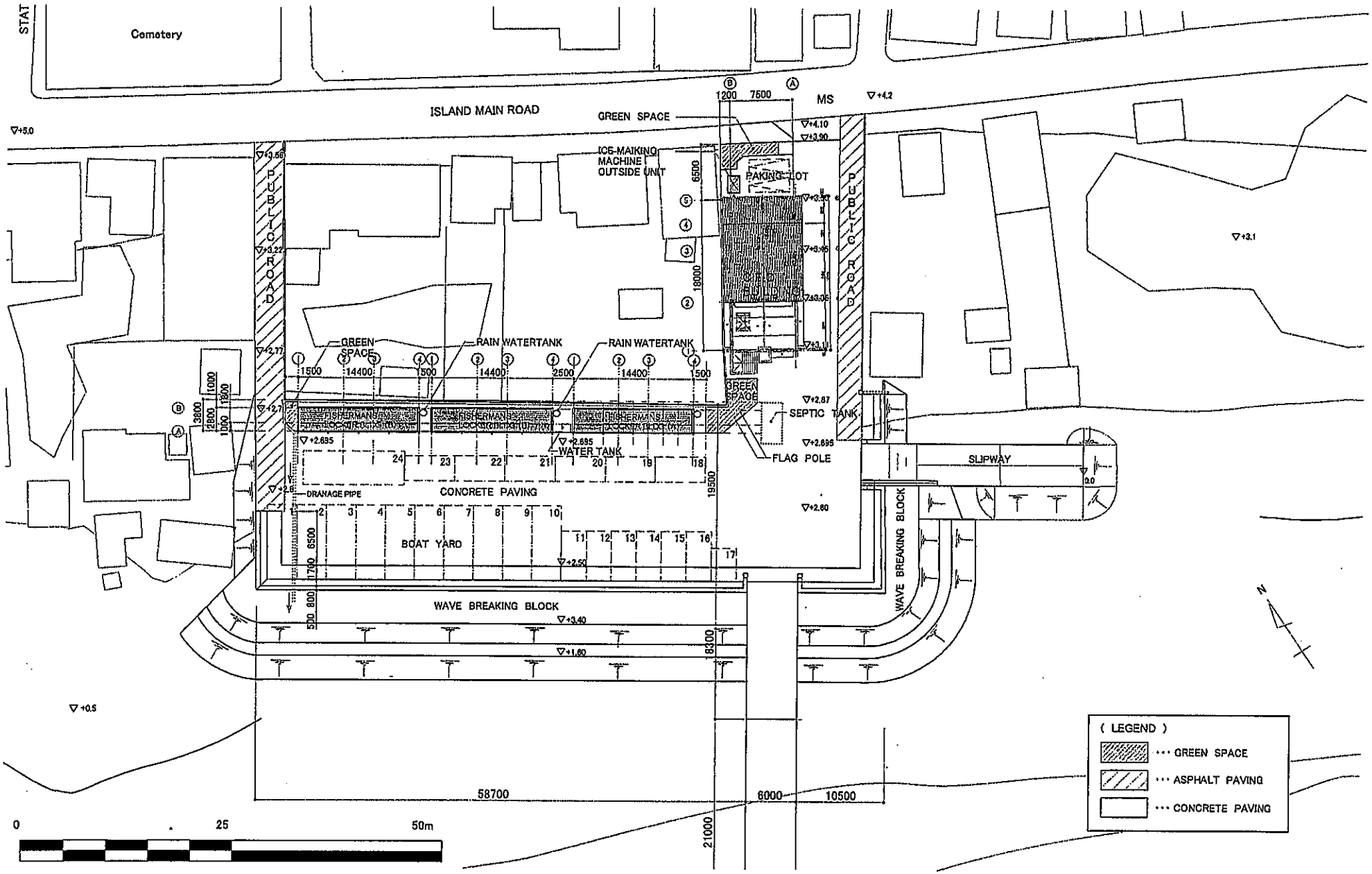
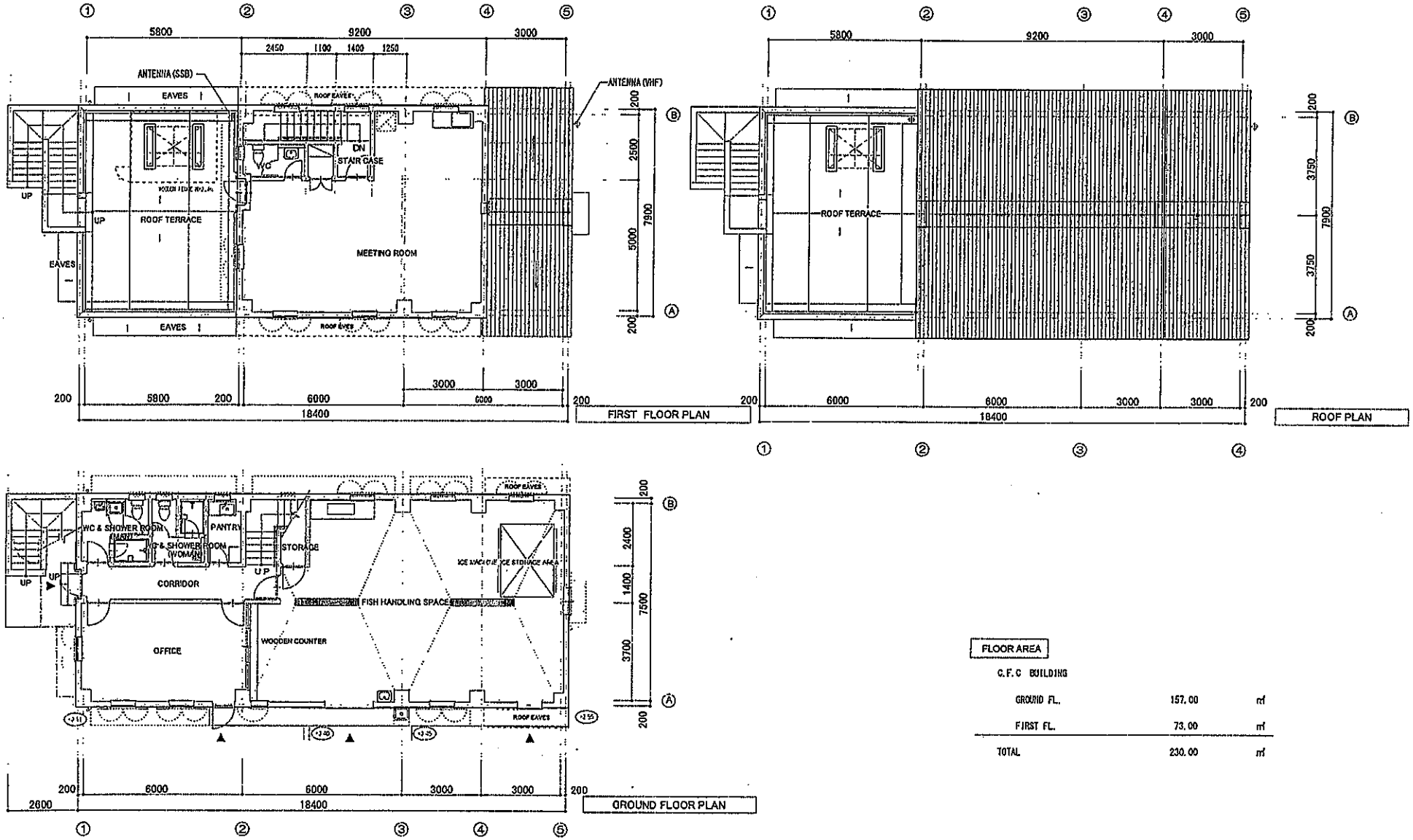


Figure 2-9 General Layout of Old Road Community Fishery Centre Building and Fishermen's Lockers

C.F.C BUILDING



FLOOR AREA		
C.F.C BUILDING		
GROUND FL.	157.00	㎡
FIRST FL.	73.00	㎡
TOTAL	230.00	㎡

Figure 2-10 Plan of Old Road Community Fishery Centre Building

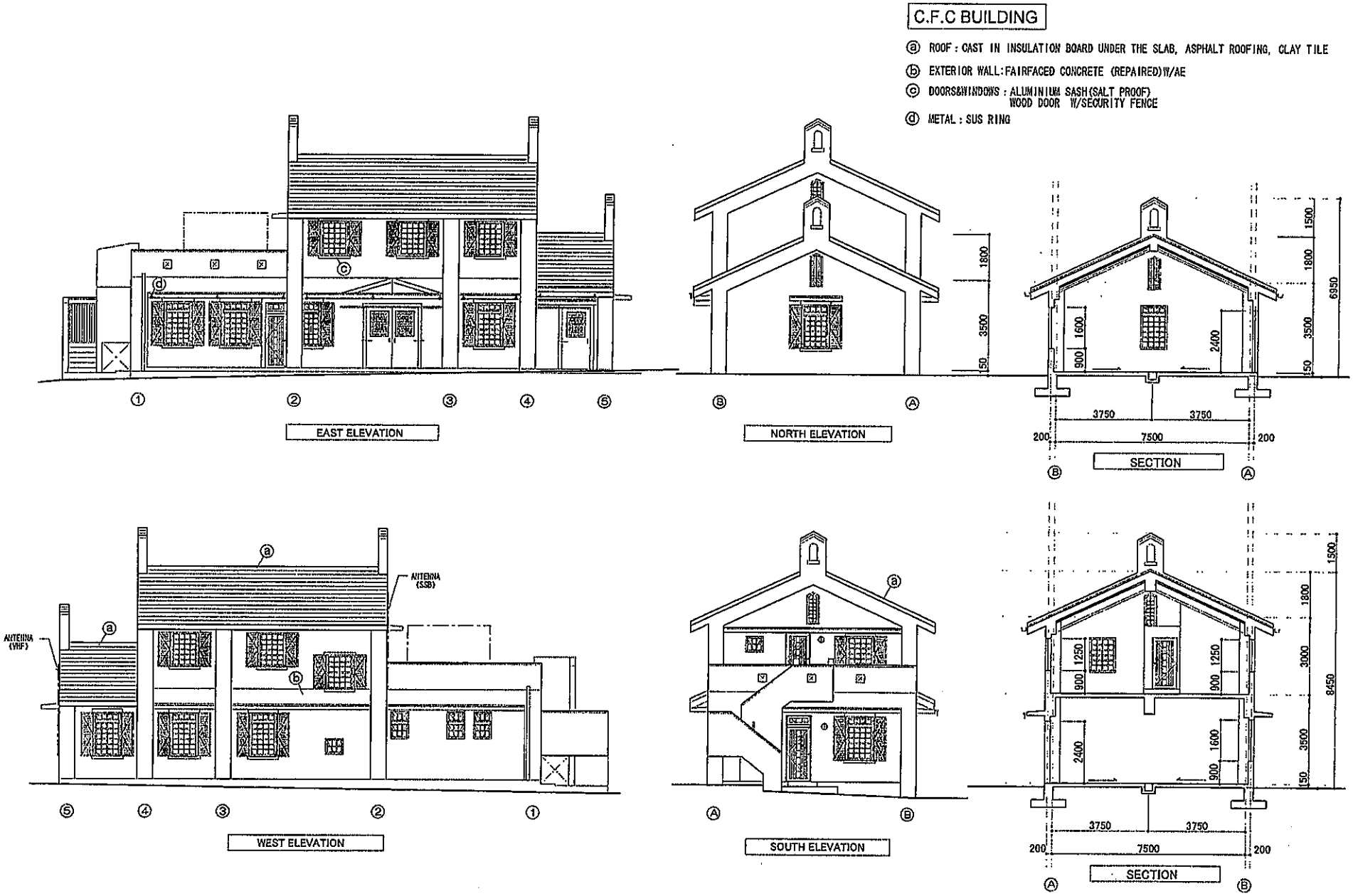


Figure 2-11 Elevation and Section of Community Fishery Centre Building

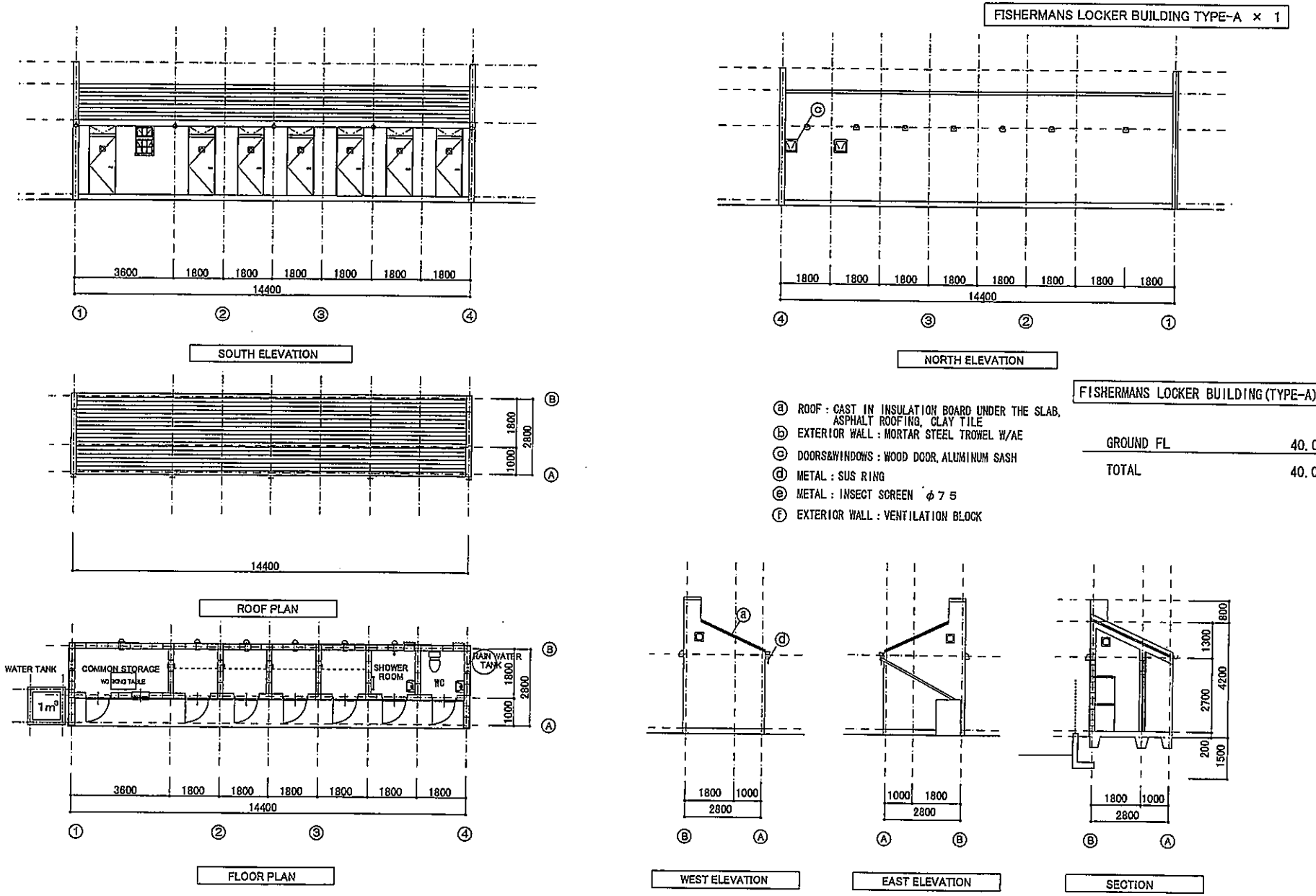


Figure 2-12 Plan, Elevation and Section of Fishermen's Lockers (1)

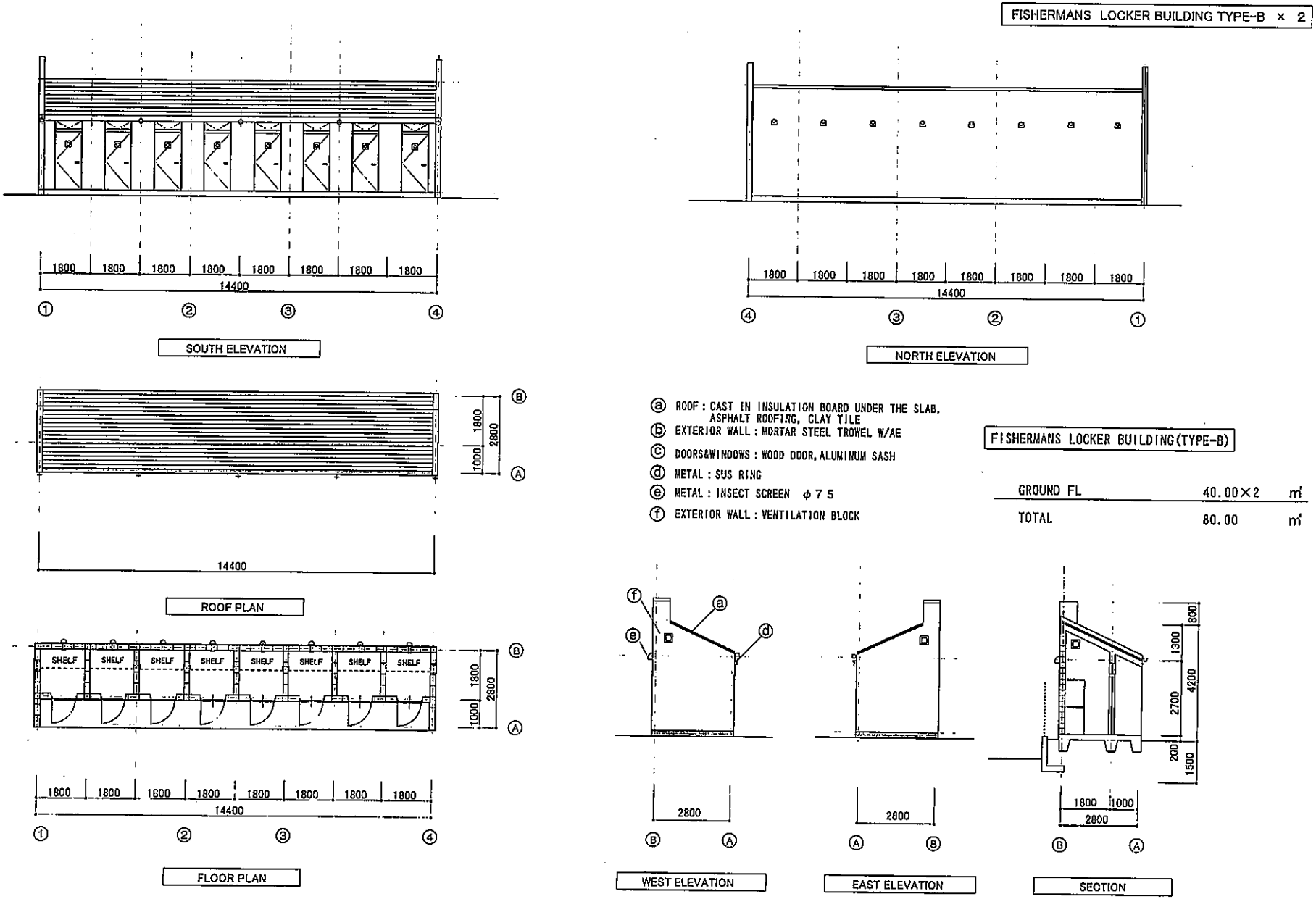


Figure 2-13 Plan, Elevation and Section of Fishermen's Lockers (2)

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The Project will be implemented in accordance with the framework of the grant aid scheme of the Government of Japan through the following policy.

(1) The construction should be smoothly implemented by sufficiently exchanging opinions and promoting favourable communication with the concerned agencies of the Government of SCN related to facility maintenance such as the Ministry of Public Works, the consultant and builders including the Ministry of Housing, Agriculture, Fisheries and Consumer Affairs (MHAFCA), the Department of Fisheries of the said ministry, and the Department of Co-operatives, fishermen's cooperatives and parties concerned at the project sites.

(2) Regulations such as temporary traffic disruptions during the daytime are necessary when bringing in construction materials during the construction period. Definite measures with regards to construction time or traffic regulations should be sufficiently discussed with the Government of SCN in advance.

(3) Old Road (OL), a proposed site located in the centre of St. Kitts Island in SCN is a historic town and is third largest in population after Basseterre the capital and Sandy Point. The labor force and materials are therefore deemed to be relatively easily to procure. In the case of procuring equipment and materials, by sufficiently taking the construction conditions of most East Caribbean nations including Trinidad and Tobago and Barbados into account and by formulating an effective operation plan for construction machinery and skilled workers, high quality and serviceable materials and labor force with reliable skills should be secured.

(4) When commencing with the construction work, an execution method of less work time at the site should be selected whenever possible in due consideration of the impact on the surrounding environment, the securing of a substitute landing site to continue existing fishing activities, and the occurrence of various problems associated with the transfer.

(5) Measures for Occurrence of Noise during Construction Work

The occurrence of noise from various works associated with construction is anticipated. Such sources of noise include noise from steel pipe and sheet piling during the construction of the jetty and slipway under the Project. Furthermore, many residences, clinics and office buildings are located near the site in Old Road (OL), so equipment with a lower operational noise output should be procured and utilized as much as possible.

(6) The following matters should be taken into account in order to secure the accuracy and quality of execution.

1) Measures for Salt Damage

The proposed site faces the shore, which is susceptible to salt damage. Accordingly, in the case of selecting construction materials, materials resistant to salt damage should be procured as much as possible, and aggregates for concrete should be rinsed in water at need to keep salinity to lower than permissible

concentrations. With respect to ice making and freezing equipment to be installed indoors, sufficient countermeasures against salt damage for equipment and materials during construction should be taken by using protective vinyl sheets.

2) Procurement of Construction Equipment and Materials

Materials used for major structures such as the boat yard, for land creation work (with seawall) applicable to a critical path in the execution, the jetty and slipway construction, foundation work, and architectural work which is technically permissible should be procured locally as much as possible. In addition, only proven construction methods should be adopted. Sufficient preparation should therefore be taken in advance.

2-2-4-2 Implementation Conditions

The large-scale civil engineering and construction works in SCN include Port Zante tourist pier in the capital of Basseterre, the Basseterre port commercial dock, a large-scale tourist resort hotel, the Ross University School of Veterinary Medicine, Robert Bradshaw International Airport, the island ring road construction and shore protection work, and the White Gate tourist resort development project currently underway. The builders responsible for these engineering projects and building construction and who have the best local reputation are Caribbean firms based in Trinidad and Tobago and American companies with their head offices in Miami.

(1) The contractor based in Trinidad and Tobago covers the entire East Caribbean and dominates both private and public construction works. However, training in specialized or leading contractors is lacking and they are not fully qualified as engineers or specialists. Accordingly, the introduction of those engineers from neighbouring countries should be considered. If a similar scale project is underway at the same time, a shortage in engineers may occur. In a similar manner, a shortage of necessary construction materials or a sudden rise in prices could also be expected. Consequently, steps should be taken to sufficiently grasp the construction market during the implementation period.

(2) The annual precipitation of St. Kitts Island is approximately 1,700mm. The average temperature is 27.3℃ (29.3℃ average highest and 23.9C lowest) and the humidity is 70 to 79% (75% annual average) throughout the year, which is quite high. Consequently, construction work is carried out under severe working conditions. Governmental agencies are on a five-day work week (off Saturdays and Sundays). At the construction sites of private-sector firms, operations continue on Saturdays and Sundays. Therefore, careful consideration should be given to safety during the construction period, the transporting of necessary equipment and materials, and securing temporary stock yard space.

(3) Since the total or partial closing of roads is unavoidable due to the transporting of heavy construction machinery, through close coordination with traffic police and temporary detours, etc. when the occasion arises, local people can be well informed through public announcements or through other means. Furthermore, an implementation plan should be formulated by sufficiently considering the local customs and conditions of the site.

2-2-4-3 Scope of Works

The construction work on the SCN side will be as follows. Electrical feed-in work, water service connection and telephone feed-in work should be implemented before the start of construction. Other facility construction work and the procurement of equipment and materials will be taken by the Japanese side.

Undertakings to be taken by the Recipient Country

1) Removal, etc. of existing facility equipment and materials (Removal of abandoned fishing boats or neglected fishing gear) 2) Electrical feed-in work 3) Water service connection 4) Telephone line feed-in work 5) Securing of substitute land for fishermen for fish landing during construction 6) Procurement of furniture and furnishings for the facility

2-2-4-4 Consultant Supervision

The fundamental principles and important points with regards to work supervision under the Project are described below.

(1) The Consultant should work closely with the Ministry of Housing, Agriculture, Fisheries and consumer Affairs (MHAFCA) and the Department of Fisheries of the said ministry, which are the implementing agencies, in order to ensure smooth implementation of construction work. In particular, the designation of a substitute landing place, removal of abandoned fishing boats and neglected fishing gear, entry restriction for the construction area, and preparation of the site lands and surrounding area should be scheduled and sufficiently discussed in advance for the purpose of coordination with the Japanese side.

(2) Before the commencement of construction, an implementation plan and execution drawings submitted by the builders should be sufficiently examined in advance, and a temporary plan, schedule plan, the quality of planned materials, and relevance of the construction method, etc. should be examined.

(3) In the case of delivery of facilities after the completion of construction work, an examination of whether or not the contents of the completed work satisfy the planned specifications should be carried out. Any modifications, appropriate instructions should also be included.

(4) Comprehensive work supervision of construction will be the responsibility of the chief of operations. Civil engineers and architects will assist with technical matters.

2-2-4-5 Quality Control Plan

(1) Concrete Work

With respect to quality control for concrete work, the volume of chlorides in both sand and fine aggregates should be confirmed and grain size should be adjusted. Attention should be taken during curing after installing concrete.

(2) Construction Materials to be procured

Since the procurement, processing and transportation of steel sheet and steel pipe pile materials are critical from an execution point of view, quality, quantity and specifications should be carefully examined and confirmed in advance.

2-2-4-6 Procurement Plan

Construction materials that can be locally procured are limited to aggregate related materials, sand, gravel and landfill, etc. There are local aggregate traders, so aggregates and ready-mix concrete can be purchased from them. Cement, although reinforcing rods and plywood, etc. will be mainly imported from Trinidad and Tobago, the United States, Venezuela and Brazil, etc., local stock will also be used. In principle, construction materials for construction work (such as cement, reinforcing rods, wooden and metal frame materials) will be locally procured. However, materials which cannot be locally procured or materials which cannot be used for the construction due to poor quality or stock volume, will be procured from a third country or Japan and transported by sea to SCN. With respect to construction machinery, although machinery for construction can be secured locally, machinery loading vessels for civil engineering construction should be brought in from Trinidad and Tobago, the Untied States or neighbourhood Caribbean nations.

Table 2-34 List of Equipment and Materials to be procured

Item	Transportation Method
① Construction Machinery	
Barge with crane	Marine transportation from a third country
Pontoon for operations	Marine transportation from a third country
Anchor boat	Marine transportation from a third country
Tug boat	Marine transportation from a third country
Piling barge (quiet type piling gin)	Marine transportation from a third country
② General Construction Materials	Local procurement Partially procured from Trinidad or United States

2-2-4-7 Soft Component Plan

It is possible to operate the facilities and equipment to be introduced under the Project if handling is explained at the time of initial introduction. Therefore, a soft component plan is unnecessary.

2-2-4-8 Implementation Schedule

If the implementation of the Project is reached in accordance with the grant aid scheme of the Government of Japan, after concluding the exchange of notes (E/N) for implementation of the Project between both nations, construction work will be implemented through the preparation of tender documents by the Consultant, tendering related to construction work, and a consultancy agreement.

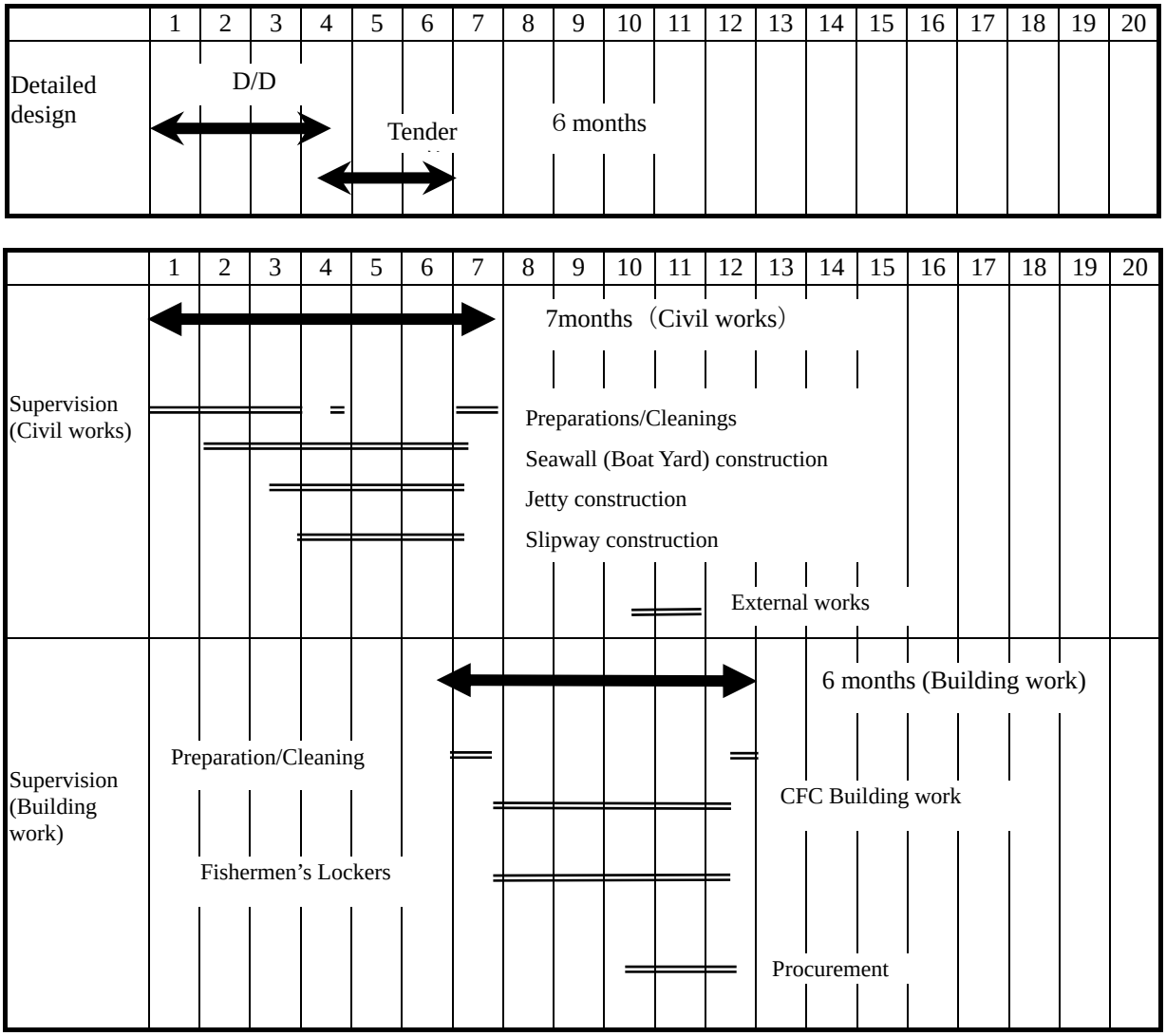
The implementation schedule should adhere to the following procedures.

(1) Detailed Design: In accordance with the Basic Design Study Report of the Project, the Consultant will carry out a detailed design and prepare the tender documents for selection of construction contractors. The required period is estimated to be approximately 3.5 months.

(2) Tender: After completion of the detailed design, application to tender (eligible tenderers) for construction work under the Project in Japan will be invited through official announcement. After evaluating all eligible tenderers, successful applicants will be selected. Based on the results of the evaluation, the implementing agency will invite successful tenderers and open the tender in the presence of parties concerned. The time required from official announcement for tender to verification of the construction contract is estimated to be approximately 2.5 months.

(3) Construction Work: After concluding a construction contract and verification of the contract is obtained from the Government of Japan, the construction work will commence. Assuming that undertakings on the SCN side will be progress smoothly, civil engineering-related work and building-related work are estimated to take approximately 7 months and 6 months respectively. Hereinafter, the project implementation schedule (draft) is shown.

Table 2-35 Implementation Schedule



2-3 Obligations of Recipient Country

2-3-1 Work Share Plan

Projects undertakings by the Japanese and SCN sides are shown in the following table.

Table 2-36 Work Share between Japanese and SCN Sides

Contents of Construction Work, etc.	Japan	SCN
0. Secure land for construction of fisheries facilities and coastal areas for jetty construction		☆
1. Measures for continuing public services during construction period by securing reclaimed land and quarry pit, leveling the project site and securing substitute land for fish landing		○
2. Create infrastructure connection with the project site (electricity, water supply, telephone)		○
3. Remove abandoned fishing boats, neglected fishing gear and mooring buoys, etc.		○
4. Construction Work (1) CFC facilities, breakwater (seawall), jetty and slipway, etc. (2) Fences, planting, etc. (3) Secure temporary land (stock yard) for construction	○	 ○ ○
5. Importing, Customs Clearance (1) Transportation to SCN and domestic transportation (2) Tax exemption and customs clearance	○	 ○
6. Pay service charges through a banking arrangement (B/A) to a Japanese foreign exchange bank		○
7. Ensure convenience for Japanese entry into SCN and stay for the performance of work under the Project		○
8. To appropriately and effectively manage and operate facilities through the grant aid scheme		○
9. Bear all expenses pertaining to construction of facilities excluded in the grant aid scheme, furniture, transportation of equipment and materials and installation		○
10. Take all procedures for necessary permits, approval and application with respect to construction work		○
11. Exemption from all domestic taxes including local taxes with respect to payment for equipment and materials for builders under the Project to be procured in SCN		○

2-3-2 Securing of Land for the Project

(1) Land acquisition systems

There are two systems when public project will acquire the necessary lands. Two of the possible ways are "Negotiation with landowners" and "Land acquisition by law" as shown below. In case land acquisition by "Negotiation" is difficult, the next step by "Land acquisition by law" will be considered.

1) Negotiation with landowners

Procedures for "Negotiation with the landowners" are from (a) to (e) as shown below;

(a) Project explanation

(b) Land survey & Property investigation

(c) Compensation estimate & Negotiation for Agreement

(d) Purchase Agreement

(e) Property clearance & Land registration

2) Land acquisition by law for Government projects

Procedures for "Land acquisition law" are explained as (f) and (g) as shown below;

(f) Authorization procedure

(f-1) Application for Authorization

(f-2) Project authorization（Cabinet approval）and the public notice

(g) Finalization procedure

After (f) above, settlement procedure shall be taken for compensation, etc.

(2) Land Acquisition status

As mentioned above, there are two means of acquiring land for public use which are (a) on a negotiation basis and (b) on a compulsory purchase/exchange basis.

SCN side has taken necessary actions for the land acquisition by law as follows:

February 14: Minister requested Attorney General for compulsory land acquisition

February 18: Announcement in the government gazzette for initiating compulsory purchase/ exchange of the land

February 21: Cabinet Decision on submitting to the Parliament

February 24: Parliament approved the compulsory purchase/exchange of the land

February 24:Attorney General started the acquisition procedure

(First Preference will be given to each owner in choosing his next land to be exchanged.)

SCN side has completed the land acquisition for the project and formally reported to the Embassy of Japan at Trinidad and Tobago on the 3rd March 2005.

2-4 Project Operation Plan

The administration of facilities under the Project will be taken by the Department of Fisheries of the Ministry of Housing, Agriculture, Fisheries and Consumer Affairs (MHAFCA). Since the Department of Fisheries has actual data on the management of the existing Basseterre Fisheries Complex (BFC), their experience can be effectively utilized, and at the same time, the business of coordinating with the BFC facilities can be carried out.

Through this coordination system, the efficient utilization of refrigerating engineers during maintenance such as ice making plant is possible. Since the Community Fishery Centre (CFC) facilities, jetty and slipway, boat lifting equipment utilizing the said slipway and boat yard, etc. are public facilities, in accordance with the beneficiary principle, charges for utilizing the facilities will be collected.

This income will be delivered to the national treasury and operating cost financed through governmental budget.

2-4-1 Community Fishery Centre at Old Road (CFC-OL)

Major responsibilities in the operation and management at the Old Road Community Fishery Centre (CFC-OL) will be to operate the CFC facilities, and to maintain and repair project facilities such as the jetty and slipway.

In addition, major activities at the CFC will be to collect facility usage fees (service charges for fish handling space, jetty and slipway, boat yard and fishermen's lockers, etc.) and to ship and sell perishable fish and shellfish. Furthermore, their activities will also cover daily maintenance such as cleaning inside the facilities and waste disposal.

Business activities at the CFC-OL will be taken by eight (8) personnel in total including a manager and six (6) other staff, and one person in charge of maintenance of ice making plant (concurrently working at BFC facilities) as shown in the following table.

Table 2-37 Personnel Schedule at Community Fishery Centre at Old Road (CFC-OL)

Position	Number of Personnel	Job Description	Remarks
1. Manager	1	Responsible person for business operations at CFC, liaison duty, recording and reporting of business activities and catch data	Appointed by the Department of Fisheries
2. Accountant (Assistant)	1	Accounting business, collection of service charges and bookkeeping	
3. Business Department (Fishing Business, etc.)	4	Measuring and recording of catches, administration of business activities utilizing the facilities such as fish handling space and jetty, shipping of fish to BFC and supplying ice, submission of said records and reports, ice making plant maintenance, ice storage(*).	One staff member responsible for maintaining ice making plant
4. Facility Cleaning Guard	2	Cleaning and security within the facilities	
Total	8		

Note: *Maintenance of ice making plant at OL will be carried out by a mechanic concurrently working at the BFC.

2-5 Estimated Project Cost

2-5-1 Estimated Project Cost

The estimated project cost for implementing the Project in accordance with the grant aid scheme will be approximately ¥6.75million. The breakdown of expenses between the Japanese and SCN sides in accordance with the work share described earlier is estimated to be as follows based on the following estimated conditions. This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

(1) Expenses to be covered by the Japanese side (note : the project cost is provisional)

Table 2-38 Total Estimated Project Cost **Approximately ¥ 673million**

Old Road Community Fisheries Centre (CFC-OL)

Breakwater (seawall), jetty and slipway

Total building floor area: Approximately 350m^2

Item		Estimated Project Cost (¥ million)		
Facility	Seawall (Boat yard)	246	474	602
	Jetty	183		
	Slipway	45		
	CFC Building	86	120	
	Fishermen's Lockers	34		
Equipment		8		
Detailed design & work supervision		71		

(2) Expenses to be covered by the SCN side

The construction cost to be covered by the SCN side is estimated to be approximately 59,500 East Caribbean dollars (approximately ¥2.44 million, exchange rate: 1 EC$ ＝ ¥41.03). However, the cost associated with the acquisition of land is uncertain so it is not included.

Table 2-39 Expenses for Undertakings to be covered by SCN Side **Approximately ¥2.44 million**

Description of Undertakings	Amount
・Disassembly & removal at the site Removal of abandoned fishing boats, gear & structures within the site	EC$ 30,000
・Infrastructure connecting work to the project site Installation of electricity junction boxes & watt meters, connection of telephone lines, installation of water supply junction boxes & water meters	EC$ 5,500 EC$ 1,000
・Service charges associated with the bank agreement (B/A)	EC$ 23,000
Total	EC$ 59,500
Conversion to Japanese yen	¥ 2.441 million

(3) Estimated Conditions

Estimated conditions are as follows.

1) Date of Estimation: October 2004

2) Foreign Exchange Rate: US$1.0 ＝ ¥110.79, US$1.0 ＝ EC$2.70, EC$1.0 ＝ ¥41.03

3) Work Period: As shown in the implementation schedule.

4) Other: The Project will be implemented in accordance with the grant aid scheme of the Government of Japan.

2-5-2 Operation and Maintenance Cost

The operation and maintenance of facilities under the Project will be through the collection of facility service charges in accordance with the beneficiary principle. In similar manner as existing facilities, these revenues will be delivered to the national treasury and the operating cost will be financed through the fiscal budget (budget of the Department of Fisheries). Hereinafter, the annual maintenance cost at the CFC facilities is described.

(1) Project Maintenance Cost

An overview of annual expenses required for maintaining the facilities is shown in the following table. According to the table, with respect to business revenue and expenditure at the Old Road Community Fishery Centre (CFC-OL), the annual revenue and expenditure will be approximately EC$251,000 (approximately ¥10.29 million) and EC$221,000 (approximately ¥9.06 million) respectively. Consequently, annual revenue of approximately EC$30,544 (approximately ¥1.23 million) is estimated. Based on these results, maintenance of the facilities is judged to be possible.

Table 2-40 Annual Maintenance Cost (CFC-OL) (Unit: EC$)

Revenue		Expenditure	
Item	Amount	Item	Amount
Fish Handling Service Charges	120,488	Personnel Expenses	129,600
Fishing Gear Sales Service Charges	—	Direct Expenses	7,631
Ice Sales Service Charges	127,575	Maintenance Cost	84,006
Facility Utilization Fees	3,758		
Total Revenue	251,821	Total Expenditure	221,277
Balance 30,544			

The grounds for calculating revenue and expenditure items are demonstrated below.

1) Revenue Items

Revenue items cover fish handling service charges, fishing gear sales service charges, ice sales service charges, and facility utilization fees.

① Fish Handling Service Charges: EC$120,488

Utilization fees in accordance with the volume of catch handled will be collected. By utilizing a unit cost of EC$13.78/kg converted from EC$6.25/lbs, the annual average catch is estimated to be 87.5 tons.

87.5t/year × 13.78EC $ /kg × 1,000kg/t × 10% ＝ EC$120,488

② Fishing Gear Sales and Service Charges: None

These charges will not be included as business under the Project since they will be included as business of the fishermen's cooperative.

③ Ice Sales Service Charges: EC$127,575

Ice per pound will be EC$0.32. The converted unit cost is calculated based on EC$0.72/kg and an annual volume of manufactured ice of 180 tons.

180t/year × 0.97 × EC$0.72/kg × 1,000kg/t = EC$127,575

④ Facility Utilization Fees: EC$3,758

Fishermen's Lockers: EC$2.7/month & room × 12 months × 20rooms = EC$648

Jetty: EC$2.7/week & vessel × 4 weeks × 12 months × 24vessels = EC$3,110

Slipway: Free as a countermeasure for disaster prevention during a hurricane.

2) Expenditure Items

Expenditure items include personnel expenses, direct expenses and maintenance cost.

① Personnel Expenses: EC$129,600

The average total wages for 8 persons including the manager will be EC$1,350. Personnel expenses for a freezing engineer who will work concurrently at the BFC, also estimated to be the average expenses for one person, will be also covered.

EC$1,350/month & person × 8 persons × 12 months = EC$129,600

Table 2-41 Personnel Cost (CFC-OL) (Unit: EC$)

Duty	Unit amount (Month)	No. of Persons	Amount (Month)	Amount (Annual)
Manager	2,700	1	2,700	32,400
Accountant (Assistant)	1,620	1	1,620	19,440
Business Dept. (Fish Business, etc.)	1,080	4	4,320	51,840
Facility Cleaning, Guard	1,080	2	2,160	25,920
Total	(Average1,350)	8	10,800	129,600

② Direct Expenses: EC$7,671

Electricity charges: EC$0.34/kwh × 50kwh/day × 300 days = EC$5,100

Water charges: EC$0.52/kℓ × 4.0kℓ/day × 300 days = EC$634

Fuel cost (vehicles): EC$1.63/ℓ × 4ℓ/day × 300 days = EC$1,937

③ Maintenance Cost: EC$84,006

Equipment: EC$6,683

Ice Making equipment: US$135,000 × 0.5% = US$675 =EC$1,823

Equipment: US$600,000 × 3.0% = US$1,800 = EC$4,860

Facilities: EC$16,138

Pavement: 2,000 × US$59 × 1% = US$1,180 = EC$3,186

CFC building: 218 × US$1,364 × 1% = US$2,973 = EC$8,027

Fishermen's lockers: 77 × US$560 × 1% = US$43 1= EC$1,164

Jetty : 235 × US$59 × 1% = US$138 = EC$375

Breakwater: 2,000 × US$59 × 1% = US$1,180 = EC$3,186

Slipway (General repairs) : 125 × US$59 × 1% = US$74 = EC$200

Recovery cost for erosion around the Slipway: EC$61,185

Slipway is to be constructed on the beach in this project. Scouring/erosion around the slipway structure by the hurricane/storm surges is inevitable because the waves easily attack into the beaches on the ocean front.

Therefore, it is essential to recover/repair the scoured/eroded portion on the beach, in order to maintain the function of slipway facility.

The cost for maintaining the slipway is estimated as EC$61,185 annually (¥2.50million) provided that there are at least five (5) times attacks annually by hurricane/tropical storm surges, etc.

($100m^3$/attack×@EC$98/$m^3$+WheelbackhoeEC$2,437)×5 attacks/year

= EC$61,185（approx. 2.50million）

Preconditions:

Earth and sand for one attack ; approx. $100m^3$

Unit price of the earth&sand ; @EC$98/ m^3（@¥4,000/ m^3）

Construction machinery ; Wheel backhoe 1 unit

EC$2,437 （¥100,000/time）

Estimated attacks by storm/hurricane waves

; approx. 5attacks per year

Chapter 3 Project Evaluation and Recommendations

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effect

The construction of a breakwater (seawall), boat yard, fish landing jetty, slipway, community fishery centre building (including an ice plant), fishermen's lockers and other facilities at the Old Road Community Fishery Centre (CFC-OL) through the implementation of the Project can be expected to have the following effects.

(1) Direct Effects

1) Safe and efficient preparations for fishing and shortening of time for fish landing works with the construction of fish landing jetty

As there is currently no jetty at the Old Road site, the lowering of fishing boats when going fishing and their lifting on their return are conducted in the breaker zone. As the fishing boats greatly roll due to the waves in this zone, the said works which last for 30 – 45 minutes are quite dangerous. With the construction of the landing jetty, safe and efficient lowering and lifting works lasting for some 10 minutes/boat will become a reality.

2) Integration of landing sites for effective and efficient fish distribution

As there has been no proper landing site in the Old Road area up to the present, landings of the catch of artisanal fishing boats are conducted at three beaches and the landing and subsequent distribution of the catch after landing are conducted in a disjointed manner. With the implementation of the Project, there will be a centralized landing site, enabling much more effective and efficient distribution and marketing.

3) Improved freshness and quality of catch through supply of ice

With the introduction of the new Old Road Community Fishery Centre and ice plant, etc., ice which is currently difficult to obtain will be readily available for fishing activities and the distribution of fish. Moreover, because of the availability of a fish handling area where the landed catch can be washed, weighed, sorted and shipped in a hygienic manner, the freshness and quality of the landed catch as well as fish at the distribution stage will be significantly improved.

4) Avoidance of disasters through availability of safe boat yard

At present, when a hurricane warning is issued, all available fishermen are mobilized to pull the fishing boats to the far side of the beach or roadside to prevent them from being washed away. However, the beach at Old Road is narrow and short and the width of the access road to the beach is as narrow as 3.5m, making the evacuation of fishing boats to safety difficult. With the introduction of a boat yard and slipway under the Project, safe and swift evacuation of fishing boats to the boat yard which will not be affected by the violent waves caused by a hurricane will substantially reduce the risk of fishing boats being washed away and damage to fishing boats by violent waves.

5) Thorough repair and maintenance for fishing boats and gear

At present, the narrow beach at the landing site makes it difficult to repair fishing boats or to prepare and repair fishing gear near the landing site. Repair works are, therefore, currently conducted some distance from the landing site. With the construction of the Old Road Community Fishery Centre under the Project, the newly created boat yard can be used to maintain, inspect and, if necessary, repair fishing boats and gear at the boat yard, making proper maintenance much easier.

(2) Indirect Effects

1) Increased demand and improved quality of marine products

The implementation of the Project will establish a fish distribution system using ice. The resulting improved freshness and quality of marine products will greatly improve the confidence of consumers in these products as food, increasing the general demand for marine products. In addition, the switch of tourist hotels and restaurants from imported fishery products to local fishery products will facilitate the process of import substitution.

2) Promotion and development of artisanal fisheries

The effective use of the new facilities constructed under the Project in accordance with the policy of sustainable use of fishery resources will stimulate coastal artisanal fisheries on the island while the improved fishing techniques will contribute to the artisanal fishermen's income generation and the development of fisheries throughout SCN.

3-2 Recommendations

The following recommendations are made for the effective utilization of the new facilities and equipment which will be constructed or provided under the Project.

(1) Assignment of personnel

For the effective use of the new facilities constructed under the Project to achieve the project objectives, it will be necessary for the Department of Fisheries, SCN to make the best use of the experience it has obtained during the two years of operation of the Basseterre Fisheries Complex (BFC), to establish a system to manage the new CFC-OL in collaboration with the direct beneficiaries of the new facilities, i.e. fishermen, fishermen's cooperative and other relevant bodies and to assign appropriate personnel for this purpose.

(2) Maintenance of civil engineering facilities

As a problem concerning the civil engineering facilities, it is forecast that the waves caused by a hurricane may scour the sediment around the slipway, making repair work every time such scouring occurs necessary. In view of the frequency of hurricanes in recent years, it is possible that minor repair work will be required

approximately five times a year. Accordingly, it will be necessary to establish a support system with the Ministry of Public Works and Port Authority in advance to ensure that the said work is promptly conducted.

(3) Securing of budget

As all of the facilities and equipment have their own lifespan, requiring their renewal at some point in the future, it will be important to retain part of the revenue from the project-related facilities in a special reserve fund for this purpose. Accordingly, it will be necessary for the Government of SNC to plan and secure the necessary budget for facility and equipment maintenance and renewal.