

**BASIC DESIGN STUDY REPORT**  
**ON**  
**THE PROJECT FOR CONSTRUCTING**  
**NEW KINGSTOWN FISH MARKET**  
**IN**  
**ST. VINCENT AND THE GRENADINES**

**AUGUST 1987**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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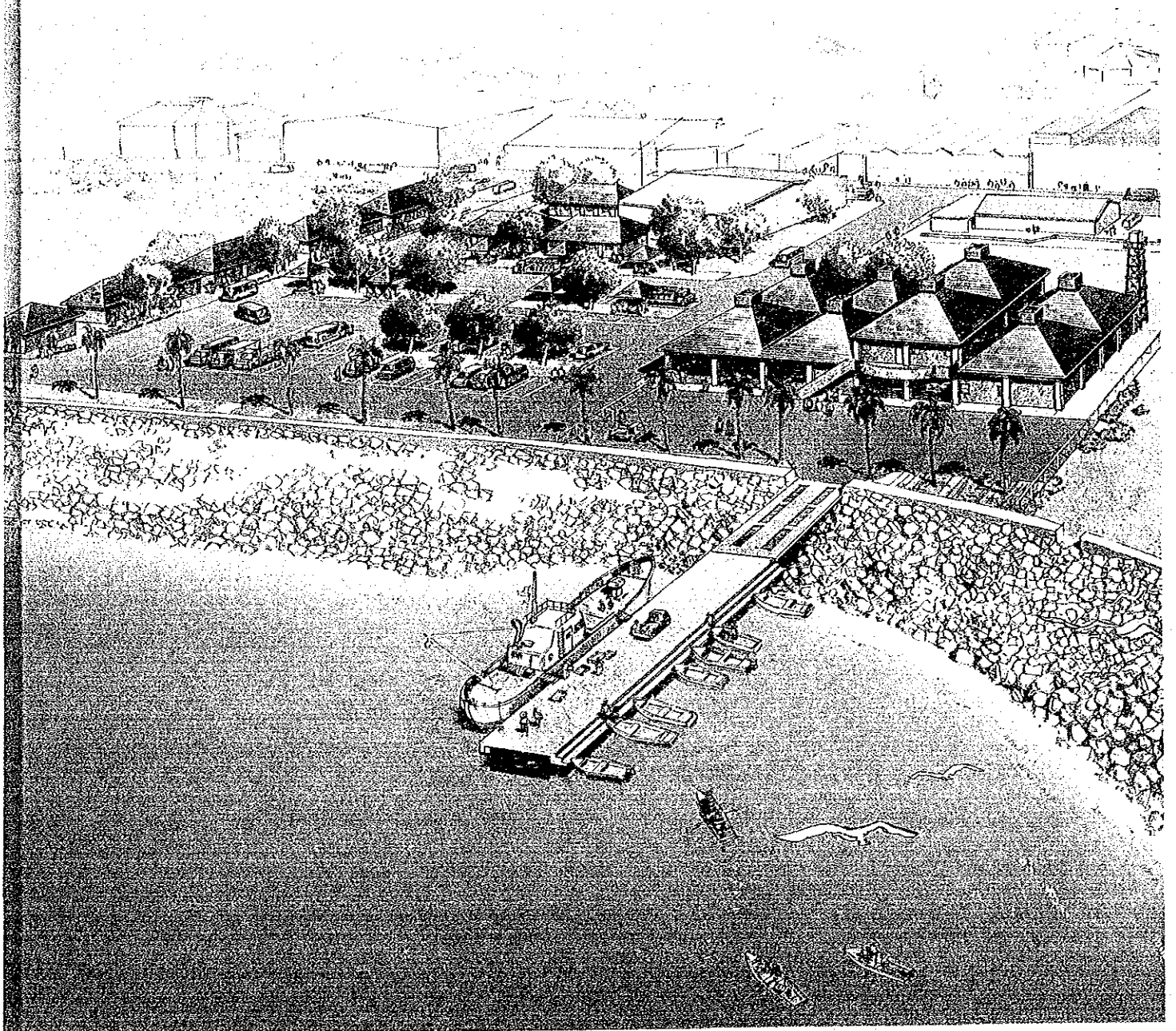


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国際協力事業団		
受入 月日	'87.10.14	621
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NEW KINGSTOWN FISH MARKET



## PREFACE

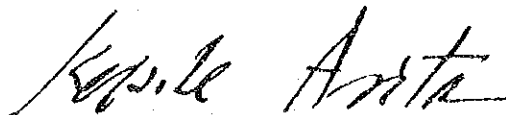
In response to the request of the Government of St. Vincent and the Grenadines, the Government of Japan has decided to conduct a basic design study on The Project for Constructing New Kingstown Fish Market and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to St. Vincent and the Grenadines a study team headed by Mr. Jun-ichiro Okamoto, Deputy Director of the Long Distance Fisheries Division, Oceanic Fisheries Department, Fisheries Agency from 29th March to 21st April 1987.

The team had discussions on the Project with the officials concerned of the Government of St. Vincent and the Grenadines and conducted a field survey in the Kingstown area. After the team returned to Japan, further studies were made, a draft report was prepared and, for the explanation and discussion of it, a mission headed by Mr. Shigeyoshi Kikuchi, Senior Planning Officer, Fishing Port Department, Fisheries Agency, was sent to St. Vincent and the Grenadines from 6th to 17th July, 1987. As a result, the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of St. Vincent and the Grenadines for their close cooperation extended to the team.

August, 1987



Keisuke Arita

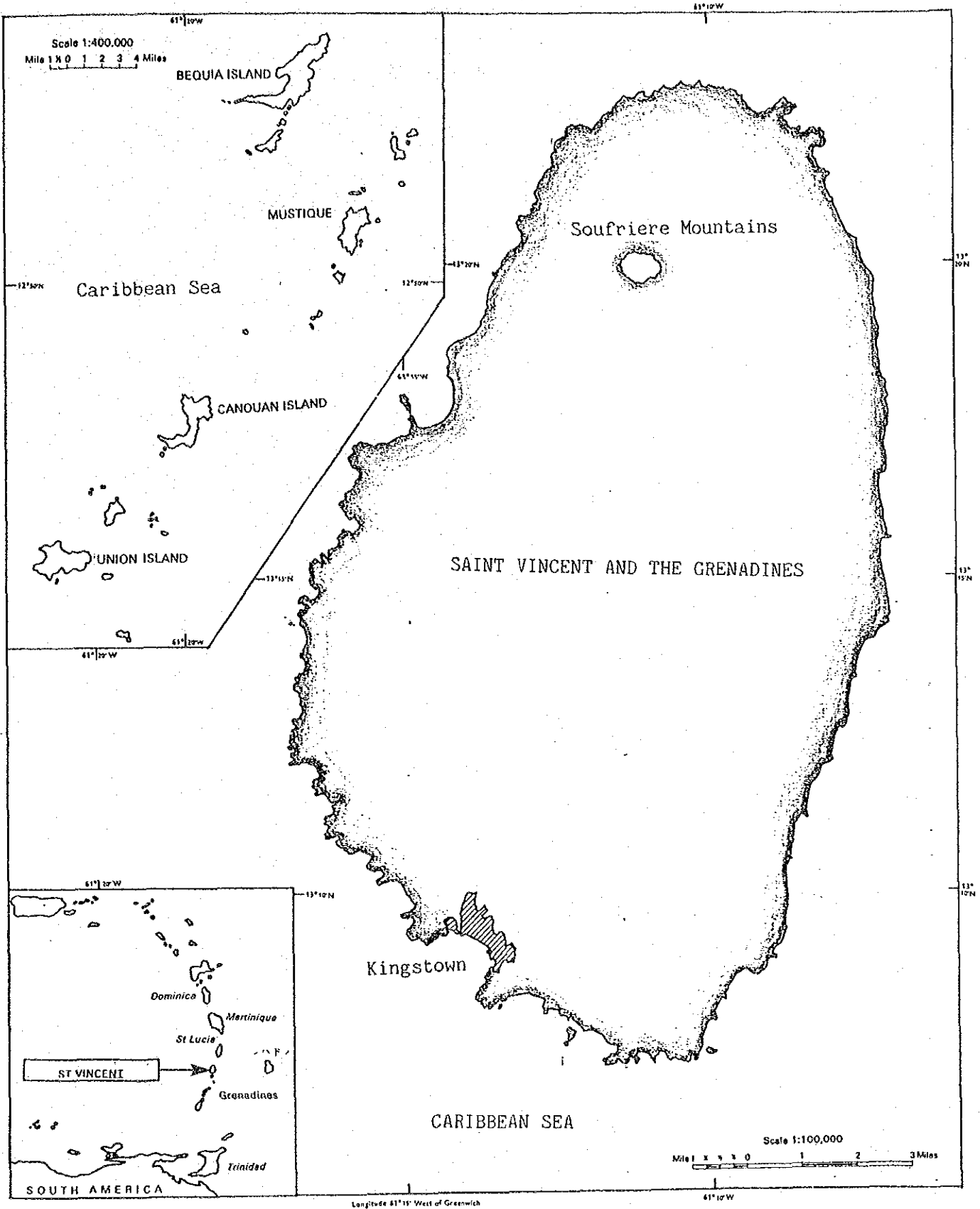
President

Japan International Cooperation Agency



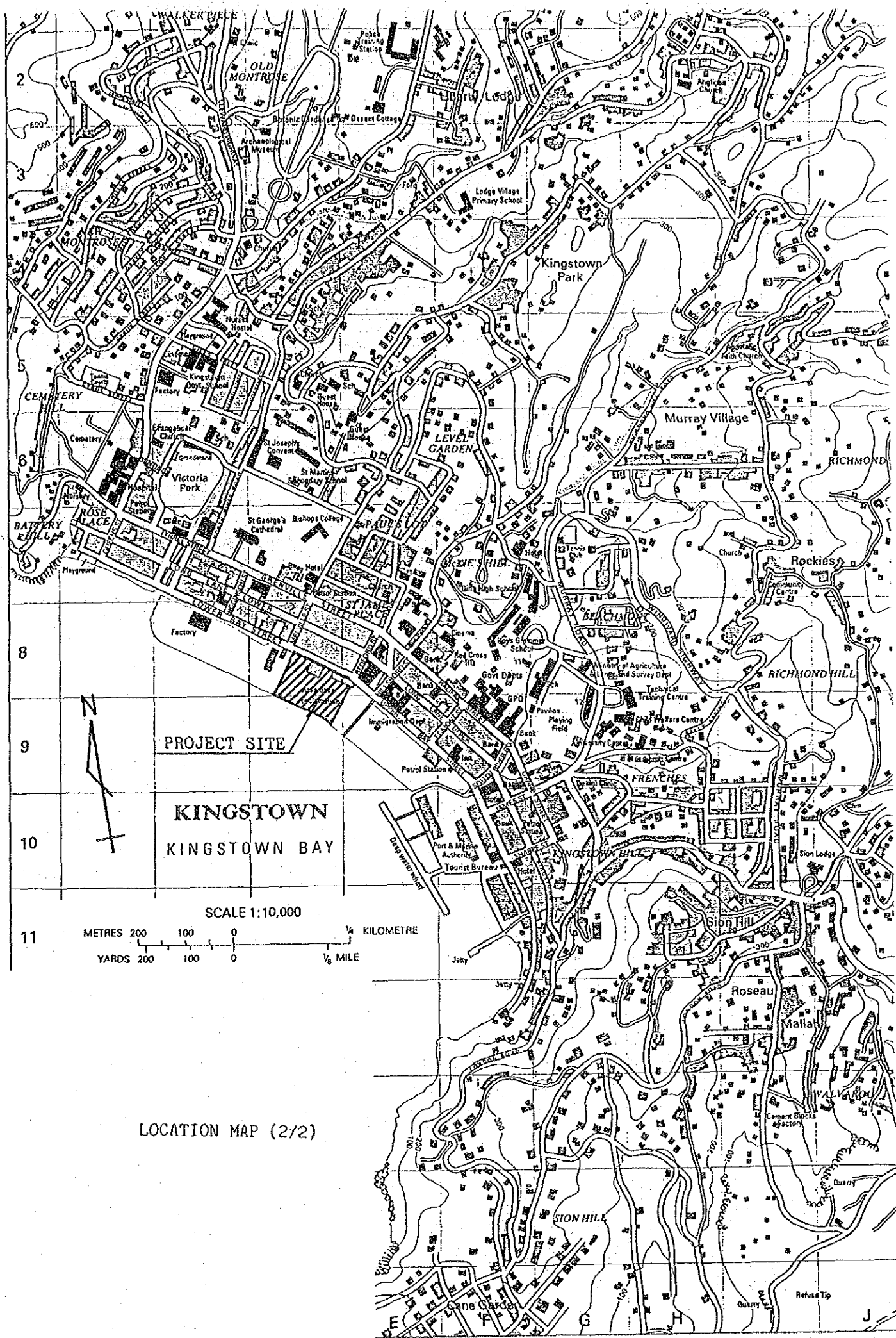


# SAINT VINCENT



LOCATION MAP (1/2)





LOCATION MAP (2/2)



## SUMMARY

The Government of St. Vincent and the Grenadines requested the Government of Japan for its grant-aid assistance for the Kingstown Fish Market Construction Project which aims to improve the distribution and marketing system of fish together with its National Fisheries Development Program(NFDP). In response to this request, the Government of Japan decided to conduct a basic design study on the Project, and entrusted the Japan International Cooperation Agency (JICA) with the study. JICA sent to St. Vincent and the Grenadines a study team led by Mr. Jun-ichiro Okamoto, Deputy Director, Long Distance Fisheries Division, Oceanic Fisheries Department, Fisheries Agency, from 29th March to 17th April 1987. The Team had discussions with the officials concerned of the Government of St. Vincent and the Grenadines, studied the request and the background of the Project, and conducted a field study to establish the most appropriate basic design for the Project. After the team returned to Japan, further studies were made, and a draft report on the basic design for the Project was prepared. For explanation and discussion of the draft report, a mission headed by Mr. Shigeyoshi Kikuchi, Senior Planning Officer, Fishing Port Department, Fisheries Agency was sent to St. Vincent and the Grenadines from 6th to 17th July 1987. As a result the present report has been prepared.

At present, in St. Vincent and the Grenadines, not only under development in organisation and human-resources but also the insufficiency of distribution and marketing facilities are posing difficulties in its fisheries development. To improve this situation, the Government of St. Vincent and the Grenadines is now formulating the National Fisheries Development Program with the assistance of the Canadian International Development Agency (CIDA). The program aims to develop the nation's fisheries by i) establishing fisheries related organizations, ii) developing human resources, iii) implementing fisheries infrastructure for common use of fishermen, and iv) improving distribution and marketing systems to achieve i) better supply of fish to the nation's people, ii) higher economic and social standard of fishermen, iii) less importation of processed fish, and iv) bigger exportation of fisheries products. To achieve these objectives, a new fish market provided with fish landing and storing facilities is an urgent need for stabilized supply of fish both in quality and quantity.

This is the background of the request from the Government of St. Vincent and the Grenadines to the Government of Japan for its grant aid assistance in the construction of the Kingstown Fish Market.

However, the project shall include the construction of small shops, bus-terminal and parking lot within the project site for the convenience of shoppers and vendors.

The implementation agency of the Government of St. Vincent and the Grenadines for the Project is the Central Planning Unit, the Ministry of Finance, Planning and Development. The Marketing Corporation is responsible for the administration, maintenance and operation of the fish market after its completion. The Kingstown City Board, the Police Department and the Ministry of Education and Health are responsible for the Small Shops, Bus Terminal and Parking Lot, and Public Toilet respectively.

The request from the Government of St. Vincent and the Grenadines to the Government of Japan for its assistance on the project was prepared based on the target turnover in its National Fisheries Development Program. After careful study of the Program, the results of the field study and the discussions with the concerned authorities of the Government of St. Vincent and the Grenadines, the following facilities were found appropriate for the purpose of the Project:

Fish Market	: Handling volume, 2.4 Mlbs/year, 8,000 lbs/day (max. 11,000 lbs/d)
Landing Facility	: Number of arriving fishing boats, 20' class 34 boats/day 60' class 3 boats/day
Small Shops	: 35 shops and a garbage storage
Bus terminal	: for minibuses
Parking Lot	: for buses, taxis and small sedans
Others	: Fuel and water supply facilities for fishing boats Public toilet

A basic design for the Project was established as follows after a careful study of the request and taking into consideration natural and social conditions, results of field survey, construction industry, and study on similar facilities:

(1) Fish Market : 30 stalls, Chill Room (volume 22,000 lbs), Cold Storage (volume 55,000 lbs), Blast Freezer (capacity 4,000 lbs/d), Ice Machine (capacity 7,700 lbs/d), Bargaining area, Processing Area, and Administration Offices  
A reinforced concrete frame building with wooden truss roof,  
total floor area 1,440 m<sup>2</sup>

- (2) Landing Facility : Jetty with 10 berths for 20' class and 1 berth for 60' class fishing boats  
A reinforced concrete deck type with steel-pipe piles,  
132 ft long and 23 ft wide
- (3) Small shops : 35 small shops and a garbage storage  
Concrete block building, 15m<sup>2</sup> ea. total 525 m<sup>2</sup>
- (4) Bus-terminal : 24 berths for minibuses
- (5) Parking lot : 16 berths for buses, 20 berths for taxis  
Bus-terminal and Parking Lot Pavement area 5,300m<sup>2</sup>
- (6) Others : Fuel supply with 2.5kl tank for gasoline, 4kl tank for diesel fuel  
Public toilet
- (7) Equipment : Equipment for use in the Fish Market and for Quality Control

The budget for the administration, maintenance and operation of the Fish Market is estimated at EC\$ 169,300 in 1989 and EC\$ 282,000 in 1994. In 1994, it is expected that the income from the Fish Market fees and profits from selling processed fish will cover such expenses. The Marketing Corporation will have to make up the difference between income and expenditures till that time with its own resources, which appears to be possible from its financial scales.

There is a great need in St. Vincent and the Grenadines for facilities for the distribution and marketing of fish and fisheries products. Once the Project is completed it will contribute to the development of the country by raising the living standard of people through an improved supply of fish in quality and quantity, and by saving foreign currency by cutting fish imports and promoting exports.





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**CHAPTER 1**  
**INTRODUCTION**



## CHAPTER 1: INTRODUCTION

At present, in St. Vincent and the Grenadines (SVG), both organizations and human resources related to the fisheries, marketing and distribution systems are still at an under-developed stage, which forces the fishermen into a depressed living standard and results in a poor supply to the national in both quality and quantity of fishery products. To supplement the total and seasonal shortages of fisheries products, the Government of St. Vincent and the Grenadines (GOSVG) is now importing salted fish from Canada, accounting for about half the volume of total consumption.

To improve the fisheries situation, GOSVG is now formulating the National Fisheries Development Plan (NFDP) with the assistance of the Canadian International Development Authority (CIDA), which aims to:

- (1) Increase the fisheries products by organizational and human resources development, and by the construction of community facilities for fishermen.
- (2) Raise quality and quantity of fisheries products by improving marketing and distribution facilities and systems.

GOSVG finds that the establishment of a fish-market equipped with fish-landing and storage facilities is the most fundamental, and therefore most important and urgent need for the nation's fisheries development. This is the reason for its seeking the grant aid assistance of the Government of Japan (GOJ) in the construction of the Kingstown fish Market Project (the Project).

In response to this request, GOJ sent an Economic Cooperation Study Mission to SVG in September 1986 to study the request and the Project. As a result of this study, GOJ decided to send a basic design study team through the Japan International Cooperation Agency (JICA) led by Mr. Jun-ichiro OKAMOTO, Deputy Director of the Long Distance Fisheries Division, Oceanic Fisheries Department, Fisheries Agency, (the Team) to SVG from 29th March to 21st April 1987.

The Team had a series of discussions with the GOSVG Central Planning Unit and Fisheries Division on the NFDP and the project request. Fundamental understandings of the Project by both sides were summarized in the Minutes of the Meetings and representatives of both sides put their signatures thereto on 7th April 1987.

The Team also conducted the following studies to formulate a basic design for the realization of the Project under the Japanese grant-aid system.

- (1) Analysis of the project background and study of its appropriateness for implementation under the Japanese grant-aid system,
- (2) Survey and study of related national programs,
- (3) Survey of SVG's fisheries, focusing on the present situation and problems in fisheries distribution systems,
- (4) Study and discussion with relevant SVG authorities on the function and scale of the Project,
- (5) Confirmation of GOSVG's implementation and administration systems and budget allotment for the Project,
- (6) Investigation of the proposed construction site,
- (7) Study of similar facilities, and
- (8) Investigation of the construction market and conditions in SVG.

JICA compiled the results of studies on scope and scale of the project, implementation method and schedule, project costs and feasibilities into a basic design study report (draft) and sent a team headed by Mr. Shigeyoshi Kikuchi, Senior Planning Officer, Fishing Port Department, Fisheries Agency, to SVG from 6 to 17 July 1987 to explain it.

The team submitted and explained the basic design study report (draft) to the officials concerned of GOSVG, and confirmed the contents of the report and results of studies conducted further after the return of the basic design study team to Japan.

As the result, fundamental agreement on the basic design study report (draft) was obtained and results of the meetings were summarized into the Minutes of the Meetings and representatives of both sides put their signatures thereto on 14 July 1987.



**CHAPTER 2**  
**BACKGROUND OF THE PROJECT**



## CHAPTER 2: BACKGROUND OF THE PROJECT

### 2-1 OUTLINE OF ST. VINCENT AND THE GRENADINES

#### 2-1-1 Geographical Data

St. Vincent and the Grenadines consists of 32 islands situated in the Windward island group of the West Indies, located in latitude 13°15'N. and longitude 60°56'W.

The country's total population is about 110,000. The capital, Kingstown, is located on the island of St. Vincent, and has a population of approximately 23,000. St. Vincent is a volcanic island stretching for 18 km from east to west, and for 29.6 km from north to south, with a total area of about 345 square kilometers.

#### 2-1-2 Political System

St. Vincent and the Grenadines is a constitutional monarchy belonging to the British Commonwealth. The Governor General represents the Queen locally. The affairs of the state are administered by the Prime Minister and a Cabinet of Ministers who are elected by universal adult suffrage in elections constitutionally due every five years.

St. Vincent and the Grenadines is a member country of the Organization of Eastern Caribbean States and the Caribbean Community.

#### 2-1-3 Agriculture and Industry

St. Vincent, a volcanic island, is blessed with fertile soil suitable for agriculture. A total of approximately 2,500 hectares is devoted to farmlands, and about 65% of the island's working force is engaged in agriculture which provides an important source of income for the economy. As of 1983, the banana exports totalled 27,892 tons. The country is also known as the world's leading producer of arrowroot which is a mainstay export item next to bananas. About 2,600 hectares of land are used for the cultivation of coconuts. Other major cash crops include sweet potatoes, carrots, yams, pumpkins, beans, tomatoes, mangoes, pineapples, citrus fruits, peanuts, and tobacco. Some of these are exported to other Caribbean nations.

In Campden Industrial Park located about 5 km north of Kingstown, there are plants for milling flour, manufacturing tennis rackets, carton boxes and garments, and producing soft drinks. Other than these, there are household industries producing furniture, rattan work, jams, and garments.

#### 2-1-4 Economy

Between 1975 and 1978, SVG witnessed rapid economic growth with agriculture being its driving force. The economy, however, was hampered by natural disasters that hit the country in 1979 and 1980, and the damage to the economy was aggravated by the following world-wide recession.

#### 2-1-5 Climate

As with the other Caribbean nations, SVG is dominated by the trade wind all year round, and the prevailing wind is an easterly wind. The climate of this region is governed by the movements of the subtropical anticyclone belt and the intertropical convergence zone (ITCZ) across the equator.

Monthly average temperatures stay above 20°C throughout the year. Annual rainfall is more than 800 mm, and the average wind velocity is around 7 m/sec.

#### 2-1-6 Disasters

Due to its geographical location in the hurricane zone and also on a seismic belt situated on the Atlantic side of the West Indies, the country suffers damage from high winds, torrential rains, and earthquakes. The Soufriere Volcano on the island of St. Vincent is an active volcano, the most recent eruption of which took place in 1979, causing serious damage to the island's crops.

#### 2-1-7 Social Infrastructure

There are two trunk roads, on the East and West side of SV, which are traversed by minibuses. Regional air and sea services are available. A good quality social infrastructure such as electric power, water supply and communication services is available.

## 2-2 OUTLINE OF FISHING SECTOR

### 2-2-1 Present State and Problems of Local Fisheries

Priority has been given by the Government to the development of the country's fisheries industry as one of its major policies for achieving future economic growth. The industry, however, is plagued with a number of problems, such as underdeveloped social infrastructure and organizations, low labour productivity of the fishermen, insanitary handling of fish hauls, and so forth.

The current state and problems of the country's fisheries have been identified as follows:

- (1) Though there exist some fishermen's cooperatives, they do not seem viable in view of the fact that their unity is weak in fishing-related activities owing to the lack of fishermen's organized activities. A proper organizational system required for raising productivity is yet to be created in this sector.
- (2) Inadequate facilities for handling, storing, and delivering fish have impeded the attempts to raise productivity and improve product quality, the development of new markets, and the stabilizing of prices against fluctuating hauls. This physical condition has also resulted in restricting on vendors' fish sales to the inhabitants of the interior of the main island, and consequently has deprived them of the opportunity to take in fish protein. Interviews with fishermen, on the other hand, have revealed that 1/4 to 1/3 of the total hauls during the high season has to be abandoned at sea, owing to the lack of appropriate storage facilities.
- (3) Of the total annual haul of 950 metric tons, some 500 tons are sold to trade vessels from Martinique because of the lack of proper transportation systems. In the waters of the Grenadine islands, fishing is undertaken only when trade vessels come around as both on-board and on-land storage facilities are far from adequate, thus leaving a good part of the fishery resources unexploited.
- (4) Of the total amount of fish landed on St. Vincent, a major portion is discharged at Kingstown. The fish landed at Kingstown are mostly sold at the existing fish market or in neighbouring areas. Compared with the varieties of fish marketed in Kingstown, those sold to the interior are quite limited, and also the quality is much inferior. It is estimated that some 180 tons, which account for 50% of the

total fish haul landed at Kingstown, are sold at the existing fish market. This quantity accounts for 10% of the country's total annual haul (1,810 tons), 15% of the country's total annual consumption (1,250 tons excluding imported fish), and 20% of the total annual consumption on the inland of St. Vincent alone (900 tons excluding imported fish).

- (5) 1,300 tons of salted dry cod are imported from Canada, which is equivalent to the total annual consumption of domestic fish in SVG. From the standpoint of foreign currency saving, there is an urgent need to hold down these imports. Though production of salted dry fish is undertaken in the Grenadines, the processing techniques remain rudimentary. Therefore, it is important to make efforts to improve the fish processing techniques along with attempts to increase hauls and develop markets.
- (6) Fishing in the country is done mostly on boats of about 20' feet in length with outboard engines. Fishing gear in use is not of modern construction, and labour productivity of the fishermen is low. Lack of appropriate landing facilities tends not only to cause fish to be damaged but also to make unloading a time consuming task.
- (7) Most fishing boats at work do not carry ice aboard, and catches often spoil before they arrive at the market. No ice is used at the existing fish market at Kingstown either. It is strongly recommended that the use of ice be made obligatory both to avoid insanitary conditions and to improve the quality of fish.

#### 2-2-2 Present State and Problems of Fish Marketing and Distribution

##### Present State and Problems of Fish Marketing and Distribution

- (1) In order to cope with the existing conditions and problems concerning promotion of the local fisheries industry, it is mandatory to first cultivate markets for the fish, as well as to develop a sound distribution system to support them.

Vigorous efforts need to be made in such areas as the development of inland markets on St. Vincent, the maintenance of the export market in Martinique, and the cultivation of additional export markets, particularly at a time when Martinique, the principal export market for SVG fish production, has begun placing protective restrictions against

fish imports, which will directly affect the livelihood of the fishermen in the Grenadines.

SVG has only a limited number of retail outlets for its fish production, and almost all of those facilities are concentrated in Kingstown where fish are sold mostly at the country's only fish market and, to a lesser extent, over the counter at several supermarkets. There are no equivalent facilities existing in the inland area of the island. When people living there wish to buy fish, they either have to travel down to the nearest fishing village to buy directly from fishermen or depend on nonregular vendors.

- (2) An FAO survey report on SVG fisheries prepared in 1985 recommends that an improved distribution system be created to establish a stable supply of fish to the inland areas of St. Vincent and also to eliminate the poor conditions now rampant at different stages of distribution. The report adds that the development of deep-sea fishing resources is necessary to cultivate new export markets.
- (3) A study report on fisheries promotion in SVG compiled by the CIDA in 1986 identifies the following new markets to be developed:
  - 1) inland market of St. Vincent
  - 2) local markets of the Grenadines
  - 3) export market in Martinique (principal export market at present)
  - 4) export market in St. Lucia (A small quantity of fish is exported from the northern coast of St. Vincent to a fisheries complex in Castries where quality fish is in demand for processing.)
  - 5) export market in Barbados (Since there is a large demand for flying fish in Barbados, St. Vincent might find a good market there.)
  - 6) other potential export markets

The CIDA report also recommends improvements to the distribution system at the stages described below for the development of the above mentioned market. A modernized system is expected to be required for handling, storing and delivering fish as these new markets come into play:

- 1) between the place of landing and the inland consumers.

- 2) between the Grenadines and the markets on St. Vincent, and
  - 3) between the Grenadines and the export markets.
- (4) To provide a sound basis for the above-mentioned development of new markets and improvements to the distribution system, SVG needs to equip itself with proper organizations for development of local fisheries, distribution management and marketing, in addition to improvements in the following areas:
- 1) construction of cold-storage and freezing facilities, fish processing facilities, and landing facilities.
  - 2) construction of minidepots in major village.
  - 3) mandatory use of ice and supply of insulated boxes for fish transportation.
  - 4) initiation of interisland ferryboat services.
  - 5) organizaing agents for warehousing, shipping and marketing.
  - 6) development of fisheries suitable for export.

In SVG, people are quite familiar with salted dry fish but not with frozen fish. Therefore, some attention needs to be paid to determine prices and people's preferences before marketing frozen fish in the country, and to development of freezing techniques.



## 2-3 BACKGROUND AND CONTENTS OF THE REQUEST FOR ECONOMIC AID

### 2-3-1 Background of Current Project

GOSVG asked FAO to formulate a fisheries development programme which aims to increase the total catch through the improvement of fishery facilities and fishing techniques. The Government had also expected that a larger fish catch would contribute to upgrading the living standards of the fishermen, securing a source of protein for the people's diet, and holding down foreign currency payments by decreasing the need for imported fish.

The 1984 ~ 1991 Fishery Development Plan formulated by the FAO in 1984 included a total of 12 projects aiming at the improvement of fisheries-related infrastructure and organizations. Then, the SVG government requested the Canadian government to formulate a new plan based on the FAO plan and also to implement it.

The CIDA, in turn, came up with its 1986 ~ 1992 development plan in 1985, which was followed by the project formulation study. The plan envisaged i) to create organizations and train personnel required for a modern fishing industry, ii) to improve infrastructure for fishermen's use (communal facilities) at 5 locations, iii) to improve the distribution system including the construction of a new fish market at Kingstown, and iv) to evaluate possible socio-economic impact resulting from the implementation of the programme. The plan was to be implemented in two phases, Phase 1 from 1987 to 1989, and Phase 2 from 1990 through 1992.

Above mentioned plan includes a vast aspect of fisheries based on the CIDA's experience in fisheries development in this area.

### 2-3-2 Details of SVG Request for Japanese Aid

On the occasion of his state visit to Japan in May 1986, Mr. Mitchell, the Prime Minister of SVG, sought assistance from the GOJ in the construction of a new food market in Kingstown. Then, the Government of Japan sent an economic cooperation study mission headed by Mr. Iino, Councilor, Survey and Planning Division, Economic Cooperation Bureau, the Ministry of Foreign Affairs to SVG. The mission had discussions with relevant authorities of the GOSVG to study possibilities of Japanese cooperation with SVG in construction of a food market including fish department. The GOSVG finds that a distribution facility for fisheries has a fundamental role in its fisheries development and considering the present conditions of the existing fish market in Kingstown, a new

fish market with fish landing is an urgent need. And, because the new fish market, together with the implementation of the CIDA's programme contributes greatly to the development of the fisheries of the nation. Accordingly, the GOSVG, to implement the fisheries department of the said food market as soon as possible, requested to the GOJ its grant-aid cooperation in the Kingstown Fish Market Construction Project stated below in January 1987 based on the following reasons:

- (1) Kingstown is the capital of the country and it is not only the biggest consuming city in the nation but also is the supply base for the inland areas. Therefore, constructing a new fish market complete with a landing facility in Kingstown shall benefit all the inhabitants of the island through the supply of fish and fisheries products.
- (2) Providing a bus terminal and integrating squatters who are doing small businesses in huts scattered within the project site shall improve the present conditions in and around the project site not only for the convenience of shoppers but also for the vendors to the inland areas.

The request from the GOSVG to the GOJ is construction of

- (1) Fish Market equipped with Cold Storages
- (2) Fish Landing Facility
- (3) Small Shops
- (4) Bus-Terminal and Parking Lot

It was in response to this last request that the Japanese Government dispatched its basic design study team to SVG.

## 2-4 PRESENT SITUATION AND PROBLEMS OF EXISTING FACILITIES

While the present situation and problems of SVG's fisheries, marketing and distribution systems have been discussed in section 2-2, the present section is devoted to specific descriptions of the current situation and problems of the existing fish market and other facilities in Kingstown.

### 2-4-1 Present Situation of Fish Market

- (1) The existing fish market is situated in a reclaimed area of Kingstown, and shares one building with a meat market and an abattoir. The building is a single-story, steel-frame structure in which the fish market with 30 retail stalls, lockers for vendors, washing areas and refrigerator occupies about 300 square meters. These stalls are concrete tables which are separated by wooden frames covered with wire netting from the the passage for shoppers. Transactions between the vendors and shoppers are conducted through openings made in the wire netting. Each vendor is assigned a space of roughly 1.5 m x 1 m on the concrete stalls on which fish are directly placed. Large fishes are cut in round slices to be sold as steaks. These stalls are not furnished with water supply or drainage equipment.

Common sinks are installed at 3 areas located somewhat away from the stalls. The refrigerator is of a prefabricated type which measures 2.4 m by 3.6 m by 2.4 m in width, length and height, respectively. The internal temperature is maintained at around 5°C. This refrigerator is used only to store unsold large fish or fish landed after the market has been closed for the day.

- (2) Problems involved in the existing fish market have been identified as follows:
  - 1) Fish marketed here lack freshness as no ice is in use.
  - 2) The market environment lacks proper sanitation partly due to the building's poor lighting and ventilation.
  - 3) The lack of a proper drainage system within and around the market is another cause of its undesirable unhygienic environment.
  - 4) The storage space in the refrigerator is not being utilized efficiently, and the temperature is not kept at

a level (-4°C ~ 0°C) appropriate for the storage of marine products.

- 5) A vegetable market is also located in the vicinity of the fish market. This area around the fish market is subject to a constant traffic snarl due to a lack of proper parking facilities for the minibuses used by shoppers.

#### 2-4-2 Landing Facilities and Fisheries Infrastructure

- (1) Hauls brought into Kingstown are currently landed either on the rubble stone revetment south of the proposed site or on the beach located about 400 meters away to the west of the site. The revetment, made of rubble stones of one ton or so in weight, cannot facilitate the mooring of fishing boats. As it affords only an insecure footing, the landing of fish there is dangerous and inefficient while the fish landed under such circumstances tend to be subject to damage. It is believed that the lack of proper landing facilities in Kingstown impedes sufficient supply of fisheries products from coming into the largest domestic market.
- (2) The beach about 400 metres west of the proposed site is used by approximately 20 local fishing boats as their base. The only fishery infrastructure installed on the beach is a refueling facility (a fuel tank with a capacity of about 3 kilolitres). There is no particular facility for common use by fishermen working in a group on the beach.

**CHAPTER 3**  
**THE PROJECT**



## CHAPTER 3. THE PROJECT

### 3-1 PURPOSE

The Project aims to construct a new fish market equipped with modern landing, and refrigerating and cold-storage facilities in a reclaimed area on the coast of the city of Kingstown, as well as to improve the country's distribution systems and facilities. These endeavours are expected not only to promote SVG's fisheries but also to bring about a stable supply of good quality marine products, thereby contributing to upgrading living standards and to the development of the country's economy as a whole.

In addition, the Project is also expected to contribute toward the improvement of the traffic and sanitation conditions in the areas surrounding the proposed site, since the Project encompasses the construction of such ancillary facilities as small shops, a bus terminal and so forth for the convenience of shoppers and vendors as part of the new market complex.

### 3-2 REVIEW OF CONTENTS OF THE REQUEST

Of the above facilities, the construction of the fish market and landing facility is of the utmost necessity for the reasons mentioned under sections 2-4 and 3-1, Purpose. On the project site, however, there are some businessin shacks presently engaged in selling snacks and beverages for the convenience of shoppers and vendors . Also, as stated in the section 2-4, many buses and minibuses servicing shoppers and vendors gather here and it is so congested that it is not only dangerous to pedestrians but also inconvenient for vendors to carry fish to inland areas. The traffic to the market is expected to increase much more in future because hotel and restaurant purchasers, people who come in motorcars and vendors with light trucks will start to come to this fish market. To let these cars park on Bay-Street shall just increase the traffic congestions there.

Therefore, providing bus terminal and parking lot within the project site and integrating scattered small shops are also important for the convenience of shoppers and vendors at the fish market, and to keep a safe and tidy environment.

As seen above, the contents of the request were sound and reasonable on the whole. However, there were a few areas

regarding the scale and functions of the proposed fish market facilities that required further study. After consultations with GOSVG during the stay of the basic design study team, partial amendments have been made to the request. The outline of the Project described in the following section represents the outcome of these studies and consultations.

### 3-3 OUTLINE OF PROJECT

#### 3-3-1 Facility Planning

In this section, the scale of the fish market and landing facilities (quay and jetty) are examined.

Future haul quantity, consumption and handling volumes of the planned fish market necessary for the facility planning were determined in consultation with relevant authorities of the GOSVG, based on the fundamental figures stated in NFDP and CIDA's report.

#### (1) Future Haul Quantity, Consumption and Handling Volume at the Fish Market

GOSVG's NFDP is prepared based on CIDA's report which aims at a haul of 6 Million pounds (2,720 tons) in 1994, the last year of the 1989 ~ 1994 Development Plan.

Table 3-1 and Figure 3-1 show the estimated quantity of consumption, export, import and handling volumes at the fish market.

The premises of this estimation are as follows:

- 1) The quantity of haul is as described in CIDA's report
- 2) Total quantity of consumption including imported processed fish shall grow along with the population growth ratio.  
(1987 population 112,500, population growth ratio 1.2% per annum, estimated 1994 population 122,400, or 1.088 times to that of 1987)
- 3) Future increase in quantity of consumption excluding imports is the same as the increased quantity of the catch stated in 1) above.



- 4) Future increase in volume of consumption at St. Vincent is the same as the volume stated in 3) above.
- 5) All the increased volume stated in 4) above is to be handled at the Kingstown Fish Market
- 6) From 4) and 5) above, the Kingstown Fish Market shall handle 60% of the total consumption in St. Vincent excluding imported processed fish.
- 7) Future volume of imported processed fish shall become 40% of the present volume based on 2) and 3) above.
- 8) Future volume of exported fish shall remain equal to that at present.

Table 3-1 VOLUMES OF TOTAL HAULS, CONSUMPTION AND HANDLING AT FISH MARKET

	a. Present per Annum	Future (1994)		
		b. Total Volume	Per Day	ratio (b/a)
1) Total Hauls	1,810 t (4.00 m lbs)	2,720 t (6.00 m lbs)	9 t (0.02 m lbs)	1.5
2) Total Consumption inc. Imports	2,500 t (5.52 m lbs)	2,720 t (6.00 m lbs)	9 t (0.02 m lbs)	1.1
3) Total Consumption exc. Imports	1,250 t (2.76 m lbs)	2,160 t (4.76 m lbs)	7 t (0.016 m lbs)	1.7
4) Total Consumption exc. Import at SV	900 t (2.00 m lbs)	1,810 t (4.00 m lbs)	6 t (0.013 m lbs)	2.0
5) Handling Volume at Fish Market	180 t (0.40 m lbs)	1,090 t (2.40 m lbs)	3.6 t (0.008 m lbs)	6.0
6) Rate 5) / 4)	20%	60%		3.0
7) Total Imports	1,250 t (2.76 m lbs)	560 t (1.24 m lbs)	1.9 t (0.004 m lbs)	0.4
8) Total Exports	560 t (1.24 m lbs)	560 t (1.24 m lbs)	1.9 t (0.004 m lbs)	1.0

Source: CIDA Report

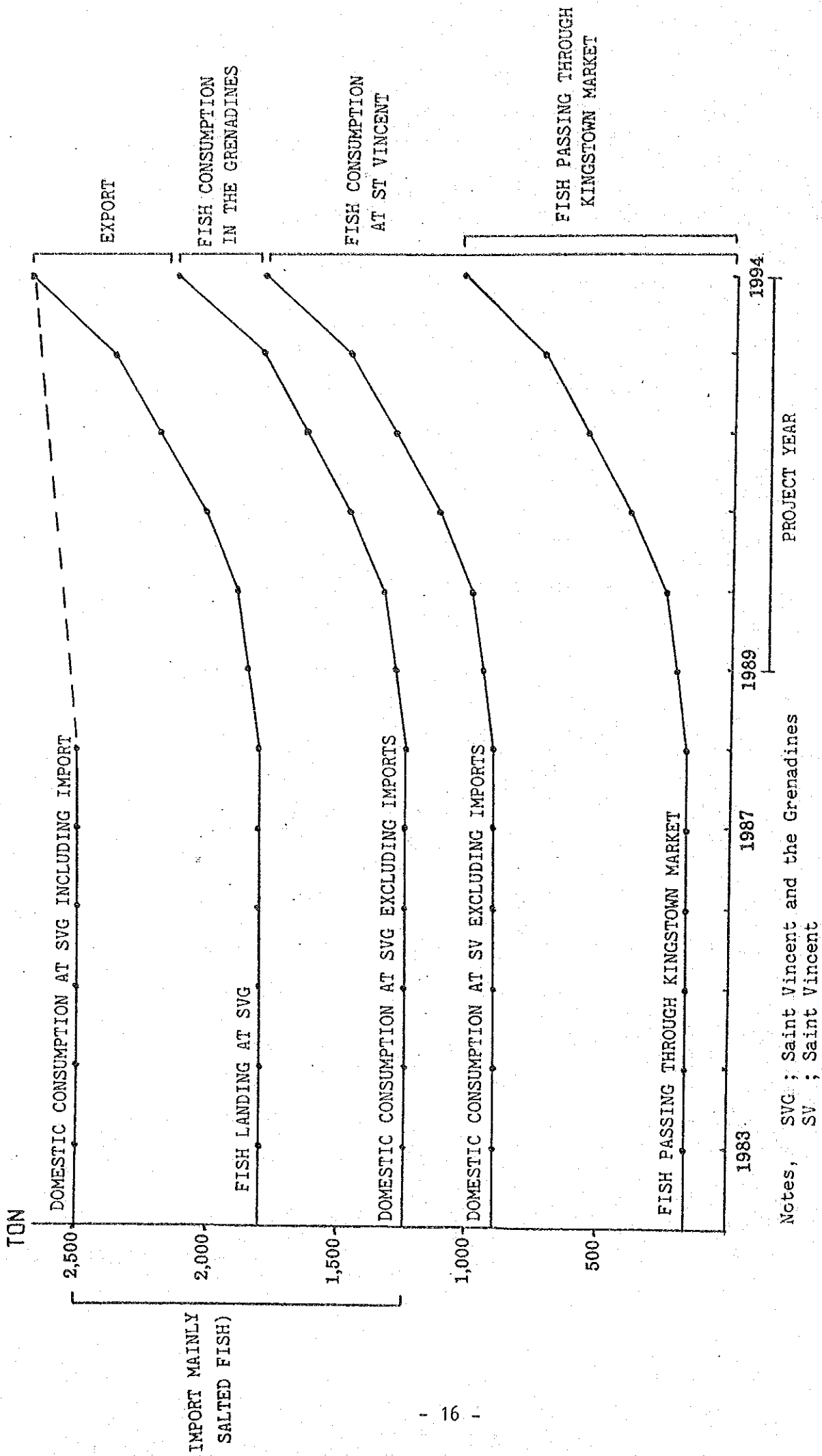


FIG. 3-1 PROJECTION OF VOLUMES OF FISH LANDING AND CONSUMPTION

(2) Future Volume of Flow and Storage at the Kingstown Fish Market

In this section, the future volumes of flow and storage at the Kingstown Fish Market are examined.

The volume of flow in the Kingstown Fish Market is computed as 8,000 lbs per day based on the premises stated in the proceeding section. However, seasonal fluctuation, with the peak during February to June, should be taken into consideration in determining the scale of the facility.

The following are maximum and average volumes of future flow at the Kingstown Fish Market which are computed based on the monthly sales data of the existing fish market. Also the basis for deciding the scale of major facilities within the market is stated here.

1) Flow within the Market

The diagram below shows the flow within the market.

- 2) Figure 3-3 shows the monthly fluctuation of handling volume at the existing Kingstown fish market. Supposing that the future fluctuation of handling volume follows the existing tendency, the future average and maximum handling volume shall be,

Average : 8,000 lbs per day (in 1994)

$$\begin{aligned} \text{Maximum} & : 8,000 \text{ lbs/d} \times \frac{\text{present maximum (19.0 t/m)}}{\text{present average (14.0 t/m)}} \\ & = 11,100 \text{ lbs /on day (in 1994)} \end{aligned}$$

3) At Bargaining and Processing Area

The landed fish shall be brought to the stalls, processing area and cold stores within the market or sold to vendors after passing through the bargaining area. The scale of the bargaining and processing areas should be enough to handle the figures stated in 2) above.

4) Storage Volume of Chill Room

Expecting that all future landed volume per day should be stored in the chill room, a maximum storage capacity equivalent to two (2) days' landed volume shall be secured.

Average storage volume :  $8,000 \text{ lbs/d} \times 2 = 16,000 \text{ lbs}$   
(1994)

Maximum storage volume :  $11,100 \text{ lbs/d} \times 2 = 22,000 \text{ lbs}$   
(1994)

5) Processing and Storage Volume of Blast Freezer and Cold Storage

To stabilize the supply volume and the cost of fish against the seasonal fluctuation of the catch, it is necessary to store the surplus supply during the peak fishing season.

Figure 3-3 shows that fish suited for frozen storage are mainly caught between February and May.

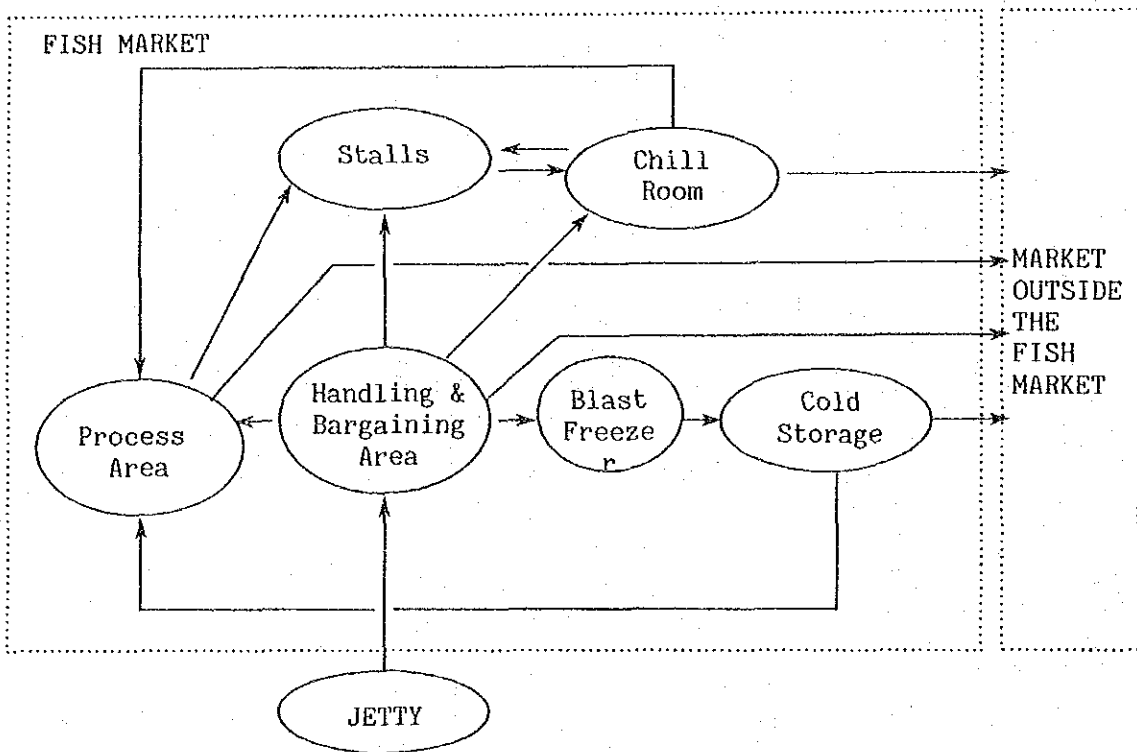
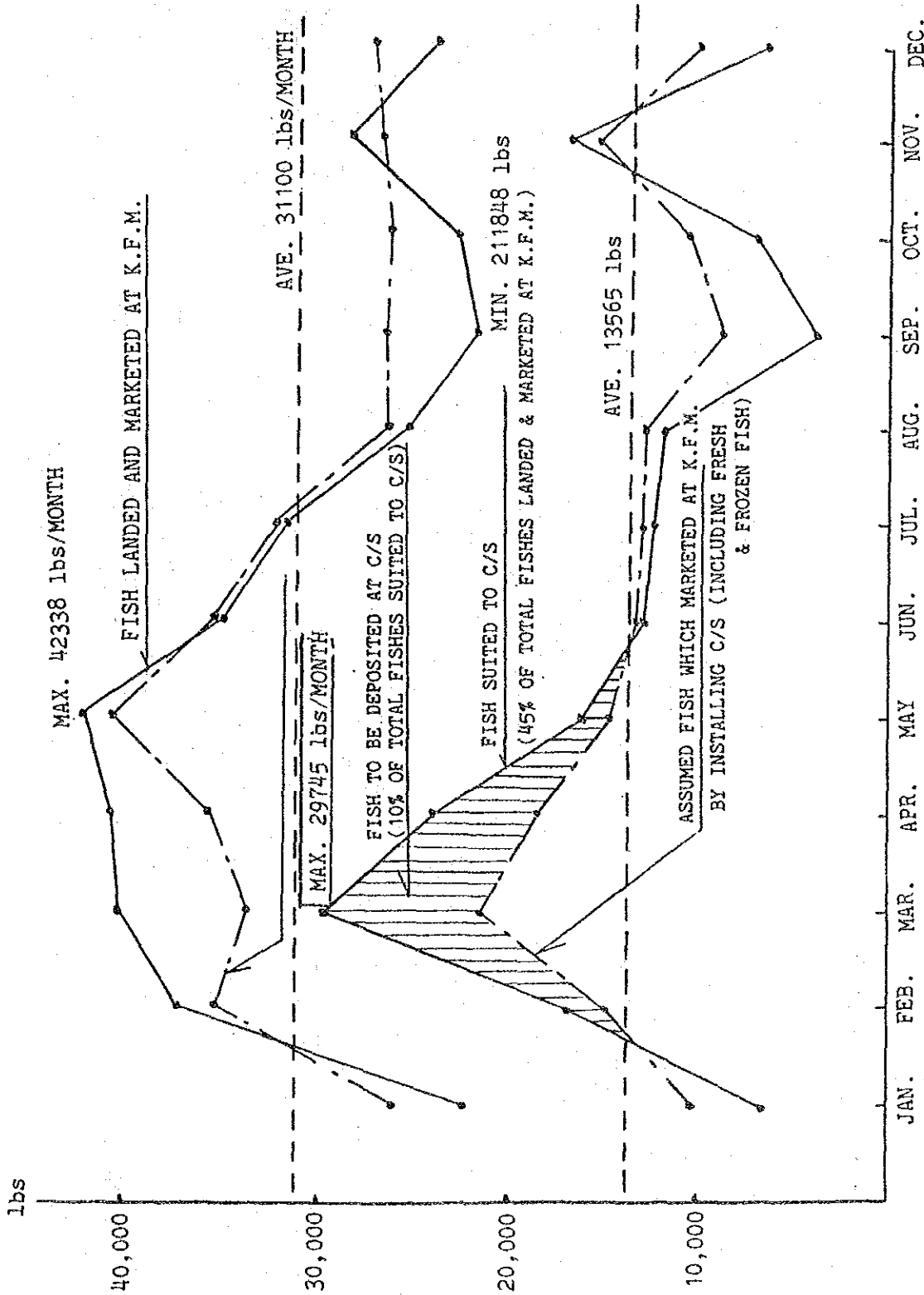


Fig. 3-2 FLOW ON FISH IN THE FISH MARKET



Notes, C/S ; COLD STORAGE  
K.F.M ; KINGSTOWN FISH MARKET

Fig. 3-3 DATA ON VOLUMES OF FISH LANDED AND MARKETED AT THE KINGSTOWN FISH MARKET (1986)

a) Processing volume of blast freezer

The volume of fish to be processed by the blast freezer for cold storage shall be, counting some extras, about half of the volume of the fish suited for cold storage which is about 45% of the total landed catch.

Average processing volume = future average  
(8,000 lbs/d) × ratio suited for cold storage (0.45)  
× 1/2 = 1,780 lbs/day (1994)

Maximum processing volume = 1,780 lbs/days ×  
maximum volume suited for cold storage (29,800 lbs)  
= 4,000 lbs/day (1994)

b) Storage volume of cold storage

It is assumed that the annual haul of fish suited for cold storage is about 1.1 m lbs.

Future handling volume (2.4 m lbs/a) × ratio suited for cold storage (0.45) = 1.1 m lbs per annum

Within this volume of haul, the volume shaded on Fig. 3-3 (about 10%) shall be actually frozen for storage. The annual volume of frozen storage shall be 0.11 m lbs (1.1 m lbs/a × 0.1 = 0.11 m lbs/a).

Considering that the storage shall rotate two (2) times a year, the necessary capacity of cold storage is 0.15 m lbs.

Incoming volume 0.11 m lbs/a ÷ 2 rotations per year = 0.055 m lbs

(3) Scale of Major Fish Market Facilities

In this section, the scale of major facilities in the fish market shall be computed based on the flow and maximum storage volume discussed in the preceding section.

Major facilities to be discussed here shall be,

- 1) Bargaining Area
- 2) Processing Area
- 3) Chill Room

- 4) Blast Freezer
- 5) Cold Storage
- 6) Ice Machine and Storage
- 7) Stalls for retail selling
- 8) Lockers for Vendors (stalls' owners)
- 9) Offices
- 10) Truck Parking
- 11) Fuel Supply Facility
- 12) Others

The scale of each facility mentioned above is computed as follows:

1) Bargaining Area

$$S = \frac{N}{R \cdot a \cdot P} = \frac{5.0 \text{ t/d}}{0.055 \text{ t/m}^2 \times 0.5 \times 0.15} = 133 \text{ m}^2$$

where S : bargaining area (m<sup>2</sup>)  
 N : planned maximum handling volume (5 t/d)  
 R : handling volume per unit area (0.05 t/m<sup>2</sup>)  
 a : effective ratio (0.5)  
 P : rotation of usage (1.5 times/d)

2) Processing Area

$$A = \frac{K \times L}{P} = \frac{5.0 \text{ t/d} \times 40 \text{ m}^2/\text{t}}{1.5} = 133 \text{ m}^2$$

where A : area for processing (m<sup>2</sup>)  
 K : maximum processing volume (5 t/d)  
 L : necessary area for processing (40 m<sup>2</sup>/t)  
 P : rotation of usage (1.5 times/day)

3) Chill Room

$$B_1 = \frac{Q_1}{E} \times \frac{F_1 \times F_2}{H} = \frac{10 \text{ t}}{0.4 \text{ t/m}^3} \times \frac{1.2 \times 1.5}{2.2} = 20 \text{ m}^2$$

where B<sub>1</sub> : area of chill room (m<sup>2</sup>)  
 Q<sub>1</sub> : planned maximum capacity of (10 t/d)  
 E : capacity per unit volume (0.4 t/m<sup>3</sup>)  
 F<sub>1</sub> : allowance for passage in chill room (1.2)  
 F<sub>2</sub> : allowance for cooling unit, etc. (1.5)  
 H : effective height (2.2 m)

4) Blast Freeze

To freeze 4,000 lbs of fish averaging 11 lbs a piece (27" x 6" x 4 1/2" in length, height and width) with freezing pan, a shelf 5 m long, 1.6 m high and 1 m deep is necessary. Providing work and air-flow space in-front and behind this shelf, the size of the deep freezer shall be 3 m x 6 m (height 2.2 m).

5) Cold Storage

$$B_3 = \frac{Q_2}{E} \times \frac{F_1 \times F_2}{H} = \frac{25 \text{ t}}{0.4 \text{ t/m}^2} \times \frac{1.2 \times 1.5}{2.2} = 50 \text{ m}^2$$

where  $B_3$  : area of cold storage ( $\text{m}^2$ )

$Q_3$  : planned maximum capacity (25 t/d)

$E, F_1, F_2, H$  : same as above

6) Ice Machine and Storage

There is a privately owned ice manufacturing plant with 6 tons per day capacity at Kingstown. However, taking an increase of total haul volume into account, a new fully automatic ice manufacturing machine and storage facility within the new fish market are necessary to provide ice for fishermen and vendors.

$$I = N \times 2/3 = 5.0 \text{ t/d} \times 2/3 = 3.5 \text{ t/d}$$

where  $I$  : ice manufacturing capacity (t/d)

$N$  : planned maximum volume handled in the market

$$U = I \times 5 \text{ days} = 3.5 \text{ t/d} \times 5 \text{ d} = 17.5 \text{ t}$$

where  $U$  : ice storage capacity

$I$  : ice manufacturing capacity (3.5 t/d)

7) Retail Market

$$W = C \times D + G$$

$$= 30 \text{ stalls} \times 4 \text{ m}^2/\text{stall} + 2 \times (30 \text{ stalls} \times 4 \text{ m}^2/\text{stall}) = 360 \text{ m}^2$$

where  $W$  : retail market area ( $\text{m}^2$ )

$C$  : number of stalls (30)

$D$  : unit area per stall

$G$  : reserve for passage and future expansion



#### 8) Vendors' Lockers

$$Y = C \times D + G = 30 \times 1.5 \text{ m}^2/\text{locker} + 40 \text{ m}^2 = 85 \text{ m}^2$$

where Y : locker room area (m<sup>2</sup>)

C : number of lockers (i.e. stalls) (30)

D : unit area of a locker (1.5 m<sup>2</sup>/locker)

G : reserve for passages (40 m<sup>2</sup>)

#### 9) Offices

For the administration and operation of the fish market and the Fisheries Division which shall move into the market later for easy access to and for fishermen, the following offices shall be provided:

##### (Marketing Corporation)

- Manager
- Assistant Manager cum Accountant
- Marketing Officer
- Operating office

##### (Fisheries Division)

- Chief Fisheries Officer-
- Extension Service Officer
- Board Room
- Laboratory
- Open Office (common)
- Lavatory

#### 10) Truck Parking

For the use of trucks transporting fish from the market to the inland area, a truck park shall be provided adjacent to the bargaining area. Judging from the present frequency of transportation (2-3 trucks a day) not so large a parking area appears to be necessary.

#### 11) Fuel Supply Facility

Though a fuel supply facility with a 3 kiloliter fuel tank is located at the shore about 400 meters west from the fish market for about 20 Kingstown fishing boats (20' class), it is deemed necessary to provide another fuel supply facility at the new landing facility which is expected to be used daily by thirty four (34) 20' class and three (3) 60' class fishing boats.

Therefore a petrol supply facility for fifteen (15) 20' class fishing boats which come here other than from

Kingstown (tank capacity 2.5 kilo-liter) and a diesel fuel supply facility for 60' class fishing boats shall be provided. For the computation of the diesel oil tank capacity, the following requirements were considered:

- a. Supply for one way consumption (about 350ℓ) of three 60' class fishing boats a day between Kingstown and Martinique via the Grenadines,
- b. Storage for two (2) days volume of supply,
- c. Storage for three (3) days consumption (1500ℓ) of the emergency generator,

hence the total capacity of the diesel fuel tank shall be 4,000 liters.

#### (4) Landing Facility

##### 1) The Field Survey

A field survey was conducted to collect data on the number of arriving fishing boats at the existing fish market per hour and the volume of their haul for designing the landing facility.

The field survey was conducted for 12 hours on 13th April 1987 (Mon.) at the landing place for the existing fish market.

Table 3-3 shows the results of the field survey and Fig. 3-4 and 3-5 are a summary of the survey in number of arriving boats per hour and "volume of haul by boat".

The total number of boats arriving on that day was 17 and the total haul was 2,779 lbs (1.3 tons). The peak time of arrival was 15:00~16:00 hours with the peak ratio of 30%. 40% of the boats had catches less than 45 kg per boat, and 80% of the boats caught less than 90 kg per boat resulting in an average of 163 lbs (74 kg) per boat.

Table 3-3 NUMBER OF ARRIVING FISHING BOATS AND  
THEIR VOLUME OF HAULS BY HOUR

Arrival Time of Fisher Boat	Number of Boats Arriving	Weight of Fishes (lbs)	Total
07:00~08:00 AM	1	250	250
08:00~09:00	-		
09:00~10:00	2	60, 56	116
10:00~11:00	-		
11:00~12:00	-		
12:00~13:00 PM	1	68	68
13:00~14:00	4	70, 120, 100, 74	364
14:00~15:00	3	390, 670, 192	1,252
15:00~16:00	5	244, 109, 70, 160, 46	629
16:00~17:00	1	100	100
17:00~18:00	-		
18:00~19:00	-		

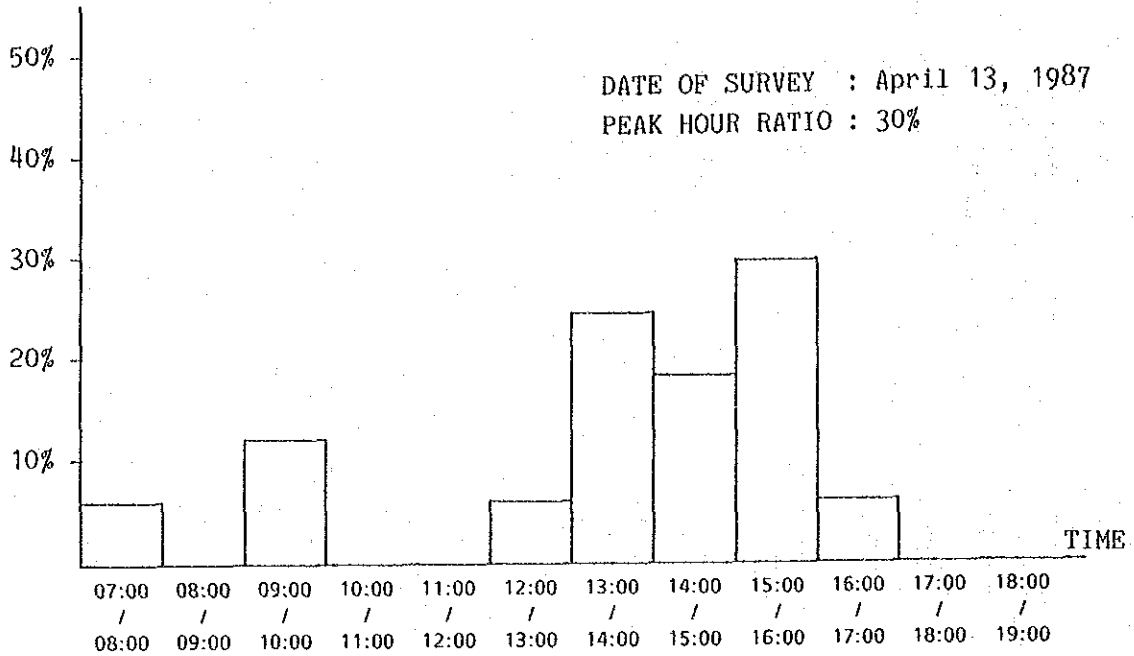


Fig. 3-4 NUMBER OF ARRIVING FISHING BOATS BY HOUR

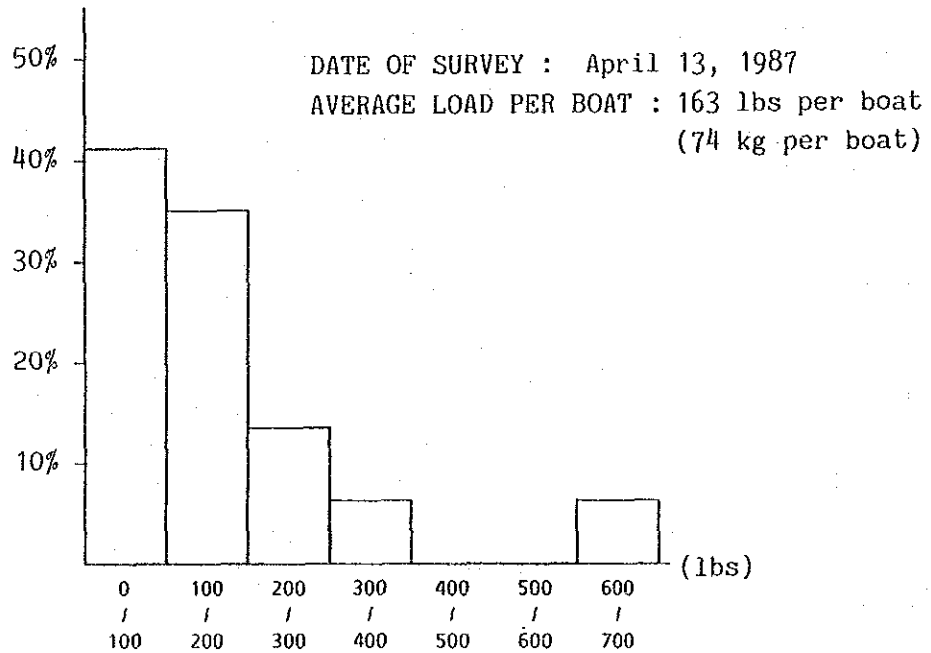


Fig. 3-5 VOLUME OF HAULES BY BOAT

2) Number of Boats at the Kingstown Fish Market in the Future.

Most of the fishing boats in SVG are 20' class outboard engine canoes, however, in NFDP the GOSVG is planning to

introduce 60' class boats for the shipment of fish from the Grenadines to Kingstown. Also, the GOSVG is planning to require foreign fishing boats operating within 200 nautical miles of SVG to unload part of their catch at Kingstown as an obligation. Therefore the landing facility should be designed also to accommodate boats larger than 20'.

In this light, the number of berths for fishing boats by size is estimated for a haul of 5 tons per day based on the assumption that;

- a) 20' class boats will land 5,555 lbs/day
- b) 60' class boats will land 5,555 lbs/day

the number of fishing boats to arrive at the Kingstown Fish Market is computed based on the above and data from the field survey which shows that the average landing volume of one 20' class fishing boat is 74 kg, and 1 ton for a 60' class boat.

- a) 20' class boat  
 $5,555 \text{ lbs/day} \div 163 \text{ lbs/boat} = 34 \text{ boats/day}$
- b) 60' class boat  
 $5,555 \text{ lbs/day} \div 2,222 \text{ lbs/boat} = 3 \text{ boats/day}$

Taking the 30% peak ratio into consideration, the number of boats arriving at peak hours is computed as follows:

- a) 20' class boat peak hour arrival  
 $34 \text{ boats/day} \times 0.3 = 10 \text{ boats/hour}$
- b) 60' class boat peak hour arrival  
 $3 \text{ boats/day} \times 0.3 = 1 \text{ boats/hour}$

### 3) Computation of number of berths

- a) 20' class boats

Hauls by small boats are landed with baskets or fish by fish, requiring rather a long time for landing.

For computing the number of berths for 20' class boats, the following were taken into consideration:

- i) time for landing is 15 minutes per boat with some additional allowance

ii) from 1) above, a berth can accommodate 4 boats per hour

hence the number of berths is,

$$10 \text{ boats/hour} + 4 \text{ boats/hour} = 3 \text{ berths.}$$

On the other hand, berths for re-fueling, preparing for the next sailing and for idle boats are necessary at this landing facility. For these purposes 7 extra berths, the difference between number of arriving and landing boats, shall be provided.

$$\text{Total number of berths } 3 + 7 = 10$$

b) 60' class boat

The peak number of arrival of 60' class boat is one (1), and this number is deemed enough including re-fueling and idle time.

### 3-3-2 Project Site

(1) Location

The project site is located in a reclaimed area situated at the center of downtown Kingstown facing the sea. It lies to the sea side of Bay Street in between Melville Street and Bedford Street as shown in Fig. 3-6.

The site is about 145 m long and 75 m wide, and is almost flat. It is about 2 m above Mean Low Water Spring Tide (M.L.W.S.T.) level.

(2) Setting

At the northwest part of the project site, facing Bay Street, there exists a fish market, a meat market, an abattoir and a privately owned warehouse. Also, squatters' huts used for their small businesses are scattered within the project site.

The south side of the project site is a rubble stone revetment about 3 m high from M.L.W.S.T. The reclamation of this area was done between 1970 and 1972 by dredging sand from the seabed. This revetment was repaired after receiving damage from a hurricane in 1980.

The sea is rather deep at -5~-7 m below M.L.W.S.T. around the site. 20' class fishing boats are using the revetment for landing their catches.

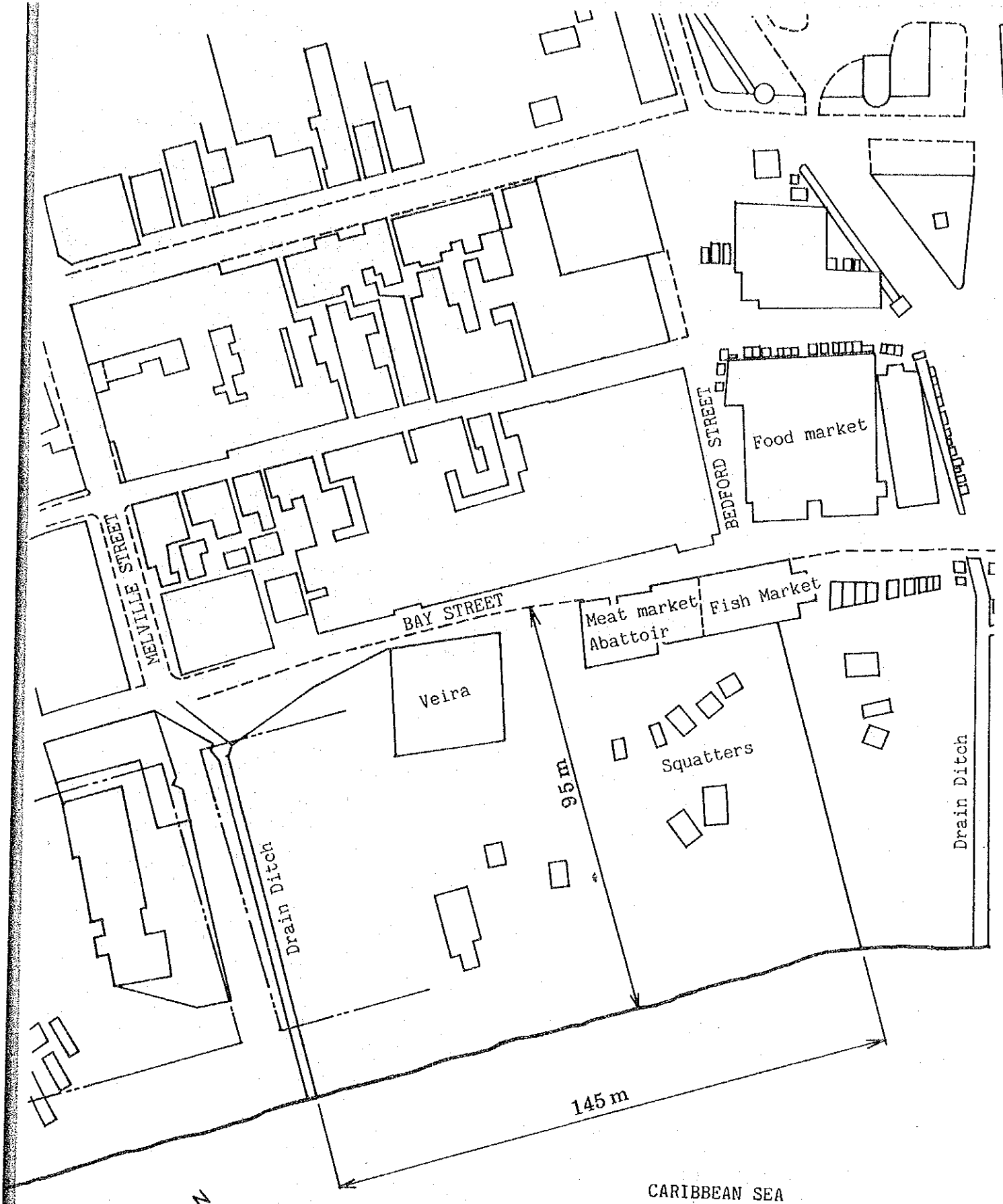


Fig. 3-6 LOCATION OF PROJECT SITE

### (3) Soil Conditions

Results of boring tests at the project site are as follows:

- a) On the land  
From ground surface to a point 6 meters under the ground is loose sand with around 5 N-valve and from that level to 20 meters deep is medium hard sand with around 15 N-valve.
- b) Under the sea  
10 to 15 meters deep from the seabed is loose sand with 3 to 10 N-valve. Under this sand, there is firm soil with more than 50 N-valve.

### 3-3-3 Outline of Facilities and Equipment

The following facilities and equipment are found necessary to achieve the aims of the project in the most appropriate and effective manner after studying the scale of required facilities taking the requirement of the GOSVG into consideration.

#### (1) Outline of Facilities

- 1) Fish Market:  
Vendors' stalls and Lockers (30 ea.), Handling and Bargaining Area, Processing Area, Chill Room, Cold Storage, Blast Freezer, Ice Machine and Ice Storage, Offices
- 2) Jetty:  
10 Berths for 20' class and 1 Berth for 60' class fishing boats with Water and Fuel Supply Facilities
- 3) Small Shops:  
Food Beverage Shops (20), Dry Goods Shops (15), Public Toilet, Garbage Storage
- 4) Bus Terminal and Parking:  
Bus terminals and Parking Lots, Pavement, Drainage
- 5) Parking Lot (future food market site):  
Light duty Pavement, Drainage
- 6) Other Infrastructure:  
Water Supply Main including High Raised Tank and



Reservoir, Sewage System, Power Supply Main and  
Communication System within the Site

(2) Outline of Equipment

- 1) Fish Market:  
Insulated Boxes, Processing Tables, Dollies, Weight  
Balances etc.
- 2) Quality Control:  
Equipment for Quality Control

3-3-4 Responsible Organization and Management System

- (1) The Central Planning Unit of SVG's Ministry of Finance, Planning and Development shall be responsible for communication and coordination with the Japanese Government. After the conclusion of the Exchange of Notes, the Central Planning Unit shall represent GOSVG for the various contracts to be entered into with the Japanese side with respect to the present project. Further the CPU shall also act as a coordinator in the implementation of the project.

After the completion of the project, the following organisations shall be responsible for each facility with regards to administration, maintenance and operation:

- 1) Fish market : Marketing Corporation
- 2) Small Shops : Kingstown City Board
- 3) Busterminal and Parking lot : Police Department
- 4) Public Toilet : Ministry of Health

- (2) The Central Planning Unit is familiar with the present project because it is responsible for all development project in SVG.

It also showed a comprehensive understanding of the Japanese grant-aid system with its experience as an executing agency in foreign assistance projects in SVG.

- (3) The Marketing Corporation was established in June 1975 under 1975 Order No. 26, as a subsidiary to the Ministry of Trade, Industry and Agriculture.
- (4) The Marketing Corporation has experience in the importation of salted dry cod and some frozen fish as well as in the maintenance, operation and management of the facilities related thereto, however, a new department has to be

organized within the Corporation for the administration, maintenance and operation of the fish market.

3-3-5 Staffing Plan

Taking the characteristics of the fish market into consideration, the following staff are deemed necessary for the new department for administration, operation and maintenance. However, personnel, accounting and general administration of the staff shall be taken care of by the Corporation headquarters.

Position	Duty
General Manager	Management, Marketing
Assistant Manager cum Accountant	Assisting the Manager, accounting, purchasing and sales
Marketing and Facility manager	Supervision of bargaining, purchasing and sales, daily maintenance of facilities
Cold Storage Manager	Management and operation of Chill Room, Blast Freezer, Cold Storage and Ice Machine & Storage
Secretary	General Manager's secretary
Worker	Marketing, Cold Storage, Re-fueling etc.

The number of staff for each position shall be one (1), however, the position of Cold Storage Manager shall remain vacant till 1994, at that time another Worker shall be employed.

**CHAPTER 4**  
**BASIC DESIGN**



## CHAPTER 4: BASIC DESIGN

### 4-1 BASIC POLICY

In view of the different nature of each facility to be constructed under the present project, individual descriptions of design policy for the market building, small shops, and infrastructure including the jetty are given, in addition to common considerations applicable to all of them.

#### (1) Common Considerations

- a. Though it is true that aggregate is the only construction material that is produced domestically, the project shall employ, wherever possible, the materials with which the local construction industry is familiar.
- b. The project shall be planned in a way that will require minimum use of construction machinery.
- c. The project plan shall also take into account the climatic, geographical and other natural conditions of the site, such as hurricanes and proximity to the coast.
- d. Though the plan certainly takes into account possible future expansion of the facilities, the size of each facility shall be such that it will be most appropriate for the anticipated activities in NFDLP.

#### (2) Fish Market

The design policy for the market building must, first of all, take account of this facility's nature. That is, the fish market is expected to become a busy place where various groups of people, such as shoppers, vendors, fishermen, administrators and officials, will be going in and out. Sanitation is another important requisite for a place that deals with food. The design of the fish market shall meet the following requirements:

- a. The building shall be one which is relatively insusceptible to contamination and easy to clean, so that a sanitary environment will be maintained at all times.
- b. Efforts shall be made, in the design stage, to hold down the operating costs of the market. For example, refrigerating and freezing facilities require a large

amount of electric power, and the power consumption is subject to seasonal fluctuations as well.

(3) Small Shops

- a. These stores shall be of hygienic construction since a good part of them will be providing food and beverage services.
- b. In order to attract general shoppers, the stores shall be designed in a way that will create a comfortable and pleasant atmosphere as well as a clean environment.

(4) Jetty

- a. Because a jetty should be able to withstand for great force such as high waves, seismic forces and berthing boats, the structure of the jetty shall be designed for soundness and maintenance-free construction.
- b. The structural system shall be free for future extension to cope with changes in the size and shape of arriving boats.
- c. The connection of the jetty to the existing revetment shall be designed to be strong enough to withstand the high waves during a hurricane.

(5) Other Facilities within the Project Site

- a. The location of buildings within the project site shall be arranged taking future plantation and gardening works by the GOSVG into consideration to create a pleasant atmosphere at the centre of downtown Kingstown.
- b. The busterminal shall be designed for the smooth flow of buses, and the pavement shall be of the same type to public roads.
- c. The site for the future food market shall be paved with light duty type pavement to prevent dust and for public temporal use as a parking lot.
- d. Drain ditches shall be designed for the smooth flow of water and easy maintenance.

## 4-2 REVIEW OF DESIGN CONDITIONS

### 4-2-1 Natural Conditions

#### (1) Earthquakes

Owing to its location on the Caribbean Sea Plate, SVG is situated in one of the world's most active seismic belts. Although specific data is not available, historical accounts indicate that the country has been frequently subjected to earthquakes with magnitudes of, presumably, 5 to 6 on the Richter Scale. The Soufriere Volcano on the island of St. Vincent erupted in 1979 and caused much damage to the country's economy. Therefore, the design of the facilities shall pay due attention to these conditions so that damage to the facilities would be kept to a minimum in the event of an earthquake or volcanic eruption.

#### (2) Hurricanes

Though SVG is generally off the route of hurricanes spawned in this part of the Caribbean Sea, it has been hit once every few years. The rubble stone revetment at the proposed site was destroyed by a hurricane in 1980.

#### (3) Rainfalls

The climatic conditions of SVG belongs to the tropical weather divided into a rainy season (July - November) and dry season (December to June). Annual rainfall is measured as 2,000 mm. Rainfall intensity used by Public Works Department at drainage systems design is 75 mm/hour.

#### (4) Marine Conditions

The tidal difference at SVG is about 20 cm. The prevailing wind direction is from north-east. Since the mean wind velocity is about 5 m/sec, the sea is calm around the project site except when a hurricane hits the SVG area.

#### (5) Contamination

Because of its proximity to the sea, building and equipment materials should be chosen carefully for the salt contamination.

#### 4-2-2 Soil Conditions

The proposed sit for the construction is situated in an area that was reclaimed about 15 years ago. The outcome of the boring test conducted at the site is shown in Appendix-4.

The planned market building is a reinforced-concrete structure. Most of the building is single-storied with a roof height of about 7.5 m, and the remaining section is two-storied. The soil has enough strength to support such a building.

As indicated by the survey results in Appendix-4, there exists firm soil under the sea-bed which is strong enough to support the piers of the jetty.

#### 4-2-3 Relevant Laws and Standards

- (1) There is no particular construction related law applicable in SVG other than the Eastern Caribbean Uniform Code which prescribes regulations regarding earthquakes and wind loads.

In many of the projects undertaken with foreign assistance, the assisting countries' laws and regulations per se are applied.

- (2) The general standard in use in SVG is the British Standard while the assisting country's standard may be used in foreign-assisted projects.
- (3) As for public works such as road pavement, kerbs, etc., there are standards set by the country's Public Works Department.
- (4) SVG does not require registered licenses of architects and contractors working for tied foreign aid programmes.
- (5) In SVG, official verification of architectural designs is under the charge of the Central Planning Unit. As far as the present project is concerned, therefore, our counterpart's approval of the designs represents the official approval.

#### 4-2-4 Construction Industry

- (1) Building Materials

SVG has no raw materials for use in the construction of buildings, other than natural volcanic rock, sand, and gravel. The only domestically manufactured building materials are concrete blocks and cement pipes for drainage



use. All other building materials including cement, reinforcement bars and timber are imported. The local market has small-diameter reinforcing rods, cement, paint, hardware, electric wire, pipe, appliances and fixtures, etc. in stock.

Most materials necessary for the construction works of the present project can be procured locally, however, quality and availability of materials should be studied further.

(2) Construction Machinery

The Public Works Department owns some basic machines including small bulldozers, trucks and so forth. Private construction firms possess trucks, forklifts, etc., too. However, heavy duty construction machinery has to be brought in from Barbados or Trinidad and Tobago.

(3) Construction Firms

There are three major construction firms which can undertake concrete structure buildings of 3 to 5 stories. When it comes to the construction of submarine structures, however, they do not have any experience or proper construction machines. Hence, the present project will have to use qualified firms from Barbados or Trinidad and Tobago as subcontractors.

As for electrical works, there are two local companies which are capable of executing electrical works in reinforced concrete buildings.

There is no established local company specializing in plumbing works, which is carried out by one-man businesses in SVG.

As for air-conditioning equipment and freezers, there is one local agency representing a Japanese manufacturer. The agency is well capable of installing room air conditioners of the window unit type. Regarding refrigerators and freezers, a Japanese manufacturer shall be employed for the construction of these facilities.

#### 4-3 BASIC DESIGN

##### 4-3-1 Site Plan

The site provided for the project by the GOSVG is located on a reclaimed area, the south side of Bay Street between Bedford Street and Melville Street. The west side boundary of the site is an existing drainage canal, and the east side boundary was decided in accordance with the followings:

- a. Access to the project site from Bay Street shall be made between the existing abattoir and timber warehouse.
- b. The new fish market (48 m long) shall be located to the east side of the above mentioned access.
- c. Therefore, the east side boundary of the project site is set 52 m east from the western corner of the existing abattoir. 52 m was decided adding 4 m to the expected length of the new fish market, which is 48 m.

The northern boundary is Bay Street and the existing buildings.

The basic allocation of buildings within the project site were made according to the plan prepared by the GOSVG.

##### (1) Fish Market

The fish market shall be located to the east side of the main access road into the site from Bay Street.

To the south of the fish market, the jetty for fish landing, and the truck parking lot for vendors especially for inland transportation, are to be located.

##### (2) Jetty

The jetty shall be located so that it has a straight connection to the bargaining area of the fish market for the easy transportation of hauls.

##### (3) Bus Terminal

Passenger platforms shall be on the East-West direction for the smooth flow of buses which enter the site from the east side and exit from the west side in accordance with the one-way traffic of Bay Street.

To the south of the bus terminal, a parking lot for sedans and taxis shall be provided for the convenience of shoppers at the fish market.

(4) Small Shops

The fundamental location of small shops are in accordance with the GOSVG's plan. A wide space shall be provided in front of the shops to create a pleasant atmosphere by the planting of trees by the GOSVG in future.

4-3-2 Building Plan

(1) Floor Plan

The floor plan of the market shall be a simple one, and due regard shall be paid to ease of construction, saving of construction costs, and future expansion to the north.

In view of the overall flow lines of both people and goods in the site, and entrance for general shoppers visiting the market shall be located on the western side of the site facing the bus terminal, while merchants and fishermen bringing in their hauls shall use separate entrance to be situated on the southern side facing the jetty.

The retail section of the market catering to the general public shall have an arrangement plan for stalls that will provide not only a smooth flow of people but easy access to each stand. To create a hygienic retail environment, the locker rooms for the merchant's trade gear shall be separated from the retail section.

Hauls unloaded at the jetty will be brought directly into the adjacent bargaining area where fish are to be traded with the Marketing Corporation, vendors from the retail market, and vendors from the inland areas. The ice to be used in the market and on fishing boats will also be taken out from this place.

Some of the fish trade on the transaction floor will be taken to the adjacent processing plant where the scales, heads and intestines will be removed to make the fish marketable.

The Chill Room, Cold Storage and blast freezers shall not only be directly connected to the transaction floor but shall also allow easy access from the retail market section.

An office shall be set up in a place facing the entrance for hauls so that it will be convenient for the personnel to attend transactions, collect market fees, deliver ice, and manage the market facilities.

The ice making machine shall be situated in a place facing the transaction floor for easy use by the fishermen and merchants while the location shall also be adjacent to the office for the convenience of its management personnel.

In order to maintain a quiet office environment, the office of the Fisheries Division and the office of the market administration shall be constructed on the 1st floor.

For both fishermen's and merchants' convenience, the offices shall be provided with indoor and outdoor staircases.

(2) Vertical Planning

Good circulation of fresh air shall be achieved to keep the interior of the building free from heat and odour. In addition, ventilating holes shall be installed on top of the roof.

(3) Structural Plan

1) Policy for Structural Plan

Efforts shall be made to use locally available structural materials as much as possible. The structural design shall also incorporate, wherever possible, construction methods with which local construction workers are familiar. In the selection of structural materials, due attention shall be paid to the physical, climatic and other natural conditions peculiar to the site, such as its proximity to the ocean, high humidity and so on. On the basis of the above policy, the present report has adopted reinforced concrete as the material to be used for foundations, structural columns and beams, and the floor. The walls of the buildings shall be made of concrete blocks, and the roofs shall be supported by wooden trusses.

2) Design Standard and Design Conditions

In principle, the Caribbean Uniform Building Code (hereinafter referred to as "CUBC") shall apply to those structural aspects that are directly affected by the local environmental condition, such as wind load and

earthquake load. The design method to be employed shall be in compliance with the standard set by the Architectural Institute of Japan, and shall also take into account local practices by reference to the CUBC. As for the standards of the materials to be used, the Japan Industrial Standard shall be applied, in principle. In view of the convenience of local procurement, however, standard products in compliance with ASTM and BS may be substituted for JIS standard products.

### 3) Design Load

#### - Carrying Load

Office	2.5 KN/m <sup>2</sup>
Lavatory	2.0 KN/m <sup>2</sup>
Market	4.0 KN/m <sup>2</sup>

#### - Wind Load

The design wind load shall comply with the provisions of the Simplified Method of the CUBC. For computation of the maximum wind load, a wind velocity of 35 m/sec., which is expected to be encountered once every 50 years (value is the 10-minute average, measured at a place as high as 10 m), has been employed.

$$q_{ref} = 0.73 \text{ kPa}$$

In consideration of the site's proximity to the ocean, the present computation uses an exposure factor 1.2 times as large as the value generally used for most cases.

$$C_{exp} = 1.2 \text{ (at height 5 m - 10 m)}$$

On the basis of these factors, the expected wind load to be applied on the windward side of the walls and on the roof, applied from beneath in this case, has been computed to be around 200 kg/m<sup>2</sup>.

#### - Earthquake Load

The earthquake load shall comply with the standard provided for in the CUBC, and the following regional coefficient is applied to SVG:

$$Z = 0.50$$

A rigid frame made of reinforced-concrete structural members is expected to bear 80% of the seismic force.

$$K = 0.8$$

Computation on the basis of these conditions has

given a design base-shear coefficient of approximately 0.05.

4) Materials Used for Structural Members

Concrete	FC180 - 210	or equivalent
Steel rods	SD30 - SD40	or equivalent
Lumber	Pine	
Reinforcement Plates	SS41	or equivalent
Bolts	SS41	or equivalent

(4) Electrical Equipment

1) Fish Market

The electric power required in the market building will be drawn in at 3-phase 400 V, 50 Hz, from VINLEC's trunk line running along Bay Street. It will be supplied for final in-site use in two ways: at either 3-phase 400 V, 50 Hz or at single-phase 230 V, 50 Hz.

a. The major equipment receiving electrical supply is as follows:

Main Breakers	Breaker for 400 V line
	Breaker for 230 V line

b. Electricity will be supplied to the facilities and equipment at the following voltages:

- For power loads of refrigerators, freezers, blast-freezer, ice machine, and pumps  
..... 400 V
- For lighting, outlets, and window coolers  
..... 230 V

c. The load capacity of equipment will be as follows:

For motive power	70 kVA
For lighting and outlets	60 kVA

d. Emergency Generator

An emergency generator with a capacity of 75 kVA shall be installed to provide backup power for the refrigerators, freezers, blast-freezer, ice machine and ice storage in case of a power failure. Motive power for the generator will be supplied by a diesel

engine, and starting and switching shall be done manually.

2) Small Shops, Bus Terminal and Jetty

Electricity for these facilities shall be drawn in from the VINLEC trunk line on Bay Street at single-phase 230 V, 50 Hz, independently of the line for the fish market. Load capacity for lighting and outlets 35 kVA

3) Load Equipment

a. Power Equipment

The piping and wiring works for the power equipment shall extend as far as piping and wiring to each item of equipment via the power panel.

b. Lighting and Outlets

As for lighting in the market, a light source with least effect on colour shall be used for the retail market, transaction floor and processing plant. In other sections, fluorescent lights shall be installed. In view of the time of use of this building, the present plan considers lighting as supplementary to sunlight.

The planned luminous intensities of major areas are as follows:

Retail market, transaction floor, and processing plant  
..... 150 lx.

Offices and laboratory  
..... 300 lx.

Lighting in the small shops shall be provided by fluorescent lamps.

Planned luminous intensity  
..... 150 lx.

For lighting at the bus terminal and jetty, pole mount lighting fixtures shall be used.

Planned luminous intensity  
..... 10 lx.

The public toilet shall be equipped with fluorescent lamps.

Planned luminous intensity  
..... 50 lx.

4) Equipment for Telecommunications

For telecommunication purposes, telephones shall be installed. The installation work shall be conducted by Cable & Wireless Corp., while the present project shall be responsible for the construction of conduit only.

(5) Plumbing Works

1) Water Supply System

Water for use in the market complex shall be drawn off a municipal service main installed underneath Bay Street. The water shall then be pooled in a receiving tank before it is pumped up to an elevated water tank. Water for the fish market, small shops, parking lot, jetty and public toilet will be supplied from the elevated tank. A water gauge shall be installed in each building in the site, and the small shops shall be equipped with individual water gauges. Water supply for each building and facility shall be planned as follows:

a) Fish market

i) Retail Market

Faucets  $10 \text{ l/min.} \times 30 \times 0.5 = 150 \text{ l/min.}$

ii) Processing Plant & Bargaining Rm

Faucets  $20 \text{ l/min.} \times 4 = 80 \text{ l/min.}$

$80 \text{ l/min.} \times 60 \text{ min.} \times 2 \text{ h}$

$= 9,600 \text{ l/day}$

iii) Drinking Water & Toilet use

Retail market

$40 \text{ people} \times 150 \text{ l/day} = 6,000 \text{ l/day}$

Processing Plant & Bargaining Rm.

$20 \text{ people} \times 150 \text{ l/day} = 3,000 \text{ l/day}$

Office

$20 \text{ people} \times 100 \text{ l/day} = 2,000 \text{ l/day}$

Visitors

$600 \text{ people} \times 1 \text{ l/day} = 600 \text{ l/day}$

Subtotal  $11,600 \text{ l/day}$



b) Small Shops

i) Small Shops  
Facets

$$10 \text{ } \ell/\text{min.} \times 20 \times 0.5 = 100 \text{ } \ell/\text{min.}$$
$$100 \text{ } \ell/\text{min.} \times 60 \text{ min.} \times 5 \text{ h} = 30,000 \text{ } \ell/\text{day}$$

ii) Drinking Water & Toilet Use

$$2 \text{ p} \times 20 \text{ shops} \times 200 \text{ } \ell/\text{head}/\text{day} = 8,000 \text{ } \ell/\text{day}$$

c) Dry Goods Shops

i) Drinking Water and Toilet Use

$$2 \text{ p} \times 15 \text{ shops} \times 100 \text{ } \ell/\text{head}/\text{day} = 3,000 \text{ } \ell/\text{day}$$

d) Public Toilet

i) Urinals

$$5 \text{ } \ell/\text{use} \times 120 \text{ uses}/\text{day} \times 3 = 1,800 \text{ } \ell/\text{day}$$

ii) Toilet Stools

$$10 \text{ } \ell/\text{use} \times 120 \text{ uses}/\text{day} \times 3 = 3,600 \text{ } \ell/\text{day}$$

iii) Washing Basins

$$10 \text{ } \ell/\text{use} \times 200 \text{ uses}/\text{day} \times 4 = 8,000 \text{ } \ell/\text{day}$$

e) Supply to Fishing Boats

i)  $50 \text{ people}/\text{day} \times 100 \text{ } \ell/\text{head} = 5,000 \text{ } \ell/\text{day}$

f) Water Sprinkling and Car Washing

i) Water Sprinkling

$$2,000 \text{ m}^2 \times 5 \text{ } \ell/\text{m}^2/\text{day} = 10,000 \text{ } \ell/\text{day}$$

ii) Car Washing

$$20 \text{ vehicles} \times 200 \text{ } \ell/\text{vehicle} = 4,000 \text{ } \ell/\text{day}$$

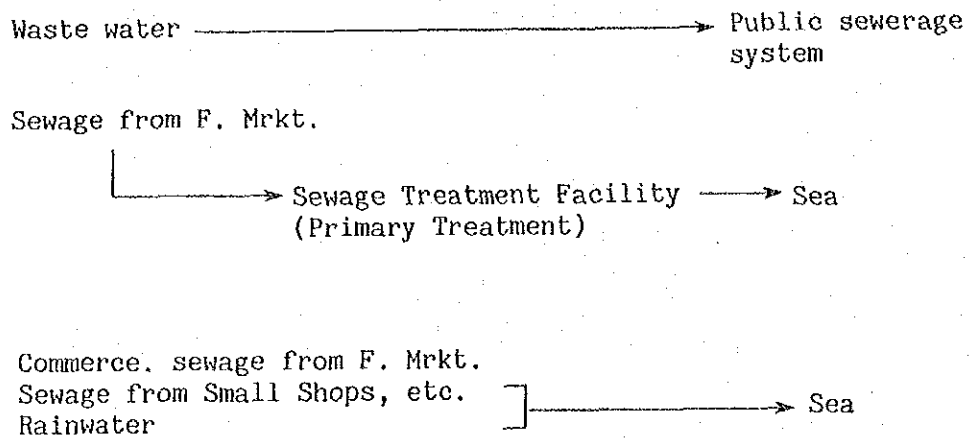
If the receiving tank is to have a capacity capable of holding 70% of the total daily water supply, the capacity shall be 80 m<sup>3</sup>. The capacity of the elevated tank shall be 10 m<sup>3</sup>, which is equivalent to 10% of the total daily supply.

2) Sewage System

Soil water and sewage from the buildings shall be discharged separately. Soil water shall drain off to the public soil pipe underneath Bay Street. Sewage, on the other hand, shall be discharged into in-site

drainage ways. However, sewage from the fish market shall join commercial sewage from the retail market, processing plant and bargaining room outside the building. The combined sewage shall then be treated to eliminate solid objects before it is finally discharged to the sea.

Rainwater from the roof of the building shall be discharged to the sea via an in-site drainage way. A flow diagram of the sewage and drainage system is given below.



3) Hot Water Supply

Electric water heaters of water-storage type shall be installed for shower and drinking purposes.

4) Gas

The laboratory shall be furnished with propane gas in cylinders.

5) Bathroom Fixtures

Toilet	Toilet stools, urinals, washing basins, mirrors
Shower room	Shower heads
Kitchenette	Sink

6) Fire Extinguishers

Fire extinguishers shall be installed. Fire hydrants shall be provided on the in-site water main.

(6) Air-Conditioning and Ventilation

1) Air-Conditioning

Room air-conditioners of a split-type shall be installed in the offices, secretary room and laboratory. The design conditions for air-conditioning shall be as follows:

Design temperature of the outside air 32°C DB

Design temperature of the inside air 26°C DB

2) Ventilation

The building shall be designed in a way that will result in good natural ventilation. Mechanical ventilation shall be installed only in the laboratory and toilets.

(7) Building materials Plan

In view of local availability and the level of skills of local construction workers, the present project shall employ the following building materials:

1) Fish Market

Structural framework : Reinforced concrete

Walls : Hollow concrete blocks

Roof Beams : Wood

Substructure : Wood

Finish : Wood shingles

Exterior Finishing : Face Stone on walls

Exterior Finish Hardware : Painted steel doors and windows with aluminium jalousies

Fences : Galvanized steel nets

Interiors Finishings

Retail, Bargaining &

Processing Area : Paint finish on mortar

Floor : Hardener finish on mortar

Wall : Paint finish on mortar

Ceiling : Exposed structure, with paint

### Offices

Floor	: Vinyl tiles
Walls	: Paint finish on mortar
Ceiling	: Acoustic boards

### Lavatories & Shower Rooms

Floor	: Mosaic tiles
Walls	: Ceramic tiles
Ceiling	: Paint finish on veneer

### Locker Rooms

Floor	: Hardener finish on mortar
Walls	: Exposed blackwork
Ceiling	: Same as market

## 2) Small Shops

Though the individual stores are of plain construction, they shall be planned in such a way as to create a certain pleasant atmosphere, when seen as a group.

Since the purposes of the individual stores differ from each other, the tenants shall be responsible for the interior works. The present project shall take care of works as far as the basic construction work to be ready for finishing.

As for the structure, the partitions between the individual stores shall be of reinforced concrete blocks for safety reasons. The facade and that part of the rear exterior to be seen from Bay Street shall be of wooden finish in order to express the local colour. For the same reason, the roof shall be of wood shingles.

The equipment to be installed in each store shall include a sink, lighting fixtures and service outlets.

## 3) Public Toilets

In view of its use by the general public, the building shall be one which is easy to clean. Because of its proximity to the bus terminal, the building's exterior shall be of a pleasant design. To maintain security, sufficient lighting shall be provided in and around the building.

#### 4-3-3 Jetty

##### (1) Scale of Jetty

The length of the jetty was determined based on the followings:

- a. One berth for mooring of 60' class fishing boat alongside the jetty

$$L_1 = \text{boat length} \times 1.2 = 72' = 24 \text{ m}$$

- b. Ten berths for mooring of 20' class fishing boats end-on to the jetty

$$\begin{aligned} L_2 &= (\text{boat width} + 3') \times 10 \\ &= (5' 6'' + 3') \times 10 = 26.5 \text{ m} \end{aligned}$$

Hence the length of the jetty should be 26.5 m, and a bridge between the existing revetment and the jetty should be 13.5 m long giving due consideration to the ease of driving supporting piles for the jetty in relation to the existing revetment. The total length of the jetty shall be 40 m.

The width of the jetty shall be 7 m considering 2 way traffic of 10 ton trucks.

##### (2) Design Conditions

###### 1) Wave Height

The wave height for designing the jetty was determined in accordance with "Shore Protection Manual" Vol. 1, 1984, Coastal Engineering Center, U.S.A.

###### a) Eastern direction

Wind velocity: 14.43 m/sec, Duration: 20 hours

$$H_s = 0.3 \times 5.3 = 1.6 \text{ m}$$

$$T = 12.2 \text{ sec}$$

where  $H_s$  : Wave Height (m)

$T$  : Period (sec)

###### b) South-eastern direction

Wind velocity: 8.25 m/sec, Duration: 30 hours

$$H_s = 1.7 \text{ m}$$

$$T = 6.8 \text{ sec.}$$

c) Southern direction

Wind velocity: 8.25 m/sec, Duration: 9 hours  
Hs = 1.2 m  
T = 5.7 sec.

d) South south-western direction

Wind velocity: 5.15 m/sec, Duration: 4.4 hours  
Hs = 0.43 m  
T = 3.2 sec

The maximum wave height during Hurricane "Allen" in 1980 was observed as 4 m at the project site.

From the above data, the design conditions for the jetty are determined as follows:

Wave height in E-W direction      Hs = 1.7 m ( 6' 0")  
Wave height in N-S direction      Hs = 4.0 m (13' 4")

2) Datum Line and Tide

The datum line of Kingstown is M.L.W.S.T. (Mean Low Water Spring Tide).

L.W.L. = M.L.W.S.T. + 0.2 m

H.W.L. = M.L.W.S.T. + 0.4 m

Hence tidal difference (H.W.L. - L.W.L.) is 0.2 m.

3) Water Depth

The minimum water depth at and around the project site is 5.0 m which is enough for a 60' class fishing boat (approx. 30 G.T) which has 2.5 m ~ 3.0 draft.

4) Design Condition for Vessel and her Berthing Velocity

Vessel                           : Overall Length   20 m (60')  
                                  : Molded Breadth   4 m (12' 4")  
                                  : Molded Depth    3.5 m (4')  
                                  : Full load Draft 2.5 m (3')  
Berthing Velocity   : 0.5 m/sec. (8"/sec.)

5) Seismic Coefficient

There is a "Caribbean Uniform Building Code" for the seismic design of buildings, however, it is not applicable to jetty design. Therefore, the seismic coefficient  $K_n = 0.1$  suggested by Faccioli, Taylor and Sephard (1983) based on the earthquake acceleration for jetty design shall be applied.

## 6) Live Load

In design of the live load, 10 ton trucks shall be considered for landing services.

## (3) Types and Structures

There are three types of jetty construction, namely gravity type, double sheet pile type and pile type. Giving due consideration to littoral drift and the effects of the existing revetment, a pile type jetty which enables waves to pass beneath it appears most suitable in this case. Also, the pile type is most economical and appropriate to the site conditions.

There are two kinds of piles, reinforced concrete piles and steel piles. Reinforced concrete piles have good corrosion resistance, however, steel piles are more advantageous regard to ease of construction, strength and economy.

Considering the abovementioned advantages the jetty shall be a concrete-deck supported by steel piles.

## (4) Corrosion Control

The upper part of the steel piles (splash zone) shall be covered with FRP pipes and cement mortar, and the remaining portion of the piles (under water and in sea bed) shall be provided with extra thickness to withstand corrosion.

## 4-3-4 Infrastructure

### (1) Roads

The width of roads within the project site shall be as follows:

#### 1) North-South Road

The north-south road for entry into the site from Bay Street shall be 10 m wide and the exit road onto Bay Street shall be 8 m wide, because the east-west road connecting to Melville Street Extension shall be used for exit purposes also.

2) East-West Road

All east-west roads shall be 8 m wide because traffic here shall be secondary relative to the north-south entry road.

(2) Bus Terminal and Parking Lot

The number of minibus terminal berths shall be 24 in accordance with the Urban Redevelopment Plan of GOSVG. Passenger platforms shall be 4 m wide and 26 m long to accommodate 4 berths on each side of the platforms. The distance between these platforms shall be 11 m with 2 parking lanes, each 2.5 m wide, and a 6 m wide passing lane.

A parking lot for 16 big buses and 20 sedans including taxis shall be provided. Unit parking space shall be 3 m x 7 m and 2.5 m x 5 m for big buses and sedans respectively.

(3) Public Parking Lot

The site proposed for construction of a food market shall be used as a public parking lot temporarily.

(4) Pavement Specification

1) Asphalt pavement

The asphalt pavement of the roads, bus terminal and parking lot shall be designed to allow 10 ton truck use, the same bearing capacity as the public roads.

The asphalt pavement of the public parking lot, however, shall be of light duty type.

2) Concrete pavement

Pedestrian ways, footpaths and passenger platforms shall be paved with concrete.

(5) Storm water Drainage

Storm water within the project site shall be drained to the existing drainage canal which empties into the sea. For easy maintenance, the storm water drainage shall be concrete gutters with concrete covers.

The rainfall intensity shall be 75 mm/hour in accordance with the design standard of the Public Works Department.



#### 4-3-5 Equipment for Fish Market

##### (1) Tools and Instruments for Fish Market

###### 1) Insulated Boxes

These boxes, to be used with ice in them, shall serve the purpose of short-term storage during handling of fish in the market and also during transit from fishing grounds to the market. The boxes shall be of plastic, and have a capacity to hold 225 kg worth of fish.

###### 2) Chopping Boards

Polyethylene chopping boards shall be installed in the retail market and processing plant. The boards will measure 30 cm in width and 60 cm in length.

###### 3) Dollies

Manual push carts shall be used to carry the chests.

###### 4) Work Tables

Work tables for use in the processing plant shall be of stainless steel, and measure 90 cm in width, 180 cm in length and 80 cm in height. The work tables shall also be equipped with sinks.

###### 5) Scales

Proper scales shall be installed to measure the weight of fish.

For the bargaining area

Platform scales with a maximum weighing capacity of 1,000 lbs.

For the retail market

Scales with a maximum weighing capacity of 50 lbs.

###### 6) Waste Bucket

35 kg capacity poly-ethylene bucket for waste from processing area.

##### (2) Quality Control Equipment

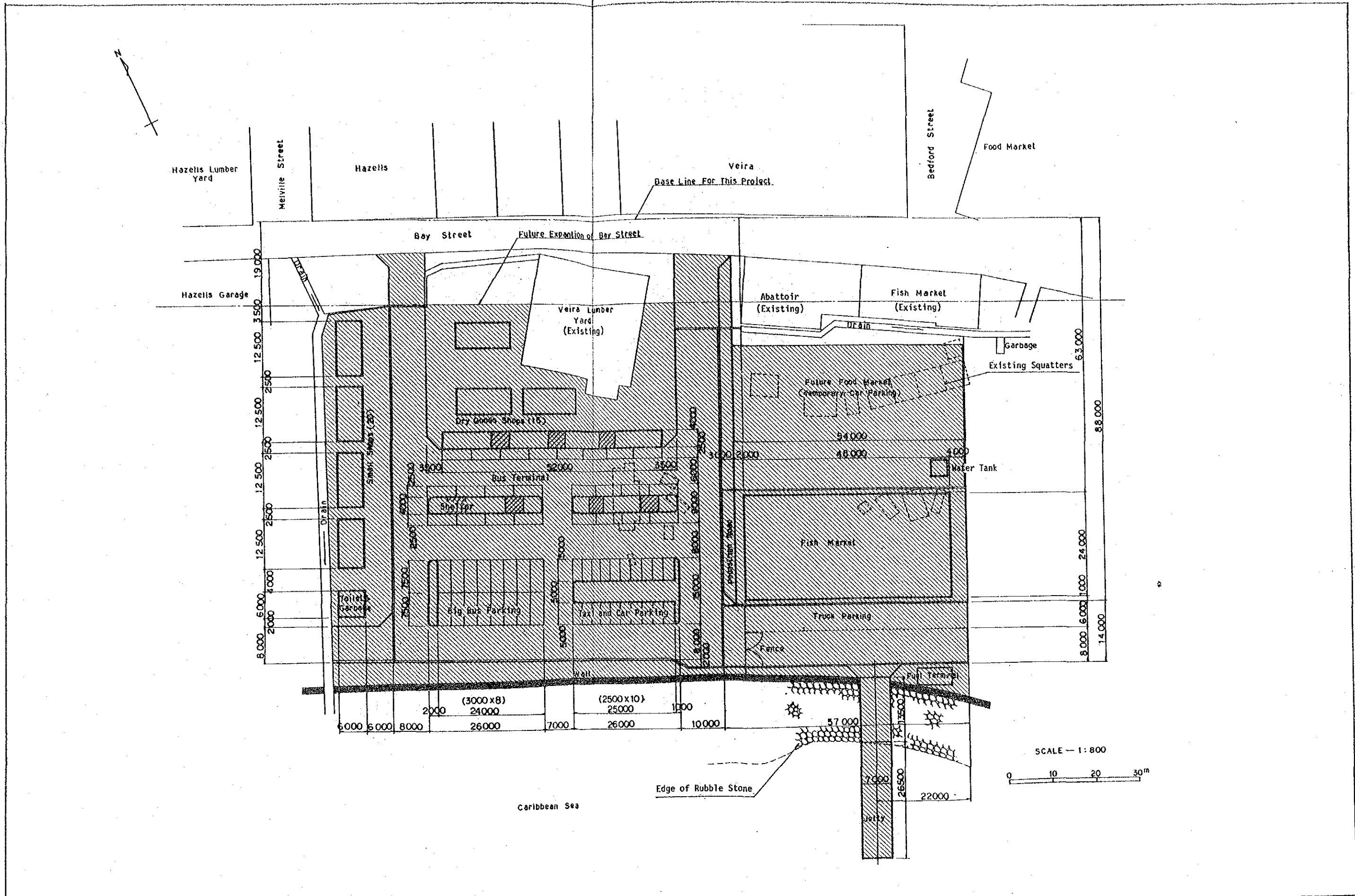
The following equipment as necessary for checking fish quality, shall be installed in the laboratory:

- 1) Binocular microscope      Of a type equipped with a built-in light source and 3 objective lenses.

- |     |                        |   |
|-----|------------------------|---|
| 2)  | Electronic balance     | Weighing capacity 30 g ~ 200 g                                      |
| 3)  | analytical balance     | Weighing capacity 4 g.  |
| 4)  | Chemical apparatus     | including pipettes, slide glasses, beakers, laboratory dishes, etc. |
| 5)  | pH meter               | Measurable range between pH 0 and 14.                               |
| 6)  | Centrifuge             | Capable of handling 414 ml centrifuge tubes at 0 to 300 rpm.        |
| 7)  | Magnetic stirrer       | With a stirring capacity of 10 to 1,500 ml at 20 to 1,00 rpm.       |
| 8)  | Refrigerator           | With a capacity of 100 litres.                                      |
| 9)  | Miscellaneous utensils | Test tube stands, scalpels, Bunsen burners, thermometers, etc.      |
| 10) | Laboratory sinks       | Of stainless steel type.  |

#### 4-3-6 Basic Design Drawings

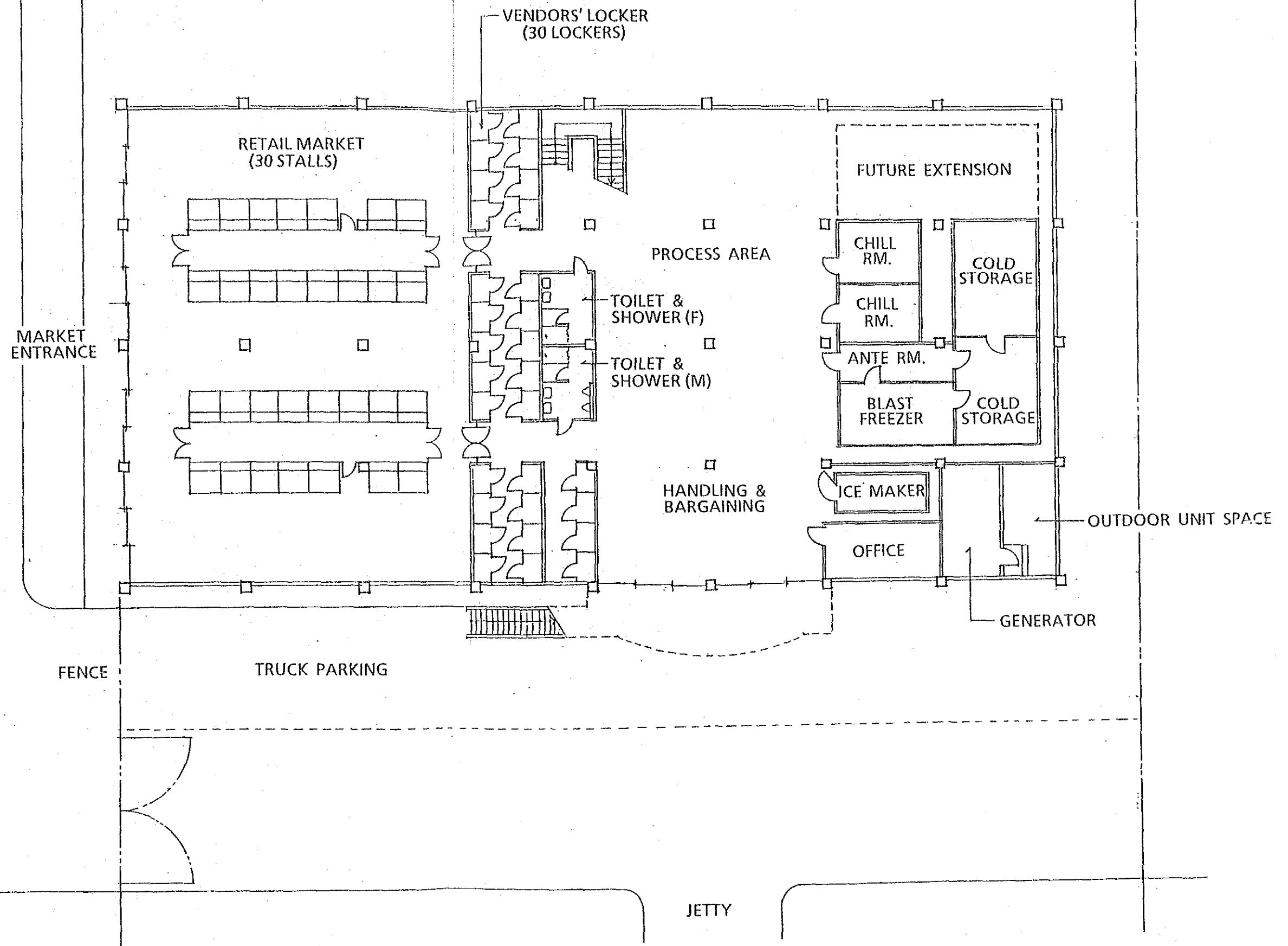
- |    |   |               |
|----|---|---------------|
| 1. | Plot Plan                                   | S. 1:800      |
| 2. | Fish Market Plot Plan (1F)                  | S. 1:200      |
| 3. | Fish Market Plot Plan (2F)                  | S. 1:200      |
| 4. | Fish Market Elevation & Section             | S. 1:200      |
| 5. | Small Shops Floor Plan, Elevation & Section | S. 1:100      |
| 6. | Public Toilet Plan, Elevation & Section     | S. 1:100      |
| 7. | Jetty Plan & Section                        | S. 1:300      |
| 8. | Pavement & Stormwater Drainage Plan         | S. 1:800      |
| 9. | Pavement & Stormwater Drainage Detail       | S. 1:10, 1:20 |

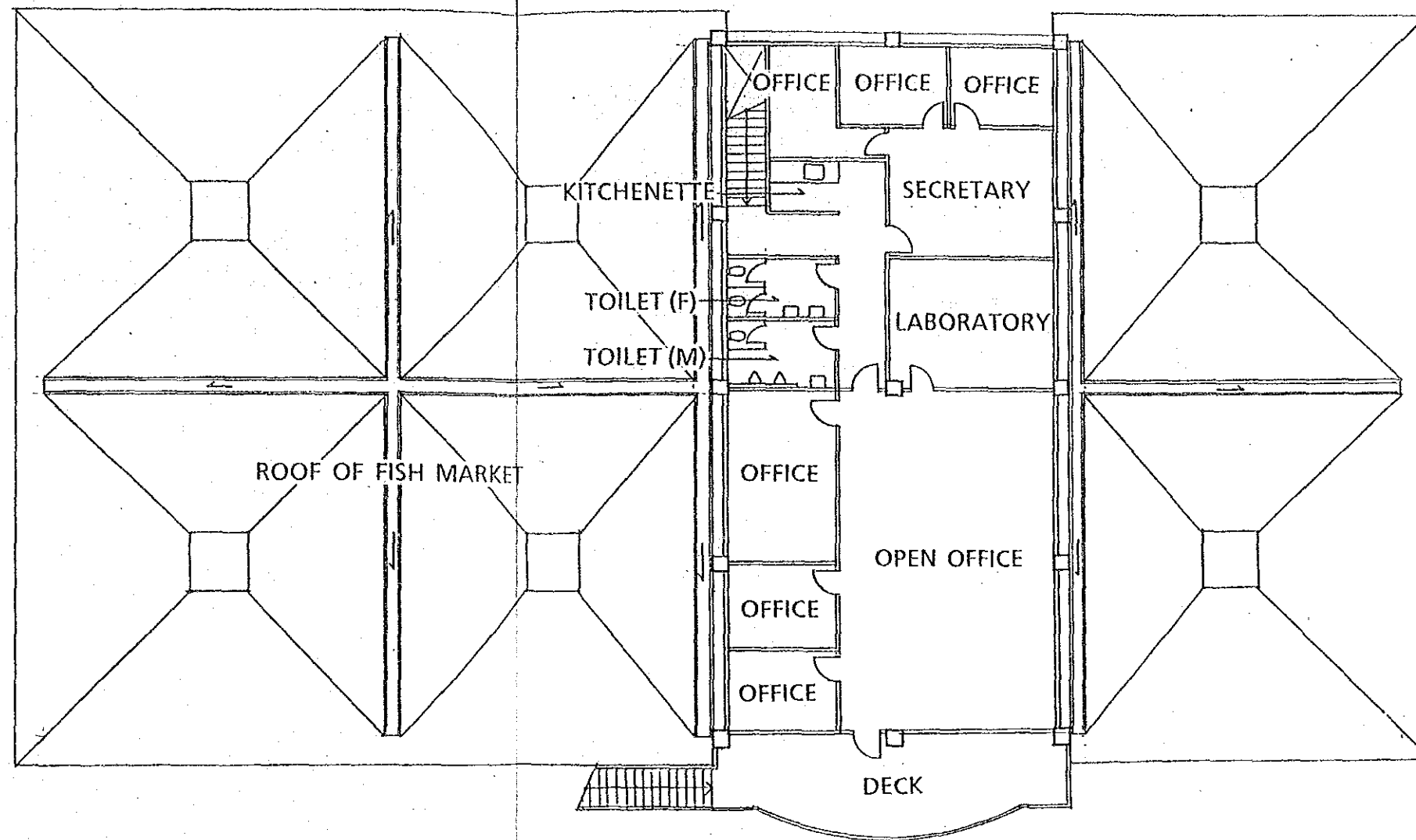


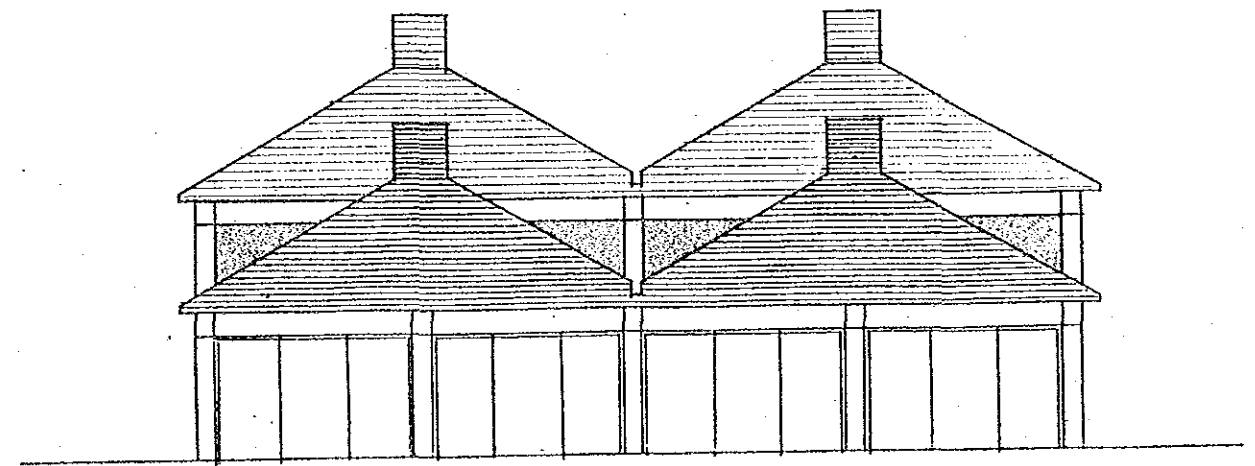
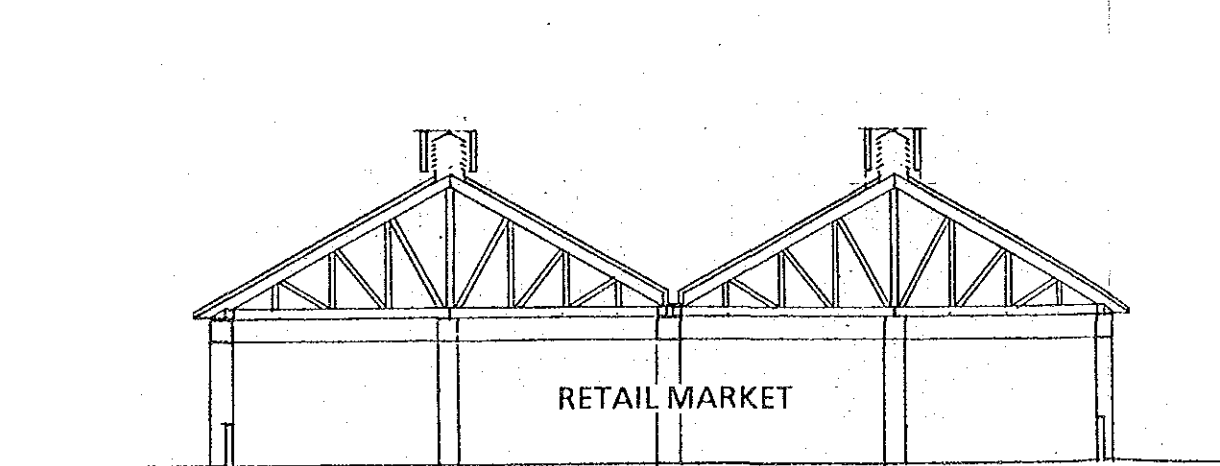
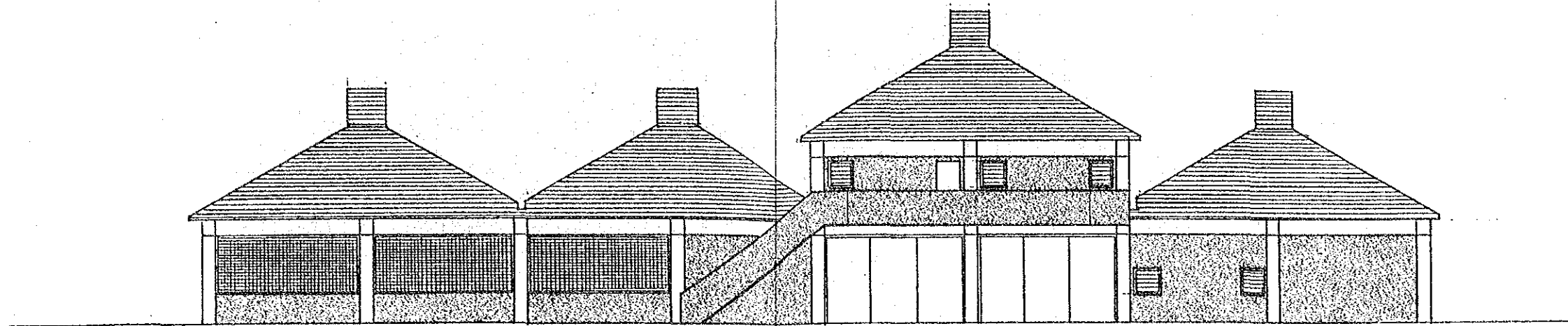
PLOT PLAN

S. 1:800

1



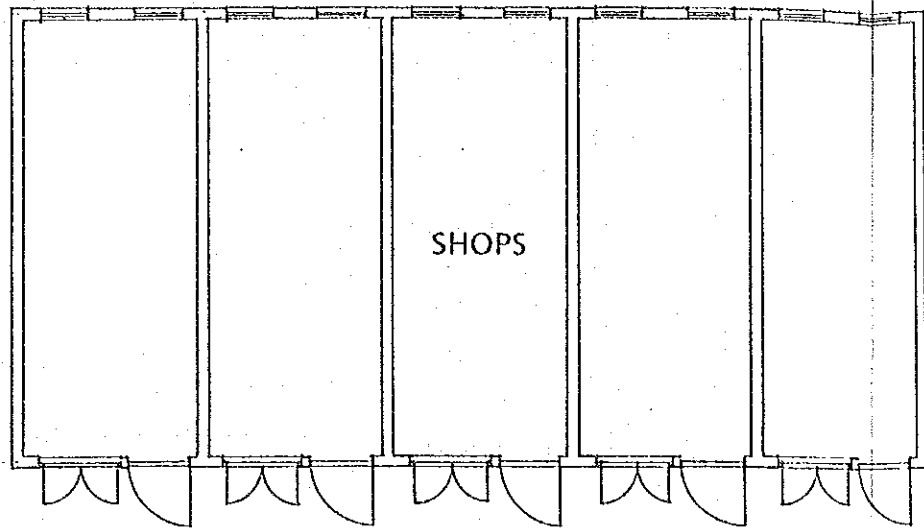




FISH MARKET  
ELEVATION & SECTION

S. 1:200

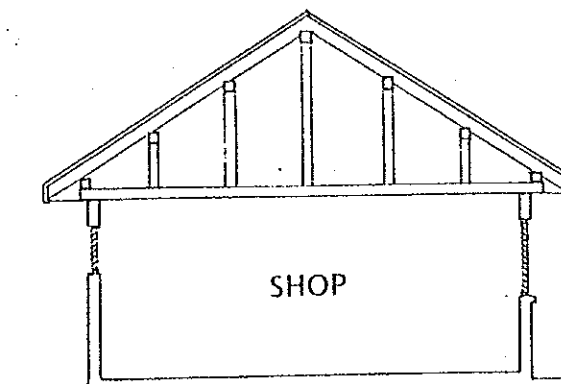
4



PLAN



ELEVATION

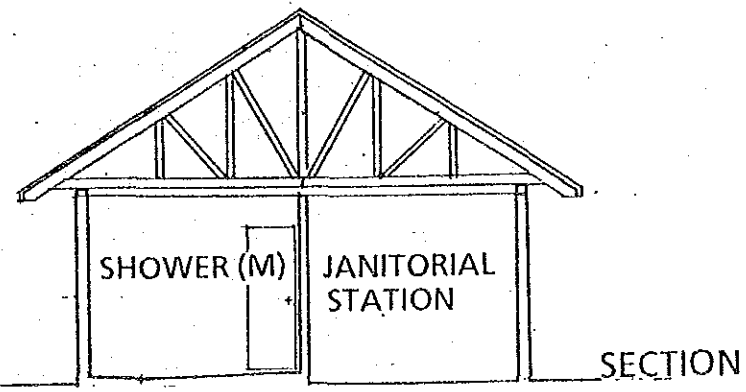
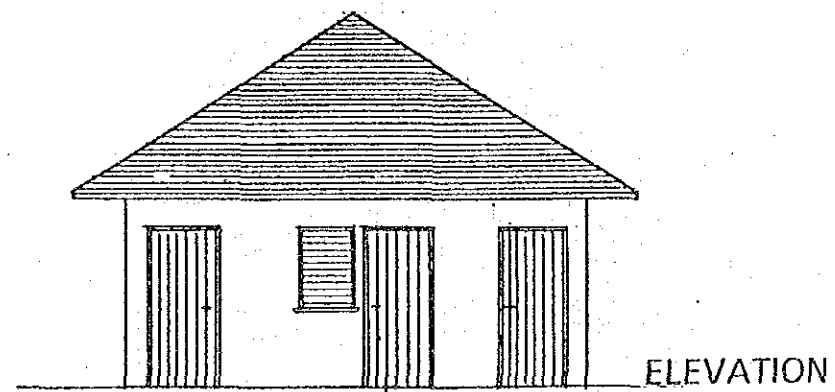
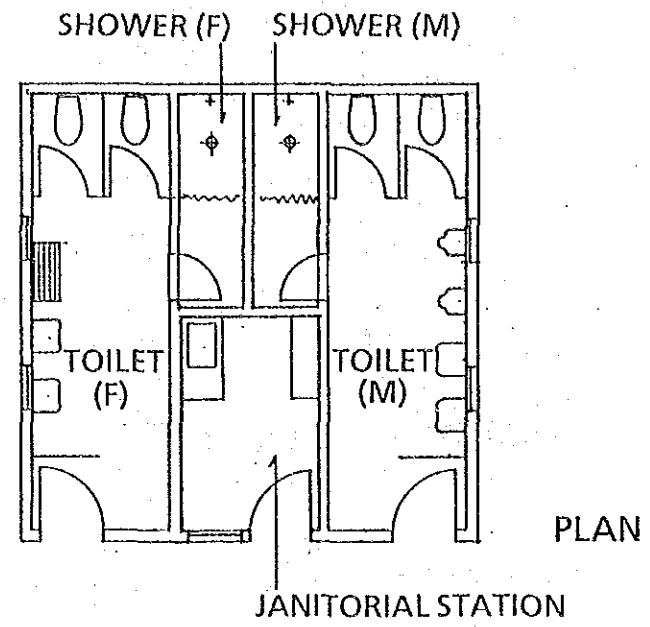


SECTION

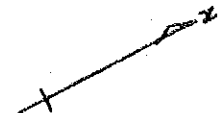
SMALL SHOPS FLOOR PLAN,  
ELEVATION & SECTION

S. 1:100

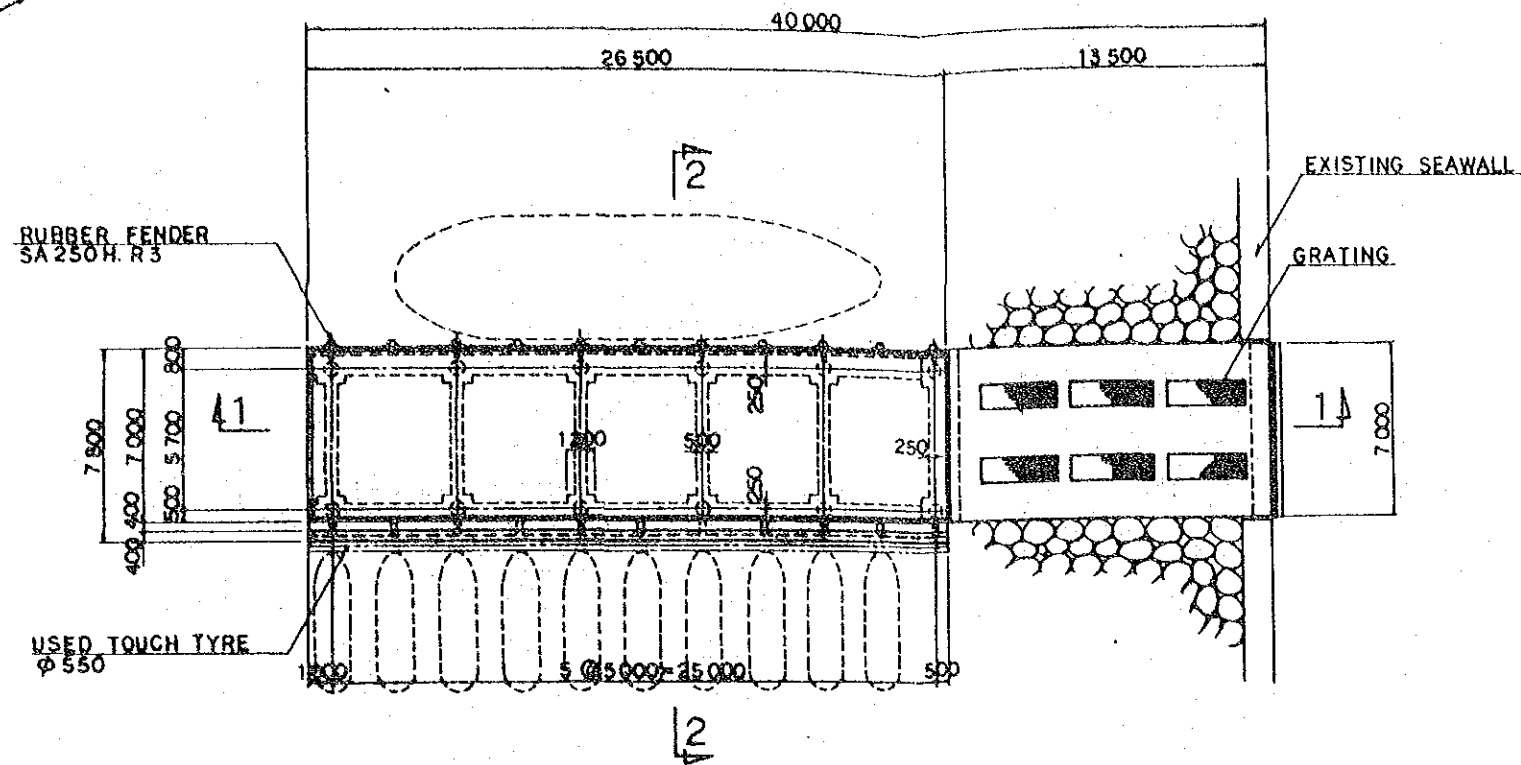
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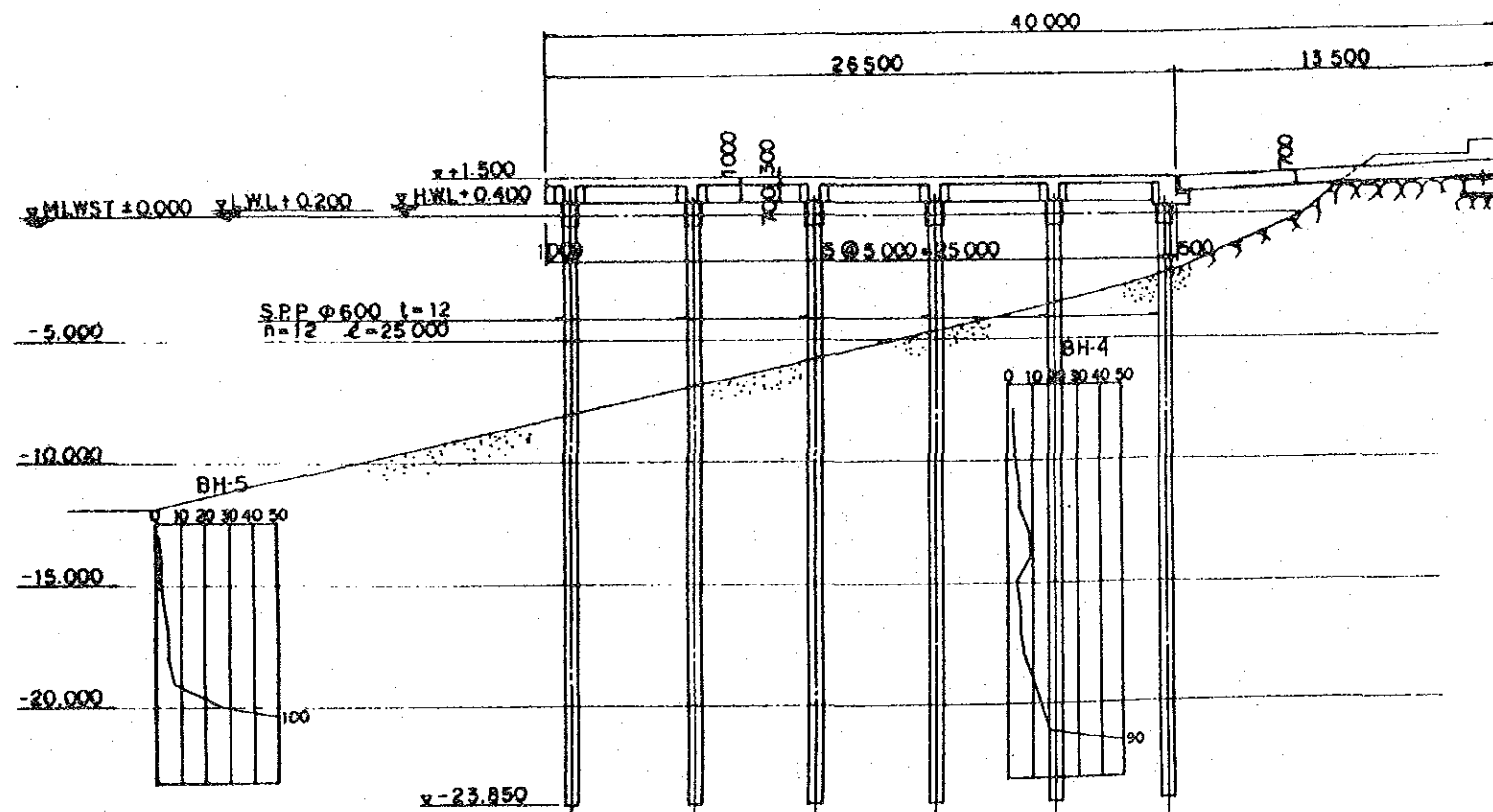




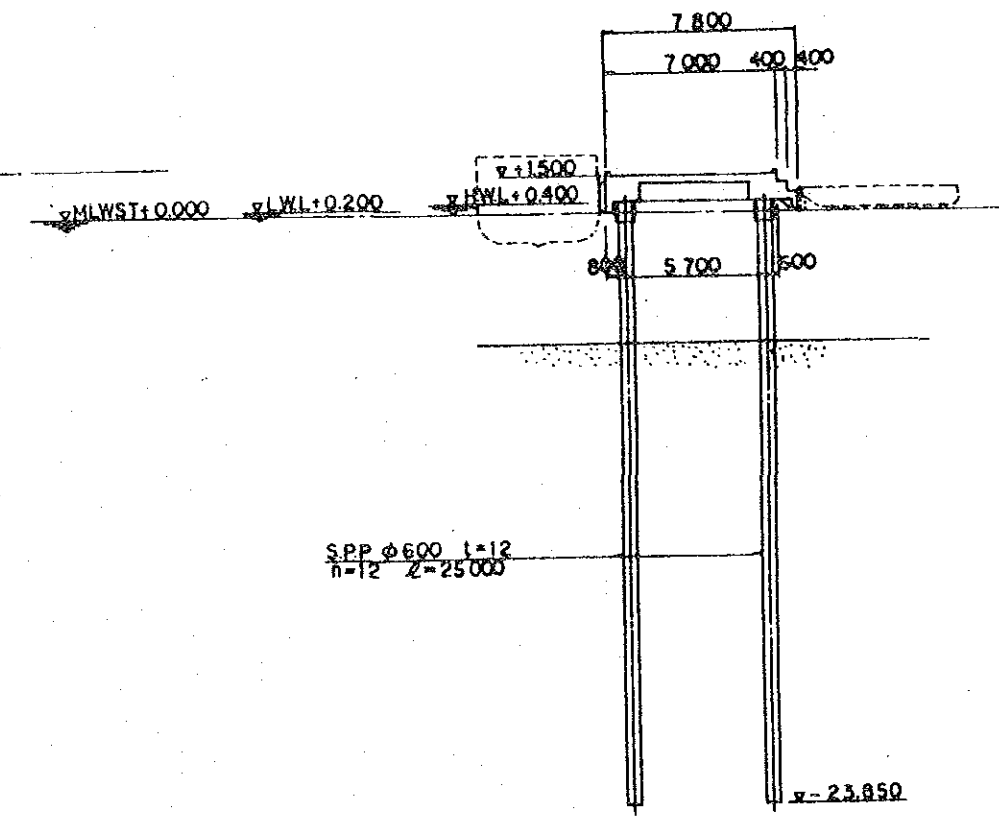
PLAN S=1/300

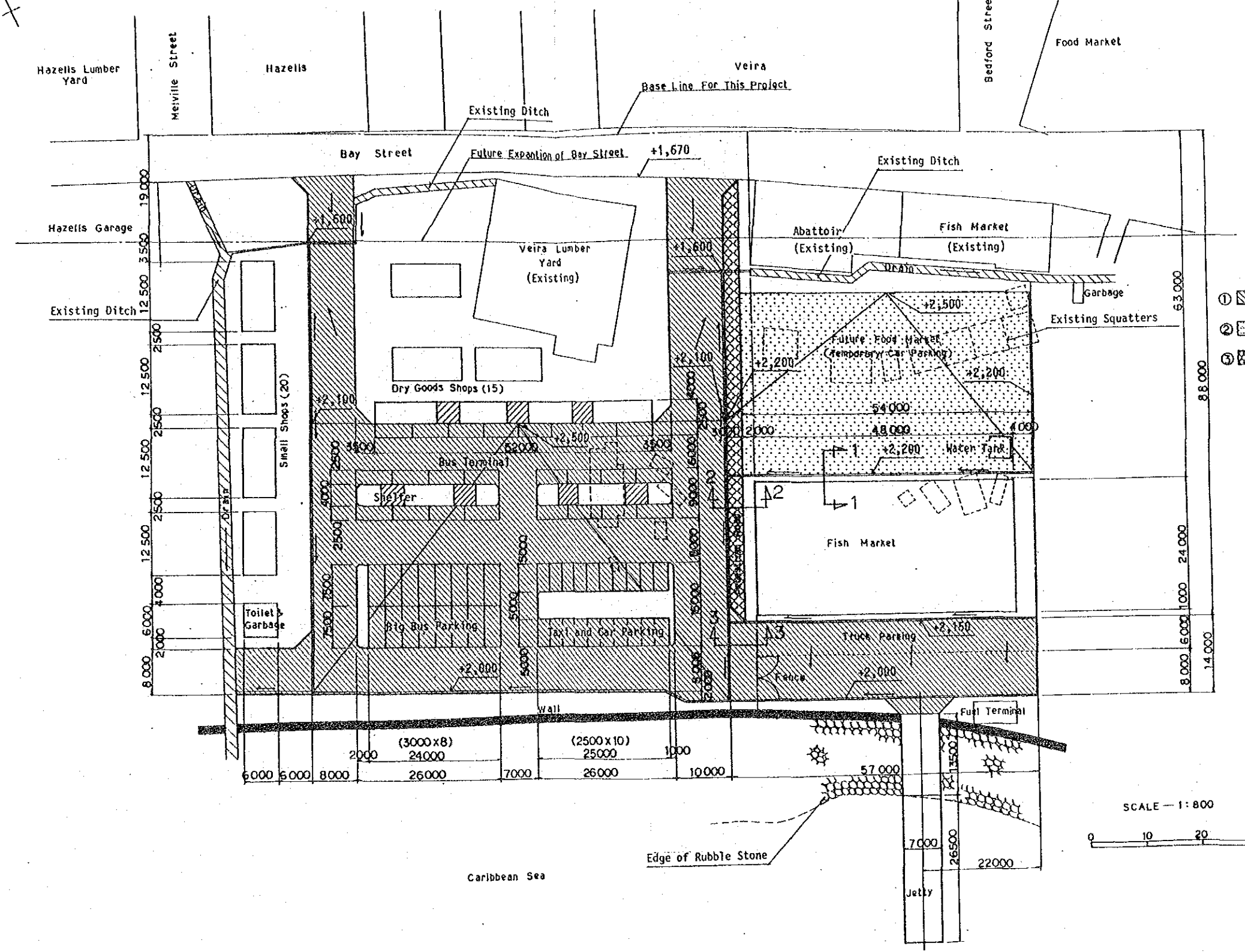


SECTION 1-1 S=1/300



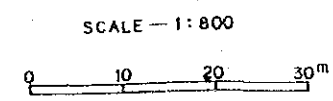
SECTION 2-2 S=1/300





**LEGEND**

- ① Asphalt Pavement (Heavy)
- ② Asphalt Pavement (Light)
- ③ Concrete Pavement

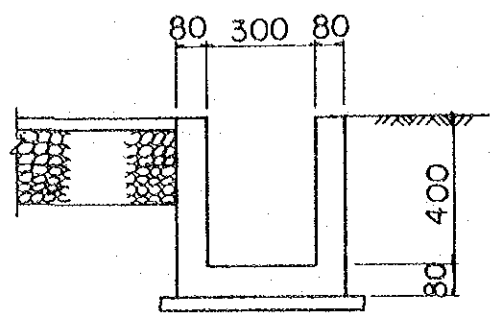


**PAVEMENT & STORMWATER DRAINAGE PLAN**

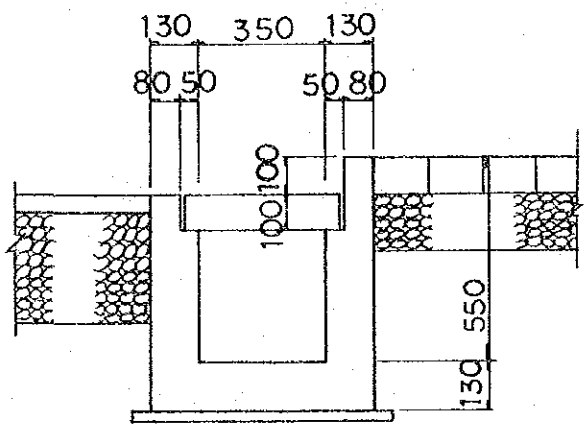
S. 1:800

8

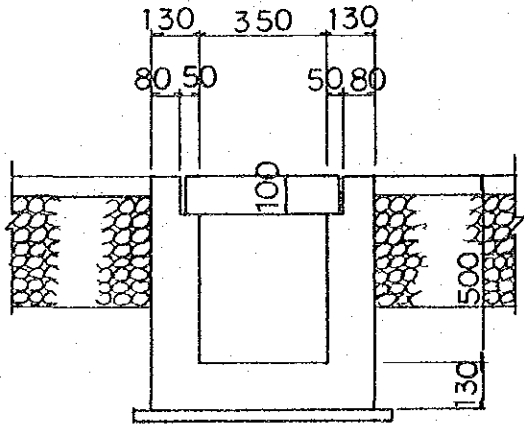
SECTION 1-1  
S=1/20



SECTION 2-2  
S=1/20

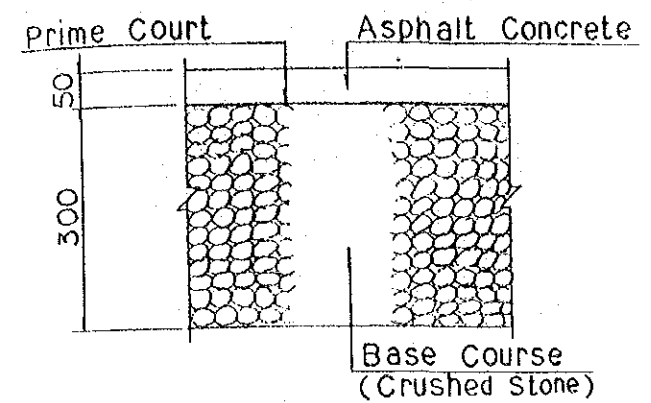


SECTION 3-3  
S=1/20



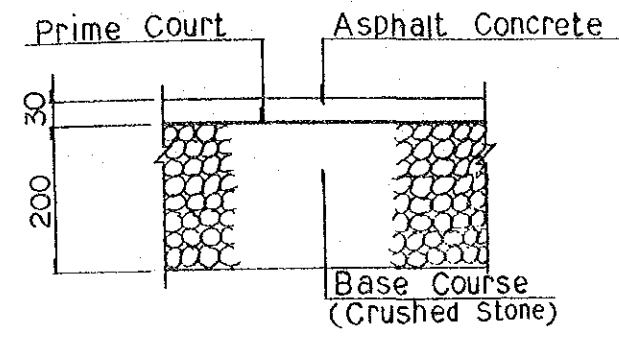
ASPHALT PAVEMENT (H)  
S=1/10

①



ASPHALT PAVEMENT (L)  
S=1/10

②



CONCRETE PAVEMENT  
S=1/10

③

