2-2-2-2 Scale of Facilities

(1) Fish landing jetty

The planned length of the fish landing jetty is 123 m based on the calculation results described below.

1) Target fishing boats

The field survey findings indicate that 74 fishing boats operate from Grenville. All of these have an outboard engine except for one which has an inboard engine.

Type of Boat	No.	Main dimension（L×B×d）
Out board engine	73	6.9×1.9×1.0 m
Inboard engine	1	8.0×2.3×1.2 m

About thirty(30) boats are moored at Grenville after daily operation. The other boats commute from such nearby fishing villages as Soubise and Marquis which support fisheries in the Grenville area. These boats return to their own villages for mooring at the beach once landing of the day's catch including preparations for the following day's operation (fishing gear, storage of materials and refueling, etc.) has been completed.

2) Functions and design conditions of jetty

Landing of fish catches, preparation and resting of the boats are considered to be the likely functions of the planned jetty. Fishing boats will be moored sideways for fish landing and preparation purposes and will be moored headways for the purpose of resting of the boats. As these boats will be moved on to the revetment apron and tied securely to prevent damage during hurricanes, this type of protective function is not considered a jetty function.

In the last three years, the highest landing level was recorded in 1999. The average number of fishing boats used in Grenville to land their catches (except Sunday) in each month and the average of the best five days in each month are shown below.

Table 2-16 Number of unloading fishing boats in Grenville (1999)

Item / Month	Jan	Feb	Mar	Apr	May	Jun	High Season
Average by month	22.4	27.7	24.6	21.4	24.8	25.8	25
Average of the 5 highest number by month	36.2	37.4	34.8	32.2	33.0	40.6	36

Jul	Aug	Sep	Oct	Nov	Dec	Low Season	Whole Year
24.2	18.2	10.9	5.3	9.9	15.0	14	19
33.0	24.8	22.0	9.8	15.8	21.4	21	28

As a condition for the present design purposes, 25 fishing boats, which is the average figure for the high fishing season of six months, is used as the daily number of fishing boats using the planned jetty. All of the fishing boats are engaged in day return operation and the landing hours are approximately from 9 o'clock in the morning to 6 o'clock in the evening around the time of sunset. Most of the boats return to the port prior to sunset because of the absence of night-time channel markers and the complicated channel configuration. Almost half of the fishing boats complete landing operation before midday because the fish is sold fresh.

The field survey findings confirmed the trend in Grenville of landing operation being conducted predominantly in the morning so that the catch can be sold on the same day.

The construction of the new jetty will make landing work easier, resulting in the improved efficiency of the entire work at the fishery complex. Based on this, the availability of the jetty for landing purposes is set at two and a half hours a day. (Note: the number of fishing boats using the jetty every hour is 10; 25 (boats) ÷ 2.5 (hours = 10 (boats/hour))

3) Required jetty length

The total required length of the jetty for (i) landing, (ii) preparation and (iii) resting purposes is 123 m (40 + 40 + 43 m) as described below.

Table 2-17 Calculation of required jetty length (Plan)

Boat type and purpose	Required length of Jetty (L (m))	Required length of Jetty/ boat (Lb or Bb)	Number of utilizing boats per day (Ni)	Rotation of berth (r)	Utilizing hour / boat (Pt)	Available hour (Mo)
①Unloading	40	7.9	25	5	0.5	2.5
②Preparation	40	7.9	25	5	0.5	2.5
③Resting	43	2.9	15	1	16	16
Total	123					

Formula

$Lji = Ni / r \cdot Lb(or\ Bb)$

Lji：Required length of Jetty

Lb：Required length of Jetty for mooring horizontally per boat = length L(m)×Allowance (1.15)

Bb：Required length of Jetty for mooring vertically per boat = length B(m)×Allowance (1.5)

Ni：Number of utilizing boats per day

r：Rotation of berth (Mo/Pt)

Mo：Available hour

Pt：Utilizing hour per boat

One boat utilizes 30 minutes (0.5 hour) each for unloading and preparation.

4) Jetty length and structure

As a water depth of 1.5 m must be secured, an initial jetty length of 25 m from the revetment will be required to reach this depth. The total length of the jetty is planned so that fishing boats can come alongside on both sides. Based on this condition, the required length of the jetty is nearly halved.

During the high fishing season, the number of fishing boats using the jetty increases from 25 to 36. On this basis, the required jetty length is calculated to be 157 m. Even though the jetty can only meet some 78% of its demand by fishing boats, this figure can be improved by shifting boat preparation after landing to other time gone, guidance to shorten the duration of landing operation and landing operation by means of multiple anchoring sideways or headway mooring.

The planned jetty must be at least 250 feet (approximately 76 m) away from the existing commercial jetty at Grenville to secure a fairway for cargo vessels using the latter. Similarly, the jetty should not stretch offshore from the revetment by more than 65 m to secure waters for maneuvering by fishing boats coming alongside the planned jetty and a fairway for cargo vessels. The location of the jetty is, therefore, planned to meet these restrictive conditions. The planned layout is shown on the Figure 2-9 of Basic Design Drawing. While the Grenada Fisheries Division plans to develop Grenville on the east coast as an additional base for tuna long lining to Gouyave and Grand Mal on the west coast, there is no detailed plan and it is not included in the design conditions for the Project. The jetty design, however, allows for the future extension of the jetty if tuna long liners are locally introduced. The design jetty width is 5.0 m to provide 2.5 m for each side given the actual usage situation of similar local facilities.

(2) Fish market facility

Fish market facilities consist of a retail zone for fresh fish sale and facilities to support sale and shipping work, including ice-making and storage, cold storage, sorting yard, fish processing room, market administration office, warehouse, sanitation area and locker yard for retailers. Among these, the size of the retail zone, ice making and storage facilities, cold storage and sorting yard, etc. changes in accordance with the quantity of fish handled by the market. The base figures to determine the size are given below.

- Annual catch of boats based at Grenville approx. 400 tons (average between 1996 and 2000)
- Maximum monthly catch by boats based at Grenville:Approx. 70 tons (average between 1998 and 2000)
- Fish handling volume of Grenville fish market: Approx. 400 tons (same as the above figure for the

annual catch)

The largest handling volume per day at the Grenville fish market of 4,569 kg was recorded on 11th February 1999. The average figure for the top 10 days in February and March 1999 when the highest landing level was recorded for two consecutive months in the last three years, i.e. 3,020 kg, is used as the design condition for the sorting yard. The fish landed at Grenville is entirely handled by the fish market. The fish is divided into that for direct retailing by six registered fish retailers to consumers in the retail zone and that sold to large wholesalers (the ratio is approximately 1 to 2 in favour of large wholesalers).

Table 2-18 Daily fish catches in Grenville (Feb 1999) Unit: lbs

Day of week	Day	Fish catches	Day	Fish catches	Day	Fish catches	Day	Fish catches	Day	Fish catches
Mon	01	1,924	08	2,837	15	6,439	22	6,487	—	—
Tue	02	2,384	09	2,598	16	7,002	23	9,187	—	—
Wed	03	2,552	10	188	17	4,640	24	6,808	—	—
Thu	04	880	11	10,154	18	128	25	3,315	—	—
Fri	05	3,613	12	5,867	19	3,609	26	3,846	—	—
Sat	06	5,380	13	4,637	20	4,335	27	2,623	—	—
Sun	07	1,483	14	0	21	3,079	28	13	—	—

Table 2-19 Daily fish catches in Grenville (Mar 1999) Unit: lbs

Day of week	Day	Fish catches	Day	Fish catches	Day	Fish catches	Day	Fish catches	Day	Fish catches
Mon	01	1,712	08	3,240	15	2,239	22	1,836	29	300
Tue	02	620	09	3,061	16	1,271	23	1,217	30	3,393
Wed	03	40	10	2,529	17	1,391	24	1,635	31	2,949
Thu	04	561	11	2,465	18	1,014	25	1,259	—	—
Fri	05	5,151	12	0	19	1,697	26	2,547	—	—
Sat	06	1,553	13	2,703	20	2,541	27	2,815	—	—
Sun	07	225	14	36	21	300	28	102	—	—

Table 2-20 Top 10 days of the highest fish catches in February and March in 1999

Unit: Upper lbs, below kg

Rank	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total	Average
Lbs	10,154	9,187	7,002	6,808	6,487	6,439	5,689	5,380	5,151	4,640	67,115	6,712
Kg	4,569	4,134	3,151	3,064	2,919	2,898	2,640	2,421	2,318	2,088	30,202	3,020

1) Retailing area

Number of booth in fish retailing area; There are 6 retailing counters in existing fishery center (fish market). Because retailing counters are limited, registered fish vendors are 6 persons. These 6 vendors are employing 3 retailers each and there are 18 fish retailers in Grenville fish market. And there are also 3 of conch vendors and 15 of jack vehicle vendors who come to sell jack fish caught by beach seine net. Vehicle vendors are prohibited max 4 cars per day.

Type of Fish vendor	No.	No. of booth (plan)
Permanent vendors	6	6
Fish sellers	18	6
Jack vendors(Car)	4	0
Conch vendors	3	3
Total	31	15

There are 10 scalers, four of which are constantly working at the sinks while the remaining six conduct the same type of work in the retail zone. In addition, there are some 10 part-time scalers.

Type of scalers	No.	No. of booth (plan)
Permanent scalers	4	4
Assistant scalers	6	6
Part-time scalers	10	0
Total	20	10

Based on the above design values, the required floor area for the retail zone is approximately 228 m^2, taking the location of the zone into consideration.

2) Ice making and storage plant

As mentioned earlier, the planned new Grenville fish market is expected to handle some 400 tons of fish a year. All of the fish landed at the planned site will be transferred to the fish market for sale to consumers at the market or via wholesalers. The ratio between wholesale and retail is approximately 2 to 1 (270 tons to 130 tons).

The fish market will require 610 tons of ice a year, consisting of 550 tons based on the monthly requirement of two-thirds of 70 tons (equivalent to the fish landing volume) in the three months of the high fishing season (70 x 2/3 x 12) and 60 tons to be shipped to the capital area during these three months.

Purpose	Quantity of fish (ton)	Quantity of ice (ton)	Note
For fishing	400	0-400*	Out of the subject *
For fish retailing	400	550**	Subject of the project (**2/3 of max 70 tons catch / month)
For fish marketing	60	60	Subject of the project
General demand	0	0*	Out of the subject*
Total	----	610-1010*	

Based on the above figures, the daily production volume of ice is set at approximately two tons for 300 operating days. In terms of the monthly catch, the figure for a month in the high fishing season is 1.4 times higher than the average and much larger than that during the low season. Because of this, two alternative plans, i.e. Plan (A) one ice-making machine with a daily production capacity of two tons and Plan (B) two ice-making machines with a daily production capacity of one ton, were compared for evaluation as shown in the table below. It was concluded that Plan (B) with two machines would be more appropriate. Accordingly, two ice-making machines capable of producing one ton of ice a day are planned.

As ice used by fishing boats is excluded from the scope of ice supply under the Project, flake ice suitable for retailing and distribution purposes will be produced.

The planned capacity of the ice storage is four tons, i.e. equivalent to two days supply of ice, taking the maximum daily catch of four tons and flake ice for storage into consideration.

Table 2-21 Comparative evaluation of ice making system

Item of comparison	Plan (A) 2 tons / day ×single unit	Plan (B) 1 ton / day ×double unit	Note
1. Initial investment cost	○（0.98）	△（1.00）	Figure in brackets are the comparative values for the two alternatives
2. Maintenance cost	◎（1.0）	◎（0.8）	Ditto
3. Adjustment of amount of ice making during low season	○(By stopping temporary)	◎(By operating single unit only)	
4. Maintenance Maintenance checks Repairing	△ △ ×(Total stoppage)	◎ ◎ ◎(Double safety)	
Evaluation	△	◎	

Note: Meanings of evaluation sign are as follows.；◎Excellent, ○Good, △Not good

3) Cold Storage

The planned capacity of the cold storage is approximately 30% (400 kg) of the average daily fish handling volume of 1,330 kg of the fish market based on the annual handling volume of 400 tons.

The corresponding figure adopted by the Melville Street Fish Market in the capital is 50%. At Grenville, however, fishing operation is basically day return operation and the entire volume landed is channeled for wholesale/retail, distribution and consumption via the fishery center (fish market). This makes the storage of the catch of those fishing boats which return to the port in the afternoon necessary (some 30% of the fishing boats operating from Grenville).

During the three months of the high fishing season (February to April), some 800 kg of the fish to be shipped to the capital zone is added (0.8 tons/day = 60 tons/(3 months x 25 days/month).

The fish is stored in fish boxes placed on the shelves in the cold storage. Each 75-liter capacity box can store 20 kg of fish (equivalent to some four skipjacks of 5 kg each).

Season	Quantity/day	No. of fish boxes
Whole year	400kg	20 boxes
High Season	800kg	40 boxes
Total		60 boxes

The required cubic capacity of the cold storage is determined based on the above figures. In regard to the in-house temperature, the cold storage is planned to be capable of providing a minimum temperature of approximately –15°C given the facts that it is situated in the tropics and that the door will be frequently opened to serve the operation of the fish market.

4) Store facility

As calculated below, an area equivalent to 25 – 35% of the sorting yard will be secured for the warehouse to store the equipment and materials required for work at the fish market and also for maintenance of the various facilities.

$99\ m^2 \times 25 – 35\% = 25 – 35\ m^2$

5) Fish processing room

A fish processing room for the processing of fresh fisheries products in a hygienic environment will be introduced to give added value to the fish caught. This room will be used for multiple purposes, including filleting, smoking and salted drying. The room will be designed mainly to produce salted dry skipjack products with a view to replacing salted dry cod products which are imported in large quantity. The size of this room should be large enough to process 60 – 120 tons/year which is equivalent to 15 – 30% of the annual handling volume of the fish market. This processing capacity means 200 – 400 kg/day and the specifications of this room are determined based on 2 – 3 full-time processing workers. The processed products will be for domestic consumption and their export to Europe and the US, etc. is not considered. Therefore, the HACCP will not be applied. However, the HACCP will be applied to suit the conditions around Grenville within the scope of economic viability and the interior specifications are designed to allow washing by water.

Item	Area(m^2)	
Space for processing	56	
Space for entrance	10	
Total	66	→ 66 m^2

6) Fish handling area

Fish handling area will be established with reference to the Fishing Ports Guidebook in Japan (compiled by the National Fishing Ports Association). The resulting floor area required is 99 m^2, consisting of 75 m^2 for the sorting yard, 12 m^2 for the weighing area and 12 m^2 for gutting (evisceration and gill removal). This site also requires sufficient space to allow good flow lines between the different types of work and space for access to offices, the ice-making and storage plant, the cold storage and the retailing area. The total floor area required, including passageways, etc., based on the layout plan is 159 m^2.

(a) Required area for fish handling area

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

S: Required Area（㎡）

N: Amount of planned fish handling per day (tons) 3.02

P: Amount of fish handling per unit area (tons/㎡)0.027

R: Rotation（Times/day）2.5

a: Possession ratio(Efficiency of space） 0.6

$S=3.02/(0.027\times 2.5\times 0.6)$

=74.57（㎡） → 75.0 ㎡

(b)Required area for weighing, etc.

Item	Area(㎡)
Space for weighing scale	0.25（=0.5×0.5）
Space for desk and chair	2.00（=2.0×1.0）
Space for weighing work	9.72（=1.8×1.8）
Total	11.97 → 12.0 ㎡

(c)Required area for gutting space

Amount of planned maximum handling	3000 kg/day
Working hour	8 hours/day
Amount of handling/unit	120 kg/man/hour

Number of worker＝3000/(8×120)=3.12 → 3 persons

Therefore required area for gutting space should be 12 ㎡.

Item	Area(㎡)
Space for gutting counter	3.60（1.5×0.8×3 unit）
Space for gutting worker	8.10（1.5×1.8×3 person）
Total	11.70 → 12.0 ㎡

7) Sanitary room

Three sanitary blocks will be introduced: one for office workers in the fish market building (shared by men and women), one for market users (separate blocks for men and women) and one for fishermen (men) using the fishermen's locker house building.

The total floor area required is approximately 84 m^2 (14 m^2 + 40 m^2 + 30 m^2).

a) Office toilets

The office toilets are planned to serve the five staff members of the fish market facility, including the manager, and will be used by both men and women. (Although there are no female employees at the Grenville fishery center, fish market, women do work at other fishery centers, i.e. fish markets). They will also be used by two guards. The required floor area is approximately 14 m^2.

b) Toilets for market users

A total of 25 people currently work as retailers and those engaged in supporting roles (21 men and 4 women). In accordance with the relevant facility standards in Grenada, facility for up to 20 users or 10 users are planned. The required floor area is approximately 40 m^2.

c) Toilets for fishermen

Toilets for fishermen will be introduced in the fishermen's locker house building. These toilets will be required as they will be used by fishermen at different times (departure of fishing boats from the port between four and six o'clock in the morning and return to the port between nine and eleven o'clock in the morning) from the times of use of the toilets in the office building. The size is determined based on the use of the locker rooms by fishermen and the required floor area is approximately 30 m^2.

8) Workshop and slipway

A workshop will be introduced near the locker building to check and repair fishing boats, outboard engines, fishing gear and other equipment. The workshop will incorporate storage for spare parts for outboard engines and spare equipment and materials for fishing. The required floor area is approximately 54 m^2.

The slipway is designed based on the basic principle of maintaining the present beach line and using the natural beach in front.

9) Water tank

One water tank with a capacity of approximately 10 tons will be introduced to meet the daily water consumption volume. The average monthly rainfall in the two dry months is 37 mm and the average annual rainfall is approximately 1,500 mm (or 125 mm/month). The roof of the fish market building receives some 25 tons of rainwater in a dry month and 87 tons in an average month.

Season	Monthly Rainfall	Area of roof	Quantity of rain water
Dry season(Feb)	37 mm	approx. 700 ㎡	25.9 tons
Monthly average	125 mm	approx. 700 ㎡	87.5 tons

10) Sewage and drainage facilities

a) Water drainage from sorting yard and processing room

The sizes and specifications of the sewage and drainage facilities are determined based on the planned contents of the sanitary blocks. Among these, the volume of waste water may increase from the sorting yard and processing room. Based on the anticipated drainage volume described below and other considerations, a waste water volume of approximately 10 m^3/day is planned.

Items	Calculation of drainage
Washing fish handling space (After each work)	$0.01m^3/m^2 \times 159\ m^2 \times 2.5/day = 4.0m^3/day$
Stream water during selecting fish	$0.2m^3/ton \times 3.02$ ton/day $= 0.6m^3/day$
Fish processing room（Streaming water during processing work）	$1.4m^3/ton \times 0.4$ ton/day $= 0.6m^3/day$
Washing fish market（After all work, by day）	$0.01m^3/m^2 \times 228\ m^2 \times 1/day = 2.3m^3/day$
Total	$7.5m^3/day$

b) Sewage from toilets

The number of people using the planned sanitary blocks (toilet and shower facilities) is calculated as follows.

-Sanitary block for fishermen's locker building

It is estimated that some 50 people/day will use this block based on the number of fishing boats and

crew members (average of two/boat).

25 (boats/day) x 2 (persons/boat) = 50 persons/day

The busiest hours of use will be from 9 o'clock to midday when the fishing boats return to the port. According to the field survey findings, the average number of fishing boats returning to the port per hour during this period is approximately 10. Using this figure as the standard figure and assuming that the average number of crew members per boat is two, the number of users of the sanitary block per unit hour is 20. The required capacity of the septic tank for this landing and preparation area is calculated with reference to the JIS standards for septic tanks.

-Sanitary block for fish market

The number of expected users is 42 as shown below.

Venders	27 persons (Number of vender who will use booth:* See note.)
Scalers	10 persons (Actual number)
Administration office	5 persons (Excluding two security)
Total	42 persons

Note: *Venders consist of 6 registered middlemen, 18 retailers and 3 conch vendors.

Based on the above figures, the capacity of the septic tank is determined to cater for 42 users of the toilet and shower facilities with reference to the JIS standards for septic tanks.

11) Office Block

Based on the situation of use of the existing fishery center (fish market) in Grenville, the market supervisor office to monitor the retail fish market and the supporting work is separated from the administration office responsible for the overall management of the planned facilities under the Project.

a) Administration office

Five staff members and two guards will be assigned by the Fisheries Division. The planned floor area based on the following standards (Collection of Building Data No. 4 edited by the Japan Architectural Society) is 42 m^2.

Name	Standard(m^2)	No.	Area(m^2)
Director	15 - 25	1	15 - 25
Management	6 - 9	1	6 - 9
Operation	9- 20	3	9 - 20
Security	6 - 9	2	12 - 18
Total		7	42 - 72

b) Supervisor office

This will be used as an office for the supervisor and his staff to monitor all types of trade activities at the fish market. The planned floor area based on the following standards (the same source as that described in a) above) is approximately 34 m^2.

Name	Standard(m^2)	No.	Area(m^2)
Supervisor	15 - 25	1	15 - 25
Worker	4.5 - 7	2	9 - 14
Total		3	24 - 39

12) Fishermen's store (Fishermen's locker)

These fishermen's locker rooms will be used for the storage of outboard engines, fishing gear (trolling and hand-line fishing gear), fishing materials and a change of clothes for fishermen. At present, each fishing boat (two crew members) uses one locker room. While the number of fishing boats in operation is 74, the number of locker rooms is only 16. The number of fishing boats has been almost constant and the provision of 74 locker rooms is desirable. However, as the ratio of fishing boats which operate an average of at least three days/week throughout the year, including during the low season, is 65 – 70%, 30 new locker rooms will be added under the Project because of the reasons given below.

Required number of fishermen's locker	N units
Actual number of fishing boats	74 boats
Boats registered in Grenville	65-70%
Existing fishermen's locker	16 units

N=74×(65～70%)-16

=(48.1～ 51.8)-16

=32.1～35.8 → 30 units

Area for a room of firemen's locker is as follows.

Items	Area(Dimension)	No.
Existing lockers	1.7 m^2 (=1.5×1.15)	16
Planed lockers	3.2 m^2 (=1.8×1.8)	30
Total		46

13) Radio Antenna Tower

The Port Authority and the Police Station located next to the Project site have their own radio communication system. The planned height of the new radio antenna tower is approximately 12 m based on the specifications (height and structure) of these similar facilities.

(3) Exterior facilities

1) Parking lots

On Grenada Island, 15 jack vehicle vendors sell jack (small pelagic fish, such as horse mackerel) caught by the beach seine method from their vehicles. In Grenville, four such vendors are licensed daily to sell jack to local consumers and the new fish market will require parking space for the vehicles of these vendors. The peak demand for fresh fish at the fish market is around midday after the return of the fishing boats to the port and there is another peak around four o'clock in the afternoon when people finish work. While the existing retail zone is too small to accommodate many people, there are always some 30 shoppers in the retail zone. People living in the suburban areas of Grenville travel to the market by car. The planned car park will, therefore, have 10 parking spaces, including those for the vehicle vendors mentioned above.

Many types of business vehicles will also require parking space. These vehicles include those to deliver fish from the market, those bringing various materials to the fisheries complex, those to transport fishing equipment and materials and those to transport repair equipment and materials to and from the workshop. Parking space will, therefore, be introduced for these vehicles and for the vehicles of market staff and visitors.

2) Lighting

Given the total area of the site of some 6,000 m^2 (some 120 m in the north-south direction and some 50 m in the east-west direction), eight outdoor lamps will be installed at 40 m intervals along the coast side perimeter and the inland side perimeter of the north-south axis.

(4) Requested equipment

1) Seawater pump

One seawater pump will be provided. As each of the 74 fishing boats based at Grenville washes the bottom of the fishing boat an average of three times a year (4 – 5 boats/week), a second pump for the washing of fishing boats at a rate of one boat/day is unnecessary.

2) Pushcarts

The weight of each fish box is 40 – 50 kg in total, consisting of the fish weight of 20 – 25 kg and the ice weight of 20 – 25 kg. The planned pushcart dimensions are approximately 900 mm x 1,200 mm with a loading capacity of some 300 kg (maximum 500 kg) which is sufficient to carry four

fully-loaded fish boxes. A total of five pushcarts will be provided, consisting of three for the handling area/fish landing jetty and two for the fish retail zone.

3) Insulated boxes and fish boxes

a) Insulated boxes

An insulated box is a heat-insulated box surrounded by 30 mm thick insulation material and with a lid of the same specifications. It has a capacity of approximately 750 liters, assuming the storage of some 150 - 200 kg of fish each time. Given the estimated daily handling volume of 300 - 400 kg, two insulated boxes will be required. This will be placed in a corner of the sorting yard.

b) Fish boxes

The external dimensions of a fish box are 720 x 480 x 200 mm which are the same as those of the fish boxes which are popularly used in Grenada at present. Fish boxes will be made of polyethylene or polypropylene and will have a structure which allows them to be stacked inside the cold storage. As each box (75 liters) can contain 20 kg of fish, 65 fish boxes will be provided based on the average daily handling volume of some 1,300 kg. This will mean the provision of four fish boxes each for 15 retailers.

4) Weighing scales

A portable scale is easy to use and capable of weighing up to 20 pounds will be provided for retailers. A platform type scale capable of weighing up to 200 pounds will be used for market operation purposes. The number of scales to be provided will be 15 to match the number of retailing booths in the fish market in addition to two reserves, totaling 17 scales. The number of platform type scales will be two: one for weighing upon landing and one for delivery to and from the market.

5) Radio sets

Most of the fishing boats operating from Grenville are equipped with VHF radio equipment. SSB radio equipment for long distance communication will be installed together with VHF equipment so that fishing boats can communicate with foreign vessels navigating in the Caribbean Sea at the time of an emergency. Each system will include an antenna and cables. In addition, the construction of an antenna tower is required as described earlier.

6) Repair tools for outboard and inboard engines

One set of standard repair tools for the outboard and inboard engines of fishing boats will be provided at the workshop.

2-2-2-3 Basic Plan

(1) Civil engineering plan

1) Design conditions for civil engineering work

a) Standards to be applied

The standards for civil engineering facilities in Grenada are based on the CUBIC which are applied in Caribbean countries. The following standards which are either equivalent to or higher than the CUBIC will be used for the Project.

- Standard Design Method for Fishing Port Structures: National Fishing Port Association
- Concrete Standards Manual: Japan Civil Engineering Society
- Technical Standards for Port Facilities and Explanations: Japan Port and Harbor Association
- Soil Testing Method: Japan Soil Engineering Society

b) Tide level

Standard Sea Level

HWL ：+0.72

MSL ：+0.44

LWL ：+0.16

MLLWL ：+0.09

CDL ：±0.00

c) Wave height (Wave height associated with hurricanes)

One of the most important elements for the planning and design of structures in Grenville Port is understood of the behavior of waves experienced in the port area. Although Grenville Port is constantly subject to strong trade winds from the east, the inside of the bay is calm because of the well-grown reef in front. No damage due to a hurricane has so far been recorded. Based on this situation, the design wave strength was estimated by computer simulation for a hurricane whch will most affect Grenville Port using meteorological data for the last 50 years or so. According to the interview results, there has not been any flood time which has caused an inflow of seawater beyond the beach to reach as far as the fishermen’s center. The highest flood tide observed only reached the end of the shore front. The simulation results suggest that the wave height associated with a hurricane is approximately 50 cm.

d) Seismic force

The value adopted for civil engineering work under past Japanese aid projects in Grenada is shown

below. The “seismic load” referred to in the CUBIC Part 2 Section 3 is the standard applied for buildings and it is judged that this load can be applied for both civil engineering structures and architectural buildings. Accordingly, this standard will be used for the Project. This standard is based on the modified seismic intensity calculation method which takes the natural period of a structure into consideration and the horizontal seismic load (H) is calculated by the following equation based on the dead weight (W) of the structure in question.

$H=K'\times W$

Modified seismic intensity: $K'=ZCISK$

Z: Numerical coefficient related to the seismic of a region. Max 0.75(North of St. Lucia), Minimum 0～0.25 (Guyana), 0.5 is applied for Grenada

C: Numerical coefficient of seismic on a particular cycle (T) of a structure. Max 0.12(= $1/(15\sqrt{T})$) is applied.

I: Occupancy importance coefficient. Hospital (1.5), meeting facility(1.2), others(1.0). Here in this plan 1.0 is applied because of civil engineering works.

S: Numerical coefficient for site-structure resonance of sub soil. Max. C x S $\leqq$ 1.4 is applied.

K: Numerical coefficient related to structural type. In general, it’s used from 0.8 to 2.0. Here 2.0 is applied for gravity type structure.

As the result, Modified seismic intensity should be as follows to a Particular cycle of a structure.

T (Particular cycle)	K’ (Modified seismic intensity)	Note
0.3-1.0 sec	0.140-0.070	K=2.0
5.0 sec	0.035	〃

As the structures planned under the Project are assumed to be civil engineering facilities with a relatively hard and short period instead of large-scale strong (steel) structures with a long period, a maximum design seismic intensity of K’ = 0.10 is adopted.

e) Soil

Support ground with a N value of 30 or higher is found some 12 – 16 m below the ground surface. Between this supporting ground and the ground surface or sea bottom lies a continuous soft formation of fine sand. Accordingly, the piles for the jetty will be supported by this supporting ground of 12 – 16 m below the ground or sea surface. In the case of the fish market building, the locker building and workshop building, double foundations will be employed in view of the low height of these buildings.

f) Use conditions of fish landing jetty

Particular dimension of the fishing boats subjected is as follows. Required jetty length is determined based on the particulars of 1 GT type because almost all fishing boats are 1 GT type, and jetty structure is designed based on the 3 GT type.

Boat type(GT: Gross Tonnage):	1 GT type	3 GT type
Length:	6.9 m	8.0 m
Breadth:	1.8 m	2.3 m
Draft:	1.0 m	1.2 m

g) Unit weights of materials used

The unit weights to be used for design purposes are listed below.

Material	Unit weight (ton/m^3)	Material	Unit weight (t/m^3)
Structural Steel	7.85	Asphalt	2.30
Reinforced concrete	2.45	Gravel (Granite)	2.60
Plain concrete	2.30	Gravel (Sandstone)	2.50
Cement mortal	2.20	Sand and aggregate (wet in the air)	1.80
Timber	0.80	Sand and aggregate (Saturation in the air)	2.00

h) Steel constant for design purposes

Constants of steel

Young module: 2.1×10^{6} kgf／cm^2

Shearing modules: 8.1×10^{5} kgf／cm^2

Poisson's ratio: 0.3

Coefficient of thermal expansion: 12×10^{-6}／℃

Allowable stress

Structural steel (SS400)	Types of stress	Allowable stress (kgf/ cm^2)
	Tensile stress toward axis (By genuine sectional area)	1,400
	Compressive stress toward axis (By genuine sectional area)	1,400
	Bending tensile stress (By genuine sectional area)	1,400
	Bending compressive stress (By genuine sectional area)	1,400
	Shearing stress (By genuine sectional area)	800

i) Allowable stress

Reinforced concrete	Type of allowable stress			Standard intensity for designing (σ_{ck}) 240(kgf/ cm^2)
	Allowable bending compressive stress (σ_{ca})			90
	Allowable shearing stress	Case not to calculate slant tensile reinforce bar (τ_{a1})	For beam	4.5
			For slab	9
		Case to calculate slant tensile reinforce bar (τ_{a2})	For only shearing stress	20
	Allowable sticking stress (τ_{0a})	Reformed bar		16
	Allowable bearing stress(σ_{ca})			0.3 σ_{ck}

2) Site plan

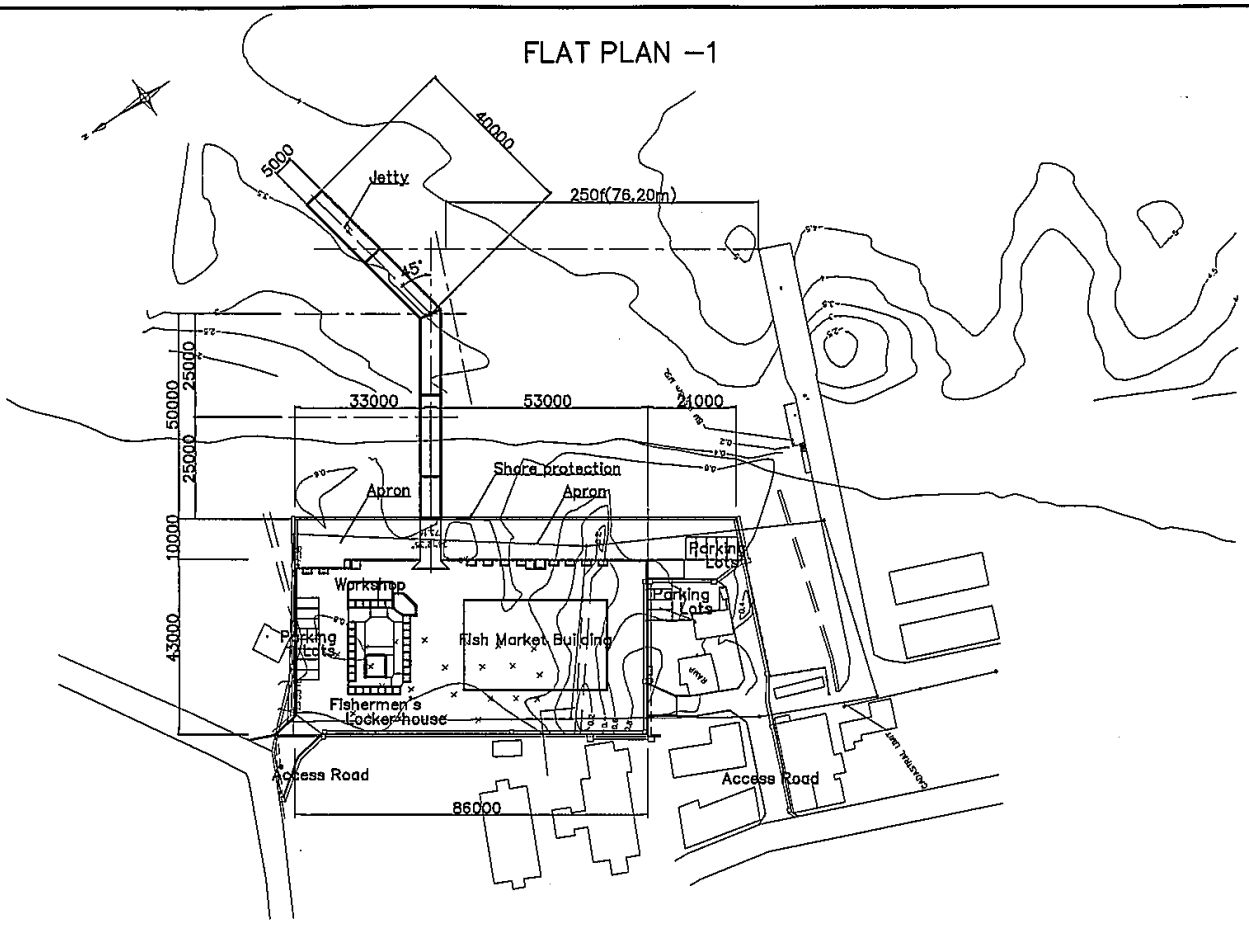
a) Examination of site layout plans

As a result of the comparative analysis of Plan-1 and Plan-2 for the site preparation shown on the next page, Plan-1 featuring a site of some 107 m in length in the north-south direction and some 53 m in length in the east-west direction has been selected. A petrol station (and shop) run by the Soubise Fishermen's Cooperative and an auxiliary oil tank, etc. are located in the southern part of this project site. Both Plan-1 and Plan-2 intend to keep these existing facilities and to construct the facilities planned under the Project. The difference between these plans is the size of the land to be newly reclaimed. The size of the land to be newly reclaimed under Plan-2 (86 m x 76 m) is 50% larger than the corresponding size under Plan-1 (86 m x 53 m). The actual findings of the comparative analysis are shown below.

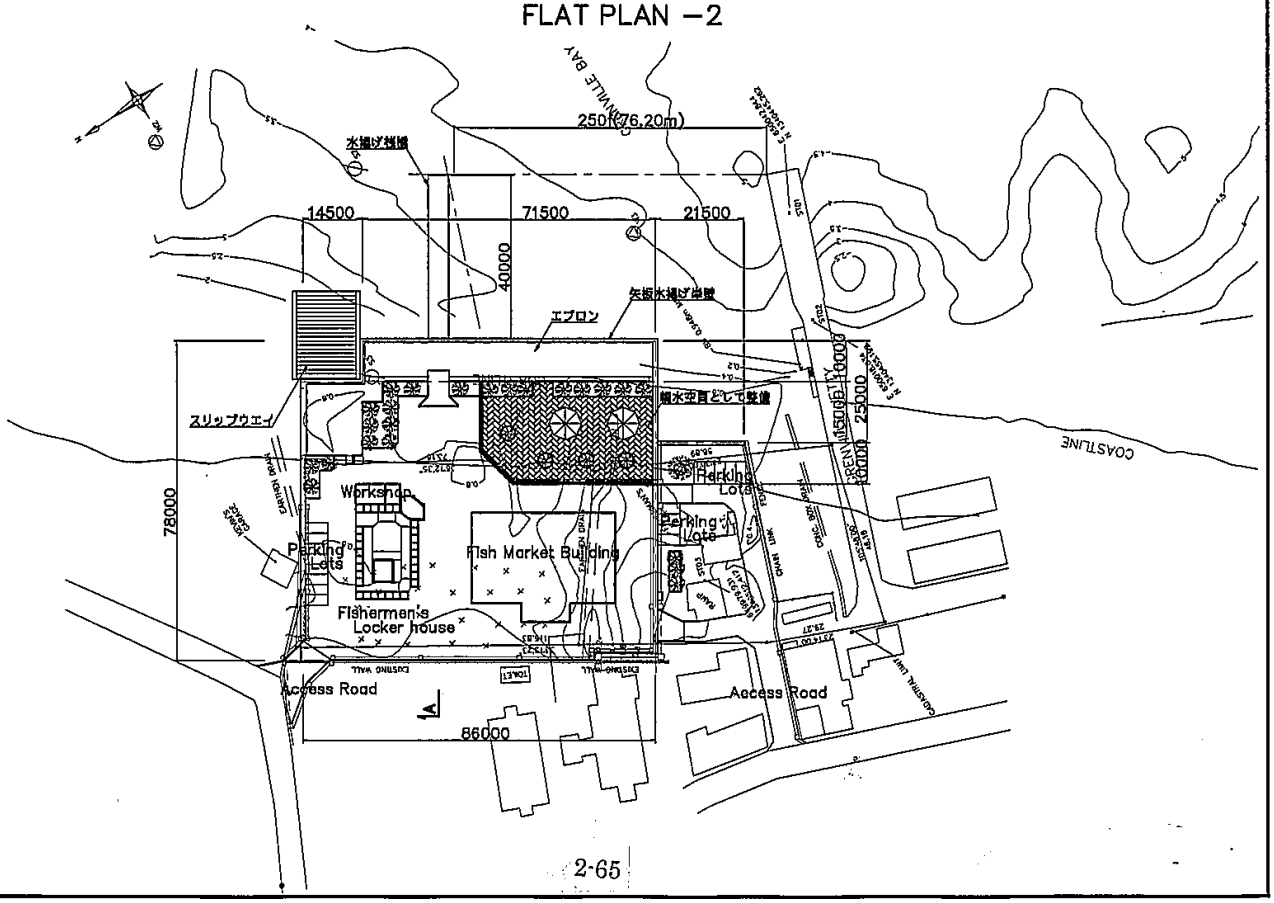
Table 2-22 Comparative evaluation of method of developing land

Plan	Plan-1	Plan-2
1. Summary	A plan to install a shore protection and arrange existing foundation	A Plan to reclaim from existing shoreline to 25 m offshore.
2. Advantage	* Because it installs a shore protection along existing shoreline and doesn't change proportion of it, there is less possibility to occur transformation of shoreline. * It doesn't disturb berthing to existing commercial jetty. * Because it can utilize the existing shoreline and apron as berthing devise, it doesn't need to install new slipway.	* It can utilize the shore protection as a landing berth, required length of jetty will be shorter. * Because it can utilize wider area, it's possible to utilize there as relaxation place.
3. Disadvantage	* Site area of plan-1 is narrower than that of plan-2. It's difficult to have relaxation place. * It needs required jetty length longer.	* Because of the sticking out square shape from shoreline, there is high possibility of transformation of shoreline due to erosion or reclaiming. * It'll disturb berthing to existing commercial jetty. * It needs to install some berthing devise. But it has possibility to be buried in sand.
4. Common matter	* Because of the rather soft land , it needs to examine some reasonable countermeasure work for it.	* Ditto
5. Construction expense	* Less expensive than plan-2	* Expensive (Comparatively)
6. Evaluation	◎ (Better than Plan-2)	○

FLAT PLAN –1



FLAT PLAN –2



The three existing drainage ditches which are end drainage ditches running from the urban area will be replaced by RC drainage ditches. In the case of one of these ditches, i.e. the drainage ditch stretching from the church side, gravity flow cannot be expected because of the inverse slope caused by the ground configuration. A drainage pump will, therefore, be installed for forced drainage. The ground elevation is considered in terms of three different heights, i.e. apron elevation, elevation of existing site after preparation and elevation of newly reclaimed land.

The design elevation of the site is determined with reference to the tide level and abnormal tide level, both analyzed and calculated using data obtained during the field survey, the site elevation of the existing buildings, the elevation of the existing commercial jetty, the elevation of the backshore and tide level gotten from the interviews at the site, etc. Firstly, the elevation of the new jetty will be CDL +1.40 m which is 2 cm higher than the elevation of the existing jetty. The seaside elevation of the apron directly connected to the jetty will be CDL +1.40 m which is the same elevation as the new jetty in order to facilitate fish landing operation by fishing boats. The design elevation for the car park for shoppers, which will be created by developing the existing site, will be CDL +1.55 m, referring to the elevation of the foundations for the fishermen's center constructed by Japan. Consequently, the elevation of the apron on the land side will be CDL +1.55 m, creating a 1.5% slope. The elevation of the reclaimed land to accommodate the new fish market building and the locker building, etc. will be CDL +2.45 m in consideration of the need to introduce drainage facilities, etc. The above design results are summarized below.

Table 2-23 Designing height of the site

Items	Height	Difference
Height of levee crown of Jetty	CDL + 1.40 m	0～0.15m
Height of levee crown of Apron	CDL + 1.40～1.55 m	
Height of existing site to be cleared	CDL + 1.55 m	-0.15～0m
Height of new reclaimed land	CDL + 2.45 m	0.90m

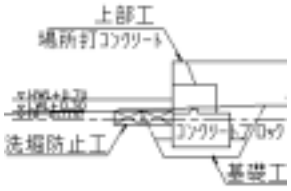
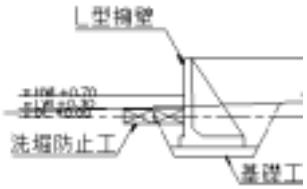
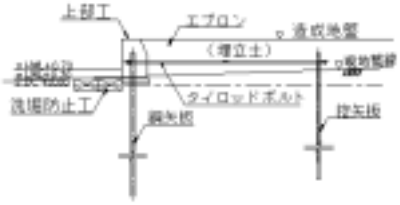
3) Examination of facility construction method and structure

a) Revetment construction and reclamation methods

For the construction of the revetment and the development of new land (reclamation), preservation of the present beach configuration is judged to be extremely important from the long-term viewpoint. There are three methods for revetment construction, i.e. (i) concrete blocks, (ii) L-shape retaining walls and (iii) steel sheet piles. The comparative analysis results of these methods indicate that (iii) the use of steel sheet piles is the best plan in terms of workability, economy and suitability vis-à-vis the ground

conditions. The comparative analysis results are shown below.

Table 2-24 Comparative evaluation on shore protection work

Item	(A)Concrete block plan	(B)L shape breast wall plan	(C)Sheet pile plan
Shape of cross section			
Type of structure	Installing concrete block on the basic foundation.	Installing L shape breast wall on the basic foundation.	Installing sheet piles in front of shore protection. Self-standing type or holding back pile type are available.
Aptitude to condition of soil	× It needs to conduct enough basic foundation work, if the method is employed because of weak accumulating sand foundation.	×It needs to conduct enough basic foundation work, if the method is employed because of weak accumulating sand foundation.	◎It's easier to install sheet piles or piles because it continues fine sand layer.
Construction material	○Mound material for basic foundation is available near the site. It's no problem on the quantity.	○Mound material for basic foundation is available near the site. It's no problem on the quantity.	○Sheet pile, pile, tie rod, etc are imported product. But these are general products in Grenada.
Construction method	△It doesn't need special construction machinery. But it needs a construction yard for concrete block near the site. And it also needs longer preparation time.	△ It doesn't need special construction machinery. But it needs a construction yard for concrete block near the site. And it also needs preparation time longer.	◎ It needs special construction machinery. But it doesn't need preparation time longer. And it is also simple and easy work, especially self-standing type.
Comparison of construction cost	△ Comparatively expensive	△Comparatively expensive	○Comparatively cheap
Comparison of working period	△Comparatively longer	△Comparatively longer	○Comparatively shorter
Total evaluation	△Not recommend	○ Recommend in limited place	◎Recommend

Note: ◎Excellent, ○Good, △Normal, ×Bad

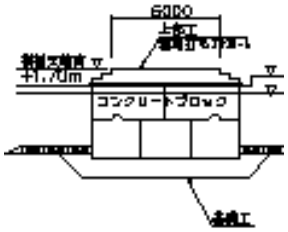
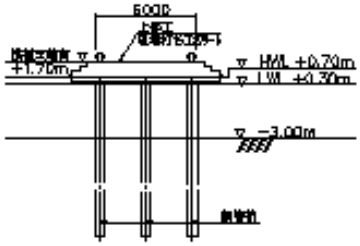
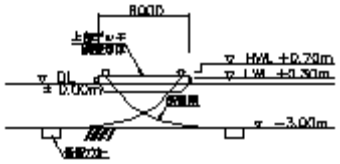
As described under the structural method in the table, the brace steel pile method will be used. Given the overall layout of the site, the revetment will be located at the boundary between the foreshore and the backshore, i.e. high water line.

The apron section of the revetment will be planned to maintain the function of the present natural beach so that fishing boats can be pulled up for repair purposes or protection from hurricane damage. Drainage from the newly reclaimed land (CDL +2.45 m) will be conducted by means of the introduction of drainage ditch at the west end. In the case of the north and south ends, no drainage ditch will be introduced and the water will be drained to the existing level drainage ditches (to be replaced by a RC ditch under the Project).

b) Fish landing jetty

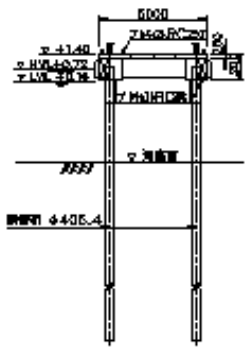
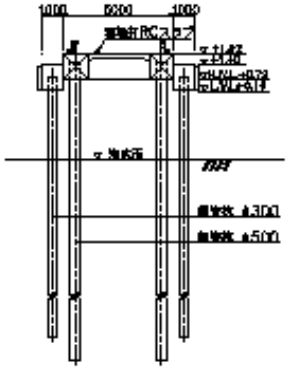
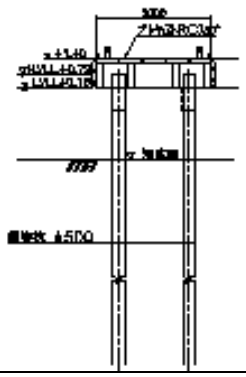
Three types of jetty structures are feasible, i.e. (i) concrete blocks, (ii) pile platform and (iii) steel floating structure. None of these has any fatal shortcoming in terms of structural safety. Moreover, no special difficulties are anticipated in regard to construction work. However, it is important that the project design maintain the existing beach configuration as described earlier in the section dealing with the revetment construction and reclamation methods in order to avoid any adverse impacts on the existing commercial jetty. The comprehensive evaluation results suggest that (iii) pile platform will be the most appropriate choice for the planned site. There are also three options for the superstructure, i.e. (a) Pre-cast RC plan with reformed bar connection, (b) Cast-in-place RC plan and (c) Pre-cast RC plan with bolt-up type. For the structure of a jetty mainly serving small fishing boats with an outboard engine, (a) and (c) Pre-cast RC plans are deemed to be the appropriate options and (a) is selected in view of less maintenance. The examination results are shown on the Table 2-26 after Table 2-25.

Table 2-25 Comparative evaluation of structure of Jetty

Item	(ⅰ)Concrete block plan	(ⅱ)Pile type platform plan	(ⅲ)Floating structure type
Shape of cross section			
Type of structure	Jetty is constructed of concrete block. The height of the levee crown is adjusted as stair to consider berthing of small boats.	Lower part is steel pile construction. Upper part is available both site constructing RC and pre-cast RC construction.	Steel float is connected 2 or 3 to secure. It's connected to shore protection by contact bridge. Each floats are fixed by mooring chain and anchor.
Convenience	○It's no problem to berth small boats.	○It's no problem to berth small boats.	○It's no problem to berth small boats.
Effects to natural environment	× There is possibility to have transformation of shoreline because of the structure jetty.	◎ It's considered to be lower possibility to have transformation of shoreline than plan (ⅰ)	◎ It's considered to be lower possibility to have transformation of shoreline than plan (ⅰ)
Difficultness of construction	○Because the site is in tranquil bay, it's available both construction method at sea utilizing working boats and construction method at land.	◎It should be construction method at sea utilizing working boats. Upper part is available both site constructing RC and pre-cast RC structure.	○Because main bodies which are produced in dock are installed by using heavy construction machineries, construction work is easier.
Maintenance	◎Maintenance is easier.	◎Maintenance is easier.	× Appropriate maintenance is indispensable.
Working period and cost	○Working period and cost are as same as plan (ⅱ).	○Working period and cost are as same as plan (ⅰ).	△Working period and cost are depend on the size of float structure. Working period in the site is the shortest among the 3 plans.
Effectiveness against cost	○It's possible to construct locally in Grenada and it contributes to local economy.	◎Piles in lower part construction or some materials will be imported from overseas. But upper part and the others will be constructed locally and it contributes to local economy as well as (ⅰ).	△Construction work in the site is only installation and it doesn't contribute to local economy.
Total evaluation	×Not recommend	◎Recommend	△Not recommend

Note: ◎Excellent, ○Good, △Normal, ×Bad

Table 2-26 Comparative evaluation of upper part construction of jetty

Item	(a) Pre-cast RC plan (Reformed bar connection)	(b) Cast-in-place RC plan	(c) Pre-cast RC plan (Bolt-up type)
Shape of cross section			
Structure	◎1 block 20～25m	◎ Ditto, suitable for higher load.	○ 1 span by 1 block structure
Difficultness of construction	○ It's easier to construct concrete structure with precast structural members.	○ Concrete work is easy because of higher position of upper structure.	○ Easy setting of Pre-cast structures.
Observing quality	○ × It needs to worry deterioration of quality of RC.	○ It doesn't need to worry deterioration of quality of RC.	◎ It doesn't need to worry deterioration of quality of RC.
Working period and cost	◎ The working period is equal to Plan(c) ◎ ○ The working cost is equal to Plan(c).	○ Working period is longer than pre-cast plans of (a)&(c). ×The working cost is the most expensive among the 3 plans.	◎Working period is shorter than Plan(b). ◎ The working cost is cheaper than Plan(b).
Convenienceness	◎It's no problem to berth small boats.	×Convenienceness is not good because of high height of jetty.	◎ It's no problem to berth small boats.
Achievements	Yes	Yes	Yes
Total evaluation	◎ Recommended	×Not recommend	○ Good / Recommendable

Note: ◎Excellent, ○Good, △Normal, ×Bad

The planned landing jetty under the Project will be located at a distance of at least 250 feet (approximately 76 m) from the existing commercial jetty. The design length of this jetty is approximately 90 m from the revetment as shown in the project drawing given later in accordance with the required length calculated earlier. The required water depth by the small fishing boats using this jetty is set at 1.5 m. As the seabed at the jetty construction site consists of fine sand deposited over a long period of time, dredging of the seabed to secure the necessary water depth and to shorten the jetty length does not appear to be a viable option because of the likely natural refilling of the area by drifting sand. A jetty length of some 90 m is, therefore, adopted despite a higher construction cost in view of the present seabed configuration and the necessity to secure the necessary jetty length to provide landing, preparation and resting functions with a water depth of 1.5 m. The shallow water section, (i.e.

water depth of less than 1.5 m) of about 25 m in length on the land side will be provided in order to maintain the present coastline as friendly to the nature as possible. The shape and position of the jetty is carefully considered to take account of the coastline and water depth at the project site, relative location of the jetty to the building facilities and flow lines involved in fishermen's preparations and landing of the catch, etc. A some 40 m long section at the top end of the jetty will be angled by 45° to the left from the straight line towards the offshore to facilitate the approach to and departure from the jetty by fishing boats.

(2) Facility plan

1) Facility layout plan

Shoppers arriving at the fish market are expected to concentrate on the south part of the planned project site which is near the existing fishery center (fish market) and bus terminal. Two flow lines are, therefore, considered, i.e. one to the south for shoppers and one to the north for staffs working in the various new fisheries facility, and fishermen. The layout of the fisheries facility is planned based on these two major flow lines.

Shoppers using the approach road in the south will park their cars in the south car park and shop on foot. On finishing their shopping, they will leave the site following the same route. In view of this, the fish market building will be located in the southern part of the Project site and the retail zone will be located at the southern end. The supporting spaces and functions will be located to the north of the retail zone as shown on the plan. The fishermen's locker house building will be located in the northern part of the newly developed land. The fishermen's locker houses will be arranged in a square shape forming a courtyard inside in view of the strong winds. Such sanitary facility as toilets and showers will be situated on the courtyard side.

The workshop building as an integral structure with the part of fishermen's locker houses will be located on the seaside. Because of the strong easterly winds from the sea, a planting area will be located along the retaining wall. A southern approach road will be created by improving the existing road while a northern approach road will be newly constructed.

2) Structural plan

a) Building and structural standards

British and American standards are mainly used in Grenada for the design of buildings and structures. In addition, there is also the CUBIC introduced by Caribbean countries.

Japanese building standards will be applied for the planned facilities under the Project while also referring to the above mentioned standards (code).

b) Outline of Structures

Items	Structure of upper part	Structure of lower part
Building of fish market	Structure: RC concrete structure Roof: RC concrete structure Wall: Concrete block	Double slab structure
Building of fishermen's locker (including Work shop)	Structure: Concrete block Roof: RC concrete structure	Double slab structure

c) Design load

a. Dead load

Weight of Structural material, Finishing material and Equipment are calculated by each. Unit weights of basic structural materials are as follows.

Concrete 2.3 ton/m^3

RC concrete 2.4 ton/m^3

Mortar 2.0 ton/m^3

Concrete block（Block dimension 19×19×39 ㎝） 300 kg/㎡

b. Live load (Unit: kg／㎡)

Name	For Slab, beam	For pillar, beam, foundation	Earthquake
Roof	30	10	0
Administration office etc	300	180	80

c. Wind load

A design wind load of 225 kg/m^2 is adopted based on the wind velocity of 60 m/sec associated with local hurricanes.

d. Seismic load

As Grenada Island is situated on the West Indies older or outer volcanic arc in the Caribbean Sea, the new structures will have sufficient anti-seismic structural strength. As in the case of Japan, a basic Co value of approximately 0.2 is considered.

e. Main materials and allowable stress

Material	Standard	Long term allowable stress (kgf /㎝^{2})			Short term allowable stress (kgf /㎝^{2})		
		Compression	Tension	Shearing	Compression	Tension	Shearing
Ordinary concrete, reinforce bar	Fc=210 kgf /㎝^{2} SD295（JIS）	70 2,000	- 2,000	7 -	140 3,000	- 3,000	10.5 -

Concrete aggregates will be locally procured. In order to prevent salt damage to the reinforcing bars, these aggregates will be washed to lower the salt concentration to the permissible level (JASS 5-11 class equivalent) or lower. Similar consideration to prevent salt damage will also be given to the mixing of concrete and the design of concrete members.

3) Facility plan

a) Water supply system

Water will be supplied from the 4" water main line buried under Victoria Street. The water supply system will be a direct connection system based on the following comparative analysis results between the direct connection system and the elevated water tank system.

a. The Project site is located in a coastal area where the water supply pressure is high with little fluctuation of the pressure.
b. The Project site is located in the central urbanized area of Grenville where the development of infrastructure is well advanced compared to other areas. As a result, frequent water cuts do not occur.

Rainwater will be effectively used for miscellaneous purposes and a rainwater tank will be introduced for this purpose.

Table 2-27 Comparative evaluation of supply water type

Items	Direct connection to water supply type	Elevated water tank type
1. Pressure of supply water	Fluctuating depend on main water pipe	Almost stable
2. Supply water when water supply is cut off.	Impossible	Water in the reservoir tank and elevated water tank is available.
3. Supply water when power is cut off.	No relation	Water in the elevated water tank is available.
4. Space for pump and rooftop tank	Unnecessary	Necessary
5. Comparison of facility price a) Reservoir tank b) Elevated water tank c) Pump, etc d) Relief valve e) Pluming material and sanitary tools	◎Comparatively cheap Unnecessary Unnecessary Unnecessary Necessary Necessary	△Comparatively expensive Necessary Necessary Necessary Unnecessary Necessary

b) Drainage facility

There is currently no public sewage system in Grenville. The existing building has a septic tank for ground infiltration or discharge to the sea. At present, water containing fish blood from the sorting

yard is discharged to the sea via a side ditch. As the Grenville Bay is encircled by a reef, there is hardly any seawater circulation in the foreshore. A waste water treatment plant is, therefore, planned under the Project to treat all types of waste water from the retail zone and sorting yard, etc. A separate septic tank will be introduced for foul water from the toilet and shower facility. Rainwater falling onto paved areas will simply be discharged to the sea.

c) Electrical installation

A service pole will be erected on the site and will be connected to the incoming panel in the power room located on the ground floor of the administration building by an overhead cable.

a. Lighting and power receptacles

Natural lighting is the main component of the lighting plan. Fluorescent and mercury lamps will be used in view of their long life and high efficiency. Receptacles will be introduced in appropriate places for connection of electrical equipment and machines.

b. Telephone system

A telephone conduit will be installed in four places, i.e. the market supervision office and three places in the administration office.

c. Public address system

The installation of a public address system is planned in the market supervisor office with the installation of speakers in the retail zone and sorting yard.

d) Exterior work

a. Paving plan

The existing access road to the new fish market from Victoria Street to the south of the site will be partly improved to serve general users and shoppers in the future and a parking area will be created. A new access road to serve business vehicles associated with the fisheries facility (including those of fishermen) will be constructed to the northwestern corner of the site and a business car park will be created in the space at the northern part of the site. These two access roads will be normally barricaded near the fish market building to completely separate the lines of flow for shoppers and business users for their own safety. The paving will be either concrete or asphalt pavement, excluding any green belt.

b. Perimeter fencing

The western side of the site is bordered by an Anglican church and a school which is affiliated to the Anglican church. New fencing which is high enough to block the line of sight from the school

premises will be erected along the border to avoid any adverse impacts on teaching at the school.

e) Building materials plan

The procurement of the building materials is planned with due attention to the following points and careful consideration of the possible supply sources in Grenada and abroad.

- Location of the construction site on the coast where buildings are liable to salt damage
- High temperatures due to the intense tropical solar radiation and high relative humidity throughout the year
- Need to select hygienic materials which are difficult to stain and easy to clean in view of the handling of fisheries products (fresh fish and shellfish) at the market

The finishing for the main building components, etc. is outlined below.

a. Exterior finish

Roof: RC slabs with waterproofing using urethane membrane

Outer walls: Concrete blocks with paint finish on mortar

b. Interior finish

Floor: Ordinary rooms - Vinyl tiles

Fish market - Cast-in-concrete with epoxy paint finish

Walls: Ordinary rooms - Concrete blocks with paint finish on mortar

Ceiling: Ordinary rooms - Calcium silicate boards with paint finish (market supervision office, administration office, toilets and shower rooms, etc.)

Doors and window frames: Salt-resistant aluminum doors and window frames facing the exterior; outside windows with a security grid

f) Ventilation and air-conditioning work

An air-conditioning system will be installed in the supervisor office, administration office and part of the processing room. A ventilation system will be installed in the locker rooms, shower rooms and toilets. Careful consideration is given to these rooms, including the introduction of skylights for natural lighting, in addition to natural ventilation.

4) Special equipment plan

a) Ice making plant

a . Frame structure

Structure: Steel frame structure

b. Ice making machine

Quantity: 2 units

Ambient temperature: 33℃

Water type : Fresh water

Temperature of water for ice: 30℃

Power source : 3P AC400Ⅴ 50Hz

Capacity : 2.0 tons/day (1 ton/day×2 units)

Ice type : Flake ice

Place for installation : Steel platform on the ice storage

Compressor : Approx. 11kw

Refrigerant : R-22

Condenser : Air cooling, alloy of copper, rust proof (fin and tube)

Accessory : Duct of exhaust gas for condenser (stainless)

c. Ice storage bin

Quantity : 1 unit

Capacity : 4 tons of ice

Ambient temperature: 33℃

Internal temperature: 0 ～-5℃

Power source : 3P AC400V 50Hz

Dimension : Approx. 4.5m (L)×3.6m (W)×2.2m(H)

Compressor : Approx. 2.2ＫW

Refrigerant : Ｒ-22

Condenser : Air cooling, alloy of copper salt resisting (fin and tube)

Starter : Variable voltage starter

Heat resisting panel: Anticorrosive color steel panel, heat resisting, thickness more than 100mm

Accessory : Duct for exhaust gas of condenser (stainless), thermometer, door heater, pluming materials for drain, grating, insert board, etc.

b) Cold storage facility

Quantity : 1 unit (2 compartments)

Ambient temperature: 33℃

Inner temperature : 0～－15℃

Power source : 3 P AC400V 50Hz

Dimension : Approx. 4.5m(Ｌ)×4.5m(Ｗ) ×2.4m(Ｈ)

Compressor : Approx. 7.0kw×2 units

Cooling medium : R-22

Condenser : Air cooling, alloy of copper salt resisting (fin and tube)

Doors : Approx. 1100mm(W)× 1700mm(H)

Material : Anticorrosive colored steel plate, heat resisting, more than 100mm

Accessory : Stainless steel shelf, duct for exhaust gas of condenser(stainless), grating, door heater, relief valve, thermometer, pluming materials for drain

c) Spare parts

Planned spare parts are as follows.

a. For ice making plant and cold storage

Main contents : Refrigeration gas for installation work, oil for refrigerator, construction and maintenance tools, spare parts for compressor of ice making machine and cold storage, spare parts for console board

(3) Equipment procurement plan

1) Total plan (Basic concept for equipment plan)

Contents of the project is carefully examined and paid attention to following points to design.

a) Equipments and the specifications are selected following the purposes, the necessity, and the technical level.

b) Numbers of equipments are carefully examined to pay attention to procurement of spare parts for maintaining them properly.

c) Specifications of fish boxes etc. are decided to consider the easiness of procurement locally.

2) Equipment

a) Seawater pump

Specification of seawater pump is as follow.

Quantity : 1 set

Specification : For seawater, throwing type 3.7KW 200 liters/mini, hose 200m hose reel and sprinkle nozzle, fitting material, etc.

b) Pushcart

Specification of pushcarts is as follow.

Quantity ：5 units

Loading weight ：300 kg

Dimension of cargo platform ：1.20m×0.90m

c) Insulated boxes

Specification of insulated boxes is as follow.

Quantity	: 2 units
Capacity	: 750 liter type
Specification	: With insulated lid

d) Fish boxes

Specification of fish boxes is as follow.

Quantity	: 65 units
Outer dimension	: 720 mm×480 mm×200 mm
Material	: Polyethylene or polypropylene (With stainless handle)

e) Scales

Specifications for scales(Scale for retailing & platform scale) are as follows.

Scales for retailing

Quantity	：33 units
Specification	：Desktop scale type
Scaling range	：0～20 lbs

Platform scale

Quantity	: 2 units (For fish and ice)
Specification	: Platform scale type
Scaling range	: 0～200 lbs

f) Radio sets

Specifications of radio sets (VHF, SSB) are as follows.

VHF radio set

Quantity	: 1 unit
Specification	：VHF 30 w with power reduction system
Accessory	：Wiring material, antenna

SSB radio set

Quantity	: 1 unit
Specification	: SSB150 W
Accessory	: Wiring material, antenna

g) Repair kit for inboard and outboard engine

One (1) unit of standard repair kit for inboard and outboard engines should be provided and installed in the planned workshop.

Quantity	: 1 unit
Contents of the set	: Spanners, wrenches, screw drivers, testers, gauges, drilling machine and bit, Vise, Hydraulic press, electric grinder, surface plate, chain block

(4) The result of basic design

The result of examination on the basic design of this project is as follow.

Table 2-28 Basic Plan

Items	Contents	Note
1. Facility		
①Fish landing jetty	Required length: Approx. 130m, Depth 1.5m 1 unit Pile type platform,	Necessary to secure distance from commercial jetty.
②Fish market facility		
②-1 Fish market building	Fish market building, one-storied building Area Approx. 770 ㎡	
-1. Retailing area	228 ㎡ Retailing booth×15, Sink×6, Processing table Sink for scalers×4	Vendors 15 persons Scalers 4 persons
-2.Ice making/storage plant	33 ㎡ Ice making capacity 2.0 ton/day(1 ton×2 units) Storage capacity 4 tons(Ice storage for 2 days)	
-3. Cold storage	49 ㎡ Approx. 1.2 tons (Divided into 2 compartments)	
-4. Store facility	36 ㎡	
-5. Fish processing room	66 ㎡	
-6. Fish handling area	159 ㎡ Including passage space for handling work, weighing work, gutting work	
-7. Sanitary room	54 ㎡ Shower, toilet and locker room for vendors	
-8.Administration office area	77 ㎡ Supervisor office×1、34 ㎡ Administration office×1、43 ㎡	
-9. Distribution panel room area	11 ㎡ Receiving panel and distribution panel room	
-10. Other facilities	Drainage and sewage facility (Toilet & Shower, fish handling area, etc) Preserver tank (For rain water approx. 10 tons) Radio antenna tower (Approx. 12m (height))	
②-2 Workshop	54m^2 For marine engine maintenance Slipway (Utilizing present beach in front of workshop)	
②-3 Fishermen's store (Fishermen's locker)	294m^2 30 rooms 264m^2 Toilet and shower room Approx. 30 ㎡	For 30 boats
③External facilities		
-1. Parking lots and access space	For 30 cars (Asphalt, partly concrete pavement)	
-2. Lighting		
2. Equipment		
①Seawater pump	Throwing type Approx. 0.2m^3/min、 1 unit (Including accessory)	For washing bottom of boats
②Pushcarts	Loading capacity 300 kg(Max 500 kg), 5 units	
③Insulated boxes and fish boxes	Insulated box, 750 litters type, 2 units Fish box: 720 mm×480 mm×200 mm, 65 units	For cold/chilled storage
④Scales	For retailing: Desktop scale type, 0～20 lbs, 17 units For ice and fish: Platform scale type, 0～200 lbs, 2 units	17 units + 3 (spare)
⑤Radio sets	For marine band, VHF: 1 unit For marine band, SSB: 1 unit	Including accessories
⑥Repair kit for workshop	Repair kit: 1 unit (Repair kit for small engine, Drilling machine, Vise, Hydraulic press, Electric grinder, Chain block, etc.)	

2-2-3 Basic Design Drawing

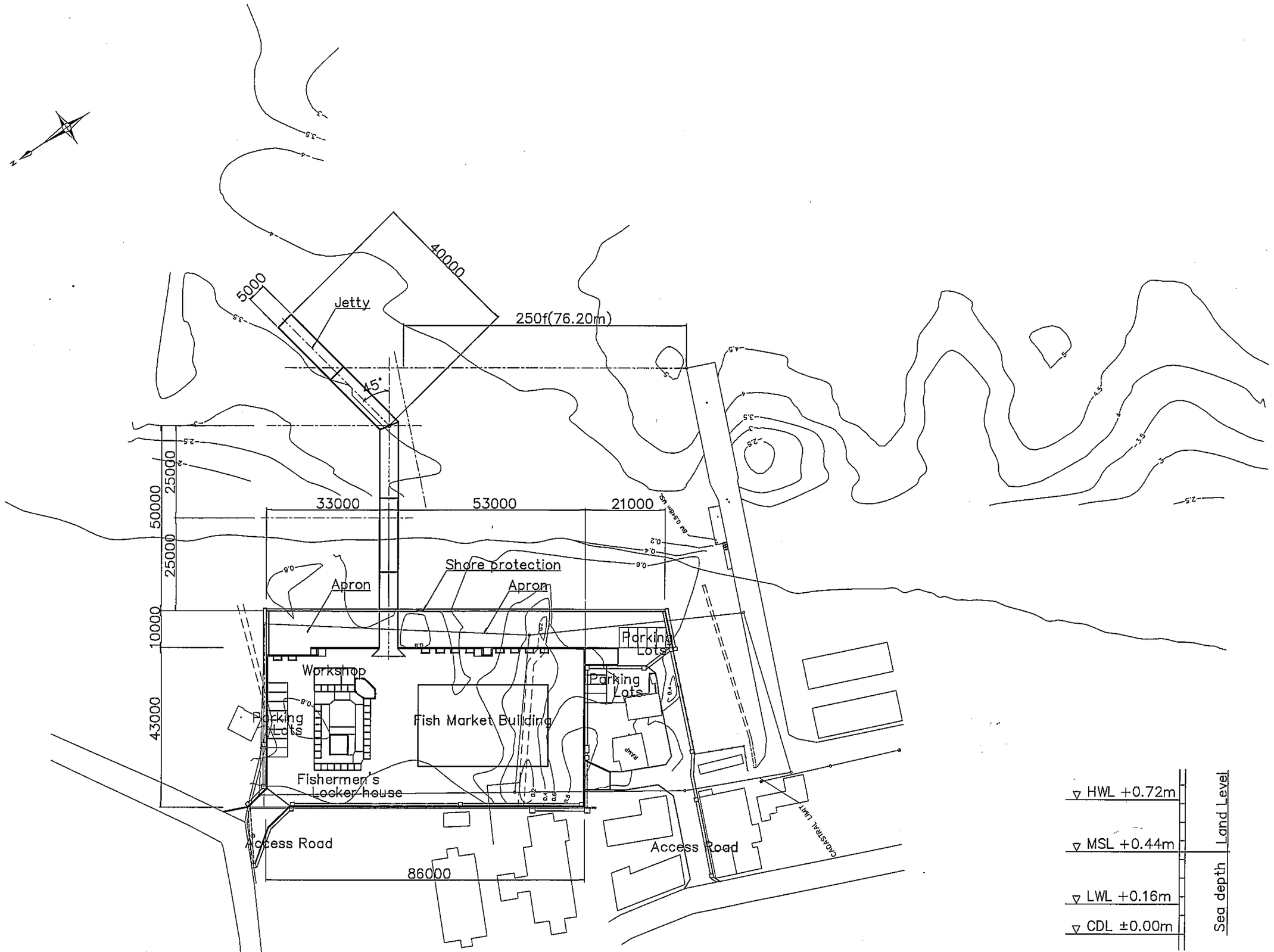


Figure 2–5 Total Arrangement Plan

Tidal Level
(Grenville Harbour)

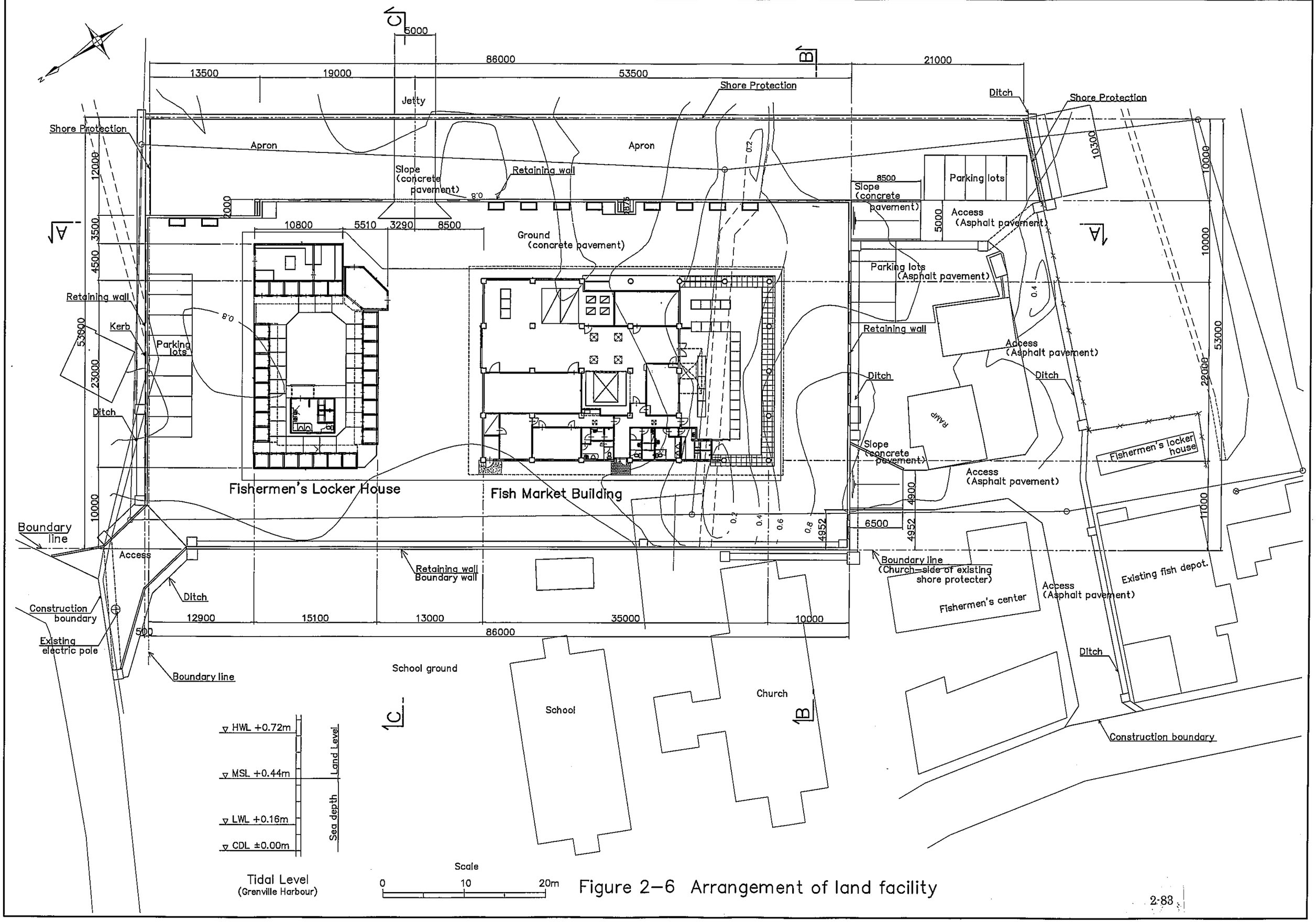
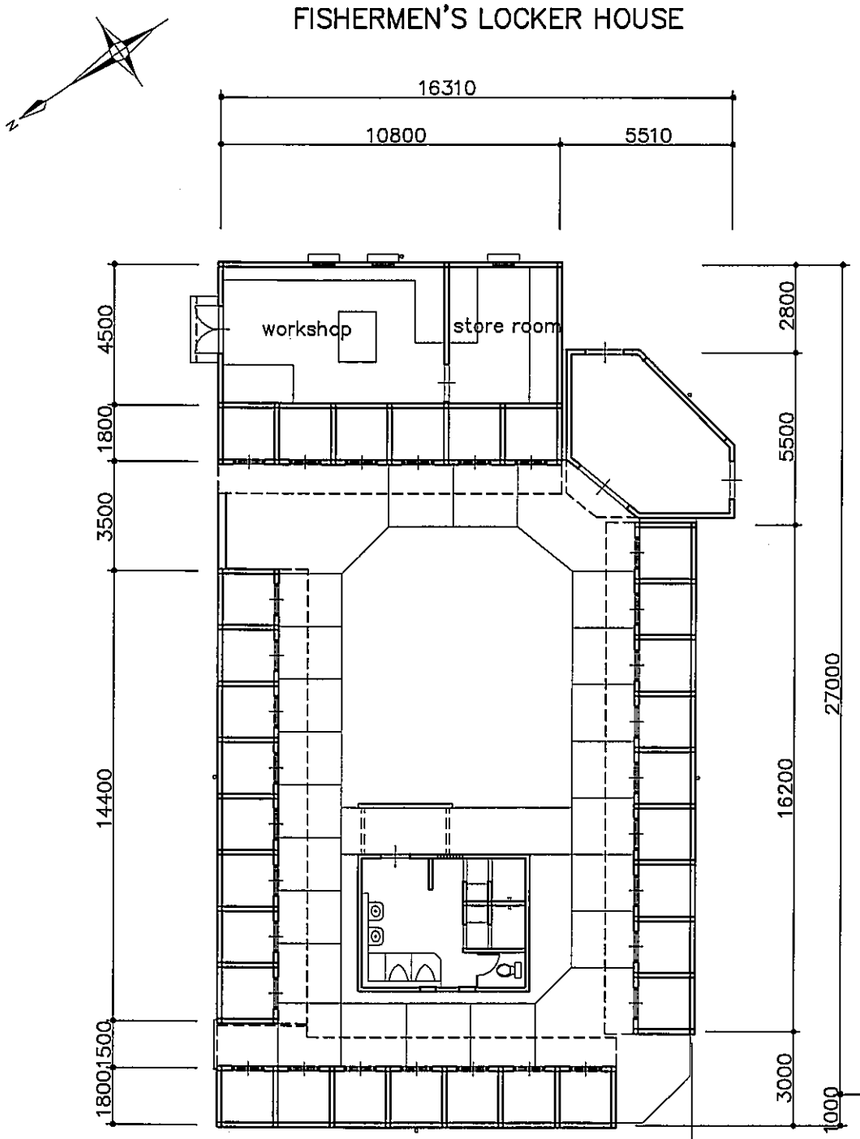


Figure 2-6 Arrangement of land facility

FISHERMEN'S LOCKER HOUSE



FISH MARKET BUILDING

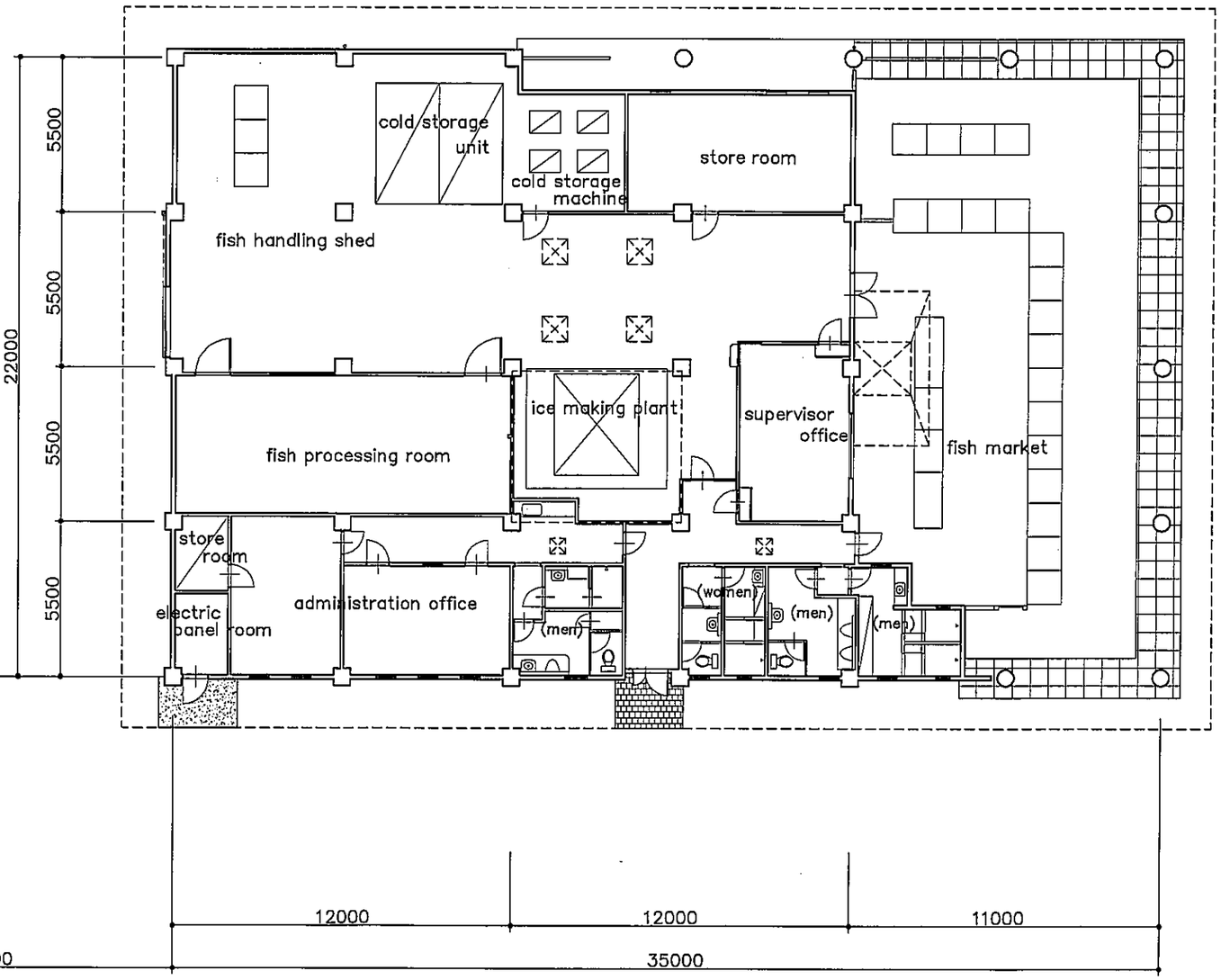
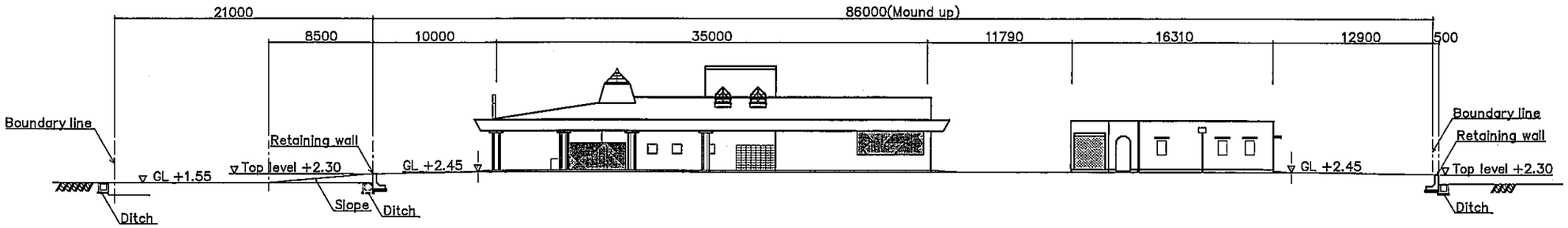
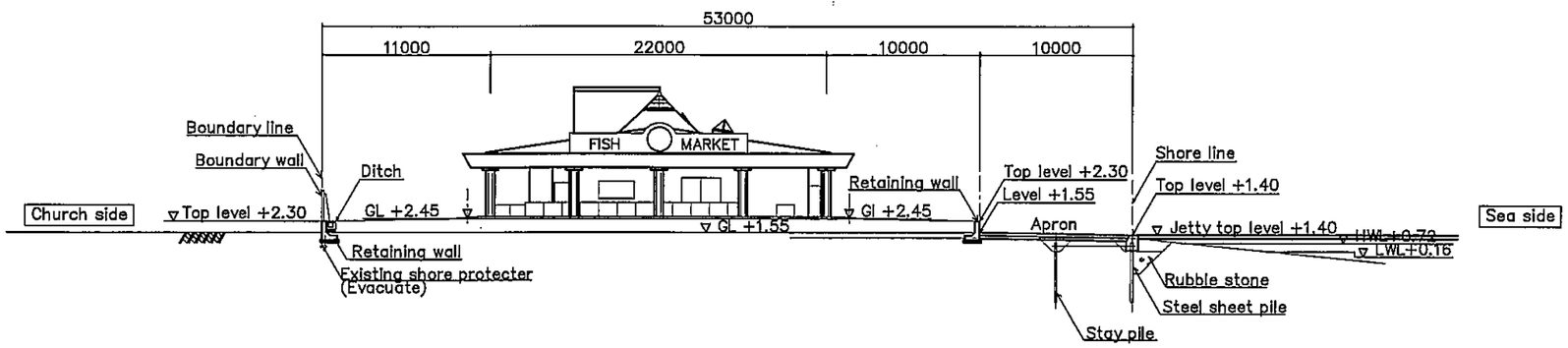


Figure 2–7 Floor plan fish market and fishermen's locker

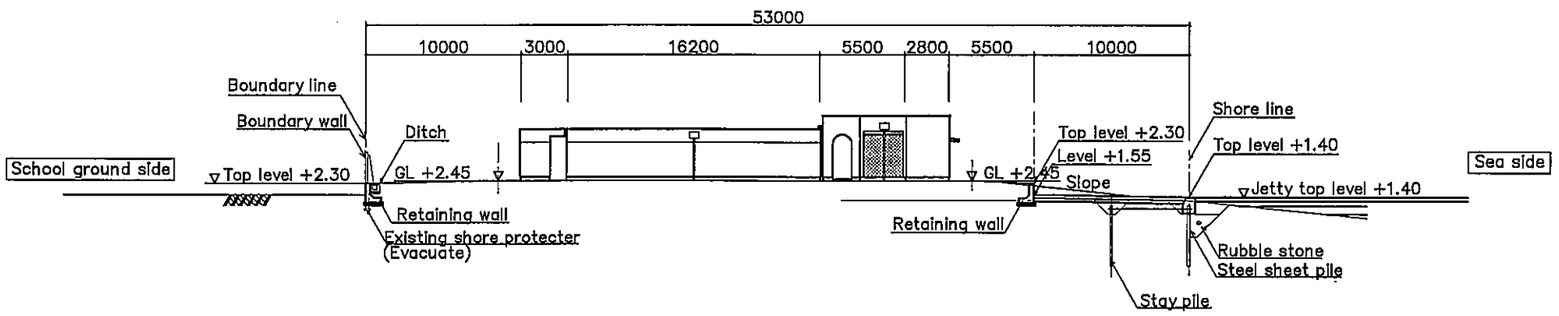
A–A VIEW



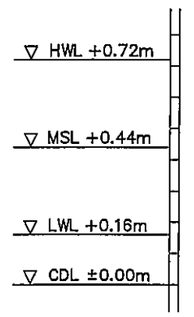
B–B VIEW



C–C VIEW



Tidal Level
(Grenville Harbour)



(Level criteria: CDL±0.00m)

Scale

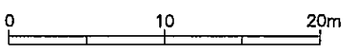
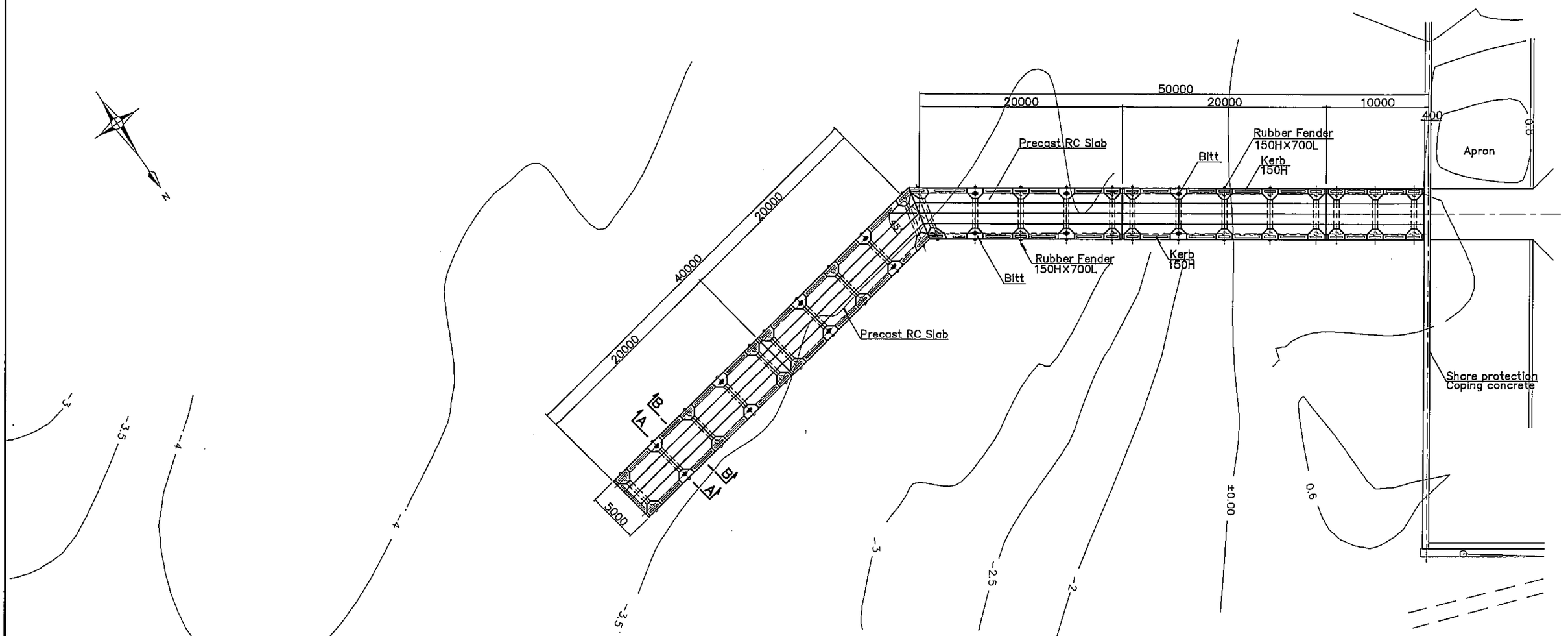
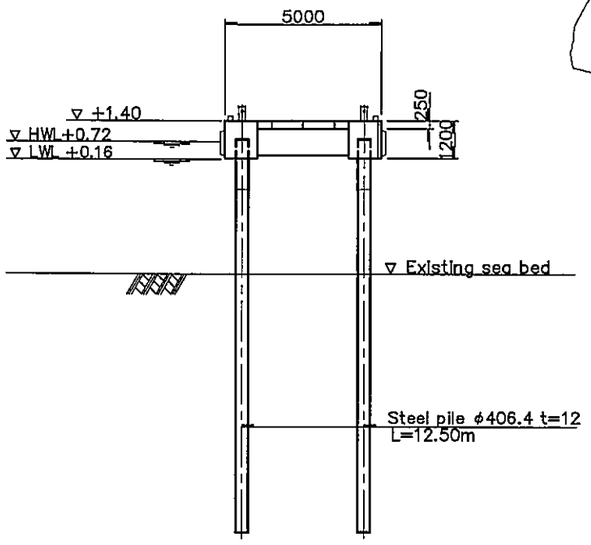


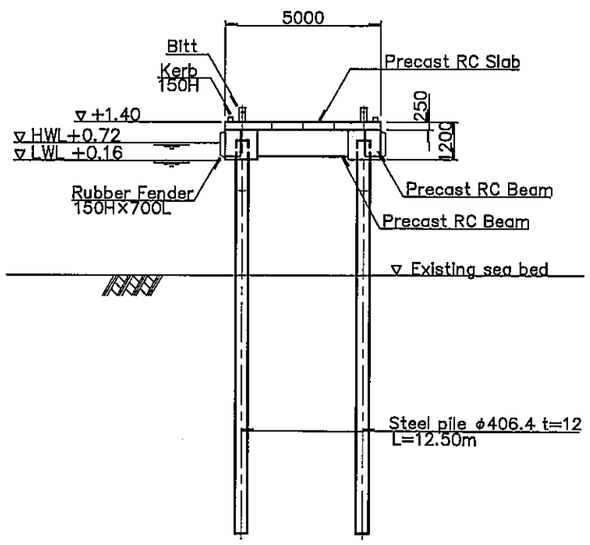
Figure 2–8 Elevation plan of fish market and fishermen's locker

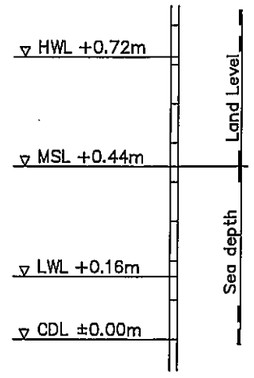


B–B SECTION



A–A SECTION





Tidal Level
(Grenville Harbour)

Figure2–9 Structure Plan of Fish landing jetty