No.

MINISTRY OF AGRICULTURE,
ANIMAL HUSBANDRY AND FISHERIES
THE REPUBLIC OF SUNINAME

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR CONSTRUCTION
OF
SMALL-SCALE FISHERIES CENTER
IN PARAMARIBO
IN
THE REPUBLIC OF SURINAME

JANUARY 2007

JAPAN INTERNATIONAL COOPERATION AGENCY

OVERSEAS AGRO-FISHERIES CONSULTANTS CO., LTD.

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PREFACE

In response to a request from the Government of the Republic of Suriname, the Government of Japan decided to conduct a basic design study on the Project for Construction of Small-Scale Fisheries Center in Paramaribo and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Suriname a study team from 13th day of July to 13th day of August, 2006.

The team held discussions with the officials concerned of the Government of Suriname, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Suriname in order to discuss a draft basic design, and as this result, the present report was finalized.

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

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

January, 2007

Masahumi Kuroki
Vice President
Japan International Cooperation Agency

January, 2007

LETTER OF TRANSMITTAL

We are pleased to submit to you the basic design study report on the Project for Construction of Small-Scale Fisheries Center in Paramaribo in the Republic of Suriname.

This study was conducted by Overseas Agro-Fisheries Consultants Co., Ltd., under a contract to JICA, during the period from June, 2006 to January, 2007. In conducting the study, we have examined the feasibility and rationale of the project with due to consideration to the present situation of Suriname and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

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

Very truly yours,

Nobuo Itoi
Project Manager,
Basic design study team on
The Project for Construction of
Small-Scale Fisheries Center in Paramaribo
Overseas Agro-Fisheries Consultants Co., Ltd.

SUMMARY

SUMMARY

(1) Outline of the recipient country

The Republic of Suriname (hereinafter referred to as "Suriname") is located in the northeastern region of the South America continent. It lies in between Guyana to the west and French Guiana to the east and it shares its southern border with Brazil. Its northern border is the Atlantic coast. The national territory extends for 164,000 km^2, 85% of which is covered by tropical rainforests. The northern part of the country is composed of fertile low-lying lands which are suitable for rice cropping, vegetable farming, and similar kinds of agriculture. The midland and the southern part form a mountainous area with an altitude of 1,000m and a dry savanna zone respectively. The overall population is 490,000, 90% of which reside on the coastal area in the north (The population in capital Paramaribo: 250,000). Whereas the GNI per capita as of 2004 recorded US$2,465 (according to the National Statistics Department), approximately 60.2% of all the households fell under the poor class (2000). As for the GDP ratio per industry (2004), the primary industry accounted for 6.9% of the total GDP, the secondary industry 38.3%, and the third industry 54.8%. Surinam's major export items include alumina, aluminum, gold and crude oil, which combined dominate 90% or more of the total exports, followed by fishery products, bananas, rice and timber in the order of export value. The working population is as low as 156,700 as of 2004, whereas the unemployment rate is 9.5%. The labor force consists of 8% in the primary industry, 14% in the secondary, and 78% in the third industry. Owing to the structural adjustment policies, such as tight budget and currency denomination, which were put in place by the incumbent administration launched in 2000, the national economy has gradually been stabilized.

Nevertheless, the economic infrastructure in Suriname is not yet rigid enough, because nearly the whole consumable goods in the country depend on import, the industry scale is rather small, and the export of alumina, one of the country's main staple products, is susceptible to effects of unstable market prices. On the other hand, Suriname is blessed with rich marine resources, and hence the fisheries industry plays an important role in both acquisition of foreign currency and supply of protein to the nation. Industrial fisheries by foreign vessels and artisanal fisheries by domestic boats have been operational since 1950s and 1980s respectively.

Surinam's coast line stretches for 380 km and its exclusive economic zone (EEZ) at a water depth of 100m or shallower is of 54,550 km^2. The continental shelf lies roughly 120 to 150 km offshore the Atlantic Ocean from the coastal line and is exposed to water inflows carrying nutritiously rich sands and soils from the four great rivers, hence providing an ample fishing ground. The fisheries in Suriname can be largely categorized into industrial fishery with the fishing base in offshore waters, artisanal fisheries in coastal waters and rivers, and mid water

fisheries in inland waters including aquaculture. The industrial fishery takes place in fishing grounds at a water depth of 20m or deeper and ranges from shrimp trawler fishery by officially-licensed foreign vessels and hook-line fishery of snapper by Venezuelan vessels, to bottom fish trawler of sciaenidae and lutjanidae, etc. Shrimp trawler fishery, in particular, has dominated the core of Surinam's fisheries since 1956 when the U.S. started the operation, and accelerated since 1973 when the Surinamese government founded a joint fisheries company with Japan. Accordingly, fish landing jetties and processing plants that satisfy the sanitary standards have been constructed for industries sector. The fishing grounds for the artisanal fishery are 20m or less below the sea surface in coastal areas, brackish waters and inland waters. The fishing methods employed are drift gill net fishing on banks (shallow ends) in coastal areas where bottom fish resources are abundant, Chinese seine fishing and drifting gill net fishing which utilizes the flow of tides around the estuaries. The fish catches primarily include sciaenidae, catfish, white croakers, shrimps, etc. and are shipped to not only the domestic market but also export markets in recent years. The aquaculture fishery is carried out to grow white leg shrimps, tilapia, etc., but is still at a low industrial level due to the small quantity of yields resulting from lack of operational and financial assistance.

The fisheries dominates 5% of the total GDP with approximately 5,000 workers engaged in the industry, which occupies roughly 3.2% of the whole working population. The annual landing of fishery products amounted to 33,065 tons in 2004, of which approximately 7,000 to 8,000 tons were presumably consumed in the domestic market including captive use. The export amount of fishery products in fiscal 2004 was 15,924 tons, worth approximately US$35.66 million (equivalent to app. 4.1 billion Japanese yen), which constitutes about 5.6% of the total export value of US$632.97 million. The fishery products were exported mainly to Western countries (50.0%), Jamaica (38.3%), and Japan (6.2%) in 2005.

(2) Background and outline of the requested project

The government of Suriname formulated a policy for promotion of artisanal fisheries in early 1980, aiming to train artisanal fishers by providing modern fishing gears and fishing methods, and motorized fishing vessels, targeting low-income artisanal fishers and bottom fishes of high development potential. The government also pulled together an artisanal fisheries development plan to establish an infrastructure in four rural coastal areas (namely Nieuw-Nickerie, Boskamp, Commewijne and Maroni), in order to raise the level of the artisanal fishers.

Since early 1980, artisanal fisheries has been taking place in the city of Paramaribo centering relatively-large Guyana-type fishing boats. Meanwhile, the number of fishing boats and the amount of landing have increased to approximately 6,000 tons per year today. On the other hand, since there is no public fish landing facility established in and around Paramaribo, most of

those SK-GG, SK-OG, and SK-B type large boats based in the city have been unable to secure places where they can regularly unload their catches, and as a result they are forced to unload and prepare for fishing in areas where they can approach their boats along the Suriname river (hereinafter referred to as "existing landing bases").

Of these areas, there are ten landing sites on the western riverbank of the Suriname river in Paramaribo, including three areas only with mooring facilities for fishing boats: (vi) revetments on the back of the public Central Market, Nene jetty and Bisoen jetty. Therefore, in the other existing landing sites, the boats have to use waterways at the exit of the sluice gate or riverbanks of the Suriname river as landing sites. Furthermore, not excepting the three major landing sites quoted above, all existing landing bases are narrow and situated at shallow depth, which only allows them to land their catches for two to four hours over the high tide. In this way, many fishing boats are inevitably working in an inefficient and unhygienic environment.

There are more problems that still remain to be solved. The supply of ice to artisanal fishing boats is insufficient in the Paramaribo area, restricting them from going on planned fishing or limiting the number of days per fishing. The government of Suriname received a request from European countries, in 1997, for formulation and enforcement of sanitary control standards to be imposed upon Surinamese companies who export and process fishery products. Though the Fish Inspection Act and its Ordinance have accordingly been in place since 2002, none of the existing landing bases satisfy the level of facility development stipulated by the laws.

Under such circumstances, the government of Suriname planned the "the project for Construction of Small-scale Fisheries Center in Paramaribo", aiming at development of a sanitary and efficient landing facility which allows safe and smooth landing at times of low tide, has functions of loading of landings into insulated vans and storing the landed catches, and is equipped with facilities to supply ice, fuel, water, etc. To this end, the government requested to the government of Japan for grant-aid assistance for construction of such a facility and procurement of necessary equipment associated therewith.

(3) Overview of Study Results and Contents of the Project (Overview of Basic Design, Facility and Equipment Plan)

In response to the request, the government of Japan has decided to conduct a Basic Design Study after carrying out a Preliminary Study and dispatched a study team to Suriname as follows.

Basic Design Study : from July 13th to August 13th, 2006
Draft Basic Design Study : from November 2nd to 9th , 2006

The study was conducted to 1) confirm the necessity of the requested contents, urgency of the project, appropriateness of the selected candidate project site, and the implementation scheme and maintenance capacity of the recipient country, 2) examine an appropriate scope and scale of the assistance, 3) collect necessary information and data, and 4) provide recommendations on the contents, scale, and other details of the Basic Design Study if implemented. It must be noted that, while the original request designated a landing facility for the first phase and a fish catch quality control facility for the second phase, the preliminary study only covered the landing facility for artisanal fishers requested for the first phase, based on a consensus with the Surinamese side.

As a result, it was judged that development of an efficient landing facility complying to Surinam's Fish Inspection Act, which would be enabled by developing public fish landing facility and jetties and related facilities equipped with facilities for preparation for fishing, ones such as supplying ice, water, and fuel, was necessary and should be given a higher priority in order to resolve the issues in the artisanal fishery sector in Paramaribo. Also, the project site was moved from the original spot on the western bank of the Suriname River adjacent to the office of the Fisheries Department to the premise of CEVIHAS, a state-owned fisheries company, located approximately 6 km upstream, in view of the recent conditions of soil and sand sediment in the original candidate area and other factors. In addition, a Basic Design whose overview is shown below was formulated, through the field survey and discussions with the Surinamese government.

Overview of Facilities

Facilities Category	Structural Details	Contents of Facility	
Civil Engineering Facility			
Jetty	Steel pipe pile structure, reinforced concrete superstructure work	Landing jetty length:55.00m, width:8.00m Section A of access jetty length:12.55m, width: 24.8m Section B of access jetty length:35.50m, width: 6.00m Section C of access jetty length:11.88m, width: 6.00m	
Revetment	H steel pile, coping of upper concrete	Total length:73m, Height:1.4m	
Construction Facility			Total floor area
Management Building	Steel structure one-story building	Manager's office, reception room, accounting room, general affairs office, sensory inspection laboratory, anteroom for engineers, meeting room, toilet for men, toilet for women, document depository, furnishing room, and refrigerator	461.64㎡
Ice-making building	Steel structure two-story building	Ice-making machine room×2, ice storage room×2, and air-cooling condenser deck	357.26㎡
Security Guard and Power-receiving Building	Reinforced concrete structure one-story building	Security guard room, power-receiving room, and standby generator room	43.67㎡
Public Toilet building	Reinforced concrete structure one-story building	Toilet for men, shower room for men, and toilet for women	36.55㎡
Fishing Gear Mending shed	Steel structure one-story building	4 areas (app. 56.15㎡×4)	224.64㎡
Outdoor Facility	Asphalt pavement	Access road and parking lot	828.60㎡
Ancillary Facilities		Water-receiving Tank, septic tank, substation facility, and standby generator	

List of major equipment and its usage

Classification	Name of Equipment	Usage	Number of Unit
Fresh fish handling Equipment	Insulated container	Store fresh fish with ice in place	10
	Fish container	Store fresh fish with ice in place	50
	Spring scale	Measure fish on jetty	2
	Flat scale	Measure fish and ice on jetty	2
	Pallet	Transport insulated container and fish container	3
	Handy pallet truck	Transport pallet	3
Freshness Measuring Equipment	Freshness meter	Measure the freshness of landed fish numerically	2
	pH meter	Measure the pH value of landed fish and assess the freshness	2
	Thermometer	Measure the temperature of landed fish and assess the icing condition and freshness.	2

(4) Construction Period and Estimated Project Cost of the Project

A construction period of 4 months for implementing design, 9.5 months for construction, and 3.5 months for procurement of equipment shall be required in implementing the Project by Japan's grant-aid assistance.

An estimated project cost shall be calculated at 828 million yens (821 million and 7 million yen to be born by the Japanese and Surinamese sides respectively.)

(5) Project Evaluation

The project is expected to bring the following effects and improvements.

- The constraints in terms of waiting for tides, waiting for landing bases to be available, etc. shall be mitigated. The time it takes to land catches will be shortened from app. 2 hours to 1 hour.
- The time it takes to load ice will be shortened from app. 4 hours to 2 hours. The time for preparation for fishing will also be shortened from app. 2 hours to 1 hour.
- The catches that cannot immediately be shipped or delivered after landing will maintain a sound quality and good price.
- The target boats will be able to procure ice all the year round.
- Provided that the conditions of decreasing stock of resources and climate, the number of trips by the artisanal fishers covered in this project will increase by 1 or 2 times/boat, thereby increasing the amount of fish catch.
- Statistics and quality inspection works in the landing bases will become significantly easier and the accuracy of statistics and inspection data will improve accordingly.

- The working environment under extreme weather conditions, such as hot sunshine and heavy rain will be improved. The time required to repair a fishing net will be shortened from app. 4 days to 2 days.

The operation and maintenance costs incurred for running the Paramaribo Small-scale Fisheries Center and the equipment supplied under the project are estimated at around 712.384 Surinamese dollars (SRD) every year following the completion of the project, whereas an annual revenue from usage charges of the Center is calculated at approximately SRD993.974. Accordingly, operation and maintenance of the Paramaribo Small-scale Fisheries Center are deemed as financially sound.

The points noted hereunder rationalize the implementation of this project as Japan's grant aid assistance.

i) The beneficiaries of the project are estimated as to include about 860 artisanal fishers and approximately 600 people engaged in fish trading, fishery product processing, and exporting, who will all be users of the Center and equipment provided in this project.

ii) The implementation of the project will expectedly improve the sanitary conditions of the landing jetty for fishery products in Paramaribo and upgrade the quality of fishery products targeted for both domestic consumption and exports.

iii) Operation and maintenance of the Center and equipment provided under the project do not require high levels of technology and experience, and can basically be handled by Surinam's funds, human resources and technologies.

iv) This project will contribute to accomplishment of the "construction of the Paramaribo Small-scale Fisheries Center" to assist artisanal fishers, which is one of the goals posted in the Surinamese government's mid- and long-term fisheries development policies.

v) Operation and maintenance of the Center and equipment provided under the project can expectedly be managed smoothly under a self-accounting system using the revenue from the operation of the project.

vi) The implementation of the project will exert minimum adverse impacts onto the environment and society, and it is possible to mitigate or avoid such impacts.

vii) The project is feasible under Japan's grant aid assistance scheme without any special struggles.

The following points are recommended in order to implement the Project in a smooth and effective manner.

(1) Exchange of opinions with users of the Center and preparation of operation rules

The Paramaribo Small-scale Fisheries Center to be constructed will be the very first public landing facility in the city of Paramaribo. Therefore, the Fisheries Department is expected to draft a set of operational rules regarding the Center and equipment associated with it, and finalize the rules based on the mutual understanding and consensus to be obtained through explanation on the contents to future users, exchange of opinions with them, hearing their requests, etc. in advance of the opening of the Center, for the purpose of providing fair and detailed assistance in artisanal fisheries.

It is particularly important to ensure a smooth ramp-up and orderly management of the Center, by keeping everyone concerned informed of the decision-making policy on the priority of using the facilities and equipment in the Center, the method of paying various relevant charges, considerations for neighboring businesses and vessels passing in the vicinity, pollution of the natural environment, penalty provisions, etc.

(2) Formulation and implementation of adequate maintenance and improvement plans

On the other hand, the existing fisheries centers tend to respond to an equipment failure or breakdown when it occurs and have undergone financial loss due to long hours of interruption before the recovery of the corresponding functions.

The Paramaribo Fisheries Center will be at the same time a public landing facility exclusively for artisanal fishing boats that is available for 172 target boats and the only landing facility that satisfies the facility development requirements stipulated in the Fish Inspection Act in Paramaribo. Therefore, the maintenance and security of its basic functions will have a significant impact on the activities of artisanal fishing boats, distributors, and processing companies based in the Center. Especially, development and expansion of an ice-making function is a desire that artisanal fishermen have been longing for up until now, thus, its maintenance is highly significant.

Therefore, in order to ensure that all the facilities in the Center will run in a smooth and economic manner, this project is expected to formulate a preventive maintenance plan which prevents failures and breakdowns from happening and allocate adequate budgeting, by introducing a routine and regular maintenance mechanism, a depreciation system which takes the lifespan of the equipment into account, and so on. Moreover, Paramaribo has a large amount of rainfall throughout the year and is highly humid. Further, the Suriname River that the project site faces is subject to back current of seawater. Therefore, it is imperative to pay attention to possible rust and corrosion of the buildings and facilities

resulting from salt damage, and, in particular, to implement anti-rust painting to steel parts, so as to extend their lifetime and preserve the functions.

(3) Countermeasures for environmental conservation

As for any possible impact onto the environment that the project may bring about, the Fisheries Department of Suriname has conducted an environment impact assessment and reported in a draft version of its report that there will be no significant adverse impact. In the meantime, the report mentions a possibility of impacts during the construction period and after the construction and recommends the necessity of formulating an environmental management plan as an alleviation method.

The environmental management plan is expected to stipulate implementation of countermeasures against river water pollution caused by dumping and outflow of garbage from the planned center, bilge (wastewater containing oil) from fishing vessels, and fuels handled on the jetty into the river, and performance of water quality monitoring near the project site.

To this end, the Fisheries Department must explain these considerations for the surrounding environment to the stakeholders including the users of the Center, keep them well aware of the operational rules of the Center, and strive for alleviating and preventing any negative impacts.

Moreover, it is also desirable to formulate and implement accident prevention and safety control measures, disaster prevention drill plans, and a communication system to report an accident to the MAS, the fire department, etc., as a means to respond to any emergency or contingency such as outflow of fuel into the river and fire disaster.

(4) Preparation and submission of project reports

The Small-scale Fisheries Center in Paramaribo shall be managed based on a self-support accounting system under supervision and instruction of the Fisheries Department. Therefore, the Center is expected to prepare annual reports on the operation and maintenance, the situation of use, and balance of payments of the Center, evaluate the details of operation every year, and improve and construct an operation and maintenance system, so as to obtain stable and highly-efficient operational outcomes in the long term.

In addition, by obliging the Center to submit the above-mentioned reports to the Fisheries Department and the Ministry of Agriculture, Animal Husbandry and Fisheries, the Fisheries Department will be responsible for supervising fair and sound operation of the Center, so

that they can provide adequate advice and instruction to the Center in case that correction or improvement needs to be made to the details of the management of the Center to reflect requests of the users. Furthermore, the Fisheries Department is expected to submit the same reports to the Japanese Embassy in Trinidad Tobago and JICA office in Mexico, to report the outcomes of the project provided under Japan's grant aid scheme.

CONTENTS

PROJECT SITE LOCATION MAP

ANTICIPATED PERSPECTIVE : SMALL-SCALE FISHERIES CENTER IN PARAMARIBO

LIST OF FIGURES AND TABLES

[Figures]

[Tables]

ABBREVIATIONS

Abbreviation	Idiom	Original Name
ADEK	Dutch	**Anton De Kom Universitet**
	English	University of Suriname
AIJ	English	Architectural Institute of Japan
ASTM	English	American Society for Testing and Materials
BOD	English	Biochemical Oxygen Demand
CBR	English	California Bearing Ratio
CDL	English	Chart Datum Level
CEN	French	Comité Européen de Normalisation
	English	European Committee for Standardization
CEVIHAS	Dutch	**Centrale voor Visseshavens in Suriname N. V.**
	English	Center of Fish Horbours in Suriname
COD	English	Chemical Oxygen Demand
EBS	Dutch	**N.V. Energie Bedrijven Suriname**
GL	English	Ground Level
G/T	English	Gross Tonnage
HWL	English	High Water level
IEC	English	**International Electrotechnical Commission**
ISO	English	International Organization for Standardization
LWL	English	Low Water Level
MAS	Dutch	**Maritieme Autoriteit Suriname**
MEY	English	Maximum Economic Yield
MSY	English	Maximum Sustainable Yield
NIMOS	Dutch	**Nationaal Instituut voor Milieu en Ontwikkeling in Suriname**
	English	National Institute for Environmental and Development in Suriname
NSP	Dutch	**Normal Suriname Peil**
OCDI	English	THE OVERSEAS COASTAL AREA DEVELOPMENT INSTITUTE OF JAPAN
PC	English	Precast Concrete
RC	English	Reinforced Concrete
SAIL	English	Suriname American Industries Limited
SRD	English	Suriname Dollar
STIVI	English	Institute for the Development of Fisheries Suriname
SUJAFI	English	Suriname Japan Fisheries
SWM	Dutch	**Surinaamsche Waterleiding Maatschappij**
SK-GG	Dutch	**Gesloten Guyana Type**
	English	Closed Guyana Type
SK-OG	Dutch	**Open Guyana Type**
	English	Open Guyana Type
BV	Dutch	**Binnenvaartvisserij**
	English	Inland Fishing Vessel (Suriname Type Fishing Boat)

CHAPTER 1 BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND OF THE PROJECT

1-1 Background of the Project

Since early 1980, artisanal fisheries has been taking place in the city of Paramaribo centering relatively-large Guyana-type fishing boats. Meanwhile, the numbers of fishing boats and the amount of landings have increased to approximately 6,000 tons per year today. On the other hand, since there is no public fish landing facility established in and around Paramaribo, most of those SK-GG, SK-OG, and SK-B type large boats based in the city have been unable to secure places where they can regularly land their catches, and as a result they are forced to land and prepare for fishing in areas where they can approach their boats along the Suriname river (hereinafter referred to as "existing landing sites").

Of these areas, there are ten landing sites ((i) - (x)) as indicated in Table 1-1 on the western bank of the Suriname river in Paramaribo, including three areas only with mooring facilities for fishing boats: (vi) revetments on the back of the public Central Market, (iv) Nene jetty and (ii) Bisoen jetty. Therefore, in the other existing landing sites, the boats have to use waterways at the exit of the sluice gate or Riverbanks of the river as landing sites. Furthermore, not excepting the three major landing sites quoted above, all existing landing sites are narrow and situated at shallow depth, which only allows them to land their catches for two to four hours over the high tide. In this way, many fishing boats are inevitably working in an inefficient and unhygienic environment.

Table 1-1 Existing Landing Sites in and around Paramaribo

	Name of place (so-called)	Present conditions
i	Clevia	Waterways at the exit of the flood gate
ii	Bisoen jetty	Small jetty (wooden)
iii	Chinese Koka	Waterways at the exit of the flood gate
iv	Nene jetty	Small jetty (wooden)
v	Platabrokie	Ferryboat terminal
vi	Central Market	Riverbank in the back of the Central Market (No jetty/wharf)
vii	Murg	Riverbank along the river
viii	Jasodora	Riverbank along the river
ix	Niekoop	Riverbank along the river
x	Kamar	Riverbank along the river
xi	Wijdenbosch	Riverbank along the river
xii	Veer-steiger	Riverbank along the river
xiii	Habiboellah(1)	Small jetty (wooden)
xiv	Habiboellah(2)	Small jetty (wooden)
xv	Hugo	Small jetty (wooden)
xvi	Habiboellah(3)	Small jetty (wooden)
xvii	Commewijne Fisheries Center	Steel floating jetty

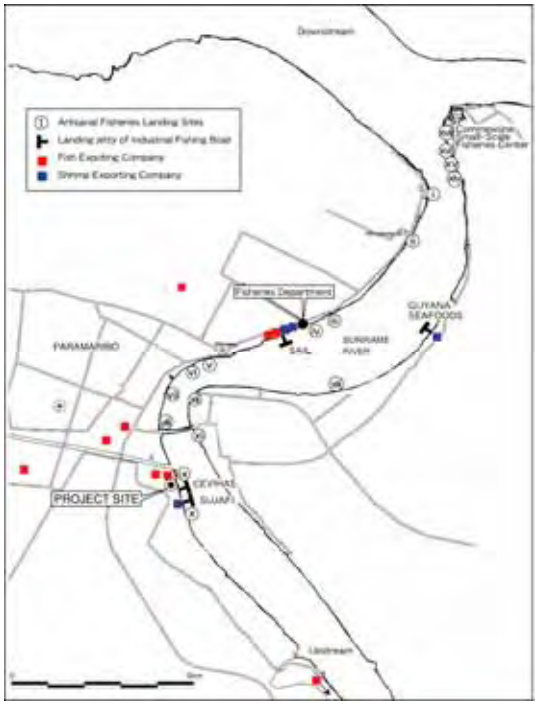


Figure 1-1 Locations of Existing Landing Sites

There are more problems that still remain to be solved. The supply of ice to artisanal fishing boats is insufficient in the Paramaribo area, restricting them from going on planned fishing trips or limiting the number of days per trip. The government of Suriname received a request from Europe, in 1997, for formulation and enforcement of sanitary control standards to be imposed upon Surinamese companies who export and process fishery products. Though the Fish Inspection Act and its Ordinance have accordingly been in place since 2002, none of the existing landing sites satisfy the level of facility development stipulated by the laws.

Against this background the Ministry of Agriculture, Animal Husbandry and Fisheries compiled the plan for construction of Small-scale Fisheries Center in Paramaribo, aiming at development of a sanitary and efficient landing facility which allows safe and smooth landing at times of low tide, has functions of loading of landings into insulated vans and storing the landed catches, and is equipped with facilities to supply ice, fuel, water, etc. To this end, the government requested to the Government of Japan for grant-aid assistance for construction of such a facility and procurement of necessary equipment associated therewith.

- Landing facility (T-shaped jetty, floating jetty, small jetty): 85m long and 4m wide
- Slipway and boat ramp: 30m long and 18m wide
- Management building: a floor area of app. 900m^2, Multi-purpose building (including ice-making machine and cooling equipment): 1,050 m^2
- the Fisheries Department office (to be rehabilitated): 300 m^2, with the laboratory to be remodeled
- Ice-making machine: a daily production capacity of 20 tons, Cooling equipment: a capacity of 50 tons
- Workshop, fishing gear warehouse, toilet/shower facilities
- Revetments, access roads, height increase of the site
- Workshop equipment: 1 set of outboard motor mending equipment, Equipment for ice-making machine and chilled room: 1set
- Equipment for disposal of fish catches, office equipment, laboratory equipment: 1 lot
- Pickup trucks, forklifts: 1 unit each

In response to the request, the Government of Japan dispatched a preliminary study team to Suriname from December 4th to 29th, 2005, in order to 1) confirm the necessity of the requested contents, urgency of the project, appropriateness of the selected candidate project site, and the implementation scheme and maintenance capacity of the recipient country, 2) examine an appropriate scope and scale of the assistance, 3) collect necessary information and data, and 4) provide recommendations on the contents, scale, and other details of the Basic Design Study if implemented. It must be noted that, while the original request designated a landing facility for the first phase and a fish catch quality

control facility for the second phase, the preliminary study only covered the landing facility for artisanal fishers requested for the first phase, based on a consensus with the Surinamese side.

As a result of the study, it was agreed that the project site would be moved from the original spot on the western bank of the Suriname River adjacent to the office of the Fisheries Department to the premise of CEVIHAS, a state-owned fisheries company, located approximately 6 km upstream, in view of the recent conditions of soil and sand sediment in the original candidate area and other factors. It was also decided, through the field survey and discussions with the Surinamese government, that the following topics would additionally be studied as part of the assistance. Further, it was confirmed that when implementing the Basic Design Study, the government of Suriname shall secure necessary land, establish an operation and maintenance mechanism, organize stakeholders' meetings to address environmental and social considerations, and carry out an environment impact assessment (EIA).

Following the preliminary study, the Basic Design Study started on July 13th and ended on August 13th, 2006. After analysis and examination of the outcomes of the study in depth in Japan, the Draft Basic Design Study took place between November 2nd and 11th, 2006.

Based on the field survey as well as discussions with the recipient government and related organizations in Surinam, the following changes were made to the components to be covered in the project.

(1) Items to be deleted

The mooring jetty, boat ramp, slipway, workshop and all equipment necessary in relation to these facilities are no longer needed and also no relevant equipment needs to be provided under the project, since there is only a limited water area available for construction of the landing jetty in front of the proposed site, and neighboring CEVIHAS Company is equipped with straddle type boat carrier as well as boat yards. Furthermore, the Surinamese side informed and explained that they need no handling hall necessary for sorting of catches, washing and primary processing, washing room, fishing gear warehouse, and processing tables and tools, because no auction takes place at the landing site. These items were therefore deleted from the list of requested components.

(2) Items to be added

Since there is no place where artisanal fishers can fully unfold their fishing nets to perform mending works near the existing landing sites and mooring areas, and fishers have therefore been strongly requesting for such a place, a fishing gear mending area was added. Further, as the Fish Inspection Act mandates quality inspection to be performed onto the catches in all processes ranging from transport and delivery of fish catch from the landing facility to processing and

shipment of fishery products from sales facilities, sensory inspection instrument to test the freshness of fish catch was also added.

Table 1-2 below compares the priorities and evaluations of the components to be covered in the project between the preliminary study and the field survey in the Basic Design Study.

Table 1-2 Comparison of the Components to Be Covered in the Project between the Preliminary Study and the Basic Design Study

Function	Contents requested in the preliminary study	Priority	Evaluation	Components studied in the Basic Design Study
(i) Landing/ Preparation for fishing Shipment	Landing jetty, jetty for preparation, water supplying facilities, lighting facilities, revetments (stone masonry), fueling facilities (securement of land)	A	An addition of a fueling station With works in early morning and evening	Jetties for landing and preparation for fishing, water supplying facilities, lighting facilities, revetments (The fueling station*) shall be born by the Surinamese side.)
	Jetty for mooring	B	Difficult to secure adequate water area.	[Deleted]
	Scales (measuring instrument), carts, forklifts, pickup trucks	A	Including forklifts for transportation	Scales (2 types) Handy carts and pallets (For transporting fish and ice)
(ii) Improvement in the fishery product quality	Ice-making machine, ice storage, chilled room, freezer operation room	A		Ice-making machine and ice storage Chilled room (kept at ±0 degrees C)
	Room for disposal of catches (Space for disposal and washing)	D		[Deleted]
	Insulated containers (catches), insulated containers (ice), plastic containers	A		Insulated containers (for fish and ice), plastic containers (for fish and ice)
	Processing table, fish processing tools	D		[Deleted]
				[Added] inspection table, freshness inspection instrument (3 items)
(iii) Assistance in fishing activities	Boat ramp, workshop	A	For small-scale mending	[Deleted]
	Slipway	B/C	Large-scale mending can be conducted in neighboring CEVIHAS Company.	[Deleted]
	Fishing gear warehouse	D		[Deleted]
				[Added] Fishing net mending area
	Equipment for workshop	A	For small-scale mending	[Deleted]
(iv) Facility control	Office, meeting room, shower/toilets, generator (standby)	A	Power in the target area is unstable.	Management office (including meeting room, shower/toilets), power receiving facilities, security guard room, toilets for fishers, shower facilities, standby generator
(v) Incidental facilities	Height increasing development, paved access roads (within the premise of the Center), pavement in the premise of the Center	A	Including simple pavement outside the Center	(Height increasing development shall be born by the Surinamese side) Paved access roads and pavement within the premise, parking lots

Note: *) As for the fueling station, it was confirmed that the recipient country would only provide (i) housing for underground gasoline tanks and (ii) vendors (service tanks) both of which are to be supplied by the gasoline company, and securement of space for and installation of housing for underground gasoline tanks and vendors and provision of piping materials on the way and installation of the pipes would be covered by the project.

1-2 Natural Condition

(1) Topographic features

1) Land topography

The project site is a flat land facing the left bank of the Suriname river right before the point where the river curves to the right. The altitude is about CDL+3.0m and the waterline at high tide is around CDL+2.5m. Vegetation extends to reach the waterline, which suggests the vegetation being a function to maintain the shoreline.

2) Riverbed topography

The riverbed is formed at an inclination of approximately 1/25 from the waterline, creating an intertidal zone (with a width of roughly 35m) where flood and exposure occur in turn in accordance with the fluctuation of the river level. The transverse topography of the riverbed starts at an altitude of CDL0.0m, reaches CDL-5.0m at an inclination of about 1/5, and continues to go down further at a more gradual inclination. In the area bound by approximately CDL+0.5m and +1.0m remain a couple of lines of wood piles that present themselves as the remains of jetties. It is worth noting that the area surrounding the Molen jetty gets abruptly deep because of the maintenance dredging for securing draft of cargo vessels arriving at the jetty. However, the riverbed level directly beneath the jetty is only about CDL 0.0m to +0.5m.

Figure 1-2 The shoreline in front of the project site

(2) Hydrographic conditions of the river

1) Tide level

The tide level of the Suriname river was observed at a point in front of the project site from July 21st to September 6th, 2006. Figure 1-3 and Table 1-3, respectively, show the point where the tide gauge was set up and the results of the tide level observation. The Maritime Authority of Suriname had also conducted observation of the tide level at four points at the estuary and the middle basin of the Suriname river, and issued the results in the form of a tide table for the ports of Paramaribo. These predicted values were verified by comparing with the results of tide level observation at the project site and confirmed as applicable.

In addition, the standard sea level NSP in Suriname is related to CDL by the equation, NSP 0.00m ＝ CDL+1.28.

Figure 1-3 Position of tide level observation

Table 1-3 Results of tide level observation

Average water level	1.370m	
Max. tide level	2.852m	
Min. tide level	0.142m	
HWL*)	2.654	Average of the maximum and minimum tide levels at four times of new moons and full moons during the observation period.
LWL*)	0.148	

2) Current speed

During the period between August 19th and September 6th, 2006, the current speed was observed by setting the current meter at a water depth of -6m in the Suriname river in front of the project site (near the Molen jetty)(UTM coordinates: WGS 84, N=703571, E=640766). In the waters surrounding the jetty construction site in front of the project site, the river currents reverse between the upstream direction and the downstream direction as the tide changes between flood and ebb. The maximum current speed is 81cm/sec at flood tide and 73cm/sec at ebb tide. The current speed was 70-90cm/sec at flood tide as a result of dorogue tracking.

Table 1-4 Current speed in front of the project site (August 19th to September 6th, 2006)

(Depth of measurement point)	Maximum current speed at flood tide	Maximum current speed at ebb tide	Permanent fluid component
2.5m above the riverbed	81cm/sec	65cm/sec	2.2cm/sec, 176° (in the upstream direction)
4.0m above the riverbed	73cm/sec	63cm/sec	0.9cm/sec, 22° (in the downstream direction)

(3) Seismism

According to the Ministry of Public Works, the seismic activity level in Suriname is extremely low, and hence structures do not reflect earthquake force. Further, no earthquake has occurred on such a scale that caused damage. Similarly, Ministry of Natural Resources, and the mining engineer of G.M.D. (Geological and Mining Department), said that there was no document concerning active faults which may cause earthquakes in Surinam, and in fact there has been no report on such an earthquake. Table 1-5 below extracts earthquakes of magnitude 1.0 or higher that occurred near Surinam, for a period of approximately 51 years from 1956 to August 1st, 2006. No earthquake with its epicenter within Suriname or its territorial waters has been reported. The highest seismic activity level point of the areas surrounding Suriname is 650km northwest from Paramaribo, offshore the west coast of Trinidad Island, and the seismic scale is M3-5. All the other epicenters are 370-550km distant from Paramaribo, with a seismic scale of M4-5.

Table 1-5 Earthquakes that occurred near Surinam

Date of occurrence	Epicenter			Magnitude
	Latitude	Longitude	Depth (km)	
1964/06/19	2.5	-58.9	65	4.5
1976/02/22	0.339	-59.325	33	4.9
1988/03/11	9.927	-59.807	33	4.4
1989/09/24	9.977	-59.851	47.1	5.1
1989/10/18	7.752	-50.844	10	4.6
1990/03/24	9.972	-59.452	33	4
1990/03/29	9.856	-59.185	33	3.8
1990/04/05	9.676	-59.087	33	3.8
1990/12/24	9.817	-59.81	20.8	4.3
1991/02/07	9.904	-59.99	33	3.7
2006/06/08	4.664	-51.896	10	5.1

Source: U.S. Geological Survey (Database of earthquake records)

(4) Abnormal weathers

According to the Ministry of Public Works, there has been no abnormal weather (earthquake, hurricane, storm, heavy rain or inundation of the Suriname river) that has caused damage in Paramaribo.

(5) Subsoil, geotechnical investigation

1) Boring

Boring was carried out at seven locations including three over land and four on water. Also, sediment sampling and analysis were carried out at six locations. The points of these surveys are provided in Figure 1-5.

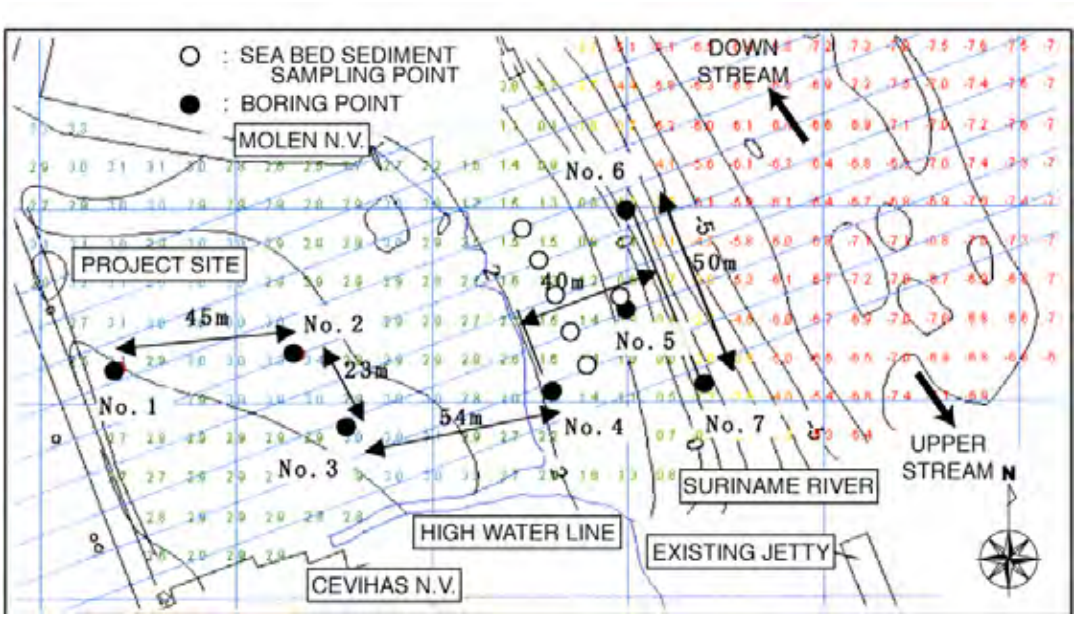


Figure 1-4 Points of boring and sediment surveys

Table 1-6 Boring results

Boring No.	Excavation depth (m)	Ground height (CDL m)	No. of unconfined strength tests	No. of consolidation tests	Remarks
B-1	25.3	+3.1	6	3	SP-SM and partially NP
B-2	25.3	+3.3	5	2	
B-3	25.3	+3.0	5	2	
B-4	30.3	+1.9	5	3	
B-5	30.3	+0.5	5	1	
B-6	30.3	-2.0	5	1	
B-7	30.3	-2.5	5	2	
SF-1-2	0.45				Sample for sediment analysis of the project site
RB-1-2	0.45				Sample for sediment analysis of the riverbed

2) Stratum formation and the results of standard penetration test

The stratum formation at the project site is virtually horizontal stratification, and as for the order of stratification, sandy silt, which seems to be earth filling, forms the land surface, followed by soft to very soft silty clay CH, soft to stiff silty sandy clay/clayey sandy silt CH-MH, and hard silty clay layers. An outline and characteristics of each layer are tabulated as Table 1-7. On land, the hard clay layer (N>30) that appear at around CDL-18.0m is most suitable as the pile toe layer for pile foundation. Under the water, the same layer is also most suitable as the supporting layer, and the height of the upper surface is about CDL-18.0m. Furthermore, one of the boring surveys conducted on the ground found the groundwater level as between GL-0.8m and GL-2.0m.
(The results of the standard penetration test are provided in the attachment.)

Table 1-7 Stratum formation and characteristics of each layer

Soil type	Layer thickness	Soil characteristics
Fill SP-SM	0.9-1.5m	This layer distributes on land at locations B-1 to B-3, possibly banked artificially. Sandy silt including organisms and wood waste. N value = 1-13
Soft to Very Soft Silty Clay CH	1.6m-10.0m	This layer appears under SP-SM on land and distributes in the surface layer in the river. Soft to very soft silty clay with the N value of 4 due to self-deposition by Rod's weight.
Soft to Stiff Silty Sandy Clay / Clayey Sandy Silt CH-MH1, CH-MH2	4.0m-11.0m	This layer distributes underneath the CH layer at all bore holes. The upper CH-MH1 layer has the N value of 9 or so, and the lower CH-MH2 layer 16.
Stiff to Hard Silty Clay CH-MH3	2.0m-5.0m	At bore holes B-4 to B-6 in the river, this layer distributes beneath the CH－MH layer. On land, this layer was confirmed at the lowermost stratum. It contains corrosives from place to place and the moisture changes accordingly. It shows the N value of 30 or more.
Hard Mottled Silty Clay CL-CH		At bore holes B-4 to B-6 in the river, this layer distributes beneath the above-mentioned stratum. It shows the N value of 50 or more.

3) Results of the geotechnical test

A summary of the results of geotechnical tests is given in Tables 1-8 and 1-9. The CH layer has a high value for the compression index, and therefore it is necessary to pay attention to possible consolidation due to an increased surcharge resulting from construction of the Center. Furthermore, it is also important to examine about possible consolidation of the CH-MH layer.

Table 1-8 Results of geotechnical test (average of all bore holes)

	Moisture Content w (%)	Wet Unit Weight γt (kN/m^3)	Undrained Shear Strength C (kN/m^2)	N-Value	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
Sp-SM	27	16.5	26.9	9	0.0	62.8	19.0	18.2
CH	89.2	13.6	2.7	1	0.0	14.8	70.8	14.3
CH-MH1	48.0	16.4	8.2	13	0.0	13.4	67.0	19.6
CH-MH2	55.0	16.3	21.5		0.0	16.1	60.7	23.2
CH-MH3	22.5	19.1	51.0	38	0.0	11.4	49.7	38.9
CL-CH		Same as above		50 or above				

Table 1-9 Results of consolidation test

CH layer				
Sample No.		e_0	Overconsolidation Pressure (t/m^2)	Compression index Cc
B-1	8	2.68	2.0	0.700
	14	0.78	3.5	0.088
B-2	8	2.23	4.0	0.830
B-3	8	1.22	3.0	0.305
	14	1.63	4.0	0.380
B-4	8	2.32	1.5	0.630
B-5	14	1.35	3.2	0.345
B-6	2	1.71	3.8	0.570
B-7	2	3.05	1.5	0.730
	8	1.43	2.8	0.335
CH-MH layer				
Sample No.		e_0	Overconsolidation Pressure (t/m^2)	Compression index Cc
B-1	26	4.22	7.0	1.13
B-2	14	1.14	5.3	0.36
B-4	14	0.834	4.5	0.16
	20	1.45	5.0	0.26

3) Groundwater level

The boring survey on land confirmed that the groundwater level was GL-0.8m to GL-2.0m.

4) Supporting layer

On land, a hard clay layer (N value>30), which is appropriate as the pile toe layer for pile foundation, was found at near GL-21m and CDL-18m. In the river, a hard clay layer suitable as the supporting layer for piles of the jetty was found at near CDL-16.0m.

5) Characteristics of consolidation

Table 1-10 summarizes the results of the consolidation test. The CH layer has a higher compression index than the hard silty layer underneath, and therefore it is important to pay attention to possible consolidation due to an increased surcharge resulting from construction of the Center. Moreover, it is important to also examine about possible consolidation of the CH-MH layer. B-4 No.26 sample greatly varies at the time of sampling and also its initial void ratio is anomalously large compared with other samples; this sample was excluded from the examination.

1-3 Environmental and Social Considerations

(1) In Surinam, the Environment Impact Assessment (EIA) law is now being drafted and is not instituted yet; therefore, an EIA is not an obligation in this project. On the other hand, the National Institute for Environment and Development in Suriname (NIMOS), having jurisdiction over EIA, is now preparing a set of EA (environmental assessment) guidelines, and recommends project entities to perform an initial environmental examination (IEE) and environmental assessment in accordance with the guidelines.

This project was judged as Category "B" as a result of the preliminary environmental and social consideration survey at the stage of an IEE, which resulted in, out of a total of 26 items, 0 for "A", 6 for "B", 0 for "C" and 20 for "D". Moreover, a simple EA was recommended, instead of a full-scale EA, based on the EA guidelines (an EIA by NIMOS).

Based on the above evaluation results, the Fisheries Department of the Ministry of Agriculture, Animal Husbandry and Fisheries committed to conducting an EA covering the six items ((i) economic activity, (ii) parties concerned in the region, (iii) wastes, (iv) accidents, (v) rivers, and (vi) water pollution) judged as "B", meaning that slight impact is anticipated, and a study concerning precautions and mitigation measures of environmental impact.

The EA was completed and its draft report was being prepared at the stage of the Basic Design Study, and as a result, it was confirmed that the project would not affect both the natural and social environments, including the above six items, on a large scale. However, it was pointed out that it is necessary to formulate, as an environment management plan, safety measures for vessels passing by near the project site during the construction period, water quality monitoring plans for the Suriname river around the project site, covering the restoration status of the waterline area after the completion of construction, exhaust of fuels and waste oil from the jetty and fishing boats after the completion of the Center, management plans to protect the river from contamination, such as dumping of garbage, etc., and so on.

(2) Status of peripheral areas of the project site

1) Companies using the industrial zone where the project site is located.

- Flour milling company (Molen: purchase and sales of wheat, feedstuff, etc., worth approximately 12,000 tons per year)
- State-run fisheries company (CEVIHAS: provision of the landing jetty to industrial fishing boats, sales of ice, fuel, water, etc., building and repair of fishing boats of a 50-ton size or smaller, rental of its chilled room and processing plant to private fisheries companies)
- Petroleum company (SOL: storage and sales of fuel)
- Others including two construction companies, two fishery product processing export companies, and one slaughter house.

2) Number of vessels traveling the main passage of the river in front of the project site

- Vessels of a 1,000 tonnage or more: 1 to 2 vessels/day

  (Note that the cargo vessels that use the dolphin-shaped mooring jetty of neighbor Molen are of a 3,000-ton class. Four vessels per year. The number of days mooring at the jetty is 5 to 6 days/vessel)
- Cargo vessels of less than 1,000 tons, work vessels: 2-3 vessels
- Industrial fishing boats: 5-10 vessels/day (The number of vessels mooring and berthing at the CEVIHAS jetty is 10-15/day on average)

  (Mainly, fishing boats that use the jetties of SUJAFI, a joint shrimp export company, located in upstream of the river, and CEVIHAS)

3) Number of residents living in the vicinity of the project site

The number of houses and the number of residents are both 0.

4) Natural ecosystem of the river (presence of precious species)

According to opinions of the Ministry of Environment, the site is situated in an area designated as industrial land where no precious flora and fauna exists.

(3) Considerations for stakeholders in the vicinity of the project area

The project site is located in an industrial zone facing the Suriname river flowing on east of Paramaribo. The Suriname river flows on east of the project site from south to north. The river width at a point in front of the project site is approximately 1km. It neighbors with the

building of state-owned fisheries company, CEVIHAS, on south, and there is a jetty for industrial fishing boats on waters. On north, a private flour milling company Molen is situated and similarly there is a dolphin-shaped jetty for cargo vessels on water. In planning the landing jetty for the project, it is necessary to pay attention to the scale and layout so as not to cause disturbance to the passage of commercial and cargo vessels that use these two jetties, considering that the construction site is designated as the area bound by a line connecting these two jetties and the shoreline, and tentatively approved in advance by the MAS.

CHAPTER 2 CONTENTS OF THE PROJECT

CHAPTER 2
CONTENTS OF THE PROJECT

2-1 The Basic Concept of the Project

(1) Overall goal and project objectives

The Ministry of Agriculture, Animal Husbandry and Fisheries of Suriname drew up the Development Plan for Agriculture, Animal Husbandry and Fisheries (ASP2004), as a development plan for these sectors, with an ultimate development goal set at "sustainable development of fisheries in both aspects of economics and natural resources", aiming at development of fisheries which contributes to vitalization of economic activities of Surinam, self-sufficiency in food, increase in export of fisheries products and acquisition of foreign currency, and reduction of poverty and income disparity.

Paramaribo is the largest fishing base in the country. Industrial fishing boats land their catch at sanitary and functional jetties that are possessed by four private companies situated in the city. However, artisanal fishing boats are forced to land their catch in an unsanitary and inefficient environment since public landing facilities in the city are undeveloped. Further, the fact that ice supply is not sufficient for these boats prevents artisanal fishers from going on a planned fishing trip and consequently hinders development of artisanal fisheries. Moreover, there is no landing jetty developed for artisanal fishing boats at a level satisfactory with the standards provided for in the Fish Inspection Act, and it is strongly called for to find a solution to these problems.

This project is intended to contribute to expansion of distribution in the domestic market as well as export of fisheries products with secure quality, which is the purpose of Surinam's fisheries development, by developing a landing jetty that complies with the Fish Inspection Act for artisanal fishing boats in Paramaribo, thereby contributing to improvement of the working environment for artisanal fishers based in Paramaribo and of the work efficiency of artisanal fishing boats, increase in production of fisheries products, and upgrading of the work efficiency of fish traders and marine product processing and export companies.

(2) Basic Concept of the Project

In order to achieve the above goals, the project will construct a jetty, ice-making and storage facility, chilled room, management building, fishing gear mending area and other necessary incidental facilities in Paramaribo, and procure equipment necessary for handling fish catches, thereby providing a sanitary and functional landing facility to 172 artisanal fishing boats to be covered in the project, which were forced to use unsanitary and inefficient landing areas, and at the same time selling ice, fuel, water, etc. to assist the artisanal fisheries industry.

The implementation of this project is expected to bring the following outcomes.

- Development of a functional and sanitary jetty for landing and preparation
- Development of a facility to supply ice, fuel and water
- Provision of equipment for storing and inspecting fish catch
- Establishment of a fishing gear mending area
- Construction of a management office building for assisting artisanal fisheries

This project therefore constructs facilities and procures equipment as listed below.

Facilities:

a. Jetty for landing and preparation
b. Water supplying facility
c. Lighting facility
d. Revetment
e. Paved access road in the premises
f. Pavement in the premises
g. Parking lot
h. Ice-making facilities and ice-storage
i. Chilledd room
j. Management building
k. Power-receiving facility
l. Standby generator
m. Toilets and shower facility for fishers
n. Fishing net mending shed
o. Fuel supply station (except fuel tanks and oil dispensing equipment to be provided by the Suriname side)

Equipment:

a. Insulated containers for fish and ice
b. Plastic fish containers
c. Sensory inspection instrument
d. Scales
e. Hand cart and pallet

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

In drawing a basic design of the Project for Construction of Small-scale Fisheries Center in Paramaribo, the followings shall be referred as design policies.

(i) The following standards, as stipulated in the Fish Inspection Act, Fish Inspection Ordinance, and Quality Control Decree, shall be taken into consideration.

- Fresh fish handled in the Center (hereinafter referred to as the "fresh fish") must be landed, classified and shipped in a prompt manner.

- The fresh fish must always be kept under a chilling temperature in hygienic containers all the way during landing, storage and transport.
- If the fishing vessels operating offshore require more than six hours from capture to landing, the catch must be kept with ice within a hygienic fish hold. Ice must be produced from clear water suitable for drinking.
- Containers and tools used in handling the fresh fish must be made of durable materials and washed as necessary to be kept hygienically. Further, washing water must be clear water suitable for drinking.
- The fresh fish must be isolated by hygienic and durable walls, floors and ceilings in order to prevent cross contamination, and it must be possible to clean the fresh fish by washing or sterilizing as necessary.
- The fresh fish to be temporarily stored after landing and before shipping must be kept in a chilled room with the locking system at a chilling temperature in a hygienic manner.
- The facilities where the fresh fish are handled must be surrounded by fences or the like, in order to control and restrict an unlimited number of outsiders from entering the premise at the entrance.
- Those who will handle the fresh fish must always wear hygienic and water-proof clothes and strictly wash their hands as necessary before and during their work.
- Fish handling places and fish landing facilities must be furnished with locks, lighting apparatus, and ventilation systems, and be open to accept public sanitary inspections. However, the sanitary inspection for the fresh fish is only limited to sensory inspection on freshness.
- The administrator of the landing facility must carry out voluntary inspection, sort out and record the inspection results, and store and manage the records for a certain period of time, in order to adequately manage the sanitary conditions within the Center.

(ii) The project must reflect the results of the survey on the natural conditions around the project site.

(iii) Due consideration must be given to the impact on the main ship course and the mooring jetties on the Suriname River.

(iv) The operation and maintenance organization of the Center must follow the staffing structure and the management mechanism of existing Commewijne Fisheries Center, with due consideration given to ease of maintenance of related facilities and equipment, saving of the operational expenses, durability, and reduction of usage charges, sales prices of various facilities, etc.

(v) The basic design must reflect the results of the survey on activities of artisanal fishers based in Paramaribo and the traffic line of fishing boats, catches, transport vehicles, loading materials, fishers and the Center staff.

(2) Basic concept for Scale of Facilities and Equipment

1) Jetty

The Project is designed to cover the SK-GG-, SK-OG-, and SK-B-type boats, out of 218 artisanal fishing boats based in Paramaribo, which have no specific landing sites. This study examines the pattern of operation and the type and dimensions of vessels while analyzing and setting water area, water depth, and other conditions suitable for constructing a landing jetty, to determine an appropriate scale of the Project.

2) Ice-making machine and ice-storage

An adequate scale of providing ice-making machines necessary for complementing the lack of ice supply to artisanal fishing boats in Paramaribo shall be determined.

3) Chilled room

The necessary scale of provision shall be determined based on the landing of catches requiring temporary storage, targeting fish traders who regularly visit the city for procurement from remote areas in accordance with 10-2, Chapter 3 of the Fish Inspection Act,

In addition, fresh fish will be stored in insulated containers or plastic containers with ice in place for a maximum 2 or 3 days with a temperature below 0℃, thereby saving the Power consumption of refrigeration units and reducing operation and maintenance cost.

4) Fuel station

Housing for underground gasoline tanks and service tanks that meet the design standards of equipment set forth by the government of Suriname are planned to be provided by Surinamese private oil company, as part of Suriname side's share of the Project work. Accordingly, this Project shall cover installation work for housing for underground gasoline tanks and service tanks and associated pipe-laying and electrical works, provided that applicable rules of Suriname and standards of the private oil company shall be observed as to the specifications for piping and standards for the laying/installation work. The level of capacity of the tanks shall be set in accordance with the fuel demand of fishing boats that will make use of the planned fisheries center, and consequently appropriate equipment will be selected from standard products offered by the private oil company.

5) Water supply facilities

They shall be planned by taking into account the amount of water necessary for ice-making machines, offices, and toilets in the Center in addition to the amount of water serving fishing boats. The capacity of water storage tanks, water supplying systems in the Center and the scale of the facilities shall be planned in consideration of water pressure drops during the daytime and in case of water failure.

6) Management building

A management building is a place for carrying out operation and maintenance work in the Center as a whole, including operation and maintenance work for the jetty, production and sales of ice, sales of fuel and water, collection of rental charge of chilled rooms and the fishing gear repair floor. Its appropriate size shall be determined based on the functions, equipment and staffing necessary for the operation and maintenance work. In addition, the layout of the building shall be planned as to have a laboratory for conducting simplified sensory inspection and an anteroom for the statisticians.

7) Security guard and power-receiving building

As the planned Center is assumed to run around the clock throughout the year, a security guard room shall be created to control fishing boats, fishers, fish traders, transportation vehicles, etc., and to serve for guards who are in charge of security and maintenance of order and safety in the Center. In the vicinity of the room, it is planned to install outdoor lights and a standby generator with the capacity necessary for the management building to ensure work at the landing jetty at night in case of power failure and security within the Center, together with a high-voltage power receiving room and a main distribution board.

8) Public toilet

The number of users at the fisheries center, including fishing boat crews and vendors engaged in purchasing and transporting catches, is estimated at around 50 to 60 per day. As the boat crews, in many cases, return to the port after fishing onboard for one week or more, the demand for shower at the port is expected to be quite strong. For this reason, showers shall be provided inside the toilets with the aim of improving hygienic environment and the working environment for fishers.

9) Fishing gear mending area

It shall be planned as a yard with a roof and leveled flat floor to provide a sun shade and rain protection necessary for repairing fishing net. As the repair work doesn't take place during nighttime and water-related work such as washing is not required, lighting and water

supplying facilities shall not be installed. The size of the yard shall be determined targeting three quarters of the fishing boats that conduct drift gillnet fishing 3 to 4 times a year, based on the result of interviews to fishers.

10) Insulated containers for fish and ice

Assuming that fresh fish will be stored with ice, the specifications and necessary quantity of containers shall be determined based on the volume of fish to be purchased and transported at a time by a fish trader coming from remote areas.

11) Plastic fish containers

The specifications and necessary quantity of containers shall be determined based on the number of fishing boats that unload catches at the jetty and the volumes of catches to be stored by the boats with a small landing volume. The material easy to wash and dry and corrosion resistant shall be selected.

12) Hand cart (hand pallet truck) and pallet

The specifications and necessary quantity of the equipment shall be determined based on the weight and external dimensions of containers, provided that robust ones of a manual type shall be selected for its ease in maintenance. As for pallets, those that are easy to wash and dry and made of anti-corrosive materials shall be selected.

13) Scale

The specifications and necessary quantity of scales shall be determined based on the number of fishing boats that simultaneously conduct landing work at the jetty and the landing volume. Additional scales are also necessary for selling ice and its specifications and necessary quantity shall be determined based on the number of ice storages and the volume of ice to be handled.

14) Sensory inspection instrument

The specifications and necessary quantity of instruments, required for sensory analysis of catches at the Landing site shall be determined.

(3) Concept concerning natural conditions

1) Rains

Suriname belongs to the trade wind zone under tropical rainforest climate conditions. In urban areas of Paramaribo, there has been no record of hurricane, storm wind, heavy rain

(except a flood case due to heavy rain in a village on a low land in the midland area), inundation of rivers, earthquake, or any other natural disasters. Precipitation in coastal areas is relatively high compared with that in midland areas, and the Paramaribo city experiences 2,000mm or more of rainfall every year. For the 30 years between 1976 and 2005, the average number of days per annum that daily precipitation exceeded 10mm was 68, and though rainfall has slightly lessened for the last five years, the average number of days with 10mm or more precipitation has still been 63. Thus, the impact of rainfall on the construction work must carefully be examined in planning the implementation schedule.

2) Subsoil condition

It has been confirmed that the project site is covered with thick cohesive soil. The subsoil of the project site is mainly composed of very soft silty clay, with the N-value of 0 – 7, from the existing ground level to near the -10m point, excluding the surface soil, and a little more solid silty clay mixed with sand, with the N-value of 4 – 23, from there to near the -20m point. The N-value exceeds 30 from the solid silty clay layer starting at 22m below the ground level and downward.

In order to build a structure upon such a soft ground, there are basically three applicable foundation methods as explained below, from which the most suitable approach shall be selected. (See Figure 2-1)

a) Bearing pile method (pile foundation)

This method supports the entire structure by installing bearing piles down to the solid stratum beneath the ground plane. In Surinam, reinforced concrete piles with square section are manufactured, and at the same time, an analysis of the results of boring has proven this support pile method using RC piles as an effective approach. When this method is employed, the hard clay deposits, with the N-value of 30 or higher, near the 22m point beneath the ground plane shall serve as the supporting layer.

b) Friction pile method (one of soil stabilization methods)

This method is to lay friction piles underneath the building foundation on the soft ground. Formerly, WARABAH lumber, abundantly available in the country, was cut into 10m length to be used as friction piles. However, RC piles are used today because the restrictions concerning the environmental protection have been strengthened, making it difficult to secure a necessary quantity of lumber.

c) Mat foundation with double slab of bearing slab and floor slab with space (one of spread foundation methods)

This method constructs the foundation of building directly onto the subsoil. By having the entire area of the underfloor of the building as the foundation bed, this approach maximizes the bearing power of the soft subsoil to prevent differential settlement from happening. In the mat foundation method with double slab of bearing slab and floor slab with space, the space layer is put in place under the building floor, below which the foundation bed is constructed. This method enables direct foundation onto soft ground without incurring differential settlement.

Table-2-1 summarizes the comparison of advantages and disadvantages among these three foundation approaches.

A foundation method for a structure is generally chosen according to the following procedures. (i) If the spread (mat) foundation method is deemed as feasible, then it is necessary to set assumptions for calculating the degree of settlement, such as examination on the necessity of ground stabilization and the method thereof, temporary setting of the depth of the lower bottom of the foundation, temporary setting of the form and dimensions of the foundation, calculation of the load of the structure, examination on the horizontal bearing power, estimation of the allowable bearing power of the soil, estimation of the contact pressure, and so forth. (ii) If the settlement based on these conditions remains within the allowable settling volume, the thickness of the foundation bed shall be calculated, and a final decision shall be made on the rationality of adopting the foundation method with that particular shape. (iii)If the spread foundation approach is deemed as unreasonable as a result of such a review, the pile foundation method shall necessarily be examined as a second option.

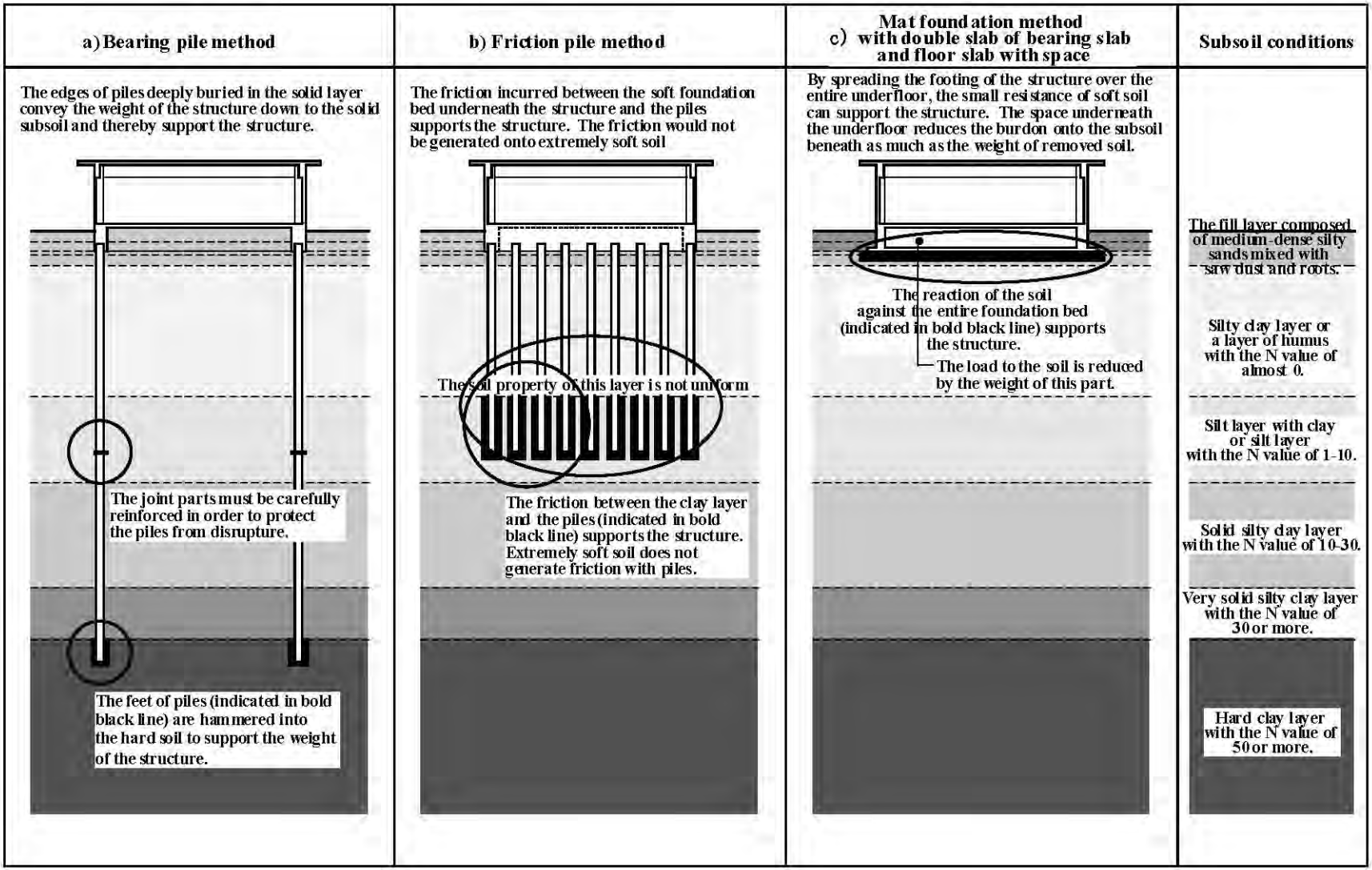


Figure 2-1 Comparison of Building Foundation Methods

Table 2-1 Comparison of Building Foundation Methods

Foundation type	Bearing pile method	Friction pile method	Mat foundation method
Theoretical advantages	Since bearing piles are inserted into solid ground, there is no risk of consolidation settlement or differential settlement. The piles have greater bearing power than friction piles, so that the number of piles will be smaller than that in case of Friction pile method.	In this method, the friction incurred between the foundation bed and the piles supports the structure, so that the piles do not have to reach the supporting layer and can therefore be short, requiring a small-scale pile driver.	Without installation of piles, wide footing directly supports the building. Therefore, there is no large-scale heavy machine required for installing piles.
Theoretical disadvantages	If the supporting layer is deep, long piles and large-scale construction equipment will be needed, and, in some cases, will lead to additional burden on transportation of long pile materials and pile drivers into the site. To solve problems in the transport, piles may be joined on the site, but in such a case, the pile joining method will control the quality of the work as a whole.	The method is considered as one way of stabilizing ground, through which piles remain in the soft layer, and also as a way of suppressing consolidation settlement of the building. There are some piles with protrusion on their surfaces to enhance the friction efficiency, which will, however, increase the resistance at the time of hammering the piles in turn. Further, if the soil type of foundation bed is not uniform, it will cause uneven friction onto the piles, which may unnecessarily cause differential settlement.	As this method places the structure directly onto the subsoil, it is unavoidable that the structure gradually undergoes consolidation settlement on soft ground. If settlement is significant, water supply, drainage, electricity, and other utilities must carefully be brought into the building. If the area of the footing is larger, more excavation will be necessary, whereas, in case of using the double slab of bearing slab and floor slab with space, the excavated ground will be below the water level, which will require sufficient countermeasures against sump water.
Issues arising out of adoption in this Project	Precast concrete piles of reasonable quality are not procurable in Surinam. Instead, RC piles with square section must be utilized by being cut into 12m length to serve as joining piles. In such a case, the ends of both piles will be attached with steel flange and connected with bolts. But it is difficult to secure the linearity of piles and also the joining parts are susceptible to disrupture. Procuring steel pipe piles procured from Japan or a third country to be used as bearing piles can remove these risks, but instead it will significantly increase the construction cost.	12m is the maximum length of RC piles that are available in the country. The subsoil with the depth at the project site produces uneven friction resistance, and hence the bearing power of different piles must greatly vary, which will most likely cause unnecessary differential settlement.	The geological survey has revealed that the water level is 0.8-2.0m below the ground and is susceptible to impact of river tides, which inevitably incur sump water at a time of high tide. However, since the excavated ground is kept around -0.8m under the ground, the impact can be assessed as minimal. In addition, the bottom ground contains a significant degree of excessive water, which might make it possible to resist consolidation settlement even when exposed to the load of building, but the degree of settlement is difficult to estimate.
Construction cost	Compared with the price of piles, the percentage of indirect expenses, for example, construction equipment is relatively high, which results in being an expensive approach. In general, this method is examined as a second option after the mat foundation method is evaluated and deemed as impractical.	Frictional resistance of the subsoil is assumed as low, requiring relatively long piles in a large quantity. As a result, this approach may likely be the most cost-consuming.	This is the least expensive approach, although additional cost for providing piping trench, flexible joints, etc. will be incurred in order to bring water supply, drainage, electricity and other utilities into the building.
Overall evaluation	On the condition that joined piles must have a good quality:		From the standpoints of cost and construction period:

Based on the study provided as Table 2-1 above and an analysis on the result of geological survey, adoption of mat foundation was examined as building foundation method.

(i) Adoption of spread foundation (mat foundation) method and (ii) Calculation of consolidation settlement

First of all, the cross section was assessed as to each building, followed by deriving average contact pressure by substituting the live load conditions. Then, consolidation settlement was calculated as shown in Table-2 by using the result of soil test obtained from the boring survey.

Table 2-2 Estimation of Consolidation Settlement per Building in Case of Mat Foundation

Facility	Average contact pressure (kN/m^2)	Total (consolidation) settlement (cm)						Foundation method
		A	B	C	D	Δe method	Cc method	
Management building	15.69	96.2	14.8	48.7	14.8	12.7	17.0	Bearing pile
Security guard and power-receiving building	16.48	67.7	33.7	49.7	15.8	13.3	17.8	Bearing pile
Public toilet	16.57	97.6	15.9	49.9	15.9	13.4	17.8	Bearing pile
Fishing gear mending area	14.91	108.0	43.6	47.6	13.9	12.1	16.2	Continuous footing

*A: From the data on soil property obtained through the boring survey at three locations on the land, the data on the nearest boring point to each building was used in the calculation. The consolidation settlement was calculated based on the (4.3.17) equation in the "Guidelines for Basic Structural Design of Architecture" by Architectural Institute of Japan (AIJ), assuming the clay layer mixed with silt and the layer of humus with the N-value of almost 0 (hereinafter referred to as the first layer), and silt layer mixed with clay or clay layer mixed with silt with the N-value of 1-30 (hereinafter referred to as the second layer) as consolidation layers.

*B: Considering that the equal settlement in "A" is great compared with surrounding situations, the second layer is not regarded as a consolidation layer, and the settling amount was deducted from that of "A".

*C: From the soil data obtained as a result of boring at three points on the land, B3 is used for the first layer, which would have the least settlement and B-1 for the second layer, for all buildings, in order to calculate the settlement.

*D: Even when standing on "C", the settlement is still greater than that of the periphery, and the second layer is, similar to "B", not regarded as a consolidation layer and the settlement thereof was deducted from "C".

*Δe and Cc methods: In both cases, the settlement was calculated using the results of a study on consolidation settlement of the ground of a temporary work yard.

* : From a functional point of view, the ice-making machines/storage building will be constructed on the landing jetty and hence supported by steel pipe piles. Therefore, no calculation on its settlement was carried out and it is not included in the above table. Furthermore, because this building will be furnished with ice storages and heavy machines for making ice, the weight of the building shall be significantly large, and hence it is reasonable to build it on the landing jetty also from the foundation perspective.

Design guidelines provided for by the Architectural Institute of Japan (AIJ) state that the standard settlement is 10 cm for RC structures in case of mat foundation, and the maximum allowable settlement is 20 cm. The settlement values of A and C in Table-2, as mentioned in the notes beneath, are compliant with the guidelines by the institute, but can be considered as excessively high in consideration of the actual

surrounding conditions. On the other hand, the settlement values of B and D appear close to those of Δe and Cc methods, but do not reflect consolidation settlement of the second layer. Thus, the actual settlement will most likely be greater.

(iii) Selection of pile foundation method

The settlement values obtained in the above table all exceed the standard values, and may also exceed the maximum allowable values as well. Further, except for the fishing gear mending area, all buildings will be equipped with water supply, drainage and power facilities, and since as the settlement of the buildings grows greater, the joining parts of external piping and wiring may well be adversely affected, resulting in, for example, disrupture, it is difficult to apply mat foundation to all buildings other than the Fishing gear mending area. Hence, the bearing pile method is deemed as the most appropriate of all.

The fishing gear mending area, in terms of functionality, does not require the same level of accuracy as the other buildings. Consequently, settlement shall be allowed to an extent that no adverse effect is brought about to the joining parts of the upper structure, by having typical continuous footing with the foundation bottom at GL-600 and the foundation width of 1,200mm or so.

In this case, the average contact pressure will be 20.98 (kN/m^2), whereas the final settlement 16.7cm and 22.1cm for the Δe and Cc methods respectively.

In addition, the surface layer of land at the project site is the buried stratum, which contains sand mixed with silt, saw dust, plant roots, and other organic fragments intricately mixed together. The thickness of the surface of this stratum is between 0.9 to 1.5m, while the standard penetration test conducted at three locations has shown that the N-values 1 to 1.3m below the ground level are 1, 2 and 8, respectively, which suggests that the surface layer of the premise consists of an extremely soft layer and a moderately-solid layer. For this reason, in case that excavation is performed in order to create the bottom slab (foundation slab) of buildings and roads, the bearing power of the excavated ground is unstable, resulting in differential settlement or any other negative impact. The boring report also recommends that the surface layer soil must be replaced by better soil in order to stabilize the soil. For all these reasons, the surface layer soil shall be replaced by soil of a better quality across the building construction zones, internal passways and parking lot construction zones, and zones for building temporary structures or passing construction machines. In addition, the removed soil as a result of excavation and soil replacement, as mentioned above, may

not be reused as backfill soil, therefore it shall be transported and disposed for dredging on the riverbed or in other soil disposal sites.

3) Suriname River and the form of mooring facilities

The Suriname River is a great river with its source at an altitude of 900m in the southern part of the country, runs across a huge dam lake, called Lake Brokopondo, and stretches for 300km to Paramaribo. In the areas downstream of the dam lake, there are small villages scattered in a less cultivated land with strong tendencies to cause overflow of the surface soil into the river when it rains. For this reason, the Suriname River is heavily contaminated with sands and mud.

The construction of the landing jetty shall be planned with consideration given to these characteristics of the river and the natural and environmental conditions in the vicinity of the project site, in selecting the form and planning the deployment of mooring facilities.

There are three types of a mooring facility to be constructed at a site adjacent to a river.

(i) Gravity-type revetment method

A revetment-type structure is constructed on the riverside in parallel with the direction of river currents to serve as a mooring facility. This method is actually employed in the revetment of the Paramaribo Central Market or the mooring facility for container vessels at the port of Paramaribo.

(ii) Floating jetty

In case that the water level of the river greatly fluctuates, a floating jetty set up on the river is used as a mooring facility. Another jetty will also be needed to connect the project site to the floating jetty, which will follow variation of height of the floating jetty in accordance with the water level fluctuation. This method is in place at the Commewijne Fisheries Center.

(iii) Parallel jetty

A jetty-like structure (a jetty supported by piles) is built offshore the river in parallel with the direction of the river currents, with a connecting jetty necessitated between the premise and the mooring jetty, which will form a T-shaped facility. The mooring jetty and the connecting jetty are fixed to the riverbed with piles, creating no fluctuation in the heights. This is a major method employed among the mooring facilities across the Paramaribo city. This form can also assume a banking (or

gravity) structure, but it is not employed for river mooring facilities in view of a high possibility of the river flow to destroy the banking or of the sands and mud in the flow to sediment down to the riverbed thereby burying the periphery. Additionally, an I-shaped mooring facility, perpendicular to the shoreline, is another possible option, however, this is again not usually employed for rivers due to the instability and danger at the time of berthing and departing the jetty or during mooring because vessels are exposed to the river flow on the belly side.

The results of a comparison study on the above three options and the selected mooring method for this Project are summarized in Table 2-3 below.

Table 2-3 Comparison among Possible Forms of the Landing Facility

	Revetment type	Floating jetty type	Parallel jetty type (pile type)
Advantages as a mooring facility	No connecting jetty is needed, allowing more workspace on the revetment. Good relation between the facility on land and the mooring facility.	Since the relative heights of vessels and the jetty are constant, there will be no impact of water-level fluctuation of the river.	It is easy to secure necessary water depth for mooring, since it is constructed offshore the river, eliminating effects of shallow depth near the shoreline.
Disadvantages as a mooring facility	Since this facility is to be constructed on the river bank and the riverbed at the mooring point is shallow, it often requires constant, repeated dredging to assure safe berthing of vessels. If the water level fluctuation is significant, the difference in the heights of the jetty and vessels may cause inconvenience, which is not suitable for berthing of small vessels.	Because the connecting jetty needs to follow the fluctuation of the floating jetty, it is difficult to construct the jetty far from the shore. As a result, the floating jetty may contact the seabed at a time of ebb tide. In many cases, the floating jetty and connecting jetty are made of steel, posing a concern about deterioration due to possible rusting.	Because this structure is to be constructed deep down the river, vessel operation may become extremely difficult when berthing or departing the shore at a time of rapid river flow. Furthermore, the vessels may roll, which will make it difficult to land their catches or prepare for fishing. Similarly to the revetment type, it is not suitable for small vessels in case of significant water-level fluctuation.
Feasibility of being adopted in this Project	The distance between the facility on land and a point of a water depth of CDL±0 exceeds 50m. Therefore, if this approach is adopted for the mooring facility, the entire shoreline must be dredged to be used as a revetment. Even if mooring is temporarily enabled by performing a large-scale dredging work, the dredged part can easily be buried back in time, requiring regular maintenance dredging work afterwards.	In order to prevent the floating jetty from touching the riverbed regardless of fluctuation of the water level offshore the premise, the floating jetty must be located at least 70m away from the premise. To this end, a long, movable connecting jetty need also be provided. However, this may have an adverse impact to adjacent jetties, and it is difficult to obtain approval of MAS for construction. Consequently, this method cannot be applied.	The flow rate offshore the premise does not exceed the walking speed of humans even at times of flood tide or ebb tide. Also, the water level fluctuates within a range of ±1.35m on average at most, therefore the unavoidable disadvantages of this method are still acceptable because it does not disturb the landing or preparation activities. Thus, this method can be applied to the landing jetty of this Project.

Based on the results of a comparison study as described above, the parallel jetty method shall be adopted.

(3) Concept on social and economic conditions

1) The economic situation in Suriname has been quite stable in recent years with a GDP growth rate of 5.1% (2003). On the other hand, there is a gap between the haves and the have-nots with a high poverty rate and Paramaribo, the capital city, is not safe in some parts from the perspective of public security. For these reasons, when implementing the project, it is important to pay sufficient attention to safety management of the personnel concerned and at the same time take anti-theft measures for the materials and equipment at the construction site.

2) Suriname is a multi-ethnic state with the Indians accounting for 34%, the Creoles 33%, the Africans 17%, the Indonesians 10%, and the remaining 6% being others. The religion practiced in the country also vary from Hindooism and Muslim to Protestant and Catholic. The country is also diversified in terms of language, customs and holiday. Therefore, it is necessary to give due and sufficient consideration to the values, traditions, cultures, etc. that all these populations have, while being conscious of the fact that the country is a multi-ethnic nation.

3) Since the Surinamese population is quite low at just below 500,000 and the domestic construction market is accordingly limited, most construction materials and equipment are imported. As a result, the inventory of products of the same specifications and size is scarce and the product quality differs among countries of origin. Consequently, when procuring construction materials and equipment in Surinam, it is important to pay attention to the inventory, shipment and delivery time. Furthermore, the labor-force population is also small at around 170,000 and hence the numbers of engineers and skilled workers are also limited. These must also be taken into consideration in managing the construction schedule so as to prevent any delay in the implementation and completion of the works.

(4) Concept on the construction and procurement situations and business customs

1) Legal regulations and application procedures regarding building construction

Suriname has the building standard law established in 1956, and revised twice after the independence in 1975. The law consists of 79 articles in total, which stipulate procedural steps, standards for structural designing, restrictions on urban development areas, and other related regulations. Since Suriname does not have its own design standards or quality specifications; they observe the standards and specifications stipulated by the

Netherlands(its former suzerain), EU and the international standards such as ISO and ASTM. In the case of aid into the country, it is deemed that the standards of a donor country are compliant with the international level. Therefore, in this Project, the Ministry of Public Works has approved designing based on the Japanese standards and specifications. Conformity of details of construction equipment to the building standard law shall eventually be confirmed by the municipality (city of Paramaribo), after reviewed by the Ministry of Public Works.

2) Technical standards in the Project

Japanese design standards and quality specification, namely the building standard law, JIS, JASS, the AIJ design standards, the stndards for port facility designs by the Ministry of Agriculture, Forestry and Fisheries, etc., shall be observed. Recently, the Japanese standards and specifications related to construction and port facility design have been repeatedly revised so as to meet the international standards and specifications, such as ISO, EU, ASTEM, etc., and are therefore comparable to the standards of major advanced countries including the Netherlands, in terms of design strength, structure, functionality, construction cost, etc. Moreover, as this Project is to be carried out under Japan's grant aid scheme, it would be advantageous for Japanese vendors who will be in charge of detailed design drawing, construction supervision, and construction, to follow the Japanese standards, in the aspects of design, work efficiency and construction cost reduction. However, actual adoption of individual standards and specifications must be finalized through review and necessary adaptation to Surinam's building standard law in their major parts, and furthermore, standards and specifications of the Netherlands and ISO, EU, ASTEM and other applicable international standards and specifications shall be applied, as necessary, since they are commonly used in the country.

3) Design standards and quality of facilities

While the design standards and codes and quality specifications of Japan (JIS, JASS, design standards published by various related institutes, the Interior Wiring Regulations, etc.) are to be referred regarding facility design for electricity, air-conditioning and ventilation, water supply and drainage, and other necessary utilities, the actual application of these respective standards and regulations shall be reviewed as to whether they comply with the rules by the Netherlands and EU that are commonly used in Suriname and relevant international standards and regulations, including ISO and ASTEM.

The fuel station for gasoline shall be designed in accordance with Surinam's Fire Protection Law as well as the standards provided for by the local petroleum company.

4) Structural design standards

Table 2-4 Structural Design Standards

Subject Article	Reference value, etc.	Remarks
Ground allowable bearing capacity	17kN/m^2	Varies in accordance with boring results for analysis
Wind pressure	q: 360N/m^2	q: V^2/16, V=24m/sec
Seismic load	Primary design: 0.05	However shall be 0.1 to build ice-making /storage building on landing jetty.
Live load	1,900N/m^2	Building standards (Japan) excluding special part
Concrete		
Slump	8 – 10cm	
Strength	15 – 24Nf/mm^2	
Salt content	Target value 0.004%wt and less	Nacl conversion
Cement	Normal portland cement	
Thickness to cover reinforcing bar	5cm or more in principle	Apply the standard thickness used for the areas affected by JASS 5 sea water as a second option
Reinforcing bar	EU	
Reinforcing beam	EU	
Timber	Tensile Strength: 78Nf/mm^2 Compressive strength : 42Nf/mm^2 Shear strength: 8Nf/mm^2 Modulus of Elasticity (MOE): 13kNf/mm^2	Apply the average functionality of North American coniferous trees The design must focus on the MOE value

5) Construction conditions special to Surinam

The central urban area of Paramaribo city is composed of middle- and low-rise wooden buildings. Since the former colonial era, Suriname has traditionally adopted wooden skeleton construction techniques and stone construction has rarely been seen. In the course of modernization afterwards, steel-frame construction of a similar skeleton technology became more and more common to middle-rise commercial buildings and office quarters constructed in the surrounding areas of the former central urban area. The RC pile construction of a stone construction category has only been adopted in limited luxury homes. This is probably because the costal areas of Surinam, including Paramaribo, wholly stand on soft subsoil covered with a thick alluvial layer, and hence it is difficult to construct a building with a large unit weight. Such structural steelwork is normally split in separate orders by work types, with the main order to be placed to an ironworks that will carry out the main framing works. Because there is no natural disaster, such as earthquake and typhoon, Surinamese workers are not experienced in subtle welding techniques, such as the rigid-framed structure, but are well-skilled in pin-joining or processing technology using braces, which allows a certain degree of deformation due to differential settlement, etc.

Top-ranked ironworks in the country have their own processing plants with decent equipment in place, and have established a thorough construction mechanism starting with designing with their own CAD (Computer Aided Design) machines and covering also steel framing and erection works. They also order steel members directly to material traders in the Netherlands, etc., and carry out steel-frame works based on relevant international standards.

On the other hand, civil works involving roads, bridges, and ports are always accompanied by difficulties caused by the subsoil conditions, but a few large-scale general civil engineering and construction companies of a conglomerate, which have received technology transfer from the former suzerain, the Netherlands, etc., possess pontoons, pile drivers and other large-scale construction machines.

The Project intends to make most use of these construction technologies accumulated on the soft soil conditions, by leveraging the civil engineering and construction machines and steel-frame processing technologies available in the country.

6) Equipment procurement

Concerning general work types, engineering and construction supervision technologies, such as dry-construction techniques, in Suriname are assumed as at a reasonable level, since some of these have been, as already mentioned above, in place since the colonial period.

On the other hand, a large number of construction works are being carried out in the Paramaribo city, especially commercial facilities in suburban areas and residential development. However, since Suriname has a small and thin population, it is vital to pay attention to securing construction engineers and skilled workers as well as ordinary laborers.

In addition, it is also important to consider a dispatch of special and advanced skilled workers from Japan, with regard to special works, such as welding and installation of steel pipe piles, installation of cooling machines, and electrical works, that may have a significant influence on the quality and work schedule.

Construction materials that originate from Suriname are limited to fine and coarse aggregate for concrete and timber, the latter of which is no longer exhaustlessly available due to strict restrictions on further trimming of trees from the standpoints of home-produced timber and environmental protection. For this reason, many construction material dealers, including conglomerate companies, now import and distribute a variety of construction materials from other countries across the globe. However, the import counterparts include neighboring nations in Latin America and China, which unfortunately does not guarantee a reliable

quality of materials. Moreover, the inventory level fluctuates, making it difficult to constantly procure a right quantity of materials compliant with the international specifications and standards at right timing. Taking this situation into consideration, it is significant to confirm the specifications, quantities, turnaround time, and other important factors when procuring materials with predetermined specifications, so as to ensure that there will be no discrepancy with the construction planning.

(5) Concept on utilization of local contractors

There are a total of ten or more construction companies in Surinam, including general construction companies of conglomerates with 200 or more employees and middle-sized companies with dozens of employees. The majority of them are headquartered in Paramaribo. Therefore, it is considered that there is no problem in selecting a construction company of adequate management capacity for each work, who satisfies the specifications designated by the Basic Concept of the Project.

As previously stated, Suriname has a limited engineering accumulation. Therefore, the designs in conjunction with the Project that faces many restrictions including the soft soil conditions and the river works shall be drawn up in such a way as to effectively and maximally utilize the common, advanced technologies in the country, except when the construction planning and design conditions require otherwise.

(6) Concept on Operation and Maintenance Cost of the implementing agencies

The Paramaribo Fisheries Center to be developed under the Project is planned as to lead operation and maintenance on a stand-alone basis, with the same staffing plan as the existing Commewijne Fisheries Center. There is no problem observed in terms of facility management ability, because the details of operation are almost the same as the existing center and hence the country has an accumulated experience in that regard. In the profit aspect, however, the existing center has not achieved sufficient earnings for depreciation; moreover, its expenditure consists mainly of only three items, namely labor cost which accounts for 37% of the total, electricity and water cost 29%, and maintenance cost 13% approximately, which together constitute almost 80% of the total. With this in mind, reduction in labor force and maintenance cost shall be carefully taken into consideration when planning and selecting the facilities and equipment and determining the size thereof.

(7) Concept on setting grades of facilities and equipment

[A] Designing of the civil engineering facilities

1) Development of landing jetty

A plan for the landing jetty is proposed based on the following basic concepts.

(i) The size of the jetty shall be determined in such a manner as to enable the target boats to perform landing and preparation at the jetty without being affected by the tidal level as much as possible, on the condition that the jetty is to be constructed within the area (constrained between the end of the jetty of CEVIHAS situated next on the upstream side and the extension line of the dolphin-shaped jetty of Molen Co., Ltd. on the downstream side) approved by the MAS, responsible agency for managing the port facilities along the Suriname river.

(ii) In view of the condition that the facility is to be constructed upon the deep alluvial stratum, the jetty shall have a structure that can remain stable over a long term and specifications that alleviate the horizontal force, e.g. impact of berthing of fishing boats.

(iii) In order to meet the requirements for a landing facility for artisanal fisheries as stipulated by the Fish Inspection Act and Quality Control of Surinam, the specifications of the jetty shall allow prompt shipment of fresh fish, landed at chilling temperature to the market under hygienic conditions.

2) Scale determination of the landing jetty

(i) Selection of target boats

Of the 957 artisanal fishing boats registered as of December 2005, those that register any of the existing landing sites in Paramaribo as their main landing site[*)] were extracted and narrowed down to select the boats to be covered in the project. Number of registered artisanal fishing boats per landing site is shown in Table 2-5 below.

Table 2-5 Registered Artisanal Fishing Boats per Landing Site

Landing site / Boat type	Paramaribo					Commewijne			Saramacca, Coronie, Nickerie	Total
	Bisoen jetty	Nene jetty	Central Market	Other	Sub Total	Commewijne Fisheries Center	Hugo, Habiboella	Sub Total		
SK-GG	7	28	1	4	40	13	3	16	6	62
SK-OG	19	44	92	10	165	87	6	93	47	305
SK-B	1	1	6	5	13	22	5	27	0	40
Subtotal	27	73	99	19	218	122	14	136	53	407
BV-type								386	164	550
Total										957

*) Description in the "Landing site" item at the time of registration indicates the landing base where the applicant boat mainly lands its catch. It does not restrain the applicant from landing in other areas or oblige the applicant to land there only.

a) BV-type boats

It is impossible to identify the landing sites of BV-type fishing boats, because they state "Main Operational Water" instead of "Landing Site" in the registry form. Thus, their main operational waters and landing sites were ascertained sited on a survey on their mooring areas and the distribution of moored BV-type fishing boats and opinions of the officials of the Fisheries Department and representatives of fishers organizations who participated in stake-holder's meetings. As a result, the following matters were confirmed.

- The main fishing ground is the vicinity of the estuary where the Suriname river and the Commewijne river meeting place
- The mooring area and landing site are both near the Commewijne Fisheries Center.
- No ice is used for storing the catches during the return operation.
- The project site is far from the activity area.
- As BV-type boats are small and don't have a deep draft, they can land catches without being restrained by the existing landing sites and at low tide.
- One landing weighs as small as an average of 75kg and landing operation can be finished in as a short time as 15 minutes.

From these reasons, BV-type fishing boats are not in need for the Center to be constructed under the project. Therefore, these boats were excluded from the target boats benefiting from the Center.

b) SK-GG, SK-OG, SK-B type boats

SK-GG, SK-OG, and SK-B type fishing boats are based in Paramaribo and engaged in landing and preparation for fishing in the existing landing sites in the district with 218 boats being confirmed. 172 boats (hereinafter referred to as the "target boats"), which excludes below-mentioned 46 of the 218 boats, have been selected as the boats to be covered in the project. Accordingly, all scaling for the jetty facilities and various other facilities shall be based upon this number.

- Boats possessed by the shipowners who also own jetties and having secured landing sites
  (SK-GG type: 16 boats)
- Boats that are registered but don't operate with few times of fishing per year
  (SK-GG type: 6 boats), (SK-OG type: 18 boats), and (SK-B type: 6 boats)

Breakdown of target boats : SK-GG = 40－(16＋6) = 18 boats
SK-OG = 165－18 = 147 boats
SK-B = 13－6 = 7 boats
Total 172 boats

(ii) The necessary number of berths and berth length

The necessary number of berths and berth length are calculated following the procedures below.

① Calculation of the number of fishing boats using the landing jetty per day
↓
② Calculation of time for using the landing jetty per boat and work type
↓
③ Calculation of necessary berth length

① Calculation of the number of fishing boats using the landing jetty per day

In consideration of the average number of fishing trips per year quoted from statistical data and the number of operational days per annum calculated based on interviews, the number of fishing boats indicated in Table 2-6 shall be assumed in planning the size of the jetty as a basic condition for the number of boats that will use the jetty in a day.

Table 2-6 Number of Fishing Boats Using the Landing Jetty per Day

Fishing boat type	Number of fishing boats	Average annual fishing frequency	Working days (per year)	Number of fishing boats using landing jetty per day
SK-GG	18 boats	12 times/year	288 days	1 boat
SK-OG	147 boats	15 times/year	288 days	8 boats
SK-B	7 boats	25 times/year	288 days	1 boat
Total	172 boats	-	-	10 boats

The number of operational days indicated in Table 2-6 is derived based on an assumption of one month non-operation period due to maintenance of boats and gears and six working days as a weekly average.

No. of operational days per annum =
365 − (30 off days) × (6 days per week: 6/7) = 288 days

② Calculation of time for using the landing jetty per boat and work type

1] Time required for landing and necessary berth length

The time required for landing per boat type is calculated based on the survey on the current status of existing landing sites and interviews with the officials of the Fisheries Department and artisanal fishers. The result is shown in Table 2-7 below.

Table 2-7 Time Required for Landing Work by Fishing Boat Type

Fishing boat type	Number of fishing boats	For leaving / berthing	For preparation	For landing	Time for occupying landing jetty	Accumulated time for occupying the landing jetty
SK-GG	1 boat	10 minutes	10minutes	45minutes	65 minutes	65 minutes
SK-OG	8 boats	10 minutes	10 minutes	55 minutes	75 minutes	600 minutes
SK-B	1 boat	10 minutes	10 minutes	50 minutes	70 minutes	70 minutes
Total	10 boats					735 minutes

The size of the landing jetty shall be determined based on the time required for each activity as given in Table 2-7 above. Further more, most fishing boats depart for fishing at a time of ebb tide taking advantage of river current and return to Paramaribo at a time of flow tide taking advantage of adverse current. Consequently, the actual landing work is usually conducted at some point between flow tide and high tide. Under these circumstances, the work hours for landing are set at four hours, and the number of berths necessary for the fishing boats using the jetty in a day to complete landing within these hours shall be calculated.

[Total occupancy time (735 minutes)] / [Landing time (240 minutes)]
= app. 3.1 berths

2] Time required for preparation for fishing and necessary number of berths

Berths for preparation for fishing (including loading of ice, water, and fuel) are necessary in parallel with berths for landing. The number of fishing boats that will prepare for fishing at the landing jetty will basically be the same as the number of fishing boats that unload their catch at the jetty. As in the case of landing, the time required for preparation for fishing is calculated per work type based on the survey on the current status of existing landing sites and interviews with the officials of the Fisheries Department and artisanal fishers.

Time required for loading ice:

It is the time required for loading 20 tons of ice to be produced daily in the Center to be constructed under the project. Since 20 tons correspond to four times the necessary quantity of ice an SK-OG boat requires, the size of the preparation jetty will be determined based on that four SK-OG boats load ice simultaneously. Ice loading of the other types of boats shall take place in the existing landing sites as ever. Table 2-8 below shows the time required for loading ice.

Table 2-8 Time Required for Loading Ice

Fishing boat type	Number of fishing boats using landing jetty	The amount of ice loaded	Berthing/ leaving	Time for preparation	Time required for loading ice	Total time for occupying landing jetty
SK-GG	4 boats	4.5 tons	10 minutes	10 minutes	125 minutes	580 minutes

Time required for loading fuel:

While SK-OG and SK-B type boats have outboard motor and use gasoline as fuel, SK-GG type boats have onboard motor and use diesel oil(light oil)as fuel. However, fuel supply station for diesel oil shall not be installed as only an average of one SK-GG boat will use the jetty daily. The time required for loading fuel is calculated targeting SK-OG and SK-B type boats. It is as shown in Table 2-9 below.

Table 2-9 Time Required for Loading Fuel

Fishing boat type	Number of fishing boats using landing jetty	The amount of fuel loaded	Berthing/ leaving	Time for preparation	Time required for loading	Time for occupying landing jetty	Total time for occupying landing jetty
SK-OG	8 boats	600ℓ	5 minutes	5 minutes	30 minutes	40 minutes	320 minutes
SK-B	1 boats	300ℓ	5 minutes	5 minutes	15 minutes	25 minutes	25 minutes
Total	9 boats						345minutes

Loading efficiency: 20litres/ min. Since fresh water is loaded onto OG type and SKB type fishing boats, apart from fuel, time required for leaving/ berthing and preparation will be divided as 5minutes and 5 minutes respectively for both types.

Time required for loading water:

It is calculated targeting all boat types using the jetty. It is as shown in Table 2-10 below.

Table 2-10 Time Required for Loading Fresh Water

Fishing boat type	Number of fishing boats using landing jetty	The amount of fresh water loaded	Leaving/ berthing	Preparation	Time required for loading	Time for occupying landing jetty	Total time for occupying landing jetty
SK-GG	1 boat	600ℓ	10minutes	10minutes	30minutes	50minutes	50minutes
SK-OG	8 boats	400ℓ	5minutes	5minutes	20minutes	30minutes	240minutes
SK-B	1 boat	200ℓ	5minutes	5minutes	10minutes	20minutes	20minutes
Total	10 boats						310minutes

Loading efficiency: 20litres/ min. Time required for leaving/ berthing and preparation for OG type and SKB type fishing boats will be divided as 5 minutes and 5minutes respectively from the reason indicated in Table 13.

Number of berths required for preparation for fishing:

Preparation for fishing is taken place approximately eight hours between high tide and low tide to utilize ebb tides. For this reason, the number of berths necessary to prepare for fishing in these hours can be calculated as three or less.

[Total occupancy time(1,235 minutes)]/[Landing work time(480 minutes)] = app. 2.6 berths

3] Calculation of necessary berth length

Three berths (no.1, no.2, and no.3) necessary for landing shall be dedicated to landing work during four hours out of eight hours of preparation time(4~11) as shown in Figure 2-2. However, they(no.1, no.2, and no.3) can also be used as a preparation jetty during the second half of four hours(7~11). Accordingly, the preparation jetty shall be equipped with only two berths(no.4, no.5) , totaling up to five berths altogether for both the unloading and preparation purposes, in order to enable all target boats to smoothly carry out unloading and preparation activities.

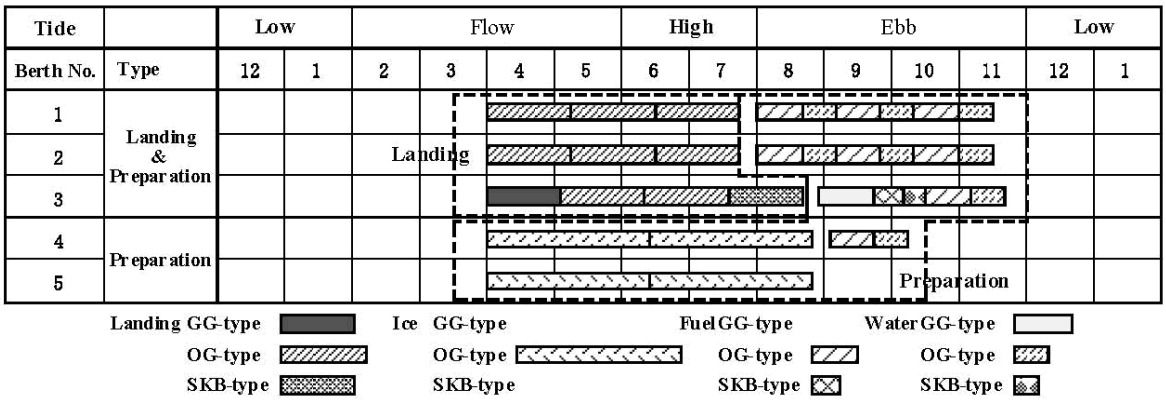


Figure 2-2 Model and Timetable of Berth Use

From the above calculation and examination, the jetty having five berths, three for unloading and two for preparation, shall be planned. Boats shall be moored in parallel to the jetty so that the target boats can use the jetty in a safe and smooth manner. The berth length is calculated by taking into account average boat length of each boat type, allowance length of 0.15 L necessary for safety leaving, berthing, and mooring, and space of jetty ends. It is as shown in Table 2-11.

Table 2-11 Berth Length of the Landing Jetty

Fishing boat type	Average boat length=L	Basic berth length (1.15×L)	Berth number	Required jetty length
SK-OG	12m	14m	2	28.0m
SK-GG	18m	21m	1	21.0m
Length of gap				3.0m×2
Total				55.0m

The berths for landing shall be provided on the main passage side where it is deeper and easier to leave and berth the shore. The two berths for preparation shall be provided on the other (land) side and arranged each on upstream and downstream side. The berth length for preparation is calculated based on the standard berth length of SK-OG boats that will mainly use the jetty.

Berth length for preparation=standard berth length of SK-OG 14m×2= 28m

(iii) Setting up of the water depth

The position of constructing the landing jetty shall be planned based on the assumption of use at a water depth (CDL+0.6 to -2.0m), in the areas permitted by the MAS. In addition, the MAS has instructed to construct the jetty parallel with the shoreline. The loaded draft of the project fishing boats is about 1m, which means another 1.5m or so will be sufficient for berthing considering fluctuation of the water level. Taking these design conditions into consideration, the water depth inside the jetty will be CDL+0.5 - 0.6m and the boat berthing at a low tide will hit the riverbed. However, the berths to be used for preparation will only be used by the project fishing boats at flow tide and these boats are supposed to leave the jetty after landing and preparation before the ebb tide period. Above all, it is deemed that there is no restriction in terms of use of the jetty. In addition, night lighting shall be arranged to enhance the convenience and safety of fishing activities at the landing jetty, in light of situations where preparation for fishing may sometimes continue to the night according to the tidal level.

3) Revetment

The project site is situated on the left bank of the Suriname River on the upstream side of the port zone. Since it is positioned outside the curving area of river, it is generally considered to be prone to erosion, but currently there seems to be no progress in erosion or sediment in the surrounding riverside conditions and the shoreline can be assumed as stable. As a result of observation on the tidal level, the maximum water level of the Suriname River can reach around CDL+2.8m, which nearly corresponds to the water level in the vicinity of the border of the project site on the river side (approximately CDL+2.9m). Thus, if a large-scale vessel navigates the river at the time when the water level reaches the maximum height, the effects of its wakes may cause water immersion to the project site near the low tide zone.

The area of the project site is spacious enough to accommodate the land facilities planned in the Project, but in order to utilize area for the land facilities and the parking lot maximally up to the borderline on the riverside, for the benefit of convenience for fishing activities on the landing jetty, it is necessary to increase the land level within the site to approximately CDL+3.3m to match the design height of the jetty. Therefore, revetment shall be constructed so as to maintain the top of slope on the river side of the site and protect the exterior of the Center when the river reaches the maximum water level.

[B] Designing of buildings

1) Development of buildings

The buildings to be constructed in the Project shall be developed based on the following five basic concepts.

(i) Construction materials, incidental facilities and equipment necessary for conforming to the requirements as a landing facility for artisanal fisheries stipulated in Surinam's Fish Inspection Act and Quality Control shall be selected.

(ii) In view of the constraint to construct building on the soft ground, buildings shall have specifications that allow easy weight reduction to an possible extent, except power receiving facilities and fuel stations. that are subject to regulations by building standards and sanitary facilities that are subject to functional restrictions.

(iii) Under the condition that the construction method must allow completion of building construction along with civil works of the landing jetty and revetment within the predetermined implementation schedule, appropriate specifications must be set both with an eye to temporary works.

(iv) In light of the facts that the buildings will be constructed in a coastal area and on the project site facing the river and that the project site is exposed to annual rainfall of 2,000mm or more, construction materials and equipment, incidental facilities and equipment to be selected must have be durable against adverse effects of water and moist or easy to remove such effects and to save cost.

(v) Construction materials and equipment, incidental facilities and equipment to be selected shall be suitable for easy operation of the Center and easy cost reduction.

In case that some of the above policies contradict with each other and have to be partly compromised as a result of an overall evaluation, the Project shall make appropriate recommendations to the Suriname side on points to be noted as regards the operation and maintenance of the Center after its completion. For example, if steel materials are to be used prioritizing the benefit of weight saving of the Center, although it is not necessarily favorable as a means of waterfront construction, the steel members shall be applied with anti-rust measures to an extent suitable as a Japanese grant aid project, but at the same time recommendation shall be made on the necessity of periodical repainting after the completion of construction.

2) Scale determination of the buildings

Suriname has been promoting since 2000 establishment of fisheries related laws and Fish Inspection Ordinance, etc. in compliance with EU guidelines, and providing guidance to small-scale fishers, Landing site administrators, fish traders, retailers, processing companies, and other fisheries related parties, in order to protect an export environment of fishery products of Surinam. Accordingly, facilities to be constructed under the Project must inevitably conform to the series of Fish Inspection Act and Quality Control Decree. These stipulations position landing facilities as part of the fish distribution network, and require them to be hygienic as well as fishing vessels, fish markets, and fish processing plants so as to enable prompt handling of fresh fish. Quoted below are the rules to be followed by landing facilities in accordance with the Fish Inspection Act. The project facilities and equipment must be planned so as to conform to these rules and regulations.

(i) Fresh fish handled in the facility must be promptly unloaded, classified and sorted before shipment (from the landing facility). The Center must allow insulated vans of fish traders and processing vendors to directly drive in the landing jetty, so that they can promptly load the fresh fish on the landing jetty to their insulated vans for shipping. Furthermore, a parking space must be provided where insulated vans waiting for fish landing can stand by.

(ii) Fresh fish handled must always be kept in hygienic containers at a chilling temperature during both transportation and storage.
Fresh fish must be handled in plastic fish containers or the like that are always maintained washed up and sterilized. The Center must be furnished with chilled rooms to keep the unloaded fresh fish temporarily within the landing facility.

(iii) Containers, tools or other equipment to be used for handling fresh fish must be made of durable materials and managed hygienically through cleaning and sterlization as necessary. Moreover, water used in washing, etc. must be fresh water suitable for drinking (city water supply).
The Center must be equipped with rooms for washing and sterilization of containers to carry fresh fish such as plastic fish containers and insulated containers for fish and ice, measuring instruments, transport tools, etc. Water supply must always be available in these rooms. These equipment pieces must be kept in dedicated hygienic storages.

(iv) The facility where fresh fish is handled must be segmented by hygienic and durable walls, floors and ceilings to prevent contamination caused by other activities, and allow washing, sterilization, and other cleaning activities, as necessary. (The workspace for landing on the landing jetty is exempted from this regulation.)

Chilled rooms to keep fresh fish temporarily must be installed in insulated rooms where washing, sterilization, and other cleaning activities can be conducted as necessary.

(v) Fresh fish that has to wait for a while to be shipped after landed must be stored hygienically in a locked chilled room at a chilling temperature. Chilled rooms therefore must have robust doors and their interiors must be finished with waterproof, durable materials. They must also be equipped with a drainage system to discharge melted ice and a lighting function for work inside. It is expected that fresh fish is stored in these chilled rooms at a chilling temperature, but not a freezing temperature.

(vi) The fresh fish to be temporarily stored in the chilled room must have been classified according to fish types. Further, fresh water suitable for drinking, i.e. city water supply, must be used for washing the fresh fish when classifying.

Surinamese artisanal fishers spend a significant time in operation on the sea. Therefore, in most cases, their catch is classified on the boat. As a result, they do not need special space for fish classification or washing. However, though very rarely, they might need some space to conduct classification and washing activities after landing, so a workspace must be available near the chilled rooms for these activities.

(vii) Landing-related facilities and fresh fish handled thereof must always be ready to undergo public sanitary inspection. Further, the Center must be furnished with rooms with locks, lighting equipment and ventilating facilities necessary for conducting inspection. Public inspection concerning fresh fish is limited to visual inspection (sensory inspection for freshness of fish). Of sensory inspection items, inspection involving anatomy, microscope, or backlight will not be carried out on the site.

Inspectors from the fish inspection authority must always be able to access unloaded fresh fish, and visually check the fish for sensory inspection and sample fish for conducting further sensory inspection by anatomies and bacteria tests. The Center therefore must be equipped with a sensory inspection room and a laboratory to temporarily keep the samples. Furthermore, the facility must be equipped with Center and equipment necessary for temporarily storing samples to be used for sanitary inspection of fishery products. (The Suriname side is in charge of providing chilled rooms, insulated boxes for transportation, and other necessary equipment, if any, whereas the Project must secure space to keep such equipment.)

(viii) The administrators of the landing facility must conduct self-inspection tests as necessary, to control the hygienic condition within the facility. The self-inspection tests include confirmation on adequate performance of washing and sterilization in the workspace of the facility. Furthermore, they need to organize and record the test

results according to inspection items, and store and manage these records for a certain period of time.

(ix) The fishing boats operating offshore must store unloaded fresh fish in hygienic fish tanks with ice onboard, if the time from catch to landing exceeds six hours. The ice to be used in the fish tank must be made from fresh water suitable for drinking (city water supply).
Jetty facilities used for preparation must have a facility to supply ice made of drinking water in order to store landed fresh fish with ice.

(x) When handling fresh fish, workers must wear hygienic and waterproof costumes and wash hands before and during their work as necessary.
Fishers engaged in landing, fish traders and workers dispatched by processing vendors who are engaged in transloading fresh fish to their insulated vans must wear hygienic and waterproof costumes. The landing jetty and the refrigerating room must be equipped with facilities for hand washing.

(xi) Facilities where fresh fish is handled must have fences around them, and screen and restrict an unknown and irrelevant person from entering the facility at the gates.
The Center must be surrounded by fences, etc. and entry of irrelevant people must be controlled and prevented at the gates.

3) Development of scale planning of the ice-making machines and ice-storage

(i) Selection of ice type

Three types of ice commonly manufactured are crushed ice (broken ice; plate ice as it is called in Japan), flake ice (like snowflakes), and block ice (ice rocks). Crushed ice is the type most generally manufactured in Surinam, while flake ice is rarely produced and block ice is not manufactured. Crushed ice is a sort of in between flake ice and block ice and is suitable for fishing boats with ice storage that go for fishing over one or two weeks. This type of ice is also most efficient for artisanal fishers to load their catch in fish storages or store their catch on board. Therefore, this is a strong request by artisanal fishers. Moreover, the process of making crushed ice is fully automated contrary to block ice, which requires easy operation and maintenance and reduces production cost. In addition, each component of machine is modularized so that transportation, and installation can be more easily conducted comparing with block ice. Crushed ice, therefore, shall be adopted from the viewpoint of advantageous construction cost.

(ii) Selection of refrigerant

R-22 is a fluorocarbon gas, and is widely used as refrigerant for ice-making machines and refrigerating equipment in Surinam. Of the 15 existing refrigerating facilities, 13 adopt R-22 as the refrigerant, and the new ice-making facility constructed in fiscal 2005 uses this gas as well. The other two facilities employ ammonia instead of R-22, but the facilities themselves are as old as roughly 40 years. On the other hand, the new refrigerant (HFCs: the ozone depletion potential (ODP) of 0.0), which are alternative materials for refrigerant subject to restrictions, are used in vehicles and multi-purpose air-conditioners, but rarely in ice-making machines or refrigerating facilities. Furthermore, no local freezer distributor or maintenance company deals with the machines and facilities applicable to the new refrigerant. As for R-22, many countries have been carrying forward various regulations concerning the production volume, export/import amounts, applications, etc. based on the recognition that it is one of ozone-depleting substances. These substances are divided roughly into two, according to the ODP: CFCs (ODP of 1.0) and HCFCs (ODP of 0.055). R-22 falls under the latter with a less potential. In Japan, the government has drawn up a regulatory schedule to reduce the consumption of R-22 in a phased manner starting in 1996, based on the actual consumption in fiscal 1989, so as to see the consumption becomes completely 0 by 2020. However, those supplemental refrigerant used for ice-making machines and refrigerating facilities, for instance, are exceptional in that the production is allowed up to 2029 setting the upper limit at 0.5% of the aforementioned reference consumption volume. On the other hand, since there are no rules as to manufacturing, installation, and operation of ice-making machines and refrigerating facilities that require R-22, new products are still being manufactured and installed.

R-22 is not produced in Suriname and the country imports the total sum of its demands. The Ministry of Environment allows import of the coolant up to 2040, setting the import amount as of fiscal 2018 as the upper limit, instead of taking a phased reduction measure. Moreover, the government allows installation and operation of new ice-making machines and refrigerating facilities that use R-22 as refrigerant even after 2040. In the meantime, neither of the Ministry of Environment or the Ministry of Agriculture, Animal Husbandry and Fisheries implements any special promotion or support for adoption and use of new refrigerant.

Considering the current status and the regulations concerning use of refrigerant in refrigerating facilities in Surinam, as described above, R-22 and ammonia are the only employable refrigerant.

Ammonia is currently used by two major fisheries-related companies, however, they use an old-type facility, installed more than 40 years before, and only a limited engineers have knowledge to run the facility. Furthermore, there is no agent that deals with ammonia in Surinam, and so these two companies purchase it directly from overseas.

On the other hand, R-22 is the most frequently-used coolant in Suriname for ice-making machines and chilled rooms. Therefore, on top of officials of the Fisheries Department, engineers of the agents and maintenance companies are all well experienced in handing it. Therefore, it is easy to install the equipment, operate and handle it after start of operation, and maintain and repair it. Furthermore, it has a lower ozone-layer destruction coefficient and the Ministry of Environment permits export of the coolant up to year 2040.

In the light of the current status of the use and utilization of refrigerantand the level of engineers in Surinam, R-22 is adopted as refrigerantto be used in the ice-making machine and the chilled room to be provided by the project.

(iii) Capacity of ice-making facilities

The production capacity of ice-making facilities shall be calculated by subtracting (ii) the annual ice quantity needed by the 218 fishing boats based in Paramaribo from (i) the production capacity of the existing ice-making facilities around Paramaribo. The remainder, in another word, (iii) shortage, is assumed as the ice-making capacity necessary for this Project.

① Production capacity of existing ice-making facilities

a) Production capacity of existing ice-making facilities for industrial fishery

The ice-making facilities for industrial fishery prioritize supply to its plant and contract/lease industrial fishing boats and supply to artisanal fishing boats only when there is surplus.)

1	SAIL	(nominal ice-making capacity)	65.0 tons/day
2	SUJUFI	(do.)	4.0 tons/day
3	GUYANA SEAFOOD (Commewijne)	(do.)	40.0 tons/day
4	SURINAME SEA CATCH	(do.)	22.0 tons/day
5	CEVIHAS	(do.)	27.0 tons/day
6	OMICRON SEAFOOD	(do.)	20.0 tons/day

7	HOLSE	(do.)	1.5 tons/day
8	TASA FISH	(do.)	3.5 tons/day
9	DEEP SEA ATLANTIC(Domburg)	(do.)	24.0 tons/day
		Total	207.0 tons/day

b) Production capacity of existing ice-making facilities for artisanal fishing boats

The following ice-making facilities supply ice to artisanal fishing boats, purchase brokers, distributors and retailers)

1	NENE(Paramaribo: shipowners)	Actual ice-making capacity	23.0 tons/day
2	BISOEN(Paramaribo: shipowners)	(do.)	7.5 tons/day
3	NICO(Paramaribo: fish processing companies)	(do.)	7.5 tons/day
4	Fish Center of Commowejine	(do.)	2.0 tons/day
5	HOGO	(do.)	6.0 tons/day
	(Commewijne: fish processing and exporting companies)		
6	STIVI	(do.)	5.0 tons/day
	(Paramaribo: Government Corporation National Fishery)		
	Actual ice-supply station produce on subject fishing boats		
		Total	51.0 tons/day

Note) Nominal ice-making capacity indicates ice-making capacity collected by interview. Actual ice-making capacity indicates ice-making machine capacity calculated on the basis of daily production of 1 ton per compressor output of 4kw for ice-making machine (daily produce 1 tons/4kw)

Of the above, the nine companies for industrial fishery under a) have ice-making machines to supply themselves and their affiliated companies, which is not sufficient in the peak season. Therefore, they will not be counted in as the ice supply station for supply to the small-scale fisheries. Further, 4 and 5 under b) and 6 of b) STIVI must be excluded from ice supply stations since the former are ice-making facilities for artisanal fisheries in Commewijne and the latter targets at processing vendors in the city and suburbs for their ice provision. Based on the above, the total production capacity of the ice-making facilities, 1, 2, and 3 (NENE, BISOEN, and NICO) of b), that can serve artisanal fishing boats in Paramaribo is estimated at 38.0 tons.

② Ice demand of artisanal fishing boats

The number of fishing boats to be used in calculating the size of the ice-making facilities to be provided in the Project is as follows:

a) Artisanal fishing boats mainly based in Paramaribo

SK GG-type	40 boats
SK OG-type	165 boats
SK B-type	13 boats
Total	218 boats

b) Ice load of subject fishing boats (per boat and per 1 fishing trip) and annual number of fishing trips:

	Ice load	Annual number of trip
SK GG-type	8.0 tons	12 times
SK OG-type	4.5 tons	15 times
SK B-type	2.0 tons	25 times

③ Ice shortage for artisanal fishing boats:

The ice shortage for artisanal fishing boats is calculated by subtracting the amount of ice necessary for artisanal fishing boats on a yearly basis from the annual ice production volume available for these boats (38.0 tons/day) as described above.

1. Daily production of the existing ice-making machines:
   38.0 x 95% = 36.29 tons/day (reflecting a thawing loss of 5%)
2. Annual ice demand by artisanal fishing boat
   = (8.0 tons x trip/boat × 40 boats × 12 trips/year)
   + (4.5 tons x trip/boat × 165 boats × 15 trips/year)
   + (2.0 tons x trip/boat × 13 boats × 25 trips/year) 15,627.5 tons
3. Annual number of days of ice-making:
   365 days in a year – 30 days (for halt due to maintenance) = 335 days
4. Demanded ice quantity per day (operation rate of 85%)
   = (15,627.5 tons/335 days × 0.85) 54.88 tons/day.

   Ice shortage for artisanal fishing boats
   = Ice demand per day – Daily production of the existing ice-making machines
   = 54.88 - 36.29 = 18.59 tons/day

Calculation of capacity of ice-making machines:

The capacity of ice-making machines is calculated to cover the above-derived ice shortage and 5% of thawing loss, as expressed as follows.

Ice-making capacity = 18.59 tons/day / 0.95 = 19.57 tons/day 20 tons/day

(iv) Quantity of ice-making machines:

As it is desirable to secure ice production even during maintenance or in case of a machine failure, it is appropriate to install several numbers of machines. Meanwhile, if a large number of units are to be introduced, the initial investment will increase, and the maintenance and repair cost is also expected to increase because of a larger number of components. For these reasons, two units of ice-making machines, each with a capacity of 10 tons/day shall be provided.

(v) Setting of ice storage capacity

Three-day worth of ice will be secured in ice storage, considering demand fluctuation due to weather factors and holidays.

- No. of boats loading ice: 4.5 ton/boat×4 boats/day= 19 tons/day
- Maximum storage capacity: 19 tons/day×3days=58 tons 60 tons
  (30 tons/unit×2 rooms)

Based on the above, the number of storage units is calculated as follows.

Calculation of the capacity of ice storages
- Internal dimensions of the ice storage: 5.2 x 6.1 x 2.5 = 79.3m^3
- Storage factor: 0.385

Ice storage volume is calculated by multiplying the capacity with the storage factor.
- Ice storage capacity 79.3m^3 x 0.385=30.5 tons

(vi) Specifications for ice-making machines and ice-storages

i. Ice-making machines

Ice type	:	crushed ice (plate ice) (10 tons/1)
Refrigerant	:	Freon 22 (R-22)
Cooling method	:	R-22(dry-expansion)
Condensation method	:	Air-cooling
Compressor model	:	Open-type 55kw motor (# of rotations: 1,000 or less)
Driving method	:	V-belt driving

ii. Ice storages

Ice-storage	:	Prefabricated panel assembly
Cooling temperature	:	Situation

Outer size	:	6,300W x 5,400D x 2,500IH (mm)
Door	:	4 doors (Standard single-swing door 850cw x 1800ch, 2 doors: small door 600cw x 600ch

4) Development and size planning of the facility to accommodate ice-making machines and ice storages

Plate ice-making machines will be installed on the upper floor of where ice storages are as ice is produced in an automated manner and stored in a storage by dropping by its own weight after being crushed. A set of ice-making equipment consists of the main unit, compressor and condenser (heat exchangers), the last of which is usually installed outdoor to enhance its efficiency. Installation of main units and compressors plus maintenance space will require almost the same area as ice storages. The ice storage composed of prefabricated, standard, heat-protection panels shall be adopted, while it shall be surrounded by walls in order to protect it from sea winds and rainfall of seaside areas and maintain it in good condition for a long time. A minimum area necessary for assembling the storages inside the walls in the Center shall be 7.2m × 6.3m.

5) Development and size planning of the gas fueling station and its storage facility and equipment

Gasoline is transported by tanker lorries from fuel companies to tanks to be stored. Then it is supplied to artisanal fishing boats from service tanks on the jetty by transport pump working with the tanks.

Daily average supply of gasoline is 8 OG boats × 600 liters + 1 SKB boat × 300 liters = 5.1 kilo liters and about 30 kilo liters is required in a week. By discussion with private gasoline supplying companies, the gasoline tank to be installed in the Center shall be one 30-kilo-liter tank, considering that a tanker lorry comes to the Center approximately every week. It will be provided by the private oil company. In the discussion, it was also decided that the dispenser (with service tank) will be provided by the oil company.

Considering the facts that there is a 60m connecting jetty from the land to the landing jetty for preparing for fishing and that the amount of oil per boat is quite large from 300 to 600 liters, the dispenser shall be installed at the base point of the landing jetty, i.e. the intersection of the connecting jetty and the landing jetty.

In accordance with the Surinamese design standards and codes concerning fuel stations, the area for installing the dispenser shall be 3m × 4m, which will be surrounded by oil retaining walls and refractory walls.

(As for GG-type fishing boats that are driven by diesel, no fuel station shall be provided under the Project because it is only one boat or less a day on average that uses the jetty.)

6) Development and size planning of facilities and equipment to supply and store water (potable water)

The average daily amount of water to be supplied to subject artisanal fishing boats is calculated as follows.

Water supply=1 GG fishing boat × 800 liters + 8 OG boats × 400 liters + 1 SKB boat × 200 liters = 3.4 kilo liters = 4.2 kilo liters/day

Similarly to the gas supply, in order to reduce labor to transport the water from the land to the landing jetty via access jetty, the water supply station shall be installed at the base point of the landing jetty. A water tap will be provided at the facility, from where an extension hose of approximately 50m will lead to directly supply fishing boats.

7) Development and size planning of washing up and storing of insulated containers for fish and ice, plastic fish containers, scales, handy carts (pallet trucks and pallets)

At the project landing jetty, pallet trucks, pallets, and plastic fish containers will be used to transport unloaded fresh fish and ice. Also, scales are needed to weigh these items. In the meantime, pallet trucks, pallets, and plastic fish containers will be used to transport fresh fish from the landing jetty and temporarily store it in the Center, and can be directly put in the chilled rooms with the fish or else transferred to special insulated containers for fish and ice for the chilled rooms. These pieces of equipment must be used in a hygienic condition, and hence have to be washed, sterilized and stored as necessary.

Since the landing jetty is designed as to have a minimal necessary area, the equipment to be used on the jetty may accordingly not have its proper storage facility on the jetty. Therefore, it shall be washed, sterilized and stored in the facilities on land.

8) Development and size planning of chilled rooms

A prefabricated chilled room shall be adopted for the sake of weight-saving and ease in installing on the site. The floor level shall be adjusted to match the floor level of the building, to allow hand pallet trucks to directly enter the chilled room. The cooling installation shall be composed of two units of a small, all-in-one type, because fish will be stored with ice in insulated containers for fish and ice or plastic fish containers and the cooling units need only remove entry heat at a preset temperature of +1℃. Moreover, this

inner temperature of +1℃ will not require anti-freezing measures. Considering the works to be carried out inside the room, that is placement of insulated containers for fish and ice and associated alignment inside the installation, and area necessary for storing plastic fish containers, the area for the installation shall be 7.2 × 7.2(m). The inner height shall be 2.2m, with an entrance for cooling boxes and another entrance for fish boxes provided separately. The insulation materials to be used for wall panels shall be urethane foam. In addition, the inner panels shall be made of Keyspan, with a load rail function, considering an installation of load rails will require an unexpectedly long period of time, which the implementation schedule of the Project cannot afford.

Key specifications for chilled rooms:

Ice storage: Assembly of prefabricated panels (floor: reinforcement method)
Cooling temperature: +1℃
External dimensions: 7,200W × 7,200D × 2,200IH (mm)
Doors: 2 doors (one single swinging door of an area of 850w × 1,800h and the other being a double door with an area of 1,500w ×1,800h)
Cooling installation: One-piece-type, air-cooling units (to be installed to the ceiling)

9) Scale planning of facilities and equipment for overall operation and maintenance of the Center (including the sensory laboratory and equipment and the statisticians' room)

The project landing facility shall involve the following personnel for its operation and maintenance.

a. Manager : 1 (to be dispatched from the Fisheries Department)
b. General secretary : 1 (to be stationed at the Center and responsible for managing the Center under instruction of the Manager.)
c. Accountant : 1 (to be stationed at the Center and responsible for accounting for the Center under instruction of the Manager)
d. Sales person : 1 (to be stationed at the Center and responsible for operation and maintenance of ice-making machines and chilled rooms, as well as collection of payment for sales of ice, fuel, fishing gears and water and rental charges of the landing jetty, chilled rooms, and fishing gear mending area.)
e. Sales assistant : 2 (to be stationed at the Center and assist operation of ice-making machines and chilled rooms as well as sales of ice, fuel, water and fishing gears.)
f. Cleaner : 2 (to be stationed at the Center and be responsible for cleaning the inside of the Center and the project site.)

g. Security guard : 1 x 3 shifts (to be stationed at the Center and be responsible for control of entry of people and vehicles into the project site and security inside the project site.)

h. Sensory inspector : 1 or 2 (to be dispatched from the Fish Inspection section of the Fisheries Department as necessary.)

i. Statistician : 1 or 2 (a contract officer to be dispatched by the Statistics section of the Fisheries Department.)

The offices for the above staff shall be planned taking into consideration the standards for setting areas of offices (from "A Collection of Architectural Design Data" by the AIJ), based on the past examples in the Commewijne Fisheries Center, CEVIHAS, and the Fisheries Department.

Table 2-12 Calculation of Size of Offices for Management Officers at the Center

Work area category	Number of personnel for the area	Estimated size	Designated floor space	Remark
Manager	1	5 - 15m^2	11.88m^2	
Reception room	4	10 - 15m^2	9.72m^2	
General secretary's room	1	5 - 15m^2	12.96m^2	
Accountant's room	1	5 - 15m^2	12.96m^2	
Meeting room	60	48 - 72m^2	60.98m^2	Based on Commewijne Fishery Center
Staff room	5+(1 - 2)	20 - 30m^2	21.60m^2	Staff room for 3 sales persons, 2 cleaners, 2 statisticians
Sensory laboratory	(1 - 2)	10 - 30m^2	12.96m^2	Based on Office quarters
Security guard (three-shift system)	1	5 - 15m^2	12.20m^2	Based on Commewijne Fishery Center

10) Development and size planning of the fishing gear mending area

The project plans to build the fishing gear mending area of the Center as an open-air facility consisting of an outdoor, flat earth floor and a roof for shade and rain protection. It will allow weak sunlight in the morning and evening and very strong crosswind. Because, unlike the other buildings, settlement and inclination of the structure, or the floor, does not disturb mending work to a certain extent, the standards for consolidation settlement or relative settling (differential settlement) will not be applied, and the joining parts of the upper structure will only be carefully treated to keep these parts free from troubles.

172 fishing boats (95% of which performs drifting gillnet fishing) will use this facility. Based on interviews with these fishers with regard to their requests on use of the fishing

gear mending area, the number of fishing boats that will actually use the facility is set at 122 of drifting gillnet fishing boats, which account for approximately 75% of the total number. Assuming that each of the boats uses the mending facility for 12 days in total throughout the year (3 or 4 days/repair, 3 or 4 times a year), the area of workspace is calculated as follows.

(172 boats × 0.95 × 0.75) × 12 days/year / 365 days/year= 4.1 sides

A set of drifting gillnets covers a width of 2 - 4m and a length of 1,000 - 2,000m. The area necessary for the capacity of a set of nets and the mending work is calculated as approximately 5m × 10m = 50m^2 per side. Having four sides under the roof and buffer space between them, the total floor area required for this facility shall be approximately 231m^2(11m× 21m).

11) Development and scale planning of incidental facilities

(i) City water distribution and drainage facilities

a) City water distribution facility

Water is used for the following purposes in this Project.

1. Ice-making
2. Drinking and cooking for fishers onboard
3. Storing fresh fish in the chilled rooms at a chilling temperature
4. Cleaning and sterilization of equipment used on the landing jetty, in the chilled rooms, or elsewhere.
5. Washing, toilet and shower facilities
6. Hot water supply in the management offices and the sensory laboratory
7. Cleaning inside the Center project site not excepting the landing jetty

Of these usages, toilets, shower and cleaning of the Center can use underground water or water from the river, instead of drinking water distributed by the city, provided that no significant expense is incurred in its operation and maintenance. However, the boring survey has found no sand or conglomerate layer which can form a free aquifer between the ground level and the solid clay layer beneath the project site. In order to utilize underground water for the above applications, it is necessary to excavate a deep well and provide pumping equipment, settling tank for sand, sterilizer, etc. In the meantime, utilizing water from the Suriname River will require an intake plant, settling tank, sterilizer, etc. as countermeasures against the large quantity of earth and sand in the river flowing from the upstream. As a matter of fact, operation and maintenance cost for the equipment will exceed the cost of using the city water; therefore, drinking

water from the water distribution of the Paramaribo city shall be used for all purposes in the Center.

Based on the demands shown in Table 2-13, the needs for fresh water in the Project are estimated as around 35m^3 per day.

The water supply pressure of the water distribution of the Paramaribo city differs according to areas and distance from the distribution main, and it causes water failure quite frequently. Thus, the water receiving tank shall have two-day worth of capacity.

Considering the fact that the project site is on soft subsoil, water will be supplied from the reservoir directly to each point in need via pressure pump, instead of providing an elevated water tower. Further, since the project site is situated along the Suriname River and the ground water level is high, the reservoir shall be an FRP, thermal insulation (sandwich), panel assembly type and be installed above the ground so as to prevent underground sump water from entering.

Table 2-13 Calculation of Water Demand

Water usage	Calculation basis	Basic quantity	Estimated water consumption (ℓ/day)
For ice-making	110% of the ice-making capacity	Ice-making capacity 20m^3	22,000
For fishing boat operation	For SK-GG fishing boats: 600ℓ/ boats, For SK-OG fishing boats: 400ℓ/ boats, For SK-B fishing boats: 200ℓ/ boats	SK-GG fishing boats:1 boats, SK-OG fishing boats:8 boats, SK-B fishing boats:1 boats	4,000
For fish storage in chilled rooms	fresh fish : fresh water=1:1	fresh fish: 1.40kg	1,400
For cleaning jetty and sterilizing	Per floor area: 1ℓ/m^2	Landing jetty:440m^2 Access jetty:360m^2	800
For cleaning fishing gear after fishing	Average 5 minutes: 100ℓ/ boats	Number of fishing boats: 10	1,000
For cleaning plastic fish containers and containers • For sterilizing	For plastic fish containers: 20ℓ/box, For container: 40ℓ/unit	plastic fish containers: 30/day, containers: 5/day	800
For cleaning chilled room • For sterilizing	Per floor area: 1ℓ/m^2	Chilled room area : 130m^2	130
For cleaning center	Per center area: 0.5ℓ/m^2	Center area :3,764m^2	1,882
For kitchenette (To include wash water)	To include dispatch from the Fisheries Department and visitors: 12ℓ/person	14+3 people	204
For wash	100%, 40% of fishers, 20% of fish traders: 5ℓ/person	:14 people (staff: 7) fishers: 82 fish traders: 20	1,067
For toilet	100%, 40% of fishers, 20% fish traders: 21ℓ/person		254
For shower	100% of staff, 20% of fishers: 60ℓ/person		1,404
Total			34,941

* Water for washing and toilets is calculated based on the calculation criteria used in the "Report on water reclamation equipment for wastewater from governmental buildings" under the editorship of the Repairs Division of the former Secretariat of Minister of Construction.
* Water to be used in the sensory laboratory is insignificant and therefore is not counted in above.

In addition, on top of the regular water examination performed by the water supply corporation of the Paramaribo city, considering the fact that water is supplied in the Center via the reservoir, the Center itself must regularly measure the residual chlorine concentration as a means to control the water quality, and if residual chlorine concentration is found insufficient, 2 - 3mg/liter of gaseous chlorine shall be injected per $1m^3$ of supplied water.

b) Hot water facility

The kitchenette of the management building and the sensory laboratory are the only places where hot water is needed. Therefore, a water heater is installed in each place to directly supply hot water. The amount of water needed in the kitchenette is limited to approximately 200 liters including water for cleaning, as indicated in Table-12, therefore, a water heater with a 50-liter tank will be provided. It shall be electrically heated from the standpoints of safety and ease of maintenance.

c) Sanitary equipment

In the city of Paramaribo, the Commewijne Fisheries Center, CEVIHAS, the Fisheries Department office building, and other similar buildings use Western-style earthenware washing basins and toilet bowls and have faced no problem so far. Since toilets and washing basins of this kind are easy to clean to maintain hygienically, earthenware items of the same kind shall be provided in this Project, too.

Attachments for showers shall be, for the same reason of easy maintenance, SUS products.

Sanitary equipment to be used in the Project shall be installed based on the quantity estimated in Table2-14.

Table 2-14 Places and Quantities of Sanitary Equipment

	Toilet bowl	Washing basin	Urinal	Shower
Toilet and shower room in Management building				
Toilet and shower room (male)	1	1	1	1
Toilet (female)	1	1	-	-
Subtotal	2	2	1	1
Public toilet				
Toilet and shower room (male)	2	4	4	2
Toilet (female)	1	1	-	-
Subtotal	3	5	4	3
Total	5	7	5	4

* The numbers of toilet bowls and urinals to be installed in the toilet/shower room for men in the public toilet is calculated based on the quantity for offices and factories designated by the Rules for Health and Safety at Work of Japan, which stipulate that the number of washing basins depends on the number of urinals and that of showers on that of toilet bowls.

* In the other rooms, one, the minimal number, is assumed. There is no shower room for women because there is no female fisher.

d) Drainage and ventilation equipments

Paramaribo does not have a public sewerage system. All buildings in the city are installed with independent septic tanks (soak pits of a seepage treatment method) for treatment of drainage, and some large-scale buildings discharge overflow from their septic tanks into the water conduit system running across the city.

Since there are no criteria for discharging domestic or office drainage in Surinam, the Project refers to international standards concerning drainage discharge and determines its quality in accordance with the actual conditions of the water channel and septic tank systems in the country.

Table 2-15 summarizes the standards for quality of drainage to be discharged into rivers or seas in other countries under similar socioeconomic conditions to Suriname (BOD values for drainage criteria).

Table 2-15 Criteria for Drainage to Be Discharged in Other Countries

Country/water district, etc.	Condition	Criteria value of BOD discharge
Peru		
Rules for industrial drainage and the like		1,000ppm
Ecuador		
Criteria for drainage quality		100ppm
Inter-American Development Bank		
Criteria for drainage quality		50ppm
Philippines		
Protected waters	existing/new	50ppm/30ppm
Inland water	existing	80 - 150ppm
Ditto	new	50 - 120ppm
Marine area	existing/new	120ppm/100ppm
Vietnam		
when it flows into surface water of general area	excluding cases that flow into local surface water used for home well, irrigation water, and fish farms	100ppm
Thailand		
Food factory, etc.*1	a pollution regulation committee may add regulations about individual industries	60ppm
Malaysia		
Life drainage and business drainage *1	excluding the upper reaches of the source	50ppm
China		
Criteria for discharge to surface water	existing/new	60ppm/30ppm
Criteria for discharge to general drainage	existing/new	80ppm/60ppm
Criteria for discharge to public sewerage		300ppm
Japan		
Criteria for drainage discharge in the Water Pollution Control Law *2		160ppm/day Average 120ppm

*1: Some countries, including Thailand and Malaysia, implement stricter rules than the uniform regulatory values provided for in the Water Pollution Control Law of Japan, but even in these countries, provided that these regulations are in place from the environmental perspective, relievers are implemented as necessary in light of the economical and technical feasibility in individual cases.

*2: Although the criteria for drainage discharge in the Water Pollution Control Law of Japan are lenient compared with major foreign countries, the Law permits an application of additional rules initiated by individual municipalities. In fact, most of municipalities in Japan implement their own additional regulations in accordance with the status in their areas.

As shown in Table 2-15, regulations on discharge into water conservation areas and surface waters are as strict as the BOD value of 30ppm and so forth, but criteria for discharge into general water channels, rivers and oceans are 50ppm at the lowest or quite commonly 100ppm or more, which is equivalent to the Japanese rules provided for in the Water Pollution Control Law. Moreover, while 50ppm is designated as the discharge criterion for newly-constructed buildings, criteria for existing buildings are looser, and in cases of the traditional industries and the foodstuff industry, relievers are often put in place considering the economical and technical feasibility.

On the other hand, one of the reasons why Suriname has not established criteria for quality of drainage is presumed that since the size of national population is very small and even its very few densely-inhabited areas are surrounded by vast alluvial swamps with luxuriant aquatic vegetation such as reeds, these aquatic organisms and bacteria are capable enough to purify the polluted domestic drainage through their functions. According to a survey conducted by the Ministry of Public Works of Suriname on the water quality of the water channel system of the Saramacca canal in the industrial zone, the BOD value of the overflow from the septic tanks discharged into the secondary conduit that exceeds 120ppm is down to 1 - 2ppm when the drainage is discharged into the Suriname river after flowing through the secondary and primary channels. This indicates that drainage running through the water conduits made of natural riverbank in the zone is naturally purified by water plants and bacteria present in the conduits. Even high-class hotels, where foreign visitors stay, discharge drainage treated in the septic tanks directly into reed fields. In Japan, it is compulsory to comply with the drainage quality criteria for office buildings, and in most cases, drainage is discharged from septic tanks after treated by the biological contact aeration using active sludge to reduce the BOD value down to below the regulated level. Other advanced countries also use automated septic tanks with a stable quality. However, no such septic tank has been available in Surinam, and hence there is no experience in maintenance of it.

In the Project, in light of the fact that the Paramaribo city is granted with a natural wastewater treatment system with its original conduit configuration, ease of maintenance shall be prioritized over the BOD removal rate in selecting the wastewater treatment system. Consequently, a wastewater treatment with the BOD removal rate of 70% or more shall be selected aiming at the BOD value of less than 60ppm.

Individual sewerage treatment tanks with the BOD removal rate of 70% or more are offered in the trickling filter method, high-rate filter method, and circular conduit

aeration method, but in this Project the long-run aeration method shall be adopted because it leverages the active sludge method.

The other approaches than the long-run aeration method have not been employed for past long years, and associated BOD removal design techniques have not accordingly been acceded in the country. On the other hand, the long-run aeration method is characterized by:

- allowing containment in a compact, plane surface,
- generating almost no odor,
- having records of its design technology, and
- generating less sludge and is comparatively easy to maintain.

Because a waste water treatment system of the long-run aeration method comes with a large aeration tank, it functions also as a septic tank even while the aeration device is not working and has a purification capacity of the same level as common septic tanks used in Surinam.

e) Drainage basin for surface water

Since rainwater does not impose any burden onto the environment, it shall be discharged from the drain in the project site directly into the neighboring water channels.

f) Fire fighting and emergency facilities

Extinguishers shall be furnished at important locations in the Center and the project site (by the Suriname side). Since all buildings, except the ice-making/storage building, are one-storied with no rooms without windows, no evacuation lights shall be provided.

g) Ventilating equipment

Automated ventilating equipment shall be installed to secure the necessary ventilation inside the offices of the manager's office, general secretary's and accountant's room, the reception room, the staffroom where salespersons, cleaners and statisticians can take rest, the meeting room, the sensory inspection room, and the kitchenette of the management building, the security guard room of the security guard and power-receiving building, and toilet and shower rooms of the management building and the public toilet. Further, places where the transformator, standby generator,

ice-making machines, and the air-cooled condenser of the chilled rooms shall be installed with forced draft vent systems along with air inlets, in order to remove the waste heat generated during the operation of these machines. In the offices where ventilation requirement is limited, a ceiling-type duct fan will be installed each. As for rooms requiring a medium level of ventilation, such as the sensory inspection room, the kitchenette and the toilet/shower room, a wall-hung type ventilation fan will be installed. Lastly a roof-type duct fan shall be adopted for the refrigerating room with the air-cooled condenser for the chilled rooms.

h) Air-conditioning facility

The manager room, reception room, offices for general secretary and accountant, fishing tackle shop, anteroom for officials, sensory inspection room, and meeting room in the management building will each have an air-conditioning facility, as in the Commewijne Fisheries Center and other equivalent facilities. The facility shall be a unit-type, package air-conditioner, for which 0.15kw/m^2 (app. 130kcal) of cooling power is chosen as the capacity, in order to avoid an excessive maintenance cost.

(ii) Electric-related facilities

a) Power-receiving facility

In Surinam, major customers of electricity, such as business offices, receive electricity from a transformator installed by the power distributor, EBS, in their power receiving room, in principle. However, since installation of a transformator by EBS will take at least two years from an application, the Project shall provide a transformator as an electric facility necessary for the Project.

The user receives primary high-tension power of 12,000V via the high-voltage service entrance switch and the protection device, and then steps down the voltage using the transformator to obtain necessary electricity of 3-phase, 4-wire, 220V/single-phase, 3-wire, 127 V. The transformed power will be sent to the main distribution board installed in the security guard room via the watt-hour meter in the receiving room.

As shown in Table 2-16, the receiving capacity shall be determined as the same as the sum of the receiving capacity requirement, that is 250KVA.

Table 2-16 Receiving Capacity Requirement

Item	Phase	Total power consumption (KW)	Power Factor Conversion Rate	Approximate load input (KVA)	Demand rate	Receiving capacity requirement
Light fixture	Single-phase	6.38	1.25	7.98	0.40	3.19 KVA
Outdoor light, floodlight	3-phase	2.16	1.50	3.24	0.80	2.92 KVA
General socket facilities	Single-phase	5.85	1.00	5.85	0.30	1.76 KVA
Air conditioner	Single-phase	4.25	1.50	6.37	0.50	3.19 KVA
Ventilating facilities	Single-phase	0.43	1.25	0.54	0.50	0.27 KVA
Ventilating facilities	3-phase	0.55	1.25	0.69	0.50	0.35 KVA
Hot-water supply system	3-phase	6.00	1.25	7.50	0.50	3.75 KVA
Ice-making facilities	3-phase	144.20	1.25	180.25	1.00	180.25 KVA
Refrigerating facilities	3-phase	2.20	1.25	2.75	0.400	1.10 KVA
Pressure pump	3-phase	7.50	1.25	9.38	0.90	8.44 KVA
Drainage pump	3-phase	0.15	1.25	0.19	0.40	0.08 KVA
Aeration blower	3-phase	1.50	1.25	1.88	1.00	0.98KVA
Oil transfer pump	3-phase	1.95	1.25	2.44	0.40	0.98 KVA
Total		183.12		229.04		207.80 KVA
Calculation of receiving capacity	Load factor of Transformer: 0.85, calculated on the basis of diversity factor of 1.0. 206.69/0.85					244.47 KVA
Standby generator	(207.80-(180.25+1.10))/0.80					33.06 KVA

b) Main line facility and the standby generator

The main distribution board shall be installed in the security guard room next to the receiving room.

Power shall be supplied from the main distribution board to the distribution boards (light fixture, power boards) and the control boards of ice-making machines, chilled rooms, pumps, etc. The necessary wiring and piping shall be laid in trenches or buried in the ground, and appropriate trenches and hand holes shall be prepared for this purpose. FEP shall be used for underground piping to be buried at a depth of 900mm or more. In designing the wiring and the diameter of piping, the IEC standards shall be referred to so that no hindrances like development of heat or voltage drop will occur. Though the city undergoes power outage a few times a month, each failure lasts only about 15 – 30 minutes in a typical case or 2 – 3 hours at most. Therefore, it is a very low chance that such an outage will greatly impact the operation of electric equipment, such as the ice-making and refrigerating facilities, in the Project. On the other hand, the landing jetty and other facilities to be operational for 24 hours a day need a standby generator to be ready for power outage at night, with a view to prevention of fall accidents and other safety measures.

Thus, the Project shall provide a standby generator targeting normal lighting and socket equipment, except the ice-making and refrigerating facilities, and its capacity shall be 40KVA based on the above table.

Apart from computers to be used in the offices of the management building, no equipment will require an instant backup system in case of a power outage. Lights of insulated vans, etc. will help work on the landing jetty in early morning or at night. Therefore, switchover to the standby generator at the time of power outage shall be manually operated.

c) Power facility

The power-driven systems used in the Project include ice-making machines, chilled rooms, water and drainage pumps, pressure duct fans, water heaters with a tank, and lighting apparatus in the project site and on the landing jetty, as listed in Table 2-17 below.

Power shall be distributed either through the main distribution board and the control panel of each system or directly to the system.

able 2-17 List of Power Facilities

Installed place	Main power facilities
Ice-making machine and ice-storage building	
Ice-making machine	Ice-making machine 10ton/day: 63.1kw, 2 unit
	Air cooled condenser: 9.0kw, 2 unit
Management building	
Refrigerator	Freezer unit of chilled room: 1.5kw, 2 unit
	Rooftop ventilation fan: Diameter 55cmø, 55w.1 unit
Pantry	Storage type electric hot water supply device: Hot water tank 50ℓ, 3.0kw, 1 unit
Sensory inspection room	Electric cooking utensils: 3.0kw
Landing jetty, exterior	
Landing jetty, each part of exterior	High voltage sodium light: 180w, jetty area 6, exterior area 6, Total 12
Pressure pump	Water supply pressure pump: 7.5kw, automatic alternation driving method, 1 system
Drainage pump	Drainage pump: 0.15kw, automatic alternation driving method, 1 system
Aeration blower	Blower:1.5 kw
Oil transfer pump	Submerged system:1,5kw, automatic alternation driving method, 1 system (provided by the Suriname side)

d) Wiring for lights and plug outlets

The Project covers piping and wiring work to connect each distribution board (electric board) with each of the lighting apparatus, lighting switches, plug outlets, ventilation equipment, etc. In designing the wiring and piping, it is important to pay attention to prevention of development of heat, voltage drop and other failures, in accordance with the IEC standards. In addition, all the outlets within the Center will have earths and be of the European model, which prevails in Surinam.

e) Lighting equipment

The illumination intensity in each room of the Center is determined by taking the Japanese standards for illumination intensity (JIS Z 9110) into consideration and referring to the status quo in similar buildings in Surinam. In addition, considering that there will be night work at the landing jetty, the plan must satisfy safety requirements. The lighting apparatus in rooms where washing and sterilizing plastic fish containers, insulated containers, etc. take place must be waterproof fluorescence, whereas exterior lighting shall be salt-resistant, waterproof fluorescent. Lighting in all the other rooms shall in principle be an open-bottom-type, fluorescent ceiling fixture. For the offices in the management building, the fixture with anti-glare louver shall be adopted. For night lights in the project site and on the landing jetty, the illumination intensity of 5 lux must at least be assured on the floor face, for the sake of safety in landing work at night and passage of insulated vans, and sodium lighting shall be adopted for its long life and low power consumption.

Table 2-18 Illuminance Standard and Design Illuminance of Each Facilities

(Unit: lux)

Facility	Japanese illuminance design standard and code JIS Z 9110	Illuminance design standard concerning situations of the site facilities	Lighting fixture	Qty	Design illuminance
Management building					
Managing director	750 - 300	500	Louver type FL-2-40W, direct-mounted (embedded type)	5	488
Ditto, Reception room	500 - 200	300	Louver type FL-2-40W, direct-mounted (embedded type)	3	342
General secretary's room	750 - 300	500	Louver type FL-2-40W, direct-mounted (embedded type)	5	457
Accountant	750 - 300	500	Louver type FL-2-40W, direct-mounted (embedded type)	5	457
Document depository	300 - 150	100	Lower part open end type FL-40W, direct-mounted	1	83
Furnishing room	300 - 150	100	Lower part open end type FL-40W, direct-mounted	1	83
Fishing tackle shop, staff room	750 - 300	500	Louver type FL-2-40W, direct-mounted (embedded type)	8	477
Sensory inspection room	1000 - 700	700	Water resistant type FL-2-40W, embedded type	8	731
Meeting room	500 - 200	300	Louver typeFL-2-40W, hang type, etc.	15	135
Toilet and shower room (male)	150 - 75	100	Water resistant type FL-40W, direct-mounted	2	101
Toilet (female)	150 - 75	100	Water resistant type FL-40W, direct-mounted	2	110
Pantry	200 - 100	150	Water resistant type FL-40W, direct-mounted	2	137
Corridor	200 - 100	100	Lower part open end type FL-40W, hanger type, etc	2	103
Entrance hall	200 - 100	100	Lower part open end type FL-40W, hanger type, etc	4	86
Handling area	300 - 150	150	Water resistant type FL-2-40W, hanger type, etc	5	139
Chilled room area	150 - 75	50	Water resistant type FL-40W, hanger type, etc.	5	43
Plastic fish containers/container/lift storage	300 - 150	100	Water resistant type FL-40W, hanger type, etc	3	94
Ditto, cleaning and sanitizing space	300 - 150	150	Water resistant type FL-2-40W, hanger type, etc	1	139
Ice-making machine and ice-storage building					
Ice supply station 1	200 - 100	100	Salt-tolerant water resistant type FL-40W, direct-mounted	2	85
Ice supply station 2	200 - 100	100	Salt-tolerant water resistant type FL-40W, direct-mounted	2	85
Ice-making machine room 1	300 - 150	150	Salt-tolerant water resistant type FL-2-40W, hanger type, etc.	1	142
Ice-making machine room 2	300 - 150	150	Salt-tolerant water resistant type FL-2-40W, hanger type, etc.	1	142
Security guard and power-receiving building					
Power-receiving room	300 - 150	150	Lower part open end type FL-40W, direct-mounted	1	147
Standby generator	300 - 150	150	Lower part open end type FL-40W, direct-mounted	1	165
Security guard	300 - 150	150	Salt-tolerant water resistant type FL-2-40W, direct-mounted	1	143
Public lavatory					
Toilet and shower room (male)	150 - 75	100	Salt-tolerant water resistant type FL-20W, direct-mounted	11	92
Toilet (female)	150 - 75	100	Salt-tolerant water resistant type FL-20W, direct-mounted	4	90
Landing jetty/project site					
Outdoor light on landing jetty	30 -	15 - 5	Salt-tolerant water resistant high voltage sodium light 180w	2	18-15
Air cooled condenser shed	30 -	15 - 5	Salt-tolerant water resistant high voltage sodium light 180w	2	18-15
Outdoor light on access jetty	30 -	15 - 5	Salt-tolerant water resistant high voltage sodium light 180w	2	20-5
Outdoor light on access jetty	30 -	15 -	Salt-tolerant water resistant high voltage sodium light 180w	8	11-5

f) Communications wiring (telephone lines and internal LAN)

The Project covers communications line laying and socket connection works in the offices, the sensory inspection room, and the meeting room of the management building and the security guard/power receiving building where communications equipment is needed.

g) Lightning protection system

The city of Paramaribo is situated in the zone subjected to frequent occurrence of lightning strokes, and hence the project Center as well requires a lightning protection system. As a result of comparing three possible protection approaches, namely the lightning rod method, the rooftop conductor method, and the dielectric method, considering that the layout of the Center reaches the landing jetty, the common lightning rod method is selected from the viewpoint of cost efficiency to be deployed in the management building and ice-making/storage building.

12) Equipment Plan

(i) Selection of equipment

The equipment to be procured under the Project is not manufactured in Surinam. Even for spring scales that are constantly available in the country, the quality is not guaranteed. Given these circumstances, the equipment shall be procured from Japan or a third country, provided that equipment that is easy to maintain at a low cost and to procure replacements in the future.

Further, insulated containers for fish and ice, plastic fish containers, hand pallet trucks, and pallets to be used for handling fishery products need to be easy to clean and made of anti-bacteria materials. As for scales, highly waterproof and salt-resistant products shall be selected.

(ii) Grade and size of equipment

Table 2-19 below is a list of equipment to be provided under the Project.

Table 2-19 Equipment List

Equipment	Country of origin	Specification	Equipment Standard	Q'ty.
Insulated container for fish and ice	Japan or third country	Capacity Approx. $1m^3$	Waterresistant , robust	10
Plastic fish containers	Japan or third country	Capacity Approx. 70L	Waterresistant , robust	50
Sensory inspection instrument				
1) Freshness meter	Japan or third country	Mobile, Oxidation-reduction potential method	Easiness to measurement method	2
2) pH meter	Japan or third country	Mobile, pH meter 0 - 14	Standard specification	2
3) Thermometer	Japan orthird country	Mobile, -30 - 150	Standard specification	2
Scale				
1) Spring scale	Japan or third country	For 100KG	Standard specification	2
2) Platform scale	Japan or third country	For 100KG, stainless	Water resistant /salt-tolerant	2
Hand pallet truck	Japan or third country	transport load 1 tons	Water resistant /salt-tolerant	3
Truck	Japan or third country	made of stainless		
Pallet	Japan or third country	withstand load: 1 tons	Water resistant, robust	3

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

2-2-2-1 Civil Engineering Facilities Plan

(1) Overall plan

(i) Layout of the jetty

The layout of the jetty will be prepared, taking the following items into consideration:

- Appropriate layout, water depth, and configuration shall be prepared, giving consideration to the operation manners of fishing boats which will use the jetty.
- No influence shall be given on boats which navigate the Suriname River waterway during and after piling works.
- An appropriate jetty interval should be secured to avoid any impediments to fishing boats which use the shore side area of CEVIHAS jetty.
- The layout shall not constitute any impediment to cargo carriers arriving Molen jetty.
- The layout shall be determined based on consultation with MAS of Suriname and confirmation of the owners of the neighboring jetties.

Considering the permitted area for the jetty instructed by MAS as well as the piloting conditions at the time of berthing at neighboring jetties, the jetty will be located inside (shore side) of the line connecting the CEVIHAS jetty and Molen jetty. The normal line of

the access jetty is perpendicular to the shoreline, while the landing jetty is placed in parallel to the shoreline, since the appropriate berthing at the landing jetty should be done in parallel to the stream and a certain water depth can be secured by making it parallel to the contour line. This layout enables usage of the shore side of the landing jetty as a wharf.

(ii) Construction Plan of the Jetties

Being a jetty for landing and sailing preparation (loading of ice, water, and fuel), the landing jetty shall have a height suitable for the relevant fishing boat shape as well as water depth and fenders which ensure safe usage also at the time of low tide. The coping of jetty shall be of a size which allows operation of insulated trucks, etc., and be equipped with a lighting system for nighttime operation. The jetty should also have a water supply facility and a gasoline supply station. Facilities on the jetty will be planned based on the configuration, traffic lines, and workability of fishing boats, vehicles, and people using the facility.

(iii) Scale of the facilities

A rational and functional facility size and specification based on the users and pattern of usage of the jetty will be selected.

(iv) Consideration on the Environment

Any influence on the river flow may result in change in the riverbed configuration, especially in the downstream area. Sufficient consideration will be given to this, when selecting the structure.

(v) Reflection of users' opinion

In addition to the intention of the Fisheries Department of Suriname, actual users in a stakeholder meeting by fishers, processors, and other concerned parties will also be investigated to prepare a construction plan, giving consideration to the result.

(vi) Implementation Plan

Since the water depth in the planned construction site is very shallow, consideration will be given to the construction schedule, possible influence on the usage of neighboring jetties and navigation on the waterway, and influence on the topography of riverbed and natural environment, while selecting a suitable implementation policy for the jetty.

(2) Composition of the civil engineering facilities

(i) Structure of the jetty

As to the structure of the jetty, a jetty supported by pile is adopted based on the result of comparative review with the quay and floating jetty, in view of ((ii) Natural Condition of 2-1 Design Policy.

A jetty supported by pile is the jetty type which is most often adopted in the Suriname River basin. In Commewijne Fishing Center, a floating jetty which has been maintained with support from Japan is in operation. When deciding the jetty structure, these two jetty types were compared and investigated. This investigation proved that introduction of the floating structure is difficult in the planned site, because the bottom hits the river bottom during the low tide and there may be some influence on the downstream area by the floating type, as shown in the comparison Table 19, while a jetty supported by pile will have only ignorable influence and constitute no problem in usage of the jetty, and thus is comprehensively superior.

Table 2-20 Comparison of different jetty structures

	Jetty supported by pile	Floating jetty
Adequacy at site	No Problem	Water depth at the planned construction site is CDL-1.0 to -2.0m (offshore side) and CDL±0.0m (shore side), and thus a floating body hits the river bottom during LWL
	Very good	Very poor
Fishing boat berthing property	The jetty will be equipped with a rubber fender for berthing of a boat. The fender length will be decided, considering the changes in the tide level.	The floating body will be equipped with a rubber fender for berthing of a boat.
	Very good	Very good
Workability in loading/ unloading	Since the cope level is determined based on the high tide level, the level difference between the fishing boat and cope level will be big during low tide. However, this constitutes no big problem, because during low tide, loading of water, ice and fuel is done mainly and in this project landing at this jetty is done during high tide.	The jetty cope level is kept at a certain level above the water surface, because it goes up and down together with the water level. Therefore, loading/ unloading can be performed regardless of the sea level.
	good	Very good
Transportation	Very good	poor
Influence on the topography of riverbed	There is almost no influence on the landscape, because the influence on the stream is ignorable.	Deposition may occur due to weakening of the stream near the floating body at the downstream side, because the gap between the floating body and river bed is narrow.
Maintenance and operation cost	Basically, no maintenance is needed.	Maintenance of the connecting bridge moving section and floating body (if made of steel) is necessary.
	Very good	poor
Construction cost	Almost same as the floating jetty, though it depends on the onshore- & offshore construction methods	Domestic manufacturing of a floating structure is difficult.
	good	good
Overall Estimation	good	Very poor

(ii) Absorption of the berthing impact

In facilities which are used by relatively big commercial fishing boats, such as CEVIHAS jetty and Sujafi jetty near the project site, berthing energy is absorbed by a log pile located about 1m away from the jetty. This is because such a pile easily wobbles and thus can absorb the energy of the fishing boat's impact, since fisher boats are relatively big and the ground is weak there. On the other hand, our jetty has to be equipped with a rubber fender which has a better impact absorption property, because the OG type fishing boats, the target user of our jetty, are small compared to the above fishing boats, and thus it is difficult to absorb their impact energy sufficiently by such a log pile. It was decided to install a rubber fender, also considering the fact that installation of a rubber fender like the Commewijne one was requested by fishers in the stakeholder meeting.

(iii) Access jetty

Between the site border and the river, vegetation continues up to the river line, forming shore zone of about 25m width. The access jetty shall have a percolation structure of a pile-supported jetty, extending to the Center point of this river line and the site boundary. The shore side of this pile-supported pier shall have embankment structure with circumference protection revetment in order to protect the shore zone and to avoid influence on the topography of riverbed in the downstream area at the same time.

(iv) Revetment

The current height of the ground where the onshore facilities are constructed is about CDL+2.8 - 3.0m, and thus the ground is generally not subjected to the river water. However, it is possible that the current river line is eaten away and withdraws due to action of cruising waves, abnormal water level raising, death of planting on the shoreline, etc. Thus, revetment is necessary to protect the onshore facilities against such erosion. The basic position of the revetment shall be on the borderline of the onshore site, i.e. about 25m away from the river line to the direction of the shore side. This position almost coincides with the river side borderline of the adjacent jetty of CEVIHAS. At the moment, the area between the planned revetment position and the river line is a grass field.

The revetment shall be of a simple structure with an embed corresponding to the erosion. The cope level shall be higher than the ground in order to prevent the earth and sand in the ground from flowing out as well as to prevent intrusion of the river water.

(3) Plane Configuration of the Jetty

(i) Jetty width

Since landing of catches, refill of ice, fuel, etc. as well as loading of fishing gear, foods, etc. which are necessary for departure of the fishing boat are performed at the same time on the jetty, the jetty will be so structured that boats are berthed at the both sides (at the main waterway side and river bank side) of the landing jetty which is set out parallel to the river. Landing work is performed with a large insulated truck brought alongside the fishing boat, while preparation for departure of another boat is done with a small vehicle pulled up alongside the boat. A sufficient width should be secured for the coping of the landing jetty in order to perform the above mentioned work at the same time. To this end, the width of the landing jetty shall be 8m.

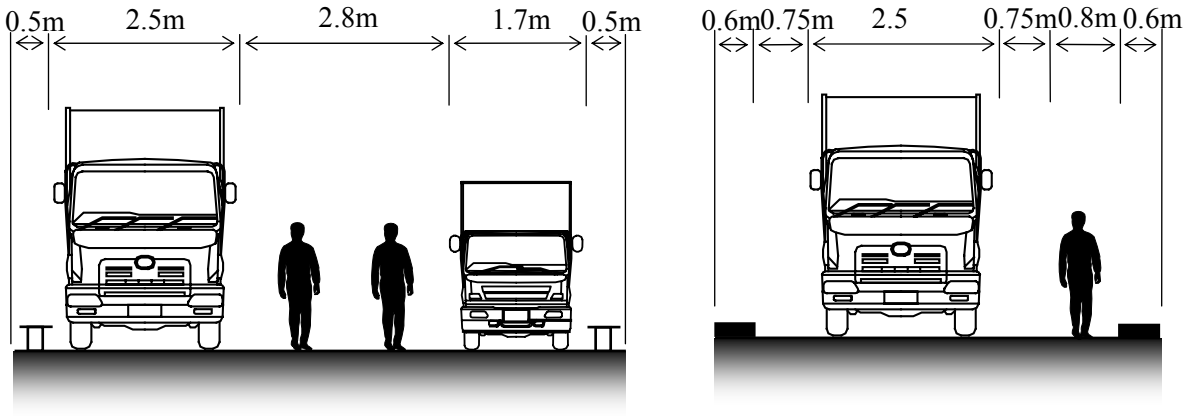
Width margin at the jetty end × 2（both sides） + Large insulated truck + Center passage + Small vehicle

＝ [Bollard & car stop : 0.5m] ×2 + [2.5m] + [2.5m+0.3m] + [1.7m] ＝8.0m

(ii) Access jetty

The passage connecting the jetty and the shore shall be planned as follows, considering the one-side traffic of insulated trucks and a footway for operators:

Width margin at the end（hand rail & curb : 0.6m）+ road shoulder（0.75m）+roadway（2.5m）+road shoulder（0.75m） + sidewalk（one-man passage : 0.8m） + Width margin at the end（hand rail & curb : 0.6m） =6.0m（Access jetty width）



(a) Configuration of the landing jetty width　　(b) Configuration of the Access jetty width

Figure 2-3　Width of the Jetty and Access jetty

(iii) Plane Configuration of the Jetty

The jetty will be set out in parallel to the river to use the both sides of it as a wharf. The access jetty will connect the jetty and the site, in traversing the river from the site perpendicular to the river bank. The connecting section of the jetty and the access jetty will be around the Center of the jetty, forming a T-shape as a whole.

A space for installation of an ice-making machine and ice-storage will be located at the both sides of the connecting section of the access jetty and jetty. This space will be a two-storied structure, with an ice-storage on the first floor and an ice-making machine on the second floor of the jetty.

Layout and overview of the jetty（see 2-3 Basic Design Drawing）

(4) Construction instructions

(i) Construction of the Jetty

The water depth at the landing jetty construction site is -2.0 - 0.0m, and that for the access jetty is 0.0 - .9m. Offshore construction is possible for the landing jetty where the water is deep, while the access jetty should be constructed from the land due to difficulty of the offshore construction.

With very shallow water for general working boats, offshore construction requires an attention to the draft and the sea level at the time of construction. Apart from the slack water during HWL and LWL, construction should be done in a strong stream from upstream to downstream or from downstream to upstream, and thus how to fix the working boats is a problem. Especially, since there is a main sea route for general boats about 100m from the river bank, it is difficult to fix a working boat there because no anchor with a sufficient length can be installed. Therefore, it is preferable to use a spud type piling boat for piling work.

Construction from the land may be performed by setting up a temporary jetty and driving piles on it, or by expanding the jetty in using itself as a jetty for construction works.

The former is a common construction method, which requires more material for temporary construction. On the other hand, though the latter requires less temporary construction material, its structure cross section is bigger, because the load during the temporary construction is bigger than the completed jetty, and the construction cost as a whole is higher and the construction time tends to be longer. Considering the above, offshore construction will be adopted for the jetty section and ice-making machine section where a certain water depth can be secured, while performing onshore construction using a

temporary jetty for the access jetty, in order to achieve completion within the planned schedule, in shortening the construction time by simultaneous implementation of the both methods.

(ii) Onshore construction yard

The site ground is used for carrying-in and storage of the construction material of the jetty and onshore facilities, assembly of the piling machine, etc. Since the present ground is not suitable for operation of such heavy machinery and material storage, it is necessary to build a construction yard which can endure such operation. To this end, trafficability has to be secured through removal of the ground surface, replacement of soft earth, setting up of temporary pavement, etc. The structure cross section of the construction yard should be determined paying attention to the relation with the structure cross section of the roads within the site and the order of construction.

(5) Design Conditions

(i) Applicable standards and guidelines

In Suriname, the design code of Netherlands, its former colonial power, applies. In these days, development of Eurocodes (EN1990-1999) in coordination with ISO-2394 by is proceeded by CEN (Comite Europeen de Normalisation) in Europe. Probably, a design code based on EN1990-1999 is being developed also in Netherlands. Also in Japan, coordination with ISO is proceeding in the area of the design code of marine structures. Thus, the design code of each country is in the phase of revision and development. In Japan, an English design manual (ii) based on the design standard for Japanese harbors (TECNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES (i)) was issued by OCDI in 2002 concerning the harbor structures. The structure of Japanese fish ports is designed based on "TECHNOLOGICAL INDICATOR FOR FISHERY HARBOR" (iii), whose content is almost the same as the structure design standard of the harbor facilities.

Therefore, civil engineering facilities of this project will be designed based on"TECHNOLOGICAL INDICATOR FOR FISHERY HARBOR", supplementing any failing part by (i).

(ii) Target fishing boats :

1) SK-B ; Length 14 × Width 2.2× Depth 1.4
2) SK-OG ; Length 19 × Width 3.0 × Depth 1.75
3) SK-GG ; Length 20 × Width 5.2 × Depth 2.15, total tonnage: 14.0 G/T

Notwithstanding the above, SK-GG (closed Guyana type) 14.0 G/T is used for study of the berthing impact.

(iii) Planned water depth : to be decided assuming SK-GG

Planned water depth＝Draft 1.2m＋Margin 0.5m＝1.7m

(iv) Natural conditions

- Sea level : HWL+2.5m, LWL0.0m, HHWL+3.18m, MSL＋1.28m
- Flow : 0.9m/s (based on the observation result)
- Waves : to be assumed from the conditions by storm wind

(v) Ground conditions

The geologic composition of the project site obtained from the geologic research is shown in Figure 2-4, and the soil quality test result is shown in Table 2-21 and Figure 2-5.

1) Geologic structure

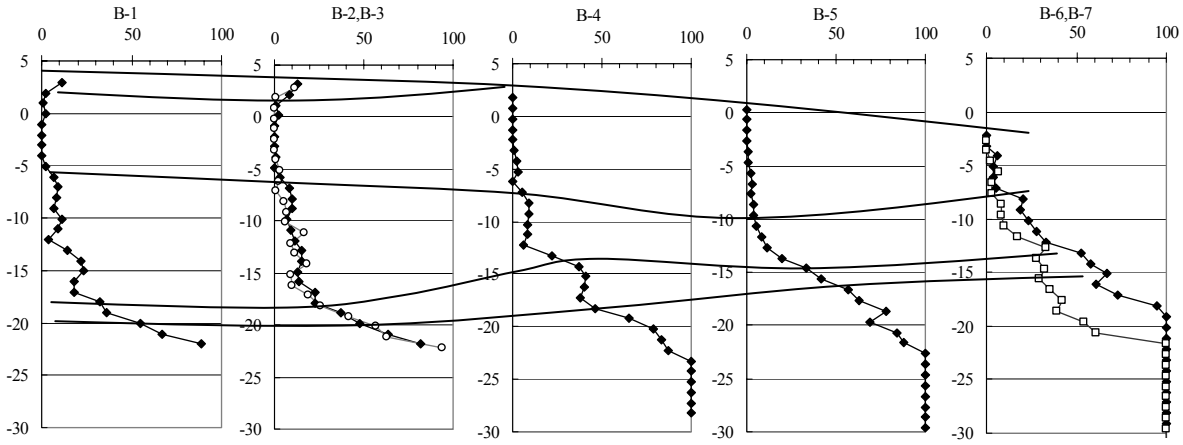


Figure 2-4 Estimated stratum cross section in the Land – Offshore direction

2) Soil quality conditions

Table 2-21 Soil Quality Test Result（Average of all boreholes）

	moisture content w (%)	wet density γt (kN/m^3)	adhesion C (kN/m^2)	N-value	gravel (%)	sand (%)	silt (%)	clay (%)
Sp-SM	27	16.5	26.9	9	0.0	62.8	19.0	18.2
CH	89.2	13.6	2.7	1	0.0	14.8	70.8	14.3
CH-MH1	48.0	16.4	8.2	13	0.0	13.4	67.0	19.6
CH-MH2	55.0	16.3	21.5		0.0	16.1	60.7	23.2
CH-MH3	22.5	19.1	51.0	38	0.0	11.4	49.7	38.9
CL-CH		Same as above		50 or above				

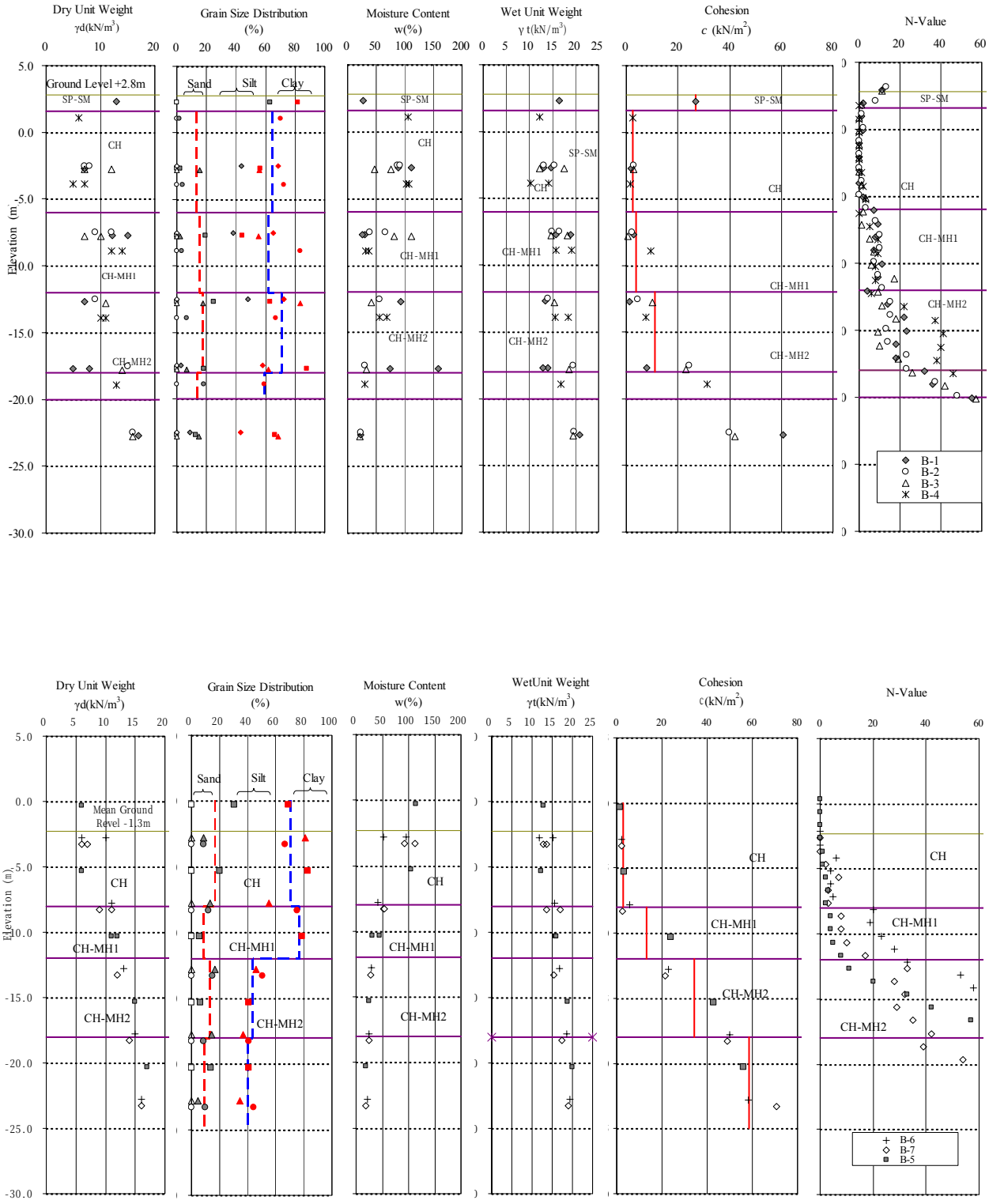


Figure 2-5 Soil Quality Test Result

(vi) Loads for Design

1) Dead load

It is assume reinforced concrete beam and precast RC floor structure. A dead load of 20kN/m^2 is used as a standard structure case in the overall structure analysis for design of a pile.

2) Unit weight of the material

Table 2-22 Unit weight of the material

Material	(kN/m^3)
Plain concrete	22.6
Reinforced concrete	24.0
Cement mortar	21.6
Steel	77.0
Timber	7.8
Asphalt pavement	22.6
Aggregate/gravel/cobble	18.0

3) Jetty surcharge

Generally, at a jetty for fishing boats, surcharge of 5-10 kN/m^2 is often used as standard load by landing of catches and sailing preparation. Surcharge of 10 kN/m^2 will be applied here.

Table 2-23 Surcharge (normal time)

Category	Load (kN/m^2)
Wharf	5
Revetment & embankment	5

4) Jetty live load

When designing a structure of the coping of jetty, the live load of vehicles coming and going the jetty should be taken into consideration. The design live load shall be the wheel load T-20 in TECHNOLOGICAL INDICATOR FOR FISHERY HARBOR[iii]. The vehicles which actually comes on the jetty will be mostly insulated trucks carrying a load of 2.0-8.0t, i.e. within the range of the design load.

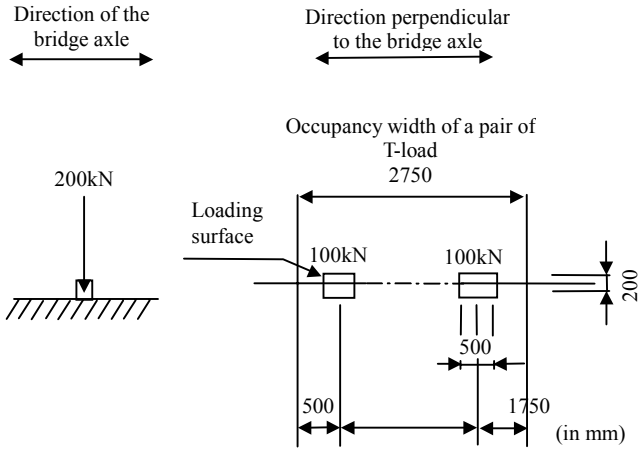


Figure 2-6 Live load (T-20)

5) Seismic load

The risk of an earthquake is small at this planned construction site. However, earthquakes originating neighboring Guyana have been occurred, while some felt earthquakes are recorded also in Paramaribo. Therefore, the minimum level of the seismic load acting on the jetty will be considered.

Design seismic coefficient $kh = 0.05$

6) Drag force caused by the stream

The drag force caused by the stream affects piles. The drag force which acts on mooring fishing boats acts also on the jetty through the bollard. However, if this is very small and ignorable, this factor will be eliminated.

7) Berthing impact

Since berthing is assumed to be a daily operation, it will be handled as a normal load. The fishing boat to be considered for assumption shall be the Guyana type (closed type), which is the largest type, and the number of boats to be berthed at one time is one.

8) Uplift

For cases where waves coming under the jetty may hit the floor slab due to the high sea level, we will investigate the action of the uplift (when studying the support power of the pile or studying the floor slab & beam)

9) Temporary facility

In design of the temporary facilities, including the temporary yard and temporary jetty, the structure will be decided base on the load of the heavy machinery to be used.

(vii) Study of the foundation pile

1) Loads used for the study of the foundation pile

Table 2-24 Loads used for the study of foundation pile

Type of loads	Normal time	Berthing	Uplift	Seismic condition
Coping dead load	20kN/m^2	20kN/m^2	20kN/m^2	20kN/m^2
Surcharge	5 kN/m^2	5 kN/m^2	0	2.5 kN/m^2
Live load	—	—	—	—
Seismic load		—	—	○
Drag force caused by the stream	○	—	—	
Drag force of a berthing boat	○	—	—	
Berthing impact	—	Type GG fishing boat	—	
Horizontal wave strength	—	—	—	—
Uplift	—	—	○	—

2) Structural analysis model

The bearing mechanism in the traverse direction for the jetty foundation pile shall be as per to the “Chang” model. The fixing condition of the pile head section shall be in principle rigid connection, and will be examined with a structure model with a rigid coping. The reaction force and sectional force of the pile head, sectional force which is generated in the pile body, and deformation volume of the jetty will be calculated in this analysis. Based on these, the layout, number, and specification of the piles will be determined and the bearing capacity will be studied in order to determine the pile length.

The construction of the foundation pile for the revetment will be determined based on study as a single pile construction which is subjected to the horizontal force and as sheet pile quay walls, depending on the construction.

3) Bearing capacity of a pile

The ultimate bearing capacity and allowable bearing capacity in the axle direction of a pile driven in the viscous ground are calculated from the equation 1 and 2, respectively. Nevertheless, if the N-value of the bearing layer is so big that it is

thought to be in the consolidated condition（N=40-50）, an equation for sandy soil shall apply mutatis mutandis to calculation of the pile toe bearing capacity. (For sampling of cohesive soil which is consolidated in such a manner, a special sampler is needed. In the soil quality investigation of this project, the sample may have been disturbed during sampling. Therefore, the unconfined compressive strength is considered to be underestimated). If any consolidation settlement of the periphery ground of the pile is expected, the negative skin friction will be discussed.

$$R_u = 8_{Cp} A_p + \overline{_{Ca}} A_S \quad \text{.....(Equation 1)}$$

$$R_a = \frac{R_u}{F_S} \quad \text{.....(Equation 2)}$$

where $_{Cp}$: cohesion at pile toe（kN/m$^{(ii)}$

$\overline{_{Ca}}$: mean adhesion for total embedded length of pile（kN/m(ii)

F_S : safety factor（as per Table 4-3-(i)

As for adhesion working to the embedment part of the pile, the following values will be used. (Nevertheless, check for adequacy of application on beforehand, paying attention to the ground conditions).

In case $\overline{_{Cu}} \leqq 100\text{kN/m}^2$: $\overline{_{Ca}} = \overline{_{Cu}}$

In case $\overline{_{Cu}} > 100\text{kN/m}^2$: $\overline{_{Cu}} = 100\text{kN/m}^2$ } ·····(Equation 3)

where $\overline{_{Cu}}$: mean undrained-shear strength of the ground for the total embedded length of pile cu (kN/m^2)

4) Corrosion protection, etc.

When using steel pipe piles, the corrosion protection method shall be studied.

(viii) Fenders

The berthing conditions of fishing boats and absorption energy of the fender beam will be studied in order to determine the data and reaction of the fender.

(viv) Design of the coping of jetty

1) Study of the beam

Structural analysis will be performed, assuming a continuous beam which is supported each load shown in the table at the pile head. The live load is operated in series as a traveling load in order to obtain the maximum sectional force. (If the case where the maximum sectional force occurs is known, investigate that condition only.)

Table 2-25 Loads for study of the beam

Type of load	Normal time	Normal time	Uplift
Dead load	Beam, floor slab	Beam, floor slab	Beam, floor slab
Surcharge	10 kN/m^2	10 kN/m^2	Not considered
Live load	—	wheel load	—
Pile head reaction force	Bending, axial force	Bending, axial force	—
Uplift	—		Uplift of the floor slab & beam is applied

2) Study of the floor slab

The floor slab will be examined as an elastic slab which is fixed at the four sides or three sides (with one free side), etc., depending on the supporting structure of the margin sides. The load condition for the study shall be as per Table 2-24.

Table 2-26 Loads used for study of the floor slab

Type of load	Normal time	uplift
Dead load	floor slab	floor slab
Surcharge	Outside the vehicle area: 5 kN/m^2	Not considered 0
Live load	wheel load (with traveling concentrated loads)	—
Uplift	—	Uplift of the floor slab & beam is applied

(x) Study of the structure of accessories

1) Bollard

The standard pulling forces of boats are shown in the table below. According to the value for the corresponding boat type (14.0GT), the 30kN type will be used. The pulling force shall be 30kN.

Table 2-27 Pulling force of fishing boats, etc. (per bollard)

Total tonnage of the fishing boat, etc.		Normal time
	Less than 10 ton	10kN
10 ton or above	Less than 50 ton	30kN

(xi) Detail of the structure

1) Cope level of the general section:

- Determine a level which constitutes no impediments in loading / unloading works on the jetty at the time of HWL. To this end, determine it as follows: [HWL＋freeboard level＋margin height] .
- Check for any impediment in loading / unloading works on the jetty during LWL （Guyana type）.
- Select a level by which no facility damage is expected in case of occurrence of HHWL.

2) Incidental facilities

- Car stop ; to be installed along the front and back side of the jetty
- Wheel guard ; to be installed at the both sides of the access jetty
- Safety facilities ; emergency ladder
- Fuel and water supply lines and electrical cables shall be installed from the onshore site to the jetty.
- Lighting system

3) Block division

- Divide the entire facility into blocks of a suitable size, with the jetty consisting of blocks each of which is about 20m long.
- The connecting section of each block shall be equipped with a shear key, if necessary, depending on the usage condition, horizontal load, etc.

4) Interval and layout of the piles

- The piles shall be set out with a standard interval of about 4 – 5m.
- Secure the standard pile interval with 2.5D or above, paying attention to the bearing capacity of the piles.

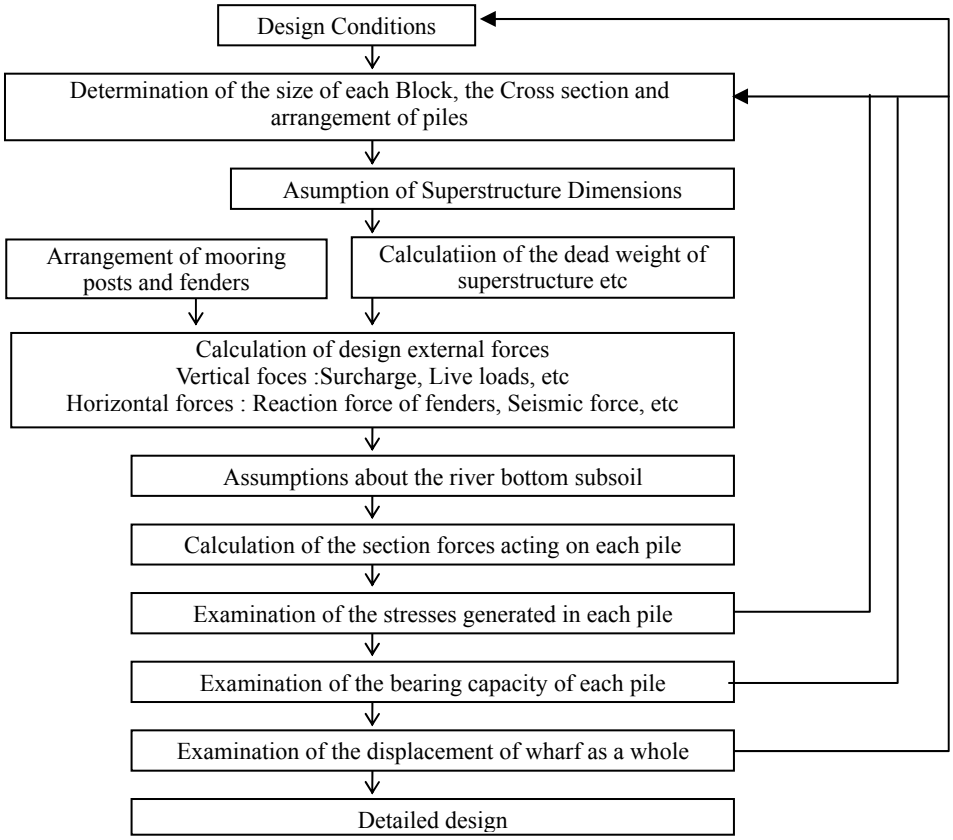


Figure 2-7 Design flow of a jetty supported by pile

(6) Overview of the Structural Design

(i) Jetty

The landing jetty (55.0m long and 8.0m wide) will consist of three blocks which are 15.0m, 20.0m, and 20.0m long, respectively. An access jetty "A" where an ice-making machine and ice-storage will be installed is located adjoining to the central block, to be connected to the onshore site through the access Jetty "B" and "C". The access Jetty "A" and "B" shall have a direct-pile structure like the landing jetty, so designed as not to disturb the river stream also if the present Suriname river line withdraws. The access jetty "C" will have an embankment structure protected by revetment, with its copings at the both sides connected by a steel tie rod in order to restrain the horizontal displacement. The copings at the up- and downstream sides shall be supported by foundation piles set up with an interval of 1.5m.

A car stop will be set out at the ends of the landing jetty copings. On each side where fishing boat will berth, fender beams will be installed in accordance with the pile line, and 2 units of emergency ladders are also installed. Also at the jetty "A", a corner-shaped fender to protect the bow of a fishing boat will be installed.

A water pipe, electrical cable and oil filler pipe will be set out, utilizing the wheel guard section at the both sides of the access jetty, connecting them to the service tank on the landing jetty. An outdoor light will be installed at the up- and downstream ends of the landing jetty and at the Center of the jetty "B". The electric cable to the outdoor light will be connected through the piping installed in the coping. The coping will be finished with an inclination of 0.5% for drainage of rain water, etc.

The corrosion protection for foundation piles of the landing jetty and the access jetty will be spraying of urethane system. Since no electrolytic protection is performed, the splash zone and underwater section will be included in the scope of corrosion protection to perform treatment up to CDL-1.0m with an allowance concerning scour. Corrosion protection will be applied to foundation piles of the access jetty "B" up to CDL±0.00m. For the jetty "C" which is of revetment structure, no pile corrosion protection is performed, because the piles are in the ground. They will be designed taking the "thickness allowance" into consideration.

(ii) Revetment

The revetment structure will consist of foundation piles, which are wide flange beams （300mm×300mm×10mm×15mm）set out with an interval of 1.0m, and a top concrete wall applied on the upper part of them (CDL+1.95m ― +3.3m). The present periphery ground level is about CDL+2.8m, and in this plan it is assumed that the site behind the revetment can be protected even in case of about 0.8m erosion of the revetment front ground.

(iii) Roads within the site

The roads specification shall be as follows, based on the design traffic volume（100 or less large vehicles/day）and roadbed design of CBR=3 or above: asphalt pavement (total of the surface layer + base layer): 50mm, upper base course: 150mm, lower base course: 200mm, total thickness: 400mm. The roadbed will be constructed in replacing the soil with sand material of good quality in order to ensure design value of CBR3 or above. The replacement depth shall be CDL+2.1m, i.e. the upper limit of the underground water level, with the thickness of the replaced sand of 0.8m. Geo textile will be laid between the replaced sand and ground surface SP-SM in order to prevent differential settlement and to improve the safety of construction.

iv) Construction Drawing

Basic design : See J-01 (Jetty overall plane view), J-02 (Jetty longitudinal sectional view), and J-0 (Jetty traverse sectional view).

2-2-2-2 Building Facilities Plan

(1) Facility Layout Plan

As shown in the basic design (facility layout A-0(i), the site of this project has a shape of a trapezoid which is sandwiched between CEVIHAS company at the upstream and Molen company at the downstream, having a border with an access road at the long side at the west and facing the Suriname River at the short side.

The installation surface of the jetty, main facility of this project, has some restriction based on consultation with MAS, and so the jetty will be installed at the upstream side of the site.

All of the facilities constructed in this project shall be designed, in a broad sense, for the purpose of assisting safe, effective, and hygienic landing and transportation works on the jetty. From this point of view, the layout of the onshore facilities shall be planned with the following policies:

1) Set out a road which gives an easy access for vehicles which visit the facility (large insulated trucks / small vehicles) in driving almost straight from the public road to the jetty.
2) Set out a parking space in an area near the access road and with a good view of the jetty, in order to eliminate waiting time of fishing boats which use the berth, in keeping related vehicles standby.
3) Offices for about 10 permanent staffs, health laboratory technicians from the Fisheries Department, and statisticians shall be installed on this site. Set out the Management building around the Center of the site so as to allow a good view of the entire site including the jetty facilities with no blind corner from the staff rooms (for sales staff, cleaners and statisticians) for precise control of the site.
4) The chilled room area shall be located in Management building, near the jetty, because: (i) it has much to do with the work of sales staff and statisticians in this building, (ii) it should be also near the sensory laboratory, and (iii) it does not infringe other functions of this building.
5) The wash & sterilization facilities and storage for insulated and plastic containers for hand pallet trucks, pallets, platform- and spring scales, and other equipment used in this project shall be installed in the Management building.

   Two layouts were studied for installation of an ice-making machine and ice-storage. In the first plan, these facilities will be attached to the Management building, installing an extra device for transportation to fishing boats berthing in the jetty, while in the second plan they are installed at the base of the departure-preparation jetty (cross section with the access

jetty) in order to shorten the ice transportation distance from the ice-storage to the fishing boat.

After studying the items shown in Table 2-28, the second plan was chosen, i.e. placing ice-making machine and ice-storage room at one part of the jetty.

Table 2-28 Comparison Table for Ice-making & Ice-storage room

	Installation in the Management building	Installation at the cross-point of the jetty and pier
Advantage of the installation position	Maintenance is easy, since it is installed within the office-making machine and ice-storage building.	Since ice can be supplied near the preparation jetty, loading can be done effectively, even if done mainly manually, and is thus convenient as a facility for departure preparation.
Disadvantage of the installation position	Due to long transportation to the jetty, it is difficult to select the best method to load ice of 20ton/day (average) on artisanal fishing boats manually at the last. If a mass-transportation device is introduced, setting up of a relay point on the jetty is necessary. Preferable layout of other facilities may become difficult, because many functions should be placed onshore.	Though the national condition in Suriname is mild and the facilities are placed indoor, it is still possible that deterioration of machinery and tools is expedited to some extent due to more frequent exposure to moist river wind.
Transportation of ice / Transportation device	A pumping device with a compressor, insulated truck for ice transportation, forklift, hand lift, etc were considered. Though a pumping device is suitable for transportation of large volume of ice in a lump, it has no mean to send a small quantity of ice on demand. Since the landing jetty is not an ideal place for vehicle traffic, truck or other vehicle transportation may disturb operations on the jetty.	Due to the distance of so small as within 25m from the ice-storage to the preparation jetty end, you can load ice to artisanal fishing boats more efficiently by manual transportation.
From the viewpoint of process planning	Installation work can be done independently from the civil engineering work of the jetty and others. It constitutes no impediment to completion of installation within the schedule.	Installation work may be delayed if arrangement for steel piles necessary for jetty construction is prolonged. However, meticulous study of the schedule proved that it is fully possible to complete jetty construction and installation of ice-making and ice-storage room including test run within the schedule.
From the viewpoint of construction cost management	If they are attached to the Management building, the construction cost may increase, due to change in the building foundation engineering into the bearing-pile method. If they are built as an independent building separate from the Management building, extra construction machinery for piling works will be needed. Thus, there is no way that the cost is lower than installation on the jetty. A higher cost is highly possible, especially depending on the selection of the transportation method.	Generally, construction work of offshore installation is more difficult and cost is higher compared to onshore construction works. However, since in this case the same material and construction machinery can be used as in the jetty construction, the cost increase includes only that due to the increased area of the jetty construction work.
Result of comparison	poor	Very good

After studying the above table, it was decided to install ice-making machine and ice-storage room at the cross-point of the jetty and pier.

6) The power-receiving facility, fresh water (supply water) tank, and security guard room will be placed at the access road side of the site according to their functions. The power-receiving facility and security guard room share a same foundation and roof, but a certain gap is placed between those buildings according to the fire protection law of Suriname. They are not separated as independent buildings, partly because they should be next to each other for operational convenience, and partly because you can reduce differential settlement and consolidation settlement of the building on weak ground, by having an as wide as possible bedrock layer.

7) Facilities related to gasoline supply include an underground housing for underground gasoline tank and a service tank. The service tank will be placed at the base of the landing jetty due to convenience in fuelling fishing boats.

The fire protection law of Suriname provides that they shall be separated from other buildings according to the relevant Suriname law, with an at least 12m interval between a housing for underground gasoline tank and other construction facilities. Since the housing for underground gasoline tank should be buried underground, it will be placed onshore. However, since the access jetty in this project is long and the suction pump of the fuel facility does not have sufficient capacity, relay facilities (oil transfer pump and gasoline tank) should be introduced. Setting of the relay facilities makes it possible to place the housing for underground gasoline tank away from the service tank. Considering these conditions, the housing for underground gasoline tank will be placed at a place alongside the front access road and next to the water channel at CEVIHAS side, where no congestion of the supply tank lorry accesses and on-site activities in other onshore facilities is expected and an interval of 12m or longer can be secured with periphery facilities.

8) The public toilet will be placed at the base of the jetty, a convenient place for fishers and other users of the landing jetty.

9) The fishing gear mending area does not require particular convenience in the layout, since mending of fishing net is done continuously for a couple of days. Therefore, it will be placed at a corner of the Molen side, a bit far away from the jetty and other facilities on the site.

(2) Plane Configuration

(i) Management building

Being the central space for management of the overall facilities including the jetty, the Management building will accommodate Management and meeting area and Chilled room area.

Management and meeting area consist of Management area, which includes a manager's office, general secretary's office, counting room, staff room (which serves also as a fishing gear shop), sensory laboratory, etc. and Meeting area, which includes a meeting room and store room, and toilet/shower rooms and a kitchenette for staffs and visitors.

Chilled room area is equipped with a chilled room and a working place in front of it. Storage and a wash facility for plastic and insulated containers for fish & ice and manual feeder, etc. are also located there. The work place in front of the chilled room and storage for fishing tools, etc. will have a doorway, respectively, which gives a direct access from the outside.

Chilled room area will be placed at the jetty side of Management building so as to ensure easy carrying in of ice-stored fishes landed on that day. Management and meeting area is located at the shore side of Chilled room area.

In Management and meeting area, the staff room, i.e. local management section of the site and the manager's office for overall supervision are located at the downstream side from where you can observe what is going on the jetty, while general secretary's office, counting room, and reception room are placed at the upstream side. The sensory laboratory will be placed next to Chilled room area for convenience of test sample transportation, and the meeting room, toilet/shower rooms, and kitchenette are located at the most inner side.

At the Center of management offices and meeting room, an entrance hall is set out, where the main doorway to the Management building is installed. To the staff room which serves also as a fishing gear shop, an access will be provided directly from the outside, considering the convenience for fishers and privacy of the management offices.

(ii) Ice-making machine and ice-storage building

Ice-making machine and ice-storage buildings will be two-storied. The second floor will accommodate an ice-making machine room where an ice-making machine and a compressor are placed, while the first floor will be ice-storage. They are placed at two points on the crossing point of the landing jetty and access jetty. An ice-making machine is placed just above the ice-storage, so as to drop ice directly into the ice-storage to omit transportation work. A mount is installed between the two ice-making machine rooms to connect them, and an air-cooled condenser for heat exchange of ice-making machines is placed on it.

(iii) Building for the Security guard room & Power-receiving facility

In the building for the security guard room & power-receiving facility will be a security guard room, power-receiving room, and a generator room where a standby generator for the case of power outage is placed. Security guards work in three shifts for 24 hours in the main building in order to perform control of site visitors and safety control of the whole facility, as well as start/stop control of the standby generator in case of power failure. Therefore, the security guard room is located at the nearest to the facility doorway, and the generator room is placed next to it.

(iv) Public toilet

The public toilet will accommodate lavatory rooms and toilets for men/women and a shower room for men.

(v) Fishing gear mending area

A fishing gear mending area is a facility to avoid sunshine and rain during mending work of fishing nets. It is without walls and exposed to wind, but poles to support a net are installed outside of each side so as to enable mending works at four sides.

(3) Cross-sectional Planning

The site ground height of this project is +2,900-3,000mm (CDL standard) according to the measurement result at site. (It is +1,620-1,720mm according to the NSP standard, the measurement reference plane in Suriname, but CDL will be used as the level reference for this project in order to relate them to civil engineering facilities, including the jetty.)

In planning of civil engineering facilities, the reference level of the jetty is set at CDL+3,500mm due to relation to the tide level. From the observation result of the tide level, it is assumed that the highest tide in the Suriname River will not exceed CDL+2,800mm. On the other hand, the level of the access road from the trunk line is about CDL+3,100mm at the front side of the site. Though this road is now made of compressed crushed stones, asphalt pavement will be applied on it in the fall of 2006. It is assumed that the level of the road center will be CDL+3,200-3,300mm after that. Therefore, the design will be set ground level of this project site at CDL+3,300mm, to get at least the same level with the public road with as small quantity of embankment as possible. To this end, embankment of 300-400mm is applied on the site ground.

The bottom sediment of this side consists of weak, cohesive soil, and the ground surface contains a layer of about 1,500mm which seems to be old embankment where a large quantity of scrap

metals and decayed organic components such as plant roots are contained in cohesive soil mixed with some sand. Differential settlement may be caused in future, if bearing capacity of the ground are not secured by replacing a part of such soil with soil of good quality. Therefore, the soil 800mm under the ground surface (the part of CDL+2,100 or above) will be replaced with soil of good quality, according to the calculation of the allowable bearing capacity based on the undrained-shear strength of the lower silt layer obtained in the soil survey and the underwater level (existing ground surface -800 to-2,000mm). Namely, the ground of the site of this project, site roads, and parking lots will have replaced soil of good quality up to the design ground surface of 1,200mm.

The standard floor level of the first floor of each building apart from Ice-making machine and ice-storage building is set at Design Ground Surface Level+450mm, in consideration of the pile head foundation depth, setting and setting of the foundation beam. Being installed on the jetty, the Ice-making machine and ice-storage building will have a floor level of Jetty Floor Level + 150mm, taking the rain fall on the jetty into consideration. The floor level of the fishing gear mending area will be Design Ground Surface level +300mm.

The eave height of Management building will be determined, considering the clearance above the air-cooled condenser for the chilled room. The floor beam height of the second floor of Ice-making machine and ice-storage building will be determined so as to enable all-time traffic (except for special vehicles) on the jetty below it, while its eave height will be determined considering the clearance above the air-cooled condenser for the chilled room.

The beam level of the building for the security guard room and power-receiving facility will be determined avoiding that the dimension below the beam is less than the electricity company's standard. Since there is no special standard for the public toilet eave height, it is decided according to that of the building for the security guard room and power-receiving facility.

For the fishing gear mending area, the eave height is so set that the distance from the floor level equals to 1/3 of the interval of the beams to avoid causing impediment in mending works while avoiding a too spacious room.

Based on the above policies, the height of each building is set as follows;

Floor level of the Management in Management building: Design G.L +478mm
Floor level of Chilled room area in Management building : Design G.L +450mm
Eave height of Management building: Design G.L +4,350mm

Floor level of Ice-making machine and ice-storage building (First floor):

Jetty floor level+150mm

Floor level of Ice-making machine and ice-storage building (Second floor):

Jetty floor level +4,420mm

Eave height of Ice-making machine and ice-storage building: Jetty floor level +8,790mm

Floor level of Security guard and power-receiving building: Design G.L +450mm

Eave height of Security guard and power-receiving building: Design G.L +3,445mm

Floor level of Public toilet.: Design G.L +500mm

Eave height of Public toilet.: Design G.L +3,445mm

Floor level of Fishing gear mending area: Design G.L +300mm

Eave height of Fishing gear mending area : Design G.L +3,900mm

(4) Construction Plan

As the foundation for construction facilities of this project, a bearing pile method using RC piles manufactured in Suriname shall be adopted, except for ice-making machine and ice-storage building which is placed on the jetty. (The fishing gear mending area will have cloth foundation, considering this as a minor facility for protection against sun and rain.)

As to upper structure, for the management building, the main structure will be reinforced concrete rigid frame, with lightweight concrete blocks as curtain walls from the viewpoint of cost efficiency. In consideration for explosion protection and anti-noise measure in the power-receiving room and standby generator room, the same applies to the security guard room and power-receiving facility. Also, the same applies to the public toilet as water-proof measure and for easy tile finishing.

However, for ice-making and ice-storage building and fishing gear mending area steel construction shall be adopted in order to minimize load of the construction on the ground, and heavy steel structure shall be applied considering the possibility of rusting, because the site is located alongside the Suriname River in a coastal zone. From the same viewpoint, folded-plates made of aluminum-galvanized sheet iron will be used for the roof.

Furthermore, folded-plates made of aluminum-galvanized sheet iron will be used for the roof structure of the management building in terms of work schedule to shorten the construction period. About 1.5 months of construction period will be reduced by adopting metal folded-plates structure rather than reinforced concrete structure.

Since no live load is specified in the building code of Suriname, the live load of each facility is set as follows, according to Japanese building standards.

Management building: 2,900 N/m^2

Ice-making machine and ice-storage building (2^{nd} floor):

900 N/ m^2+Loads of machinery and mount

Ice-making machine and ice-storage building (First floor): 20,000 N/ m^2

Security guard and power-receiving building (security guard room): 1,800 N/ m^2

Security guard and power-receiving building (power-receiving room): 4,000 N/ m^2

Fishing gear mending area: 1,800 N/ m^2

Public toilet: 1,800 N/ m^2

(5) Finishing Plan

a) Roof

In the security guard and power-receiving building and public toilet, reinforced concrete slabs (flat roof) will be used for safety and workability in construction- with simple spread waterproofing (weather-resistant topcoat finish) of urethane resin system. For management building and ice-making and ice-storage building, however, folded-plates made of galvanized sheet iron will be used for weight reduction and shortening of construction period.

Folded-plates of galvanized sheet iron are used for the fishing gear mending area, like in management building, for weight reduction and shortening of construction period.

b) Outer walls

For security guard and power-receiving building and public toilet, it is being planned to apply mortar finish on piled-up lightweight concrete. As a measure against shrinkage cracks occurring on the plastering wall, mortar containing will be used as small quantity of cement as possible. At the same time, for unavoidable hard-line cracks, influence of shrinkage cracks will be properly absorbed by applying joint to cover cracks, while applying proper coating in order to prevent any bad affects, such as water leakage.

For management building and ice-making and ice-storage building, however, square corrugated plates made of galvanized sheet iron will be used for the purpose of weight reduction and shortening of construction period, as it will be for the roof. Corrugated plates are also used for the existing Commewijne Fisheries Center, and they are kept in good condition after about 15 years.

Incidentally, walls will not be provided around the fishing gear mending area which is exposed to air.

c) Outer floor

Concrete slab floor without mortar finishing will be provided. Proper coating will be applied on the concrete surface, according to the property of the place of installation.

Occurrence of shrinkage cracks will be restrained by using concrete with as small quantity of cement as possible. Concerning unavoidable hard-line cracks, influence of shrinkage cracks will be properly absorbed by applying joint to cover cracks, while penetrative, enhanced anti-dust agent of epoxy system (hardener) being applied.

d) Ceiling

For staff offices, etc. in management building, a ceiling of plywood will be provided, considering noise absorbing and heat insulating properties.

On the other hand, chilled room area in management building and each room in Ice-making machine and ice-storage building and security guard and power-receiving building as well as the fishing gear mending area and public toilet will have no ceiling.

e) Inner wall

In security guard and power-receiving building and public toilet, mortar is applied on the piled-up lightweight concrete wall, just like the outer walls. Same countermeasures against shrinkage cracks as the outer wall will be applied.

For the ice-making and ice-storage building, however, so specific interior will be applied and exterior square corrugated plates made of galvanized sheet iron will be exposed.

f) Inner floor

Same as the outer floor, in principle.
Around the sensory laboratory and chilled room of management building, floor coating agent of urethane system is applied, while penetrative, enhanced anti-dust agent of epoxy system (hardener) is applied in other areas. Nevertheless, staff offices and the meeting room in Management building will have floor tiles made of a vinyl chloride system, and porcelain floor tiles are laid in the toilet/shower rooms and kitchenette. Tile floors will be cleaned by a special staff with appropriate intervals, and preventive measures against mold, etc. will be taken.

For the floor of the fishing gear mending area, interlocking blocks which are used for outdoor passage floors are laid in order to absorb possible effects of consolidation settlement, etc.

g) Plan of the Opening (fitting)

- Outer Opening

For outer openings, aluminum sash doors and windows, which Commewijne Fishery Products Center uses, are used in principle. However, where some strength is needed, such as for the power-receiving facility and standby generator room, steel doors with baking finish will be used. In Suriname, outer windows in general are equipped with steel anticrime grids. In this project, steel anticrime grids will be installed for all aluminum sash windows as a security measure.

- Inner Opening

Also for inner openings, flush doors of aluminum sash will be used in principle due to matching of the hinge for fittings, except for doors of toilet/shower rooms

- Finish hardware

Since this project site is located in a coastal zone, hardware made of SUS will be finished with sufficient strength, in principle.

(6) Plan of the water supply/drainage facilities and sanitary facility.

(i) Water Supply Facility

• Location of water supply:	Kitchenette, sensory laboratory, washing/sterilization area for containers for fish & ice, etc. (Management building) Toilet/shower room facility（Management building、toilet building for fishers） Ice-making machine: 22m^3/day, water supply station (on the jetty: about 20 liters/min) Water faucet in the premise
• Supply-water pipe diameter:	200mmφ
• Service pipe:	PVC pipe or steel pipe with PVC lining; 50mmφ
• Water supplying system:	Pumping type
• Water reservoir:	Heat retention water tank made of FRP (sandwich) Capacity:60m^2 (for two days)
• Squeeze pump:	Large-capacity type, 65mmφ×750ℓ/min×30mAq,

3φ225V, 7.5kw×2 (automatic alternative operation)

- Secondary water pipe: PVC pipe

(ii) Equipment in the sanitary facilities

Specification of equipment in the sanitary facilities:

- Toilet bowl: Ceramic, western-style toilet bowl, paper holder made of SUS
- Urine bowl: Ceramic, wall-hanging type urine bowl
- Washbowl: Ceramic, embedded washbowl with the capacity of about 9ℓ, butterfly valve, toilet mirror, soap dispenser
- Shower fitting: Embedded cool-water shower set made of SUS

(iii) Domestic wastewater & ventilation

- Drainage method : Mixed flow of sewage and miscellaneous drainage; With rain water separated
- Drain pipe: PVC pipe (for main and branch pipes); Main pipe:100mmφ, Branch pipe: 75mmφ
- Ventilation method: Extension ventilation
- Effluent volume: About 5,000liters/day（3.5 liters/day）
- Drain pump: 50mmφ×10mAq
  3φ225V, 0.75kw×2 (Automatic alternative operation)
  Vortex pump (detachable underwater sewage pump)
- Discharge conduit: PVC pipe 50mmφ
- Discharged to: The Suriname River through the adjacent water channel.

(iv) Waste water treatment system

- Purification method: Long-time air extraction; 5m^3/day
- Effluent quality (target value): BOD removal rate of 70% or above; BOD value of the effluent quality of 60ppm or less
- Lifting pump: 3φ225V, 0.15kw×2 (automatic alternative operation)
- Aerator: 3φ225V, 0.15kw, 1 unit
- Housing: Reinforced concrete manufactured at site, buried underground

(v) Rainwater/used water discharge system

- When cleaning of the premises is performed, no detergent or antiseptic shall be used in principle.

- Work Overview: Installation of gutters and street inlets
- Drainage method: Unforced discharge (direct discharge into the adjacent water channel and Suriname River)
- Street inlet: Reinforced concrete, manufactured at site, inlet inner width: 600mmx600mm
  Gutter grating : Steel angle and round bar:19mmφ, to be welded
- Cover of the inlet: Cast manhole cover

(vi) Gasoline supply station

- Work Overview: Installation of the housing for underground gasoline tank & service tank, and fuel piping works

(A housing for underground gasoline tank, a service tank, and its remote control equipment supplied by the fuel company shall be used)

- Fuel pipe: UPP pipe, 2 inch diameter
- Oil tank capacity: 20kltr.（2,500mmφ×5,000mmL）
- Service tank unit: Fuel pump: 45kw
- Housing: Reinforced concrete, manufactured at site, buried underground

(vii) Fire control system and Refuge accommodation

- Fire extinguishers to be placed where necessary(provided by the Suriname side)

(7) Planning of the Air conditioning & ventilation systems

(i) Air conditioning system

- Unit type, package air conditioners will be installed.
- The standard for installation capacity is about 0.15kw/m^2
- Offices, the staff room, reception room, meeting room, and sensory laboratory will be equipped with an air conditioner.

(ii) Ventilating facilities

- An air-discharge ventilation fan will be installed where necessary.
- Duct fan embedded in the ceiling for offices
- Wall-hanging type ventilation fan if medium capacity is required
- Pressure ventilation fan with a 3-phase power supply will be installed in the chilled room and standby generator room.

(8) Plan of the Electric Facilities

(i) Power-receiving facility and Substation

- Primary power: 60Hz, 3φ4W, 12,000V
- Secondary power: 3φ4W: 220V, 1φ3W: 220/127V
- Transformer capacity: 250KW specification

(ii) Main Power Line Facility and Standby Generator

- Power transmission system: 3φ4W, 220V
- Power distribution system: Buried piping made of metal or synthetic resin. For underground section, lay it at least 900mm below the ground surface, and install a hand-hole where necessary to lay the electrical cable through it.
- Diesel-engine driven standby generator: Revolution; 1,800RPM, 220V, 60Hz, 40KVA
- Power switching in case of power failure: by manual switching

(iii) Motor system

- Power transmission method: 3φ4W, 220V
- Buried piping made of metal or synthetic resin
- Main motor systems to be installed are as per Table 2-3
- As an alarm system, failure alarm and water level alarm systems are installed.

(iv) Wiring system for Lighting & Power Outlets

- Work Overview: Wiring works from each power distribution board to each lighting apparatus, lighting switch, power outlet, and ventilation system
- Power transmission method: 1φ3W, 220/127V
- Wiring method
  - Floor wiring: Wiring through synthetic resin piping
  - Wall wiring: Wiring through synthetic resin or metal piping
  - Ceiling wiring: Wiring through synthetic resin or metal piping, buried cables
- Blinking method: Manual switch, EE switch, timer switch

(v) Piping and outlet facilities for telephone and communication lines

- Work Overview: Piping works from the main terminal block to each telephone outlet, Outlet work at the receiving points

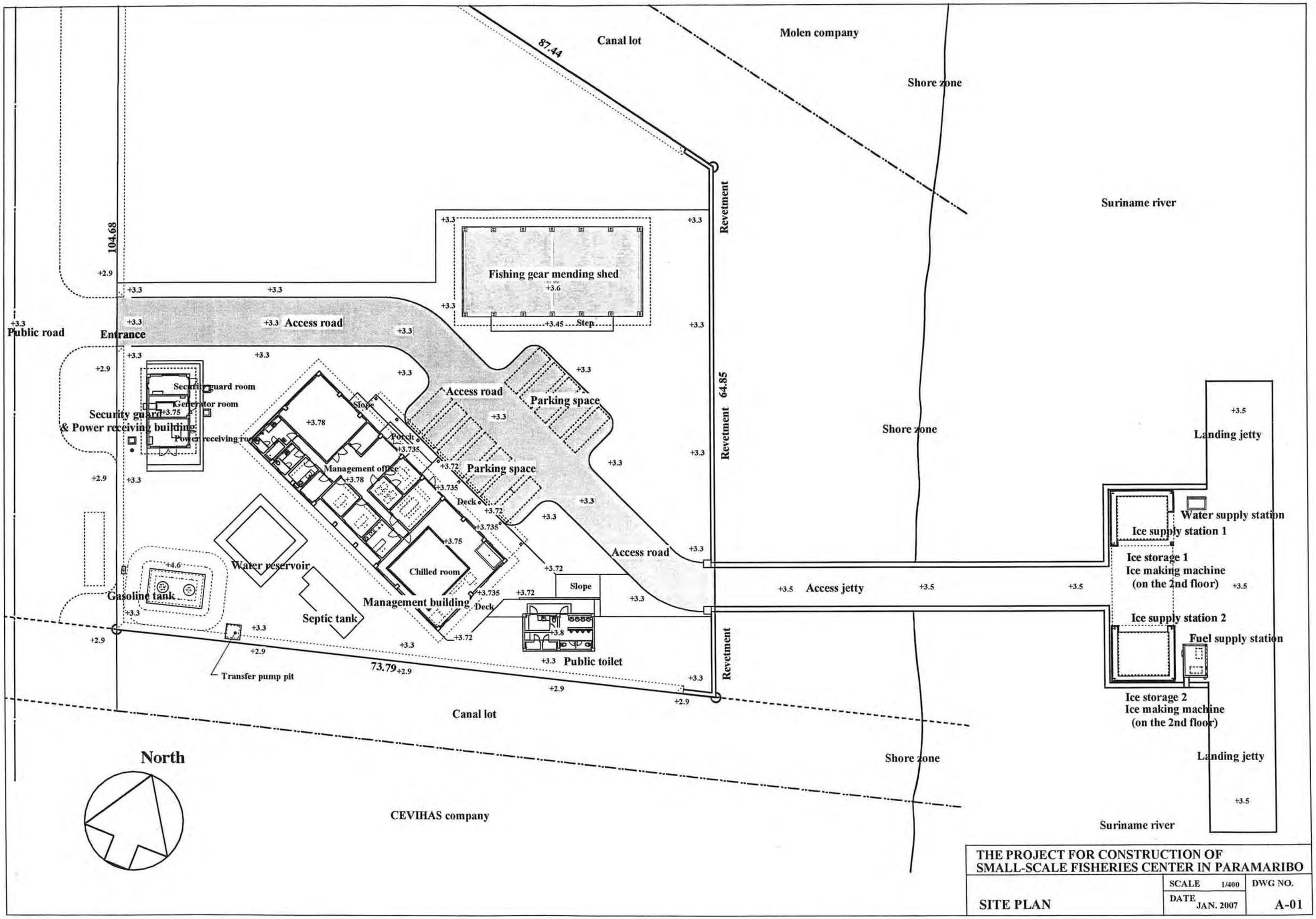
- Location of telephone- and communication outlets:
- Manager's office, reception room, general secretary's office, counting room, staff room, sensory laboratory, meeting room, and security guard room

(vi) Lightening Conductor

- Work Overview: A lightening conductor will be installed on the roof of Management building and Ice-making machine and ice-storage building, respectively.
- Installation of a lightening conductor: Installation work of a lightning rod and a ground electrode, and wiring of the conductive wiring

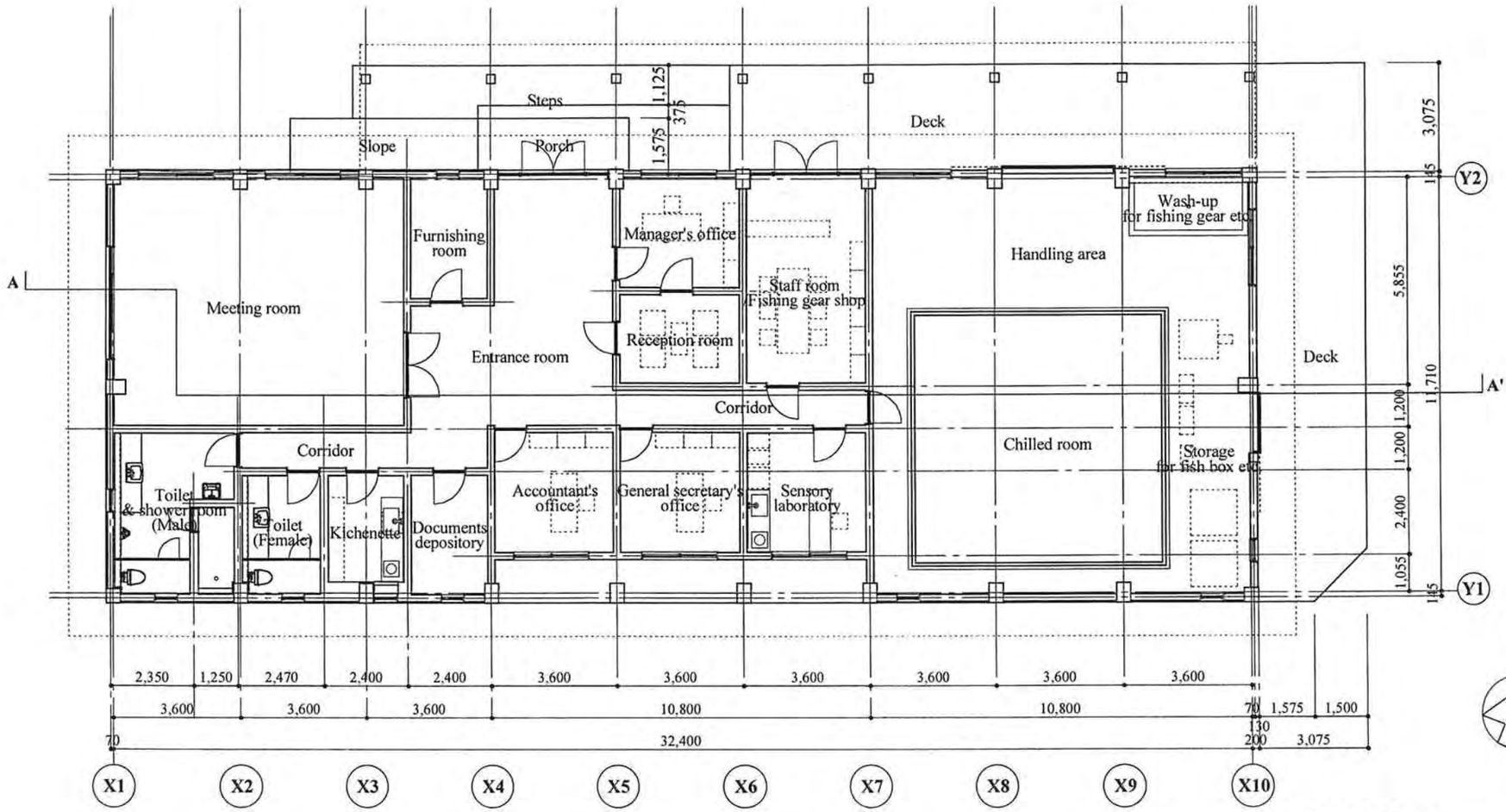
2-2-3 Basic Design Drawing

A-01 SITE PLAN
B-01 MANAGEMENT BUILDING FLOOR PLAN, SECTION
B-02 MANAGEMENT BUILDING ELEVATION
B-03 ICE-MAKING MACHINE & ICE STORAGE BUILDING FLOOR PLAN, SECTION
B-04 ICE-MAKING MACHINE & ICE STORAGE BUILDING ELEVATION
B-05 SECURITY GUARD & POWER-RECEEIVING BUILDING PLAN, SECTION, ELEVATION
B-06 PUBLIC TOILET FLOOR PLAN, SECTION, ELEVATION
B-07 FISHING GEAR MENDING SHED FLOOR PLAN, SECTION
J-01 GENERAL JETTY PLAN
J-02 JETTY SECTION (1)
J-03 JETTY SECTION (2)

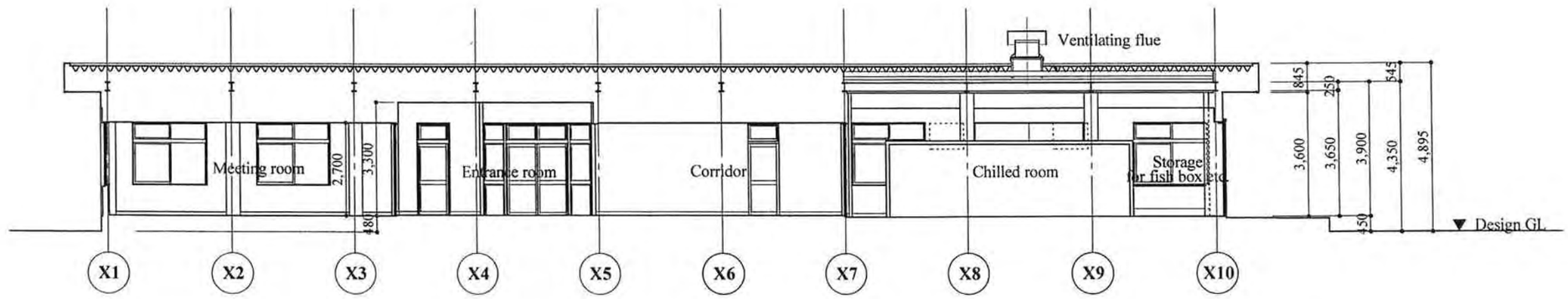


THE PROJECT FOR CONSTRUCTION OF
SMALL-SCALE FISHERIES CENTER IN PARAMARIBO

SITE PLAN	SCALE 1/400	DWG NO. A-01
	DATE JAN. 2007	

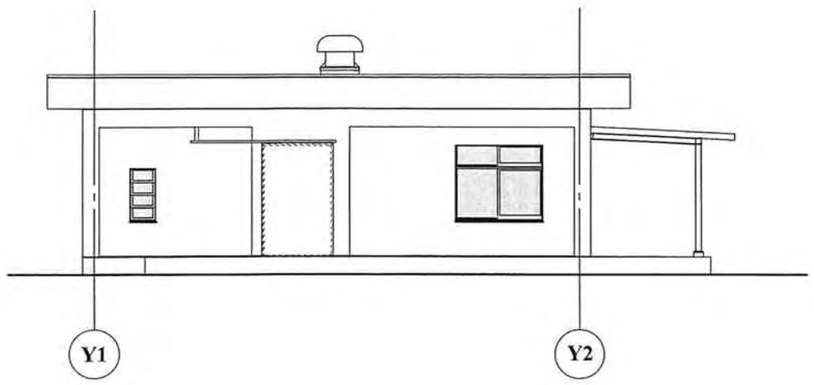


FLOOR PLAN

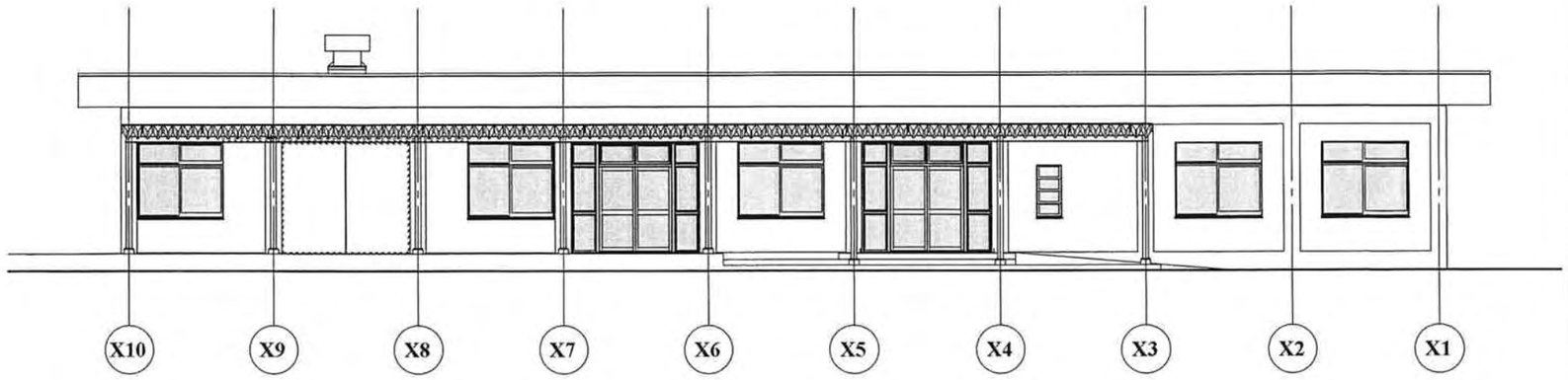


A-A' SECTION

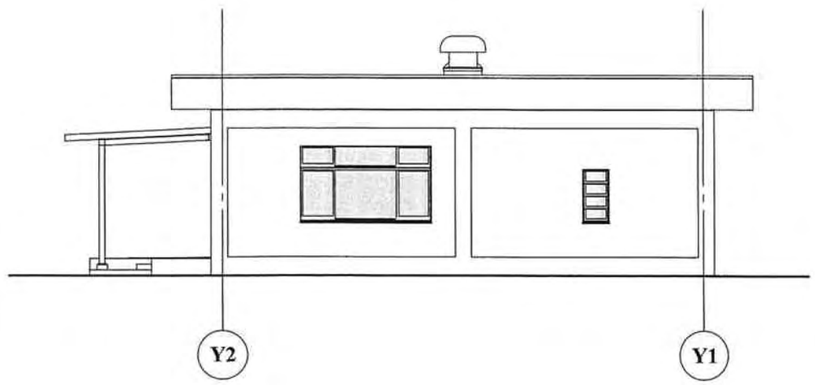
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
MANAGEMENT BUILDING FLOOR PLAN, SECTION	SCALE 1/150 DATE JAN. 2007	DWG NO. B-01



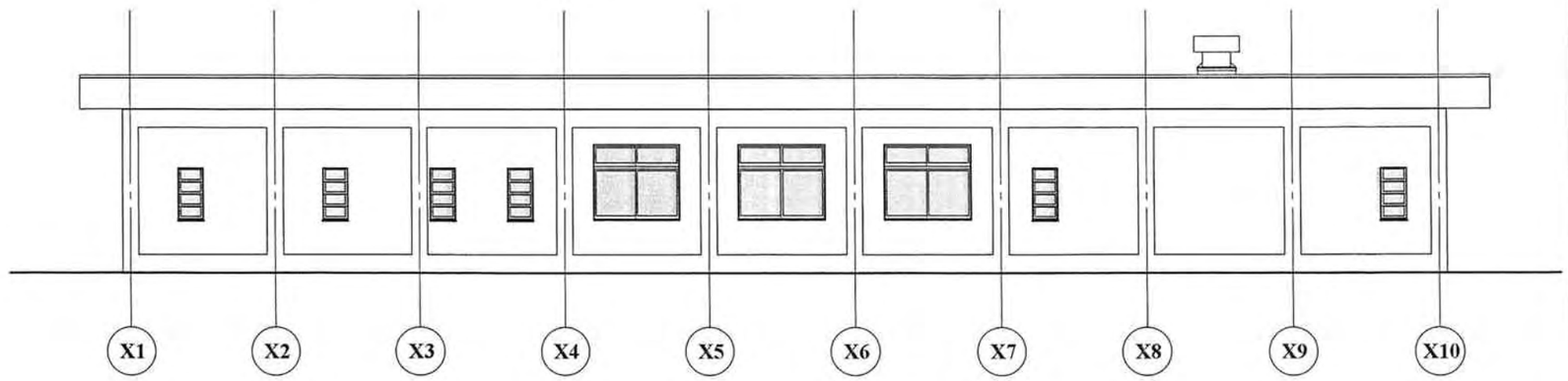
East elevation



North elevation



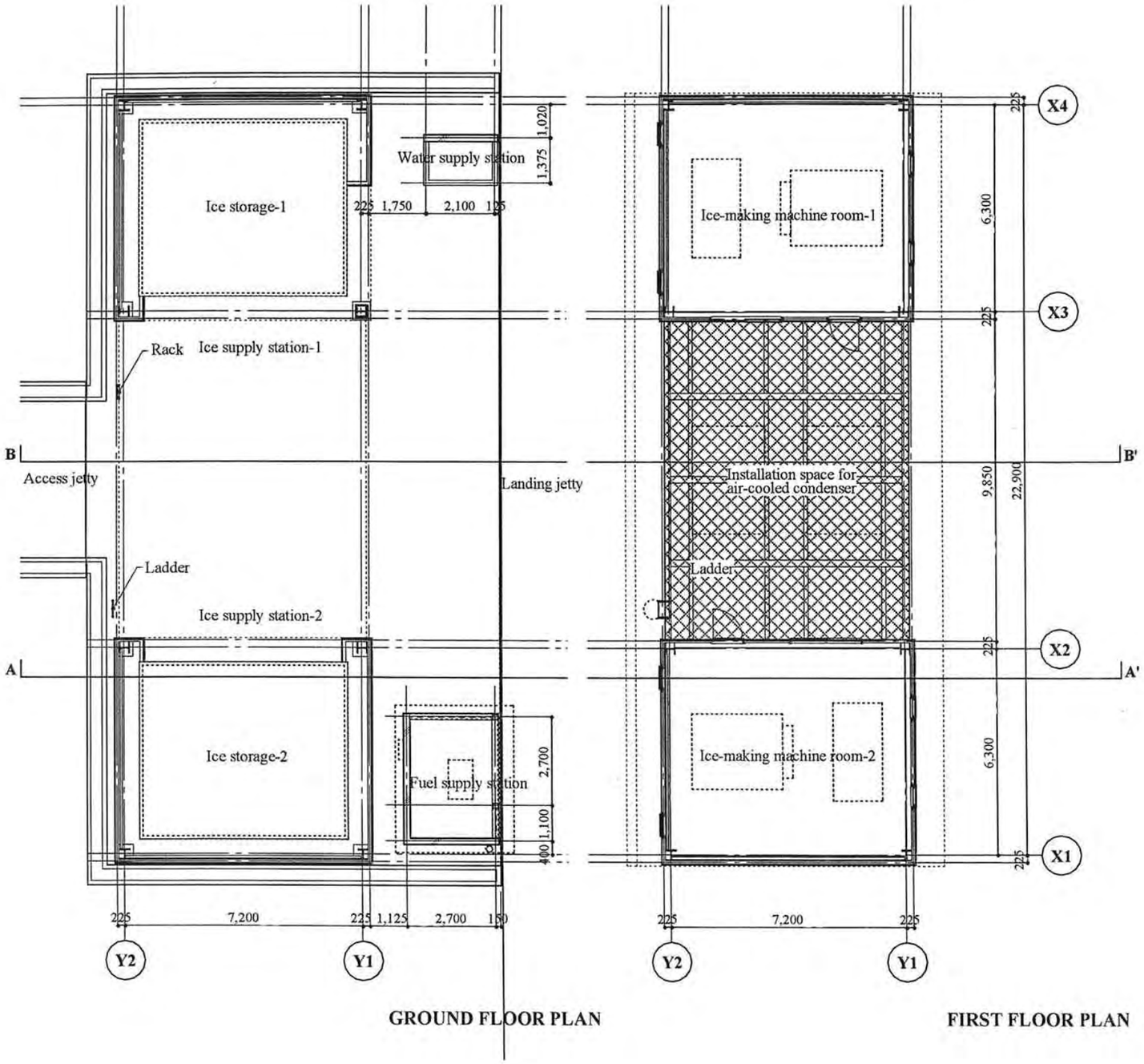
West elevation



South elevation

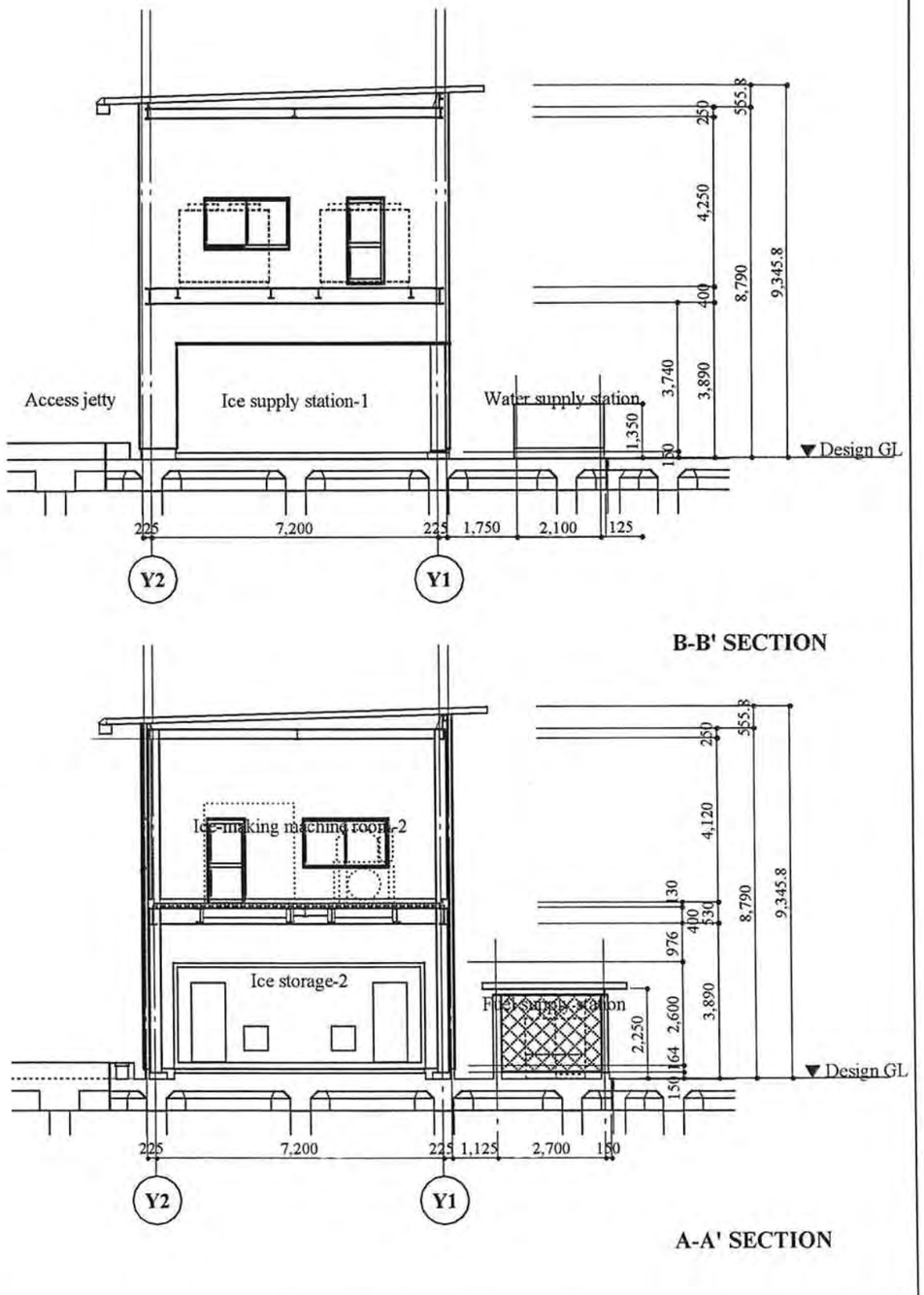
ELEVATION

THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
MANAGEMENT BUILDING ELEVATION	SCALE 1/150 DATE JAN. 2007	DWG NO. B-02



GROUND FLOOR PLAN

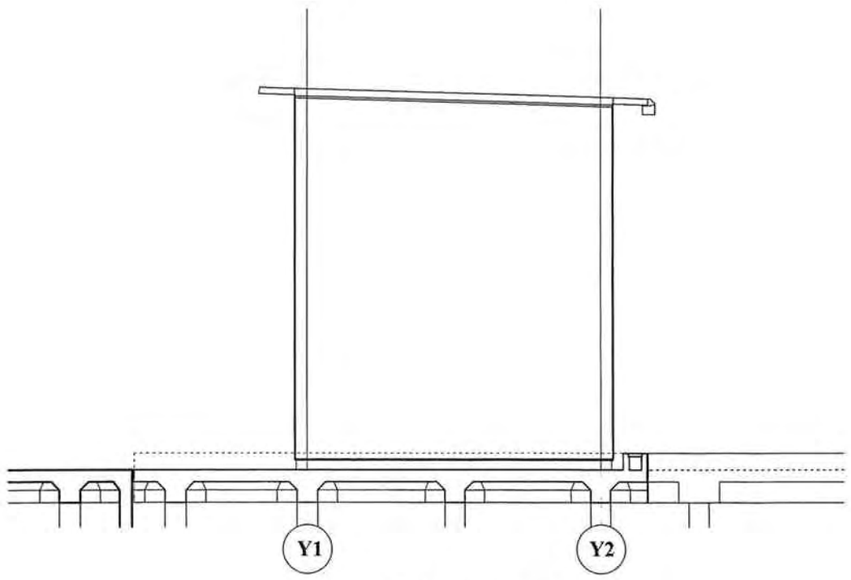
FIRST FLOOR PLAN



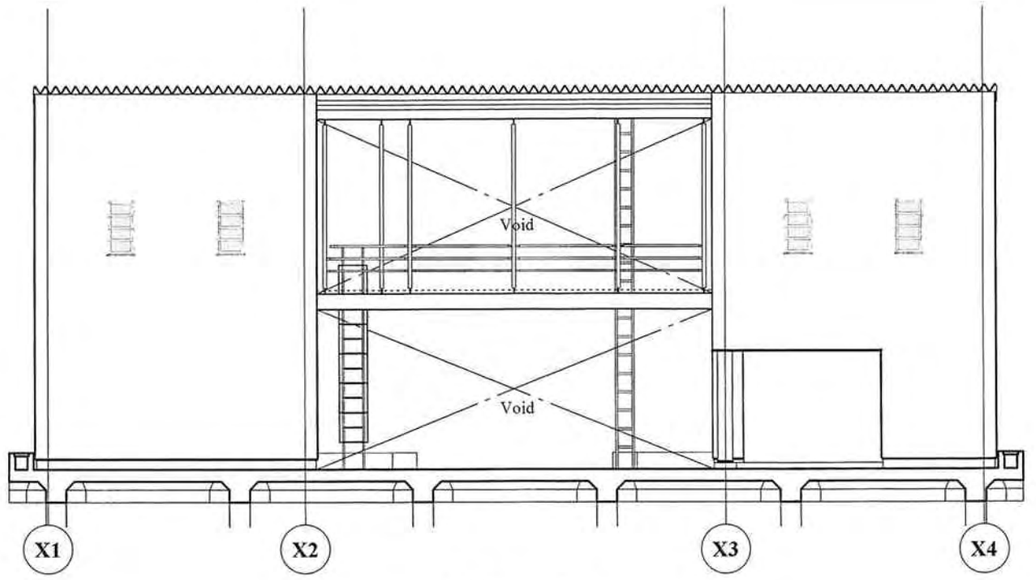
B-B' SECTION

A-A' SECTION

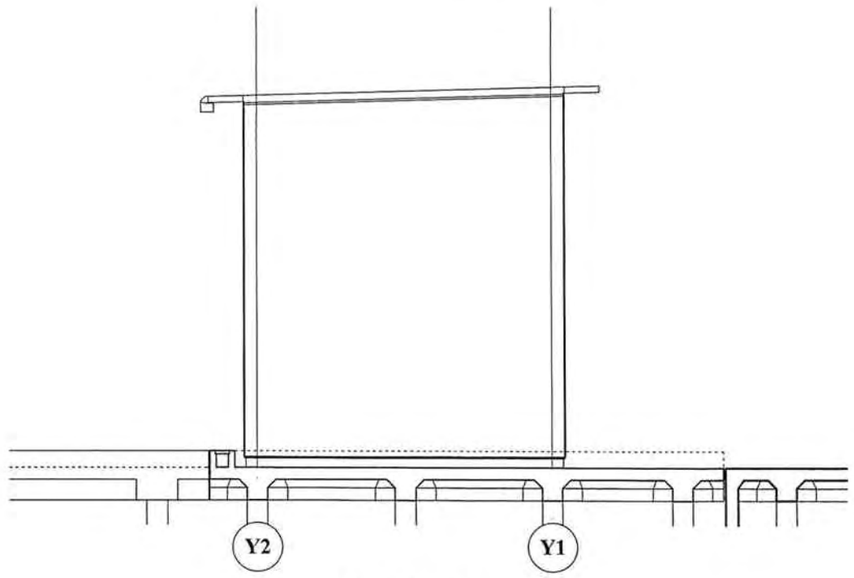
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
ICE-MAIKING MACHINE & ICE STORAGE BUILDING FLOOR PLAN, SECTION	SCALE 1/150 DATE JAN. 2007	DWG NO. B-03



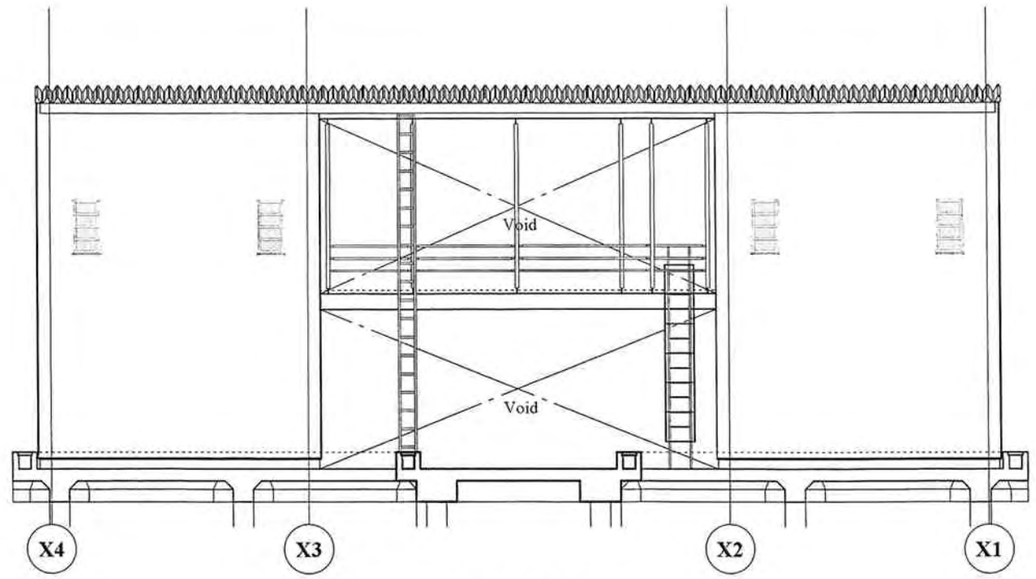
East elevation



North elevation



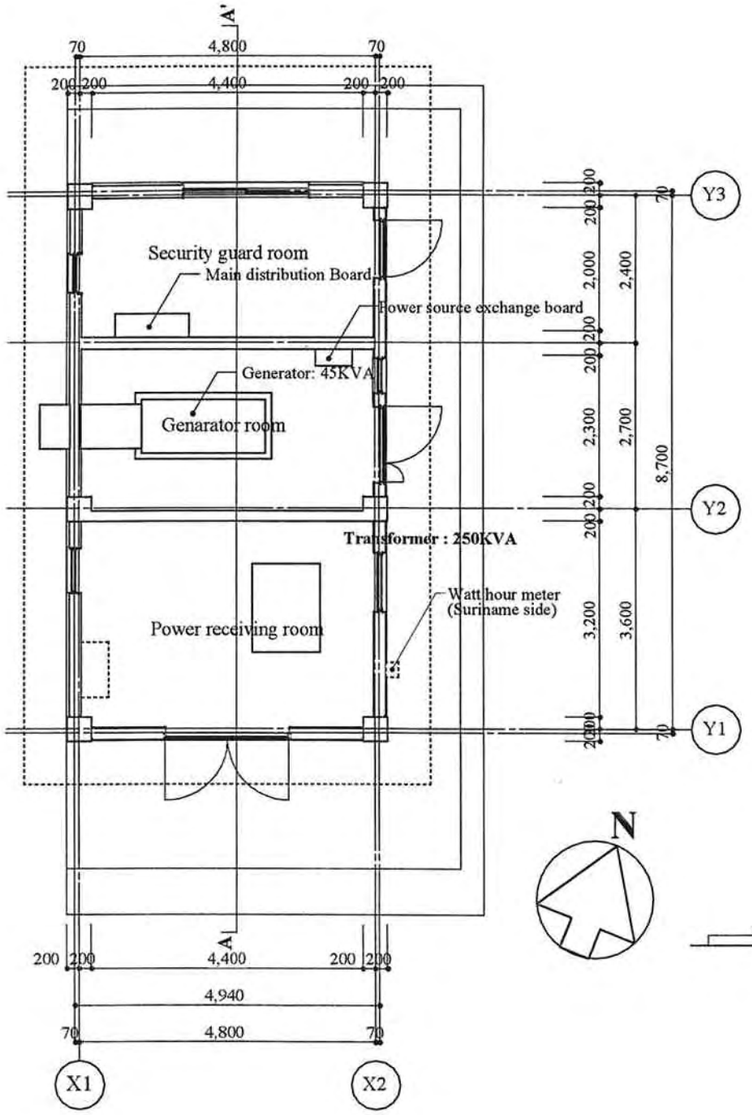
West elevation



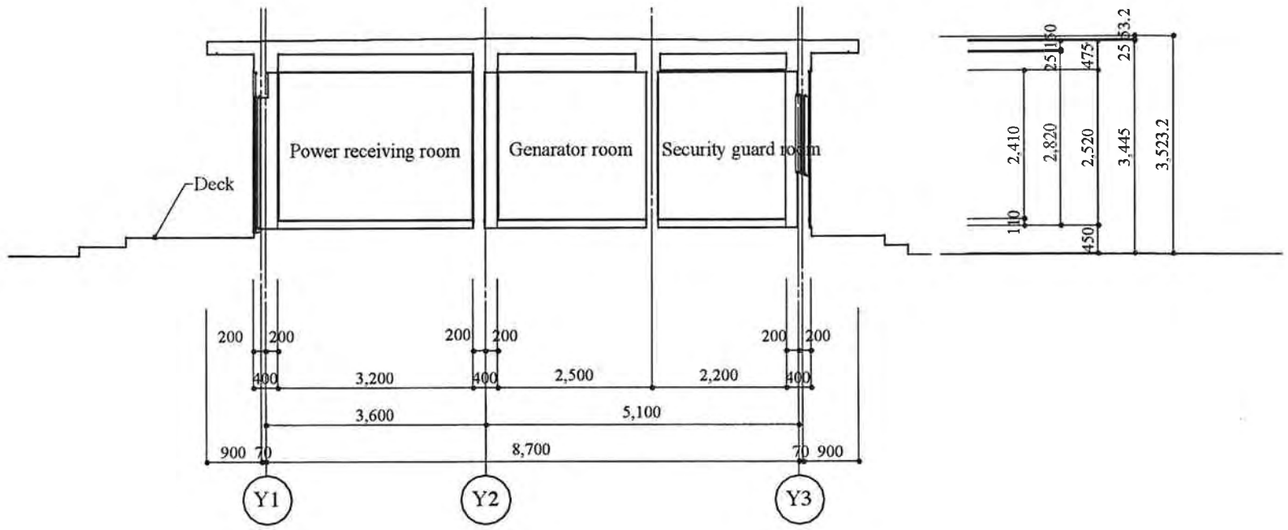
South elevation

ELEVATION

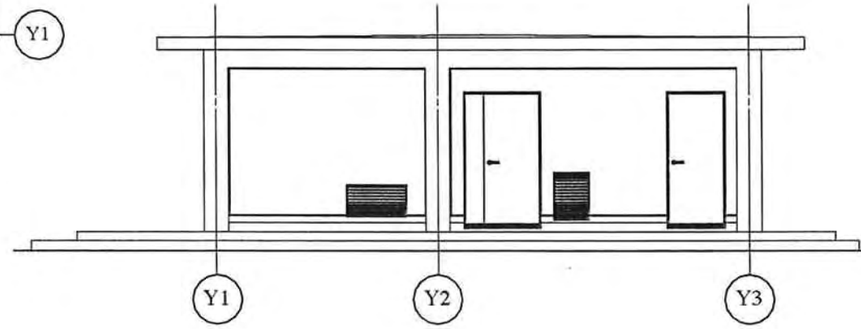
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
ICE-MAIKING MACHINE & ICE STORAGE BUILDING ELEVATION	SCALE 1/150 DATE OCT. 2006	DWG NO. B-04



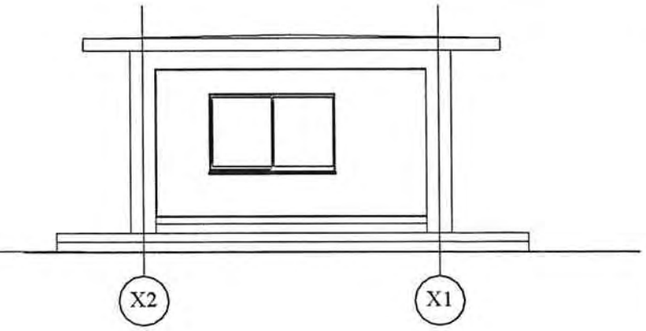
FLOOR PLAN



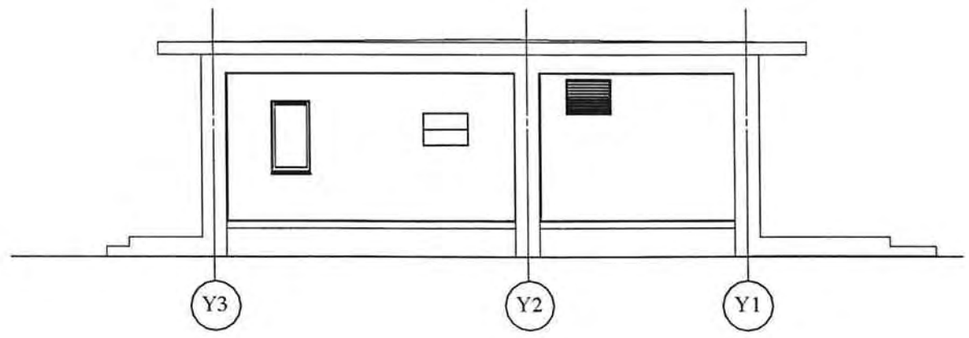
A-A' SECTION



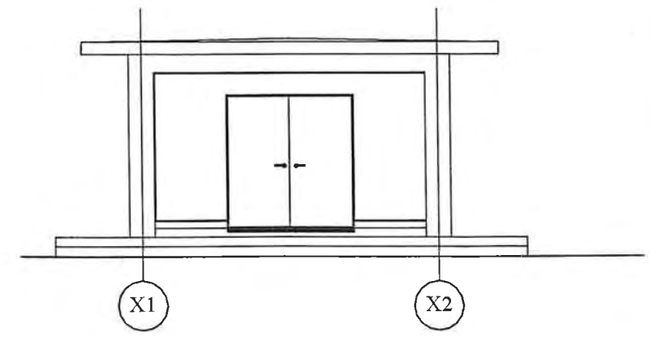
East elevation



North elevation



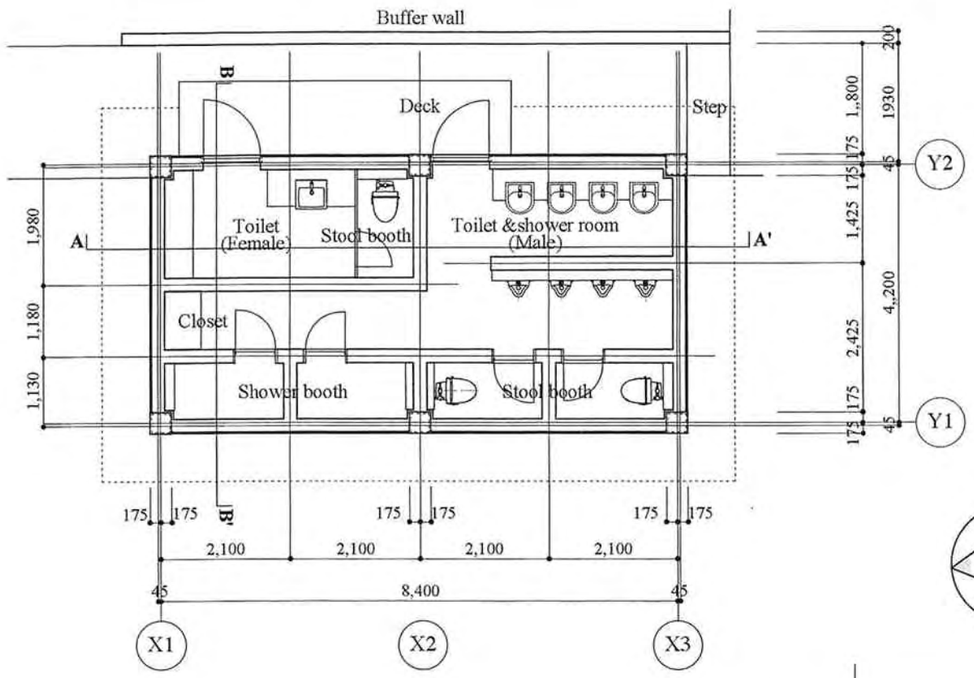
West elevation



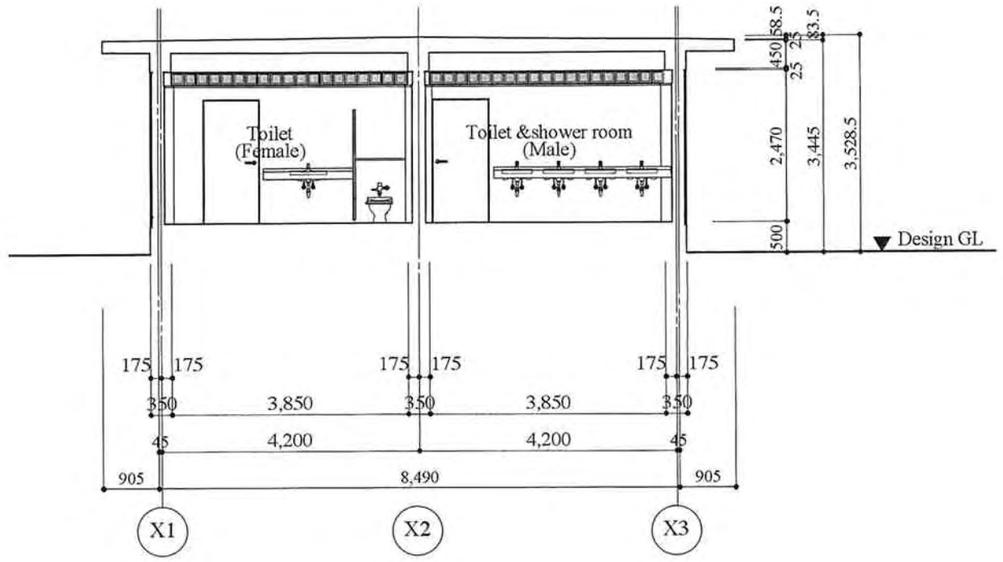
South elevation

ELEVATION

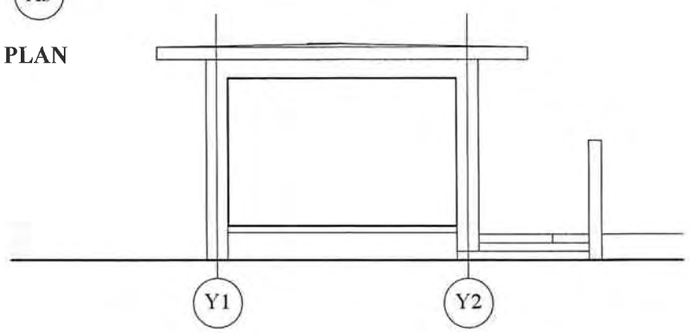
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
SECURITY GUARD & POWER-RECEIVING BUILDING PLAN, SECTION, ELEVATION	SCALE 1/100 DATE JAN. 2007	DWG NO. B-05



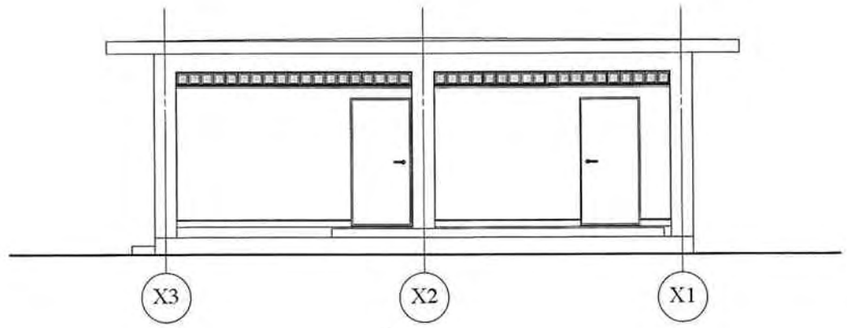
FLOOR PLAN



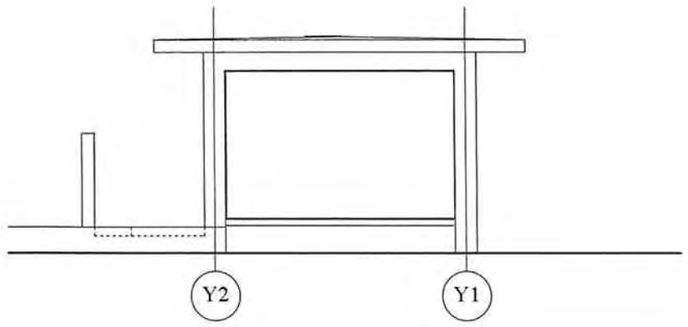
A-A' SECTION



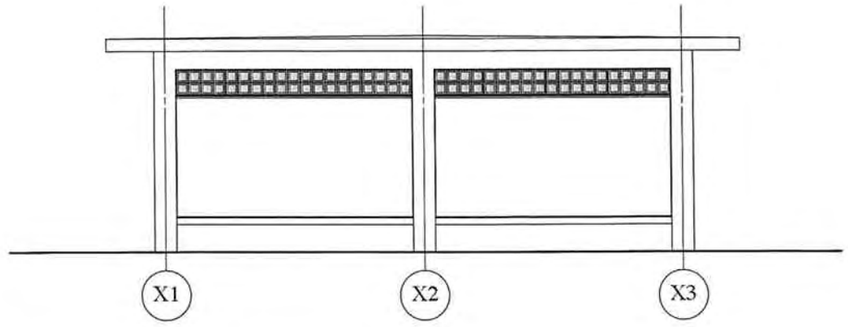
East elevation



North elevation



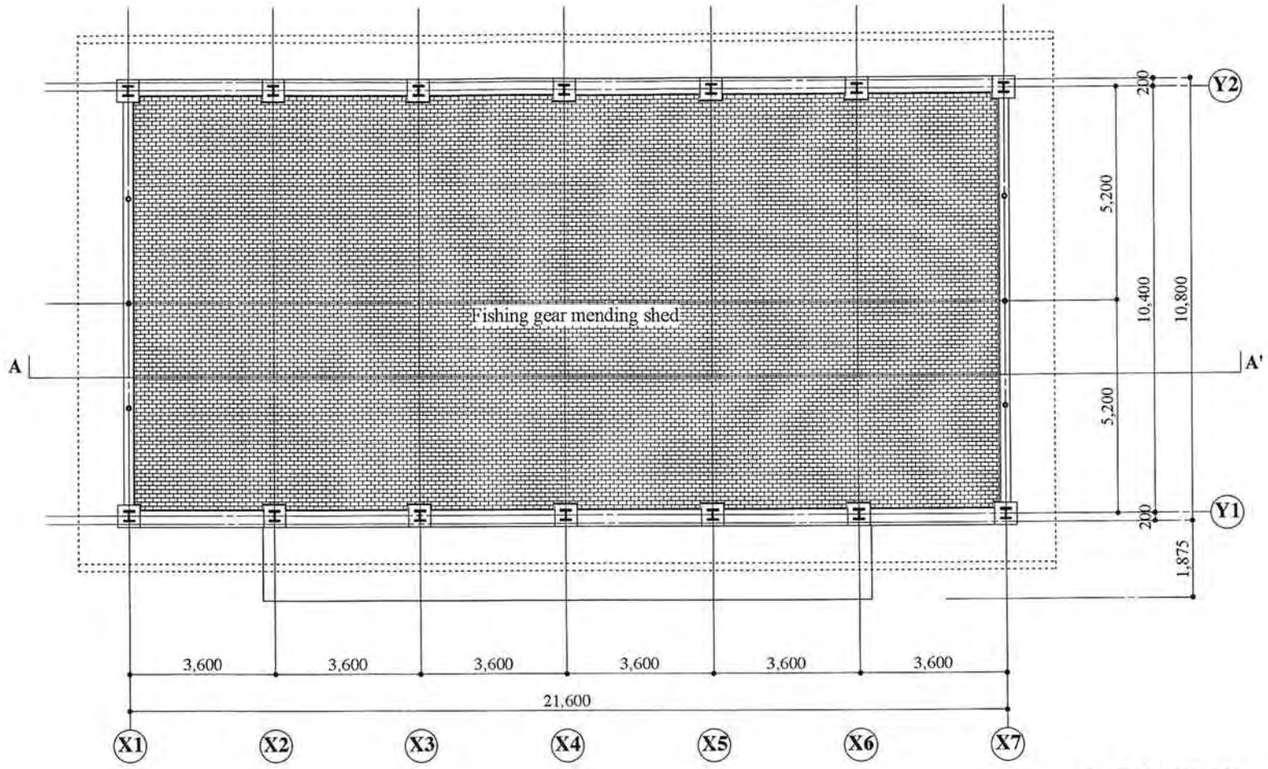
West elevation



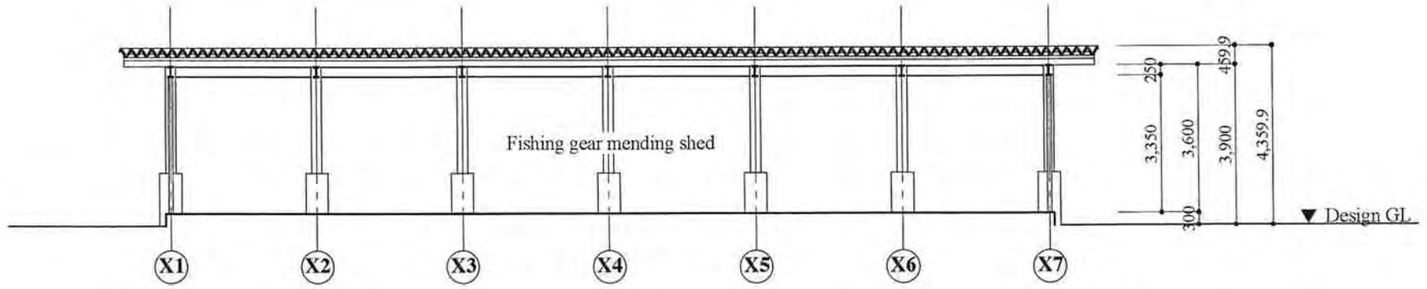
South elevation

ELEVATION

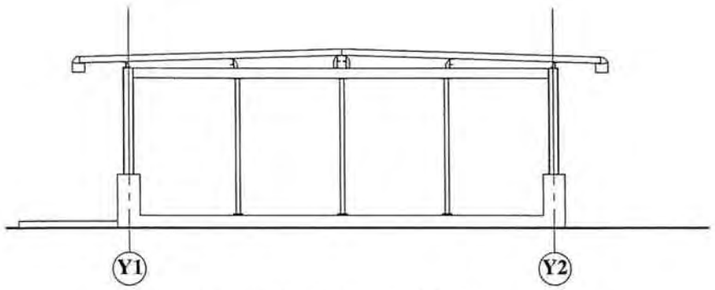
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
PUBLIC TOILET FLOOR PLAN, SECTION, ELEVATION	SCALE 1/100 DATE JAN.,2007	DWG NO. B-06



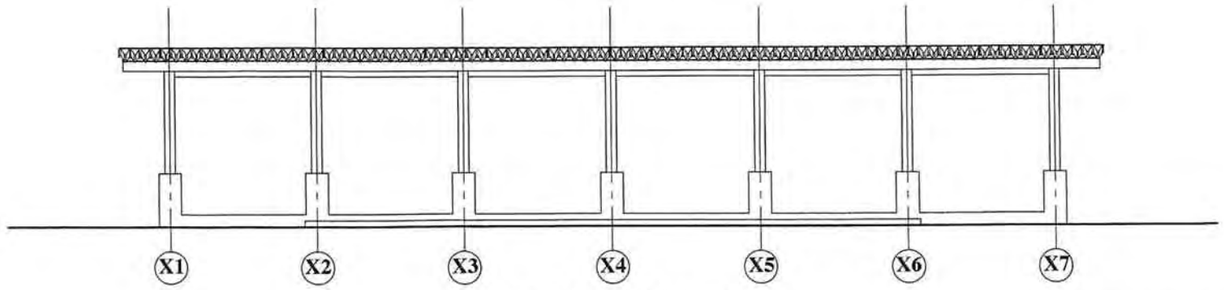
FLOOR PLAN



A-A' SECTION



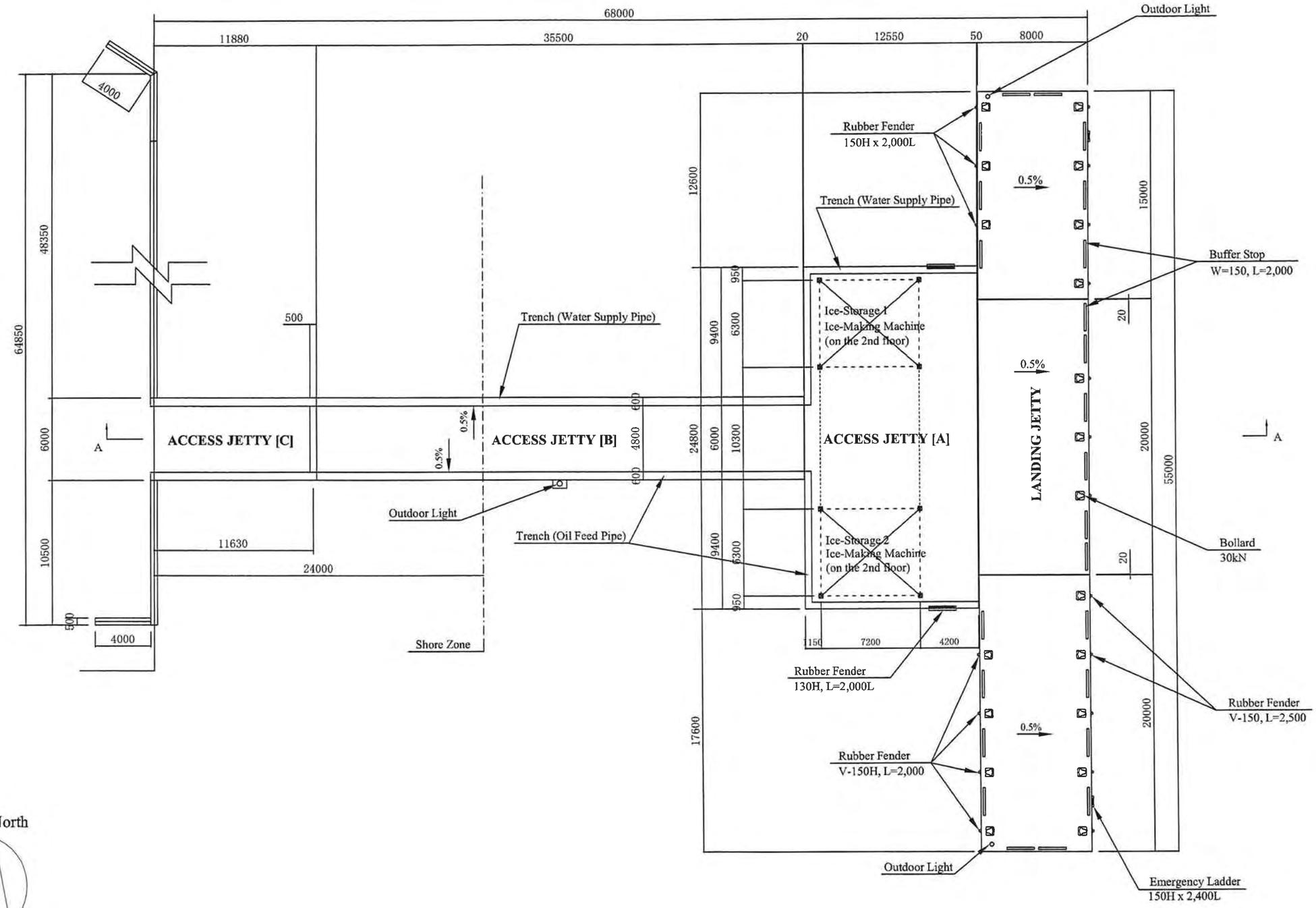
EAST (WEST) ELEVATION



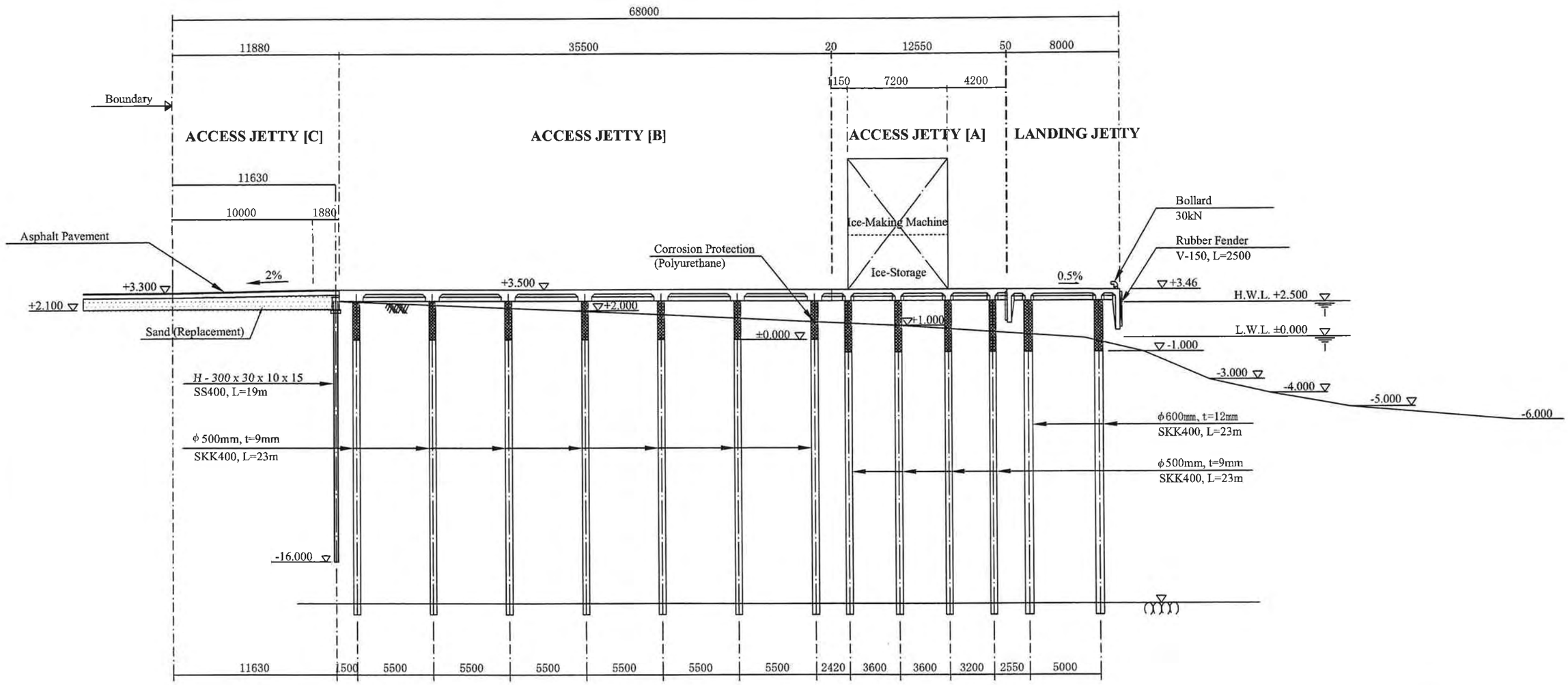
NORTH (SOUTH) ELEVATION

ELEVATION

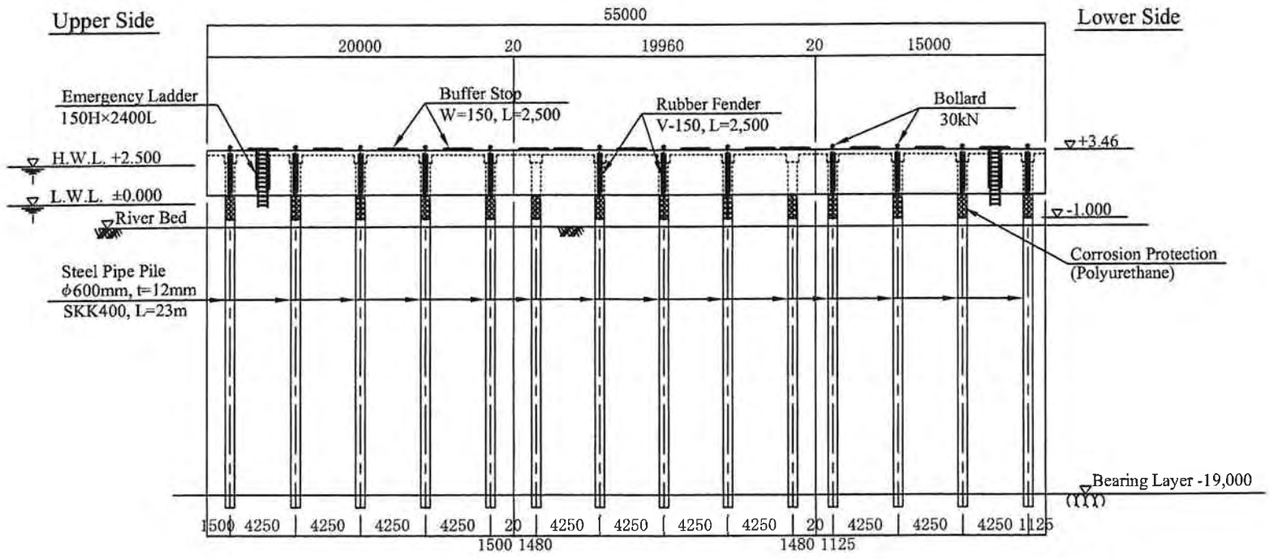
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
FISHING GEAR MENDING SHED FLOOR PLAN, SECTION	SCALE 1/150 DATE JAN. 2007	DWG NO. B-07



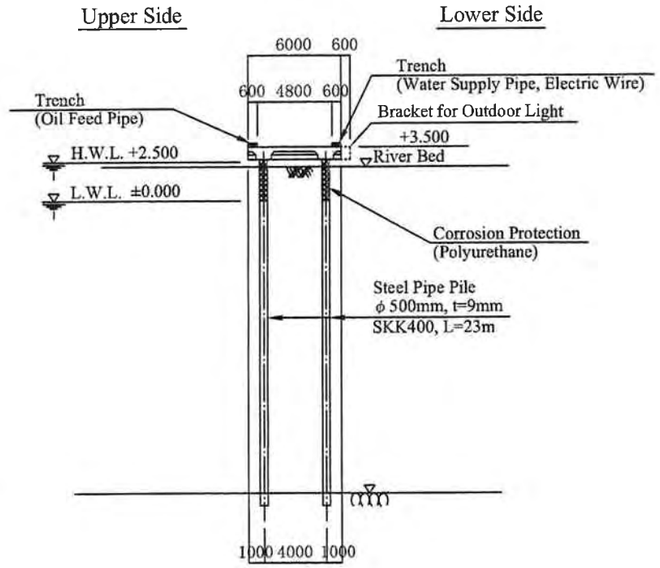
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
GENERAL JETTY PLAN	SCALE 1/300	DWG. No.
	DATE JAN. 2007	J-01



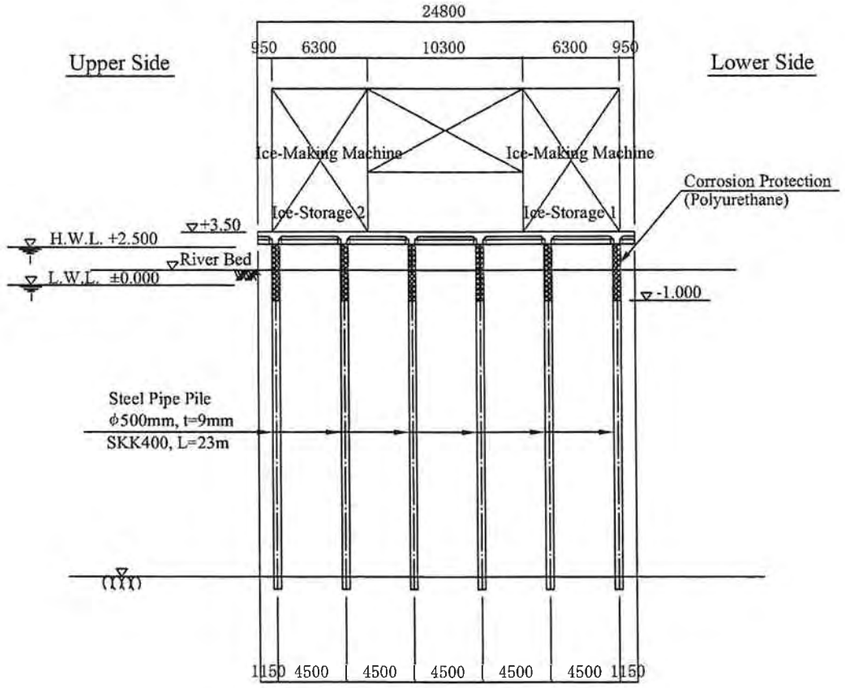
THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
JETTY SECTION (1)	SCALE 1/300 DATE JAN. 2007	DWG No. J-02



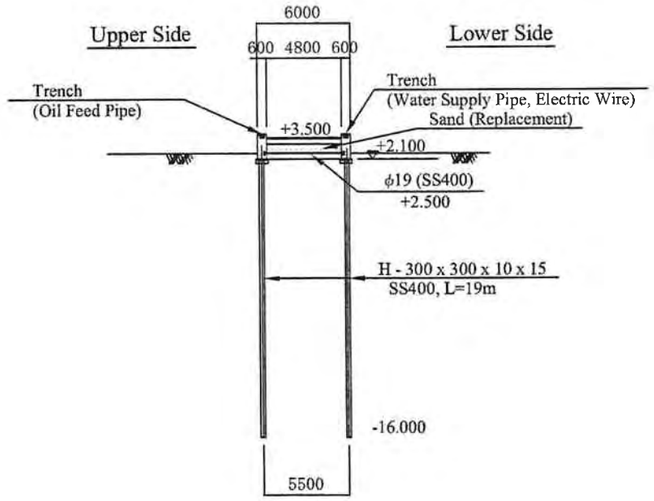
LANDING JETTY SECTION



ACCESS JETTY [B] TYPICAL SECTION



ACCESS JETTY [A] TYPICAL SECTION



ACCESS JETTY [C] TYPICAL SECTION

THE PROJECT FOR CONSTRUCTION OF SMALL-SCALE FISHERIES CENTER IN PARAMARIBO		
JETTY SECTION (2)	SCALE 1/400 DATE JAN. 2007	DWG No. J-03

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

As the Project is to be implemented under the grant aid scheme of Japan and hence is under a restriction that it needs to be completed within the preset implementation schedule, the procurement of equipment and materials and the construction of facilities must adequately be planned and scheduled. Further, the construction and procurement shall be carried out following the basic policies stated below.

1) A reasonable construction plan shall be prepared with consideration given to the geographical, natural, social and construction conditions in Paramaribo.
2) The construction plan shall be prepared reflecting business activities of neighboring companies and the natural environment of the Suriname River.
3) Labor force, equipment and materials that are locally available shall be maximally utilized.
4) Surinam's tradition, culture and customs shall be respected in carrying out the work and labor management.
5) Durable, robust and easy-to-use equipment shall be selected.
6) Those equipment and materials for which spare parts and repair materials can easily be procured shall be selected.

2-2-4-2 Implementation Conditions

1) The construction plan and schedule must be rational and precise considering that Paramaribo belongs to the tropical climate and hence it is hot and rainy.
2) The operating schedule and work progress shall be closely communicated to the counterparts so that application of relevant works, acquisition of necessary licenses and permissions, execution of role sharing, etc. will be carried out in a prompt and proper manner.
3) Water areas involved, details and period of jetty works shall be advertised in advance through the Suriname MAS, to ensure the safety of works on water as well as vessels sailing the Suriname River.
4) Giving consideration to the traffic and safety of vehicles and workers that use the road connecting to neighboring CEVIHAS Company, it is necessary to put countermeasures, such as deployment of watch standers, in place in conjunction with security control at the time of transporting equipment and materials into the construction site.

5) In light of prevention of theft of equipment and materials in the temporary construction site, it is necessary to put countermeasures, such as installation of fences and deployment of guards, in place.

6) Since steel pipe piles and many construction materials must be procured from Japan or third countries, any possible delay in procurement, marine transportation, customs clearance, etc. must carefully be observed.

7) Considering the fact that the engineering level of local workers and quality of locally-procured construction equipment and materials greatly vary, it is essential to hire engineers of a certain engineering level or higher and check the quality of procured goods.

2-2-4-3 Scope of Works

When implementing the Project under Japan's grant aid scheme, teach country shall respectively be responsible for the followings.

<Scope of work of the Surinamese side>

1) Installation of fences, gates, etc. around the project site
2) Introduction of electricity, water supply, telephone line, etc. into the construction site
3) Acquisition of licenses and permissions necessary for carrying out the construction work, etc. for the Project in Surinam.
4) Ensuring prompt tax exemption and customs clearance involved in importing construction machines, equipment and materials to be used for the Project
5) Purchase of furniture, supplies, office equipment, fire extinguishers, waste bins, etc.
6) Procurement and supply of underground gasoline tank and dispenser.

<Scope of work of the Japanese side>

1) Provision of consulting services including implementation designing, assistance in tender procedures and supervision of construction work
2) Procurement of all equipment, materials and labor necessary for constructing the facilities described in the Basic Design Study (B/D).
3) Implementation of marine and land transportation of imported equipment and materials necessary for constructing the facilities described in the Basic Design Study (B/D) and payment of export insurance expenses thereof.
4) Implementation of quality inspection necessary for constructing the facilities and procuring the equipment.

2-2-4-4 Consultant Supervision

In carrying out the work, it is necessary to appropriately prepare the communication system among parties concerned of the Suriname side, the consultant and the contractors, the equipment and materials, vehicles, offices, etc. necessary for construction supervision, and various procedures, timing and control method concerning quality management shall be also adequately planned. Furthermore, in planning staffing, the engineering level, deployment, the number of engineers, organization, etc. shall appropriately be planned by carefully examining about resident supervisor, spot supervisors, locally-employed assistants, etc.

(1) Basic policies

1) After concluding the agreements for consultancy services with the government of Surinam, the consultant shall conduct field surveys and discussions in detail with the Fishery Division, the Ministry of Public Works, and the MAS.

2) The consultant shall prepare in Japan detailed design (D/D) drawings, tender specification, structural calculation, bill of quantities, and any other drawings and documents necessary for tendering, and submit license-related documents to the parties concerned of the Suriname side for their approval.

3) Following completion of tender documents and approval thereof by the Ministry of Agriculture, Animal Husbandry and Fisheries, contractors shall be selected through adequate pre-qualification, tendering, and tender evaluation procedures.

4) After concluding the contracts for the construction/procurement between the government of Suriname and the contractors, the consultant shall check shop drawings submitted by the contractors, confirm the facility and equipment specifications, and conduct plant inspection and test operation if necessary, in Japan. In addition, as for the equipment to be procured, pre-shipment inspection shall be conducted by a third party.

5) In Surinam, the supervising engineers to be dispatched shall carry out general supervising works involved in the work, such as selection of local contractors, regular meetings with the parties concerned, work and quality control tests, onsite inspection of the work completed, preparation of management reports, etc. These supervisors shall report to the relevant organizations of the Japanese government as necessary.

(2) Points to be noted in supervision of construction work

1) Most of the construction equipment and materials to be procured shall be transported by sea. In order to prevent any possible delay in the work schedule due to the

procurement/transportation, it is important to thoroughly ensure material procurement plans, including approval of documents, fabrication periods, and delivery and shipment schedules.

2) In carrying out the construction, it is necessary to place emphasis on safety assurance in construction on rivers using work boats and in work areas on waters, and conflict with other vessels, fishing boats, etc. during the transportation of materials.

3) In light of the highest daytime temperatures in the country, frequently exceeding 30 degrees Celsius, it is essential to secure and stabilize the quality of concrete by the consistent ascertainment of its casting management and cure.

4) Since the annual number of rainy days in Paramaribo is large and therefore it is humid in the city, it is vital to ensure the number of workable days and pay due attention to process supervision.

(3) Supervision of Construction Work

1) The project manager shall cooperate with the resident supervisor to supervise the work and management system of contractors, construction drawings, and procurement and transport plans of equipment and materials, etc.

2) The materials and equipment to be procured in Japan shall undergo factory and preshipment inspections by the personnel in charge on the Japanese side.

3) In this Project, there are many parties involved as the Suriname counterparts, i.e. the Fishery Division, the Ministry of Public Works, the Suriname MAS, and the city of Paramaribo. Therefore, it is important to hold regular meetings with the personnel in charge at each related ministry or department to confirm the operating schedule and coordinate role sharing among the organizations.

(4) Plan for implementing design and construction supervision

1) Implementing organization for designing

The personnel engaged in the Basic Design Study shall take initiatives in carrying out field surveys, preparation of tender documents, and tender supervision necessary for the construction of facility and procurement of equipment, based on the basic design policies. The key personnel shall be deployed in three positions: the team leader, personnel in charge of civil engineering A, and personnel in charge of architecture, and they are accompanied by the personnel in charge of civil engineering B, architectural structure, electricity, facilities and equipment, cost estimation and tendering, all of who are assigned to the detailed design works.

2) Construction supervision organization

It is necessary to smoothly carry forward relatively-large-scale temporary works, such as development of the ground segment, including replacement of the surface soil for construction roads and temporary yards within the project site, and preparation of temporary steel Jetty for on-water works, prior to the outset of the actual works. The permanent construction supervisor must also supervise these initial temporary works in an appropriate manner. Furthermore, since the main works contain a variety of contents, consisting of civil engineering including on-water works for the landing jetty, access jetty, revetment, etc., building works for an ice-making and storage building on the jetty and four buildings on land, and incidental works for installation of receiving tanks, septic tanks, and housing for underground gasoline tanks and other exterior works, in addition to the permanent personnel, spot supervisors shall be dispatched as technical assistants for minimal periods of time as necessary. Table 2-29 below is a plan of construction supervision responsibilities.

Table 2-29 Responsibilities of Construction Supervisors

Supervisor	Period of time dispatched (Unit: month)	Responsibility
Permanent personnel	9.50	To be stationed in Suriname throughout the entire construction period to supervise the construction works. (Building specialist)
Engineer in charge of civil engineering	0.96	Spot supervision: 12 days for starting construction of jetty, 10 days for interim inspection, 7 days for final inspection
Engineer in charge of architecture	0.73	Spot supervision: 6 days and 9 days for interim inspections, 7 days for final inspection
Engineer in charge of facilities	1.00	Spot supervision: 30 days for completion of construction
Total	12.19	

The time and periods of each supervisor shall be defined as follows:

Engineer in charge of civil engineering

- Commencement of jetty construction: 12 days (at the time of starting pile driving of steel pipes)

  When starting pile driving of steel pipes in the A part of the access jetty by on-water works, the supervisor shall verify how the steel pipe piles are installed onto the support layer, the pile driving accuracy, and welding works of joining piles, etc. Also, the supervisor shall be responsible for the situation of use of the water areas and security and management of the safety of the on-water works. Finally, any considerations to be noted with regard to the pile driving work must be forwarded to the permanent supervisor.

- Interim inspection: 10 days (at the time of starting casting of upper structure concrete in the A part of the access jetty)

  Because an ice-making and storage building with a steel-frame structure is to be constructed in the A part of the access jetty, it is vital to carry out highly-accurate works for concrete casting and electricity and water pipeline laying. For this reason, the supervisor shall verify the arrangement of reinforcing bars and the casting method before actually casting concrete for the upper structure in the A part. Any necessary matters to be noted concerning the supervision on all the other concrete works shall be, similarly to steel pipes, transferred to the permanent supervisor.

- Final inspection: 7 days (at the time of completing civil works)

  The supervisor shall perform final inspection on all civil works for the landing jetty, access jetty, revetment, etc.

Engineer in charge of architecture

- Inspection on facility-related works: 30 days

  The architecture engineer shall provide technical assistance to the permanent supervisor with regard to interim onsite inspection of the frame work completed for the building facilities, commencement of concrete precasting, and final completion inspection.

Engineer in charge of facilities

- Inspection on facility-related works, etc.: 30 days

  The facility engineer shall undertake onsite verification of necessary inspections and tests for special equipment, including ice-making machines and the chilled room, the fueling station and water-supply facility on the jetty, and any other facilities to be provided under the project and also preparation for completion of the facilities to be performed by the permanent supervisor.

3) Local construction supervision organization

The construction supervision organization to be deployed at the construction site in Suriname is planned to include a local driver for the leased vehicle, which will be a key transport means of the permanent supervisor in the country, to be employed for 9.5 months. As for the transport means of spot supervisors, the leased car of the permanent supervisor shall be shared. Presented in Figure 2-8 below is an organization for construction supervision in the project.

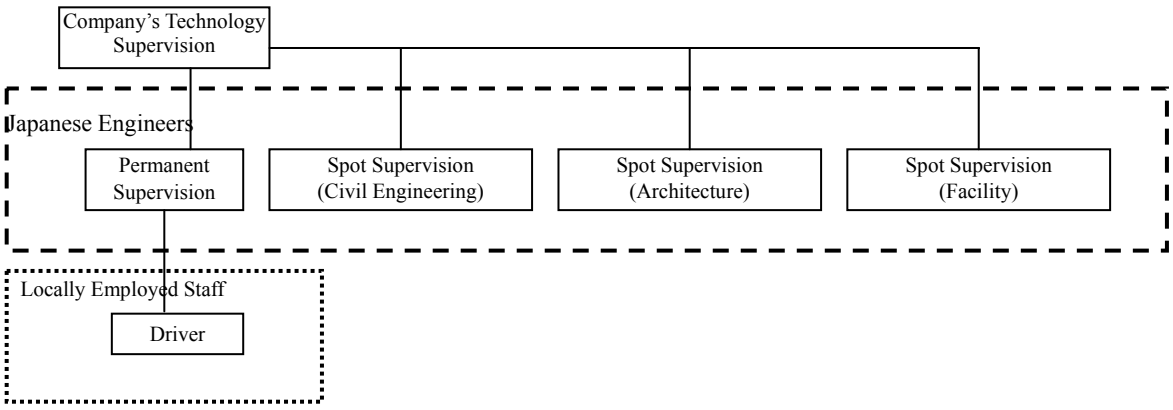


Figure 2-8 Organization for Construction Supervision

2-2-4-5 Quality Control Plan

This Project is implemented based on the following concepts, in terms of quality control, to ensure the quality and durability of the facilities to be provided by the Project.

1) The design documents clearly define the standards and attributes of materials to be referred to as reference indices for quality control.
2) For the purpose of securing the quality, the design documents must indicate how to control quality in major works in the construction plan, under construction.
3) A statistical method shall be adopted to monitor and confirm the work quality so as to make it easier to control the quality and implement corrective actions at different work stages.
4) In handling concrete, it is necessary to give consideration to distribution of particle sizes, compressive strength and concentration of salt, and to mixing and ambient temperatures at the time of laying the concrete, in light of the fact that the construction site belongs to the tropical climate with high temperature and heavy rain.
5) The accuracy of installation position and quantity and bearing power of steel pipe piles at the pier must carefully be ascertained and controlled, since they are installed to soft ground by large-scale heavy machines from temporary Jetty on land and barges on river.

Table 2-30 Major Points to Be Confirmed

Classification	Item	Detail	Arrangement of Control Results
Concrete	Compressive Strength	Compressive Strength at 4 weeks	Preparation of Control List
	Slump, Air Volume	Every Casting Day	Preparation of Control List
	Temperature	Casting Temperature	Preparation of Control List
	Salt Content	Every Designated Lot	Preparation of Control List
Replaced Sand	Particle Size Distribution	Particle Size Accumulation Curve	Examination Result Table
	Work Progress	Measurement of Work Progress	Work Progress Inspection Table
Roadbed (Quarrying)	Particle Size Distribution	Particle Size Accumulation Curve	Examination Result Table

2-2-4-6 Procurement Control Plan

(1) Construction materials and equipment

Of all construction materials necessary to carry out the construction of facilities under the Project, those produced and available in Suriname include sand, gravels, blocks, concrete piles, etc. In addition to these, reinforcing bars, steel members, lighting apparatus, paint, etc. are also available through local agencies in the country. Out of these, materials, the materials that will require maintenance in the future, shall be considered to be locally procured with priority.

However, steel pipe piles and fender of the jetty and roof and wall materials, ice-making facilities and chilled room shall be procured from Japan, in consideration of security in terms of quality assurance, procurement period and durability.

Table 2-31 Procurement Place of Construction Materials and Equipment

Item	Procurement Place			Remarks
	Surinam	Japan	Third Countries	
[Material]				
Portland Cement	○		○	Made in Trinidad
Aggregate	○			
Concrete Blocks	○			
Steel Materials	○		○	Made in EU
Steel Pipe Piles		○		
Reinforcing Bar	○		○	Made in EU
Form Timber	○		○	Made in EU
Roof Materials	○	○		
Exterier Wall Materials	○	○		
Steel Fittings		○		
Tiles	○		○	Made in EU
Coating Materials	○		○	Made in EU
Lighting Equipment	○		○	Made in EU
Wiring Materials	○		○	Made in EU

Item	Procurement Place			Remarks
	Surinam	Japan	Third Countries	
Sanitary Equipment	○		○	Made in EU
Piping Materials	○		○	Made in EU
Water Receiving Tank		○		
Standby Generator		○		
Ice-making and Refrigerating Facilities		○		
[Construction Equipment]				
Bulldozer	○			
Dump Truck	○			
Back Hoe	○			
Crawler Crane	○			
Vibratory Hammer	○			
Diesel Hammer	○			
Truck Crane	○			
Spud Pile Installed Vessel	○			
Flat Vessel	○			
Ratio (%)	54.0%	46.0%	0.0%	

(2) Equipment

The equipment to be procured in the Project is not manufactured in Suriname but imported from overseas. In particular, spring scales are constantly sold in the country, henceforth, they are available in various standards and sufficient inventories and there is no problem in locally procuring these scales. Nevertheless, since there is no local distributor of the machines or, even if there is, it is only available in a very small quantity and its quality is poorly guaranteed as for other equipment, they as well as spring scales shall be procured from either Japan or third countries.

Table 2-32 Procurement Place

Name of Equipment	Procurement Place			Remarks
	Surinam	Japan	Third Countries	
Insulated Container for fish and ice			○	Canada
Plastic Fish Container		○		
Freshness Meter			○	England
pH Meter		○		
Thermometer		○		
Spring Scale		○		
Platform Scale		○		
Handy Pallet Truck		○		
Pallet		○		
Ratio(%)	0%	45.1%	54.9%	

2-2-4-7 Operational Guidance Plan

The equipment to be procured in the Project includes plastic containers for fish and ice to be used for landing and storing catches, scales, pallets, pallet trucks, and inspection apparatus for checking the quality of the catches. All of these are already used in the existing fishery center and the laboratory of the Fishery Division, therefore, it is deemed unnecessary to provide training for initial operation or operation instruction.

However, as for handling, routine inspection and collection of refrigerant for ice-making facilities and chilled room, refrigeration engineers and electricians engaged in the construction work shall provide technical instruction at the completion of test run of the facilities, targeting the staff of Fishery Division and workers at local private fridge manufacturers who will be in charge of maintaining and repairing the cooling facilities.

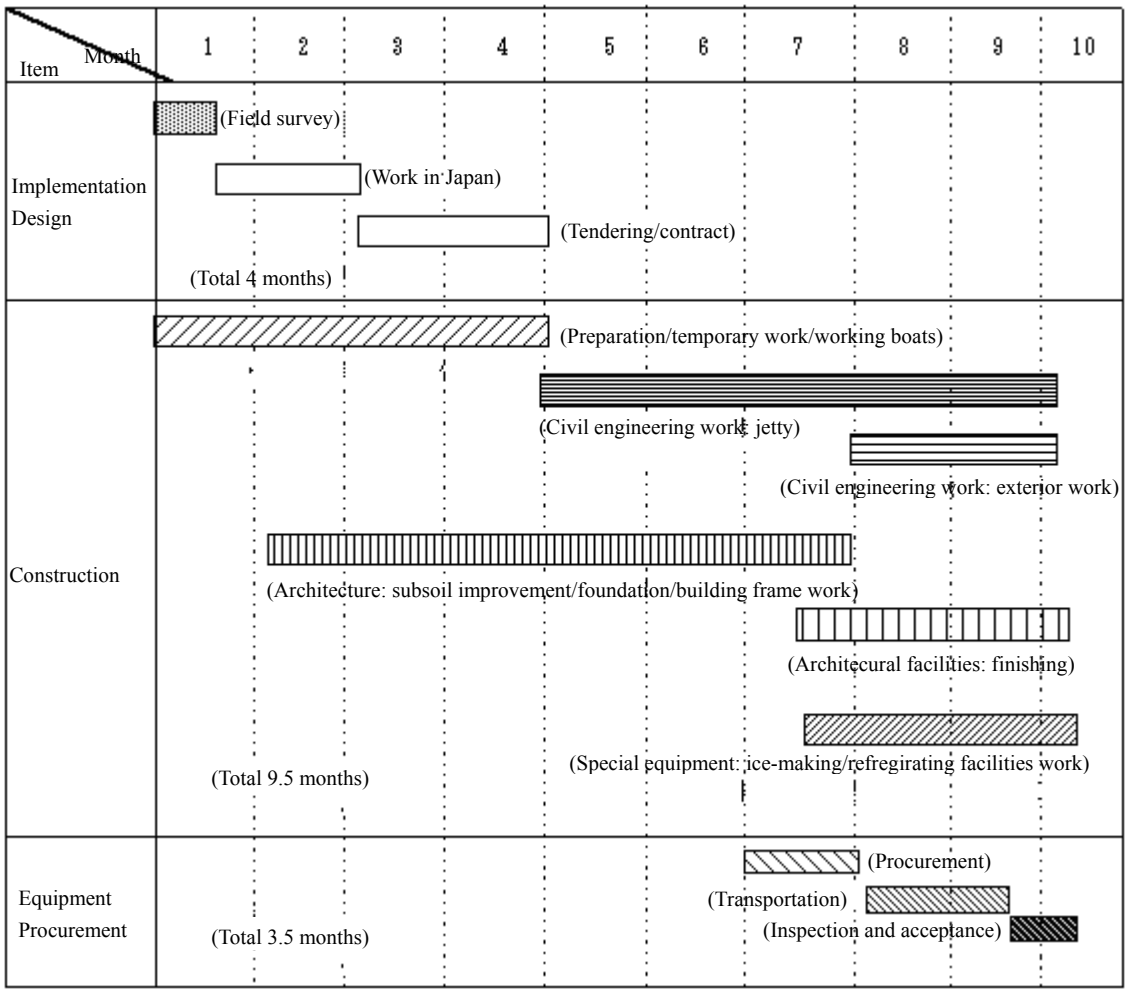
2-2-4-8 Soft Component (Technical Assistance) Plan

The Fishery Division, as one of the implementing agencies of the Project, considers it unnecessary to plan soft component projects since they have experience in operating equipment of the same scale as the fishery-related facilities to be provided in the Project. Accordingly, soft component will not be implemented.

2-2-4-9 Implementation schedule

This Project is expected to require four months for the implementation design, covering detailed design drawings and tendering, 9.5 months for approval of drawings, construction work and inspection after signing the contractor contracts, and 3.5 months for procurement of the equipment.

Table 2-33 Implementation Schedule



2-3 Obligations of Recipient Country

Matters to be shared by Suriname are as follows:

1) Securing and land preparation of the site where the project facilities are expected to be constructed.
2) Securing of sites associated with construction works of this project including the stock yard for construction, the site for the local office, and the soil dump bank.
3) Taking of measures for restricting entry into the project site during the construction works.
4) Obtainment of all permits and approval required in Suriname in association with implementation of the project and construction works and bearing of expenses required for the permits and approval.
5) Conclusion of Banking Arrangement (B/A) required for implementation of the project; prompt procedure for issue of Authorization to Pay (A/P); and payment of bank commissions required.
6) Bearing of expenses required at ports for discharging and customs clearance of products to be used in this project and implementation of prompt tax exemption procedures and customs clearance.
7) Implementation of measures for exemption of all taxes and other charges on Japanese citizens and Japanese corporations of products and services procured in association with this project.
8) Necessary facilitation of immigration and stay in Suriname required for Japanese citizens to pursuit their work associated with services to be provided based on the authenticated contract.
9) Bearing of any other required expenses of items required for implementation of the project that are not covered by the grant aid provided by the Japan government.

2-4 Project Operation Plan

(1) Administrative Structure

The Fisheries Department will be responsible for operation and maintenance of the project facility, the Paramaribo Small-scale Fisheries Center, under the supervision of the Ministry of Agriculture, Animal Husbandry and Fisheries as a public institution of the Suriname government.

The Fisheries Department will designate and dispatch one manager for the Paramaribo Small-scale Fisheries Center out of its office staff. The manager will be responsible for the comprehensive operation and maintenance of the Paramaribo Small-scale Fisheries Center. The major duties of the manager include formulation of business plans and submission to the Director

of the Fisheries Department, personnel management of office staffs, facility management, financial management and formulation of annual returns. The office staffs other than the manager are expected to be recruited from the public similarly as the office staffs for the Commewijne Small-scale Fisheries Center.

The businesses conducted by the Paramaribo Small-scale Fisheries Center are sales of ice, fuel, lubricating oils, and clear water and operation of Jetty, chilled room, and the fishing gear mending area. In addition, quality inspection will be performed by staffs of the Quality Control Division of the Fisheries Department and the statistical survey will be performed by staffs of the Statistical Survey Division of the Fisheries Department at the site for catches landed and brought to the Center.

The Paramaribo Small-scale Fisheries Center is expected to be operated based on a self-financing system in principle and funded by the profits obtained from sale of ice, fuel, lubricating oils, and water and usage charges for Jetty, chilled room, and the fishing gear mending area. the Center will open its own account and its profits will be appropriated to the expenses for maintenance and repair of the whole facilities in principle. However, the business plans and accounting audit will be guided and supervised by the Fisheries Department. In addition, any large amount of expenses exceeding the annual budget of the Center and the budget of the Fisheries Department, if incurred, are expected to be covered by the budget of the Ministry of Agriculture, Animal Husbandry and Fisheries.

Figure 2-9 shows an organization chart (draft) of the Paramaribo Small-scale Fisheries Center.

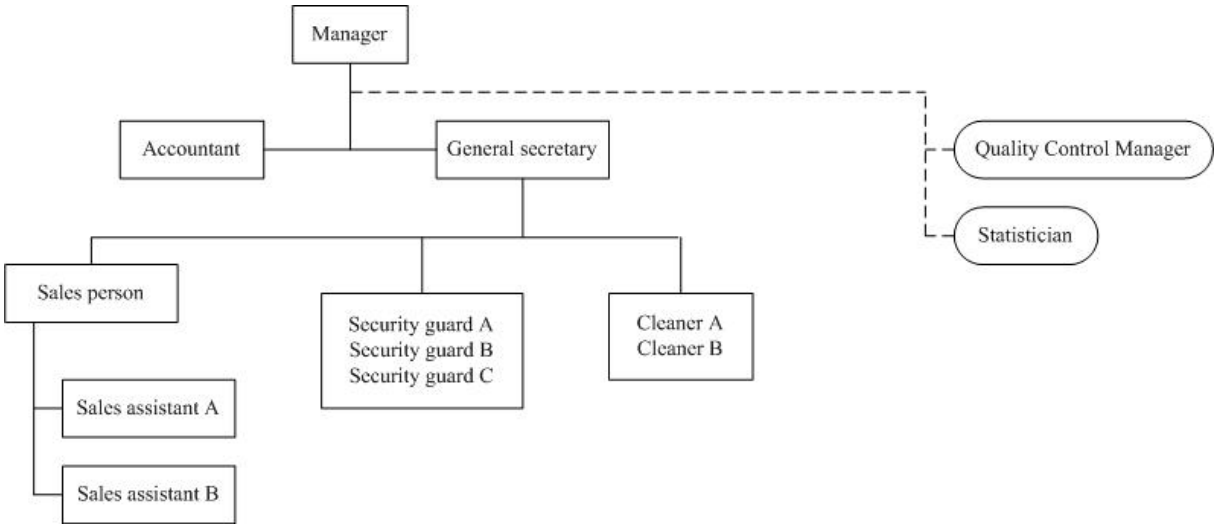


Figure 2-9 Organization Chart of the Paramaribo Small-scale Fisheries Center

(2) Operational Income and Expenditure

With the annual operational revenue of the Paramaribo Small-scale Fisheries Center after the implementation of the project estimated as SRD 993,974.00 and the annual operational expenditure as SRD 712,384.00, the Center is expected to yield an annual profit of SRD 281,589.00. With maintenance/repair cost and depreciation costs for the facilities included in the expense items, no problems are found in the operation of the facilities in respect of sound financial operation and securing of budgets expected to be required in future for large-scale replacement of facilities/equipment and the replacement works.

Table 2-34 Estimated Operational Income and Expenditure

(Unit: SRD)

Expense Item	Annual Total	(%)	Remarks
Total Revenue	993,974.00	100.0	
(1) Sale of ice	829,440.00	83.4	*
(2) Fuel sales commission	98,496.00	9.9	*
(3) Sale of water	3,830.00	0.4	*
(4) Jetty usage charge	28,800.00	2.9	*
(5) Usage charge for insulated container for fish and ice	23,040.00	2.3	* (If stored in the chilled room)
(6) Usage charge for plastic container for fish & ice	5,760.00	0.6	* (If stored in the chilled room)
(7) Usage charge for fishing gear mending area	4,608.00	0.5	
Total Expenditure	712,384.00	100.0	
(1) Personnel expenses	110,700.00	15.5	*
(2) Office maintenance expenses	6,000.00	0.8	Twice the expense of the Commewijne Fisheries Center (for the former half of the year during the term from fiscal 2003 to fiscal 2006)
(3) Electricity charges	203,774.40	28.6	*
(4) Water supply charges	41,184.00	5.8	*
(5) Taxes	149,096.00	20.9	15% of the total revenue
(6) Expenses for maintenance / repair of facilities	80,000.00	11.2	Twice the expense of the Commewijne Fisheries Center (for the first term of fiscal 2003 to fiscal 2006)
(7) Depreciation costs	121,630.00	17.1	*
Balance	281,589.00		

* (See “Basis for Calculation”)

Basis for Calculation:

[Revenue]

(1) Sale of ice

Unit price SRD 0.16/kg (4.00/25kg) × 4,500kg/vessel × 4 vessels/day × 288days
= 829,440.00/year

(2) Fuel Sales Commission

Commission SRD 0.06/l × (600 l/vessel × 8 vessels + 300 l/vessel × 1 vessel) × 288 days
= 98,496.00/year

(3) Sale of Water

Unit price SRD0.0035/l × (400 l/vessel × 8 vessels + 600 l/vessel × 1 vessel + 300 × 1 vessel) × 288 days = 3,830.00/year

(4) Jetty usage charge

Unit price SRD 10.00/vessel × 10 vessels/day × 288 days=28,800.00/year

(5) Usage charge for insulated container for fish and ice

Unit price SRD 10.00/box×8 boxes/day×288 days=23,040.00/year

(6) Usage charge for plastic container for fish & ice

Unit price SRD 1.00/box×20 boxes/day×288 days=5,760.00/year

(7) Usage charge for fishing gear mending area

Unit price SRD 4.00/ (1/4 block) × 4 blocks × 288 days=4,608.00/year

[Expenditure]

(1) Personnel expenses

The monthly base salary amount for office staffs will be calculated as 125% of the base salary amount for office staffs of the Commewijne Fisheries Center as of fiscal 2005. In addition, 50% of the base salary amount will be posted as benefits and special reward.

Table 2-35 Breakdown of Staff Salary

(Unit: SRD)

Post	Monthly salary amount	Annual Total
Base salary amount		
Manager (dispatch allowance)	500.00	6,000.00
General secretary	700.00	8,400.00
Accountant	700.00	8,400.00
Sales	750.00	6,000.00
Sales assistant A	500.00	6,000.00
Sales assistant B	500.00	6,000.00
Cleaner A	500.00	6,000.00
Cleaner B	500.00	6,000.00
Security guard (A,B,C: 3 persons)	1,500.00	18,000.00
Base salary amount Subtotal	6,150.00	73,800.00
Benefits, special reward, etc.	3,075.00	36,900.00
Total personnel expenses		110,700.00

(2) Office maintenance expenses

Twice the average monthly expenses of the Commewijne Fisheries Center for the former half of the year during the period from fiscal 2003 to fiscal 2006 will be posted as the monthly office maintenance expenses of the Paramaribo Small-scale Fisheries Center including communication expenses, office supplies, office equipment, expendable supplies, copy expenses, etc.

(Average monthly expenses for the former half of the year during the term from fiscal 2003 to fiscal 2006) approximately SRD 250.00/month×12 months×2.0=6,000.00

(3) Electricity charges

Calculated for ice-making machines, chilled room, and office equipment.

Table 2-36 Breakdown of Electricity Charges

(Unit: SRD)

Breakdown	Unit price/KWh	Electrical load	Operation hours/day	Daily cost	Annual subtotal
Ice-making machine	*0.15	140KWh	24.0	522.84	188,222.40
Chilled room	0.15	2 KWh	24.0	7.20	2,592.00
Office equipment (including air-conditioning, lighting, outdoor light, and pumps)	0.15	40 KWh	12.0	36.00	12,960.00
Annual total					203,774,40

Remarks: *The unit electricity rate for ice-making machines includes daily electricity amount (SRD14.14/day) and monthly base rate (SRD4.70/day).
Calculated on the basis of 30 days a month, 12 months a year.

(4) Water charge

Table 2-37 Breakdown of Water Charges

(Unit: SRD)

Breakdown	Unit price/ 1 m^3	Consumption/day (m^3)	Annual Subtotal
Water supply for fishing boats	3.25	4.20	4,914.00
Water for ice-making	3.25	22.00	25,740.00
Water for office, toilet, etc.	3.25	9.00	10,530.00
Annual total			41,184.00

Remarks: Calculated on the basis of 30 days a month, 12 months a year.

(5) Taxes

15% of the annual total revenue posted: SRD 993,974.40×0.15=149,096.00

(6) Expenses for maintenance/repair

Twice the average monthly expenses of the Commewijne Fisheries Center for the former half of the year during the term from fiscal 2003 to fiscal 2006 will be posted as the average monthly expenses of the Paramaribo Small-scale Fisheries Center.

Annual expenses: Approximately SRD 40,000.00×2=80,000.00

(7) Depreciation

The depreciation expenses are computed with major components of the ice-making equipment and chilled room as equipment subject to depreciation by using 10-year fixed installment method.

Major components:

1) Ice-making equipment			
Ice-making machine body	2 units	JP¥	40,000,000
Refrigeration compressor	2 units	JP¥	3,000,000
Condenser	2 units	JP¥	8,000,000
Auxiliary pumps	4 units	JP¥	600,000
2) Chilled room			
Cooling unit	2 units	JP¥	700,000
Total		JP¥	52,300,000

Depreciation costs:

(JP¥52,300,000.÷10 years) ÷ JP¥ 43/1SRD = SRD 121,630.00/year

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The project cost required for implementation of the relevant grant aid project by the grant aid scheme of Japan is estimated as 860 million yen and the breakdown of expenses shared by Suriname and Japan based on the cost sharing classification between the two countries is estimated as follows. This cost estimate is provisional, not necessarily indicating the grant limit shown in the Exchange of Notes, and would be further examine by the Government of Japan for approval of the Grant.

(1) Expense shared by the Japanese side

Estimated project cost Approximately 821 million yen (undecided)

Breakdown of the Estimated Project Cost

Expense Item				Estimated Project Cost (Million Yen)		
Facilities	Civil facilities	Landing jetty		200		
		Access jetty		138		
		Revetment		8	346	
	Building facilities	Management building	Office, meeting room, staff room, toilets (female), kitchenette, document depository, chilled room area	109		
		Ice-making building		188		
		Security guard and power-receiving building		18		
		Public toilet		13		
		Premises pavement, exteriors		60		
		Fishing gear mending shed		19	407	
Equipment					5	758
Detailed design, consultant supervision, technical guidance						63

(This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant).

(2) Cost to be borne by the Suriname side is estimated as approximately;

SRD 162.219.00 (Approx. 7million yen)

1) Primary connection works for electricity, water, and telephone within the premises;
SRD 25,297.00 (Approx. 1,100 thousand yen)
2) Construction of external walls and gates within the premises and landscape planting;
SRD 125,319.00 (Approx. 5,400 thousand yen)
3) Equipment to be placed inside the facilities such as furniture and furnishings;
SRD 11,603.00 (Approx. 500 thousand yen)

4) Expenses associated with supply and carrying in of gasoline tank, service tank;

SRD 0.00 (0 thousand yen)

Fuel tanks and dispenser, which are provided by private fuel companies on the Suriname side, are not estimated, because the fuel reserve tank, transfer pump(s), service tank and vender shall be supplied by the private oil company in Paramaribo.

(3) Estimation conditions

1) Point in time of estimation: End of August 2006

2) Foreign exchange rate: 1US$ = 116.77 yen
1SRD = 43.09 yen

3) Construction period: The period for detail design and construction for Phase I Construction is as shown in the construction schedule.

4) Other conditions: The estimation is based on the assumption that the project is implemented in accordance with the grant aid scheme of the Japan government.

2-5-2 Operation and Maintenance Cost

While the Paramaribo Small-scale Fisheries Center is basically expected to be operated and maintained smoothly, it is desired that the expenses for appropriate replacement of the facilities and equipment shown in Table 30 be secured with depreciation costs appropriately posted.

Table 2-38 Rough Estimation of Time and Expenses for Replacement of Major Facilities/Equipment

(Unit: SRD)

Name of Facilities/Equipment	Approximate Time of Replacement	(Approximate) Estimated Replacement Expense
Ice-making facilities/equipment, chilled room equipment (subject to depreciation)	10 years later	SRD 121,630.00
Water supplying pump	5 years later	SRD 10,000.00
Pump for septic tank	5 years later	SRD 10,000.00
Equipment (insulated container for fish and ice, plastic container for fish & ice, scales, and pallets)	5 years later	SRD 80,000.00

Remarks: Given the operation hours considered short, the standby generator is not included in the equipment subject to depreciation.
Fuel tanks and dispenser, which are provided by private fuel companies on the Suriname side, are not included in the equipment subject to depreciation.

2-6 Other Relevant Issues

This project is planned as a single-year project in accordance with the scheme of Japan's grant aid assistance, and hence the implementation period is limited. It is preferred to allocate sufficient period of time for the construction works included in the project, by carrying out, as promptly as possible, conclusion of the B/A, issuance of the A/P, acquisition of necessary permissions and licenses for building construction, and the like, all of which are to be undertaken by the Surinamese side.

In addition to the above, Surinam's undertakings are planned to include smooth customs clearance and process of tax exemption procedures for the construction equipment and materials at the time of starting the works, procurement of materials associated with the fuel station to be provided by the Surinamese side in the latter half of the project, and lastly introduction of power and water lines that are indispensable for completion of the works. Therefore, in implementing this project, it is considered essential for the implementing agencies, namely the Surinamese Ministry of Agriculture, Animal Husbandry and Fisheries and the Fisheries Department therein, the consultant, and the contractors to prepare an implementation schedule as detailed and precise as possible in order to clearly state the demarcation of the responsibilities between Japan and Surinam, communicate with each other to be on the same track regarding the progress of the project, carry forward the project in a smooth manner, and ensure all the works will be completed within the predetermined schedule. Especially, the Fisheries Department, consultant and contractors are expected to organize weekly or monthly meetings, and request to each of the related parties of the Surinamese side, such as the Ministry of Public Works, the MAS, the city of Paramaribo, Surinam's electricity company (EBS), water company (SWM), etc., for appointment of a person in charge of the project, so as to establish a close mutual communication route and thereby prevent any delay or redo of the works.

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3
PROJECT EVALUATION AND RECOMMENDATION

3-1 Effects of the Project

The project is expected to bring the following effects and improvements.

Current status and issues	Measures taken by the project	Direct effects and degree of improvement	Indirect effects and degree of improvement
In Paramaribo, the landing bases where artisanal fishing boats can unload their catches are dispersed in 17 locations. These are all not sufficiently equipped with the mooring function and other functions necessary for preparation for fishing. Thus, it is difficult for artisanal fishers to carry out smooth fishing activities.	• To construct a jetty for landing and preparation for fishing. For landing: 3 berths For prep.: 2 berths Total length: 77m • To procure and install an ice-making machine (20 tons/day), an ice storage (6 tons), a fueling station, and a water-supplying facility. • To procure and install a chilled room (to keep the catches at a chilling temperature)	• The constraints in terms of waiting for tides, waiting for landing bases to be available, etc. shall be mitigated. The time it takes to land catches will be shortened from app. 2 hours to 1 hour. • The time it takes to load ice will be shortened from app. 4 hours to 2 hours. The time for preparation for fishing will also be shortened from app. 2 hours to 1 hour. • The catches that cannot immediately be shipped or delivered after landing will have better quality and lower price.	• The efficiency of loading and shipping works of fish traders and fishery product processing and exporting companies will be improved. • By establishing a landing facility that satisfies the Fish Inspection Act and the quality control standards called for by the Western countries, the activities of Surinamese fish traders and fishery product export processing vendors will be strengthened. • The project will contribute to income generation of the artisanal fishers.
Surinam's Fish Inspection Act and the quality control standards demanded by major Western export partners are not met in the actual fishery product handling.			
The artisanal fishers based in Paramaribo are unable to easily procure ice.		• The target boats will be able to procure ice all the year round. • Provided that the conditions of decreasing stock of resources and climate, the number of trips by the artisanal fishers covered in this project will increase by 1 or 2 times/boat, thereby increasing the amount of fish catch.	• The artisanal fishers covered in this project will be highly motivated. • The project will contribute to an increase in the revenue of the artisanal fishers covered in this project and the acquisition of foreign currency due to the resulting increase in the export amount.
Statistics and quality inspection activities are difficult because landing bases are dispersed.	• To construct a management building where an anteroom for statisticians and quality inspectors and a sensory laboratory are provided and to procure simple sensory inspection instrument.	• Statistics and quality inspection works in the landing bases will become significantly easier and the accuracy of statistics and inspection data will improve accordingly.	• The project will enable surveys on the current status of artisanal fisheries, improvement in statistics management works, and provision of adequate and effective information and guidance to fishers, in order to realize the "Sustainable development of fisheries" that the government of Suriname strives for.
Wastes from public toilets and landing bases and waste oil are disposed without any appropriate treatment due to the lack of appropriate collection facilities.	• To construct public toilets and septic tanks and install collection boxes and containers for garbage, waste oil, etc. within the Center.	• The sanitary environment for artisanal fishers will be upgraded, enabling appropriate treatment of wastewater and collection and disposal of garbage, waste oil, etc.	• The project will contribute to conservation of the natural environment of the Suriname River and prevention of water contamination.
Without a fishing gear mending area, it takes approximately 4 days to repair a fishing net.	• To construct a fishing gear mending area with a roof (5m × 10 m × 4 yards).	• The working environment under extreme weather conditions, such as hot sunshine and heavy rain will be improved. The time required to repair a fishing net will be shortened from app. 4 days to 2 days.	• The project will contribute to motivation of artisanal fishers by improving their working environment.

In formulating indicators to evaluate outcomes of the Basic Design Study, a baseline assessment was carried out, by referring to data possessed by the statistic section of the Fisheries Department, interviews with fishers and shipowners based in Paramaribo, survey on ice-making capacity of the existing ice-making equipment, documents related to discussions with stakeholders, information collection and analysis, survey on the status quo of activities by artisanal fishing boats and artisanal fishers in existing landing bases and the Commewijne Fisheries Center.

The following tables summarize the current status and outcome indicators considered as appropriate to measure the improvement brought about by the project implementation, along with the information sources.

(i) Time taken by the target boats for landing and preparation

Current status	After the Center is developed
Landing (SK-OG type boat): app. 2 hours on average	app. 1 hour
Procurement and loading of ice: 4 hours to 1 day or more on average	app. 2 hours
Procurement and loading of fuel and water: 2-4 hours on average	app. 1 hour

Source: Data from the Fisheries Department, Survey on the status quo of fishing activities in existing landing bases and the Commewijne Fisheries Center (statistics), Interviews with fishers and shipowners

(ii) Period the target boats can procure necessary ice

Current status	After the Center is developed
4 months	12 months (all the year round)

Source: Survey on ice-making capacity of the existing ice-making equipment (12 private companies, 3 public providers), Interviews with fishers and shipowners, Discussions with stakeholders

(iii) The number of fishing trips per year (an annual number of fishing trips expectedly increased due to smooth and sufficient procurement of ice enabled by the project)

Current status	After the Center is developed
SK-OG type: 15 trips/year per boat on average	16-17 trips/year per boat on average (increased by 1-2 trips/year per boat)

Source: Data from the Fisheries Department, Interviews with fishers and shipowners

(iv) Expected increase in output of fishery products due to an increased number of fishing trips of the target boats

Current status	After the Center is developed
2,646 tons/year	2,999 tons/year (increased by 353 tons/year)

Source: Data from the Fisheries Department, Interviews with fishers and shipowners

3-2 Recommendations

3-2-1 Issues to be Addressed by the Recipient Country and Recommendations

(1) Exchange of opinions with users of the Center and preparation of operation rules

The Paramaribo Small-scale Fisheries Center to be constructed will be the very first public landing facility in the city of Paramaribo. Therefore, the Fisheries Department is expected to draft a set of operational rules regarding the Center and equipment associated with it, and finalize the rules based on the mutual understanding and consensus to be obtained through explanation on the contents to future users, exchange of opinions with them, hearing their requests, etc. in advance of the opening of the Center, for the purpose of providing fair and detailed assistance in artisanal fisheries.

It is particularly important to ensure a smooth ramp-up and orderly management of the Center, by keeping everyone concerned informed of the decision-making policy on the priority of using the facilities and equipment in the Center, the method of paying various relevant charges, considerations for neighboring businesses and vessels passing in the vicinity, pollution of the natural environment, penalty provisions, etc.

(2) Formulation and implementation of adequate maintenance and improvement plans

The Fisheries Department has an experience of at least fifteen years in operation and maintenance of the Nieuw-Nickerie, Boskamp, and Commewijne Fisheries Centers. In that course, the Fisheries Department has recognized the importance of stable supply of ice, for establishing a self-support accounting system, and hence the significance of maintenance of ice-making facilities.

On the other hand, the existing fisheries centers tend to respond to an equipment failure or breakdown when it occurs and have undergone financial loss due to long hours of interruption before the recovery of the corresponding functions.

The Paramaribo Fisheries Center will be at the same time a public landing facility exclusively for artisanal fishing boats that is available for 172 target boats and the only landing facility that satisfies the facility development requirements stipulated in the Fish Inspection Act in Paramaribo. Therefore, the maintenance and security of its basic functions will have a significant impact on the activities of artisanal fishing boats, distributors, and processing companies based in the Center. Especially, development and expansion of an ice-making function is a desire that artisanal fishermen have been longing for up until now, thus, its maintenance is highly significant.

Therefore, in order to ensure that all the facilities in the Center will run in a smooth and economic manner, this project is expected to formulate a preventive maintenance plan which prevents failures and breakdowns from happening and allocate adequate budgeting, by introducing a routine and regular maintenance mechanism, a depreciation system which takes the lifespan of the equipment into account, and so on. Moreover, Paramaribo has a large amount of rainfall throughout the year and is highly humid. Further, the Suriname River that the project site faces is subject to reflow of seawater. Therefore, it is imperative to pay attention to possible rust and corrosion of the buildings and facilities resulting from salt damage, and, in particular, to implement anti-rust painting to steel parts, so as to extend their lifetime and preserve the functions.

(3) Countermeasures for environmental conservation

As for any possible impact onto the environment that the project may bring about, the Fisheries Department of Suriname has conducted an environment impact assessment and reported in a draft version of its report that there will be no significant adverse impact. In the meantime, the report mentions a possibility of impacts during the construction period and after the construction and recommends the necessity of formulating an environmental management plan as an alleviation method.

The environmental management plan is expected to stipulate implementation of countermeasures against river water pollution caused by dumping and outflow of garbage from the planned center, bilge (wastewater containing oil) from fishing vessels, and fuels handled on the jetty into the river, and performance of water quality monitoring near the project site.

To this end, the Fisheries Department must explain these considerations for the surrounding environment to the stakeholders including the users of the Center, keep them well aware of the operational rules of the Center, and strive for alleviating and preventing any negative impacts.

Moreover, it is also desirable to formulate and implement accident prevention and safety control measures, disaster prevention drill plans, and a communication system to report an accident to the MAS, the fire department, etc., as a means to respond to any emergency or contingency such as outflow of fuel into the river and fire disaster.

(4) Preparation and submission of project reports

The Small-scale Fisheries Center in Paramaribo shall be managed based on a self-support accounting system under supervision and instruction of the Fisheries Department. Therefore, the Center is expected to prepare annual reports on the operation and maintenance, the situation of use, and balance of payments of the Center, evaluate the details of operation every year, and

improve and construct an operation and maintenance system, so as to obtain stable and highly-efficient operational outcomes in the long term.

In addition, by obliging the Center to submit the above-mentioned reports to the Fisheries Department and the Ministry of Agriculture, Animal Husbandry and Fisheries, the Fisheries Department will be responsible for supervising fair and sound operation of the Center, so that they can provide adequate advice and instruction to the Center in case that correction or improvement needs to be made to the details of the management of the Center to reflect requests of the users. Furthermore, the Fisheries Department is expected to submit the same reports to the Embassy of Japan in Trinidad Tobago and JICA office in Mexico, to report the outcomes of the project provided under Japan's grant aid scheme.

3-2-2 Coordination with Technical Cooperation Projects and Other Donors

Since the artisanal fishing in Suriname lagged behind the industrial fishing that had developed centering around shrimp trawl fishing since 1960s, the government of Suriname pulled together at the beginning of 1980s artisanal fishery promotion measures aiming at fostering of artisanal fishermen living in rural coastal areas, modernization of fishing gears and boats, and effective utilization of the undeveloped bottom fish resources.

In order to embody the promotion measures, the government of Surinam, in late 1980s, started procuring fishing gear, equipment and materials and developing infrastructure for the fishing industry with technical support and assistance from Belgium, EU, Japan, and other donors. Also, they have requested dispatch of experts to provide technical guidance to artisanal fishermen about fishing gear, fishing methods, and maintenance of fishing boats as well as handling, storage and process method of landed catch.

As a result, the landing in the artisanal fishery segment increased from 4,000 tons per year in late 1980s to above 15,000 tons in 2000s.

Furthermore, for past 20 years or so, the Fisheries Department has built up ample experiences and know-how regarding operation and maintenance of small-scale fisheries centers, through actual operation and maintenance of three centers in Boskamp, Nieuw-Nickerie, and Commewijne that were developed as the infrastructure for the artisanal fishing industry. Therefore, it is considered that the Department has a satisfactory level of knowledge and technical skills necessary for operating and maintaining the Paramaribo Small-scale Fisheries Center to be constructed under the project.

For these reasons, it is deemed that, when implementing the project, there is no need for technical cooperation to be offered by other donors both during and after the construction of the Center.