

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT OF
THE FACILITIES FOR ARTISANAL FISHERIES
SUPPORT STATIONS IN KOSRAE STATE
IN
THE FEDERATED STATES OF MICRONESIA**

MARCH 1999

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Preface

In response to a request from the Government of the Federated States of Micronesia (FSM), the Government of Japan decided to conduct a basic design study on the Project for Improvement of the Facilities for Artisanal Fisheries Support Stations in Kosrae State and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to FSM a study team from September 15 to October 11, 1998.

The team held discussions with the officials concerned of the Government of FSM, 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 FSM 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 FSM for their close cooperation extended to the teams.

March, 1999



Kimio Fujita

President

Japan International Cooperation Agency

March, 1999

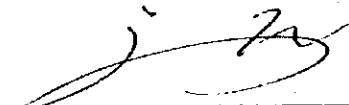
Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of the Facilities for Artisanal Fisheries Support Stations in Kosrae State.

This study was conducted by Fisheries Engineering Co.,Ltd., under a contract to JICA, during the period from September 7, 1998 to March 15, 1999. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of the Federated States of Micronesia 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.

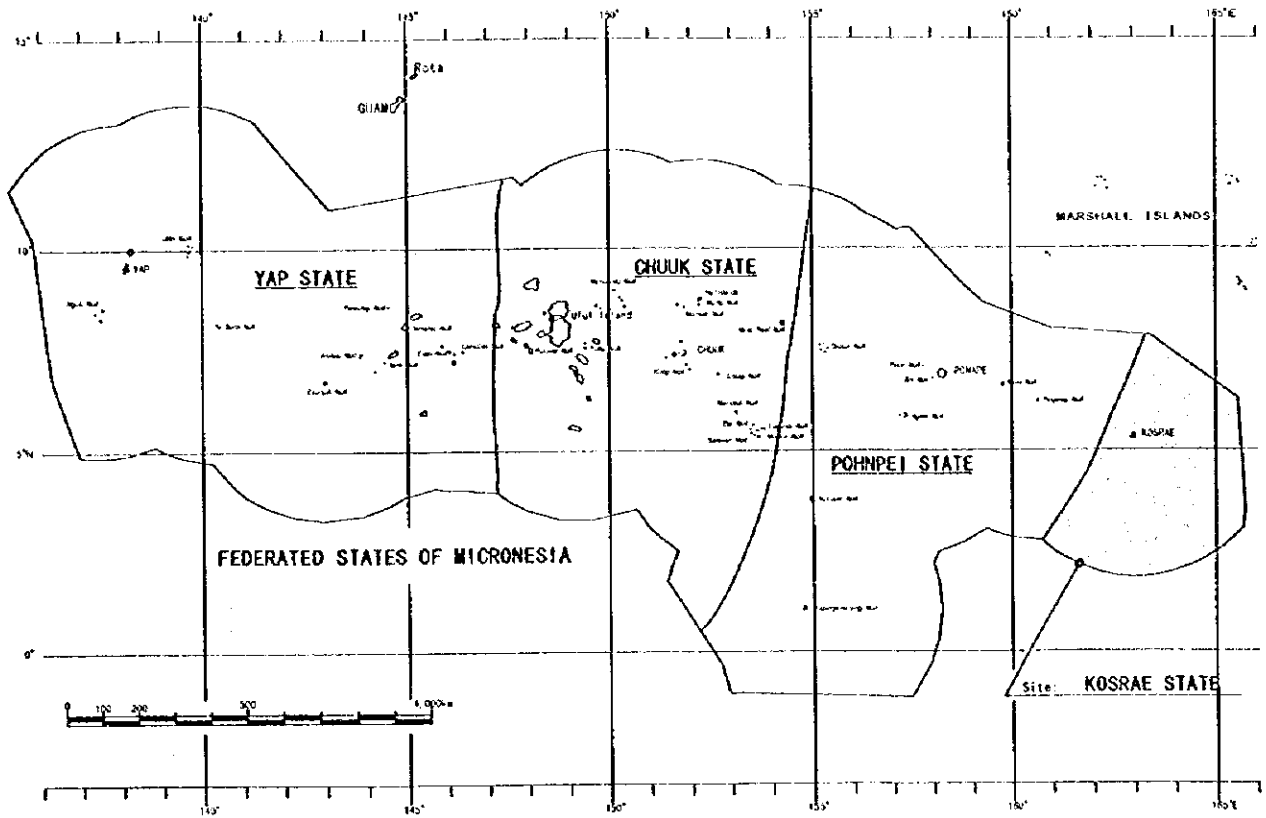
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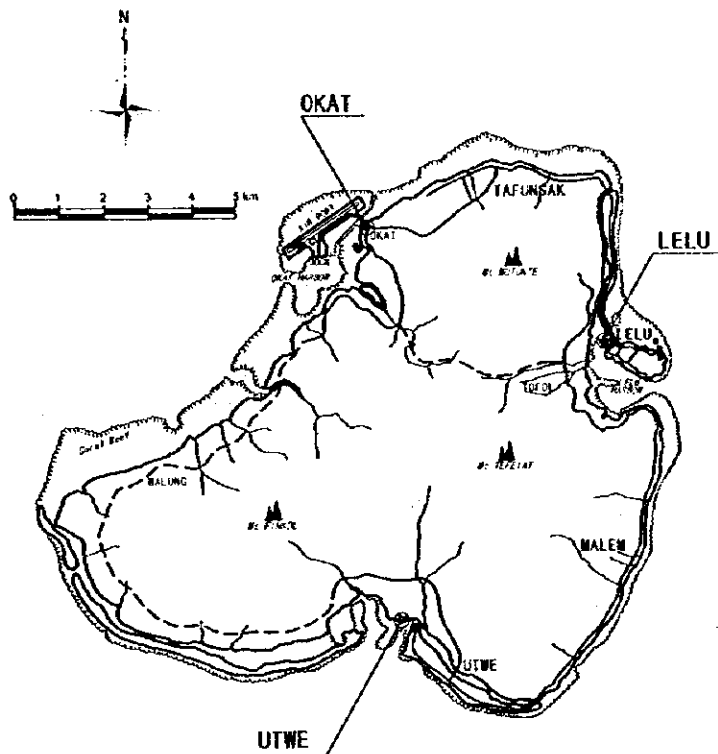
Kuniaki TAKAHASHI

Project Manager,

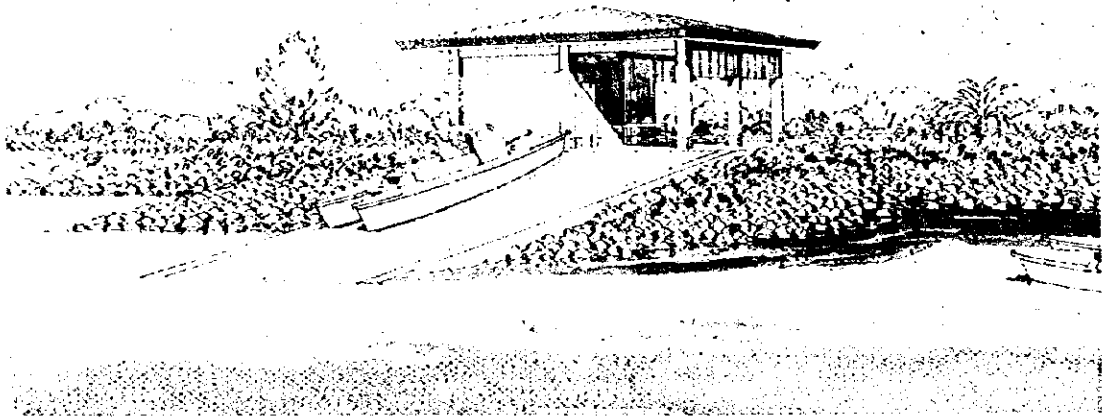
Basic design study team on the Project for Improvement of
the Facilities for Artisanal Fisheries Support Stations in Kosrae State
Fisheries Engineering Co., Ltd.



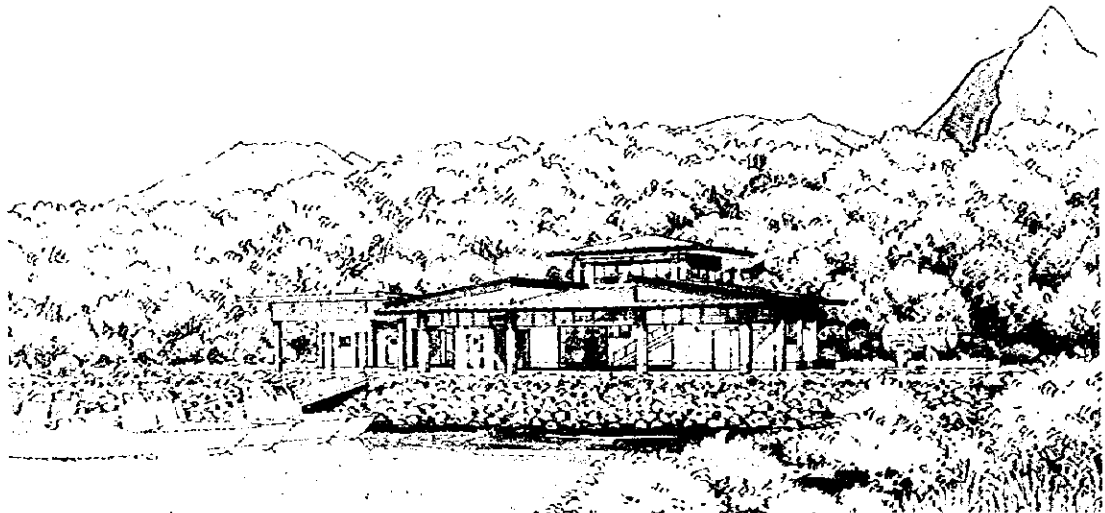
MAP OF THE FEDERATED STATES OF MICRONESIA



SITE LOCATION MAP



FRP Boat Maintenance Workshop at Lelu



Artisanal Fisheries Support Station at Okat

ABBREVIATIONS

(in alphabetical order)

- ADB : Asian Development Bank
- FAD : Fish Aggregating Devices
- FAO : Food and Agriculture Organization
- FSM : Federated States of Micronesia
- JICA : Japan International Cooperation Agency
- JOCV : Japan Overseas Cooperation Volunteers
- KIFCA : Kosrae Island Fisheries Cooperation Association *Reorganized as MFI in 1992
- KSAP : Kosrae State Action Plan
- KSV : Kosrae Sea Venture, Inc.
- MFI : Marine Foods, Inc.
- MMA : Micronesia Maritime Authority
- NFC : National Fisheries Corporation
- OFCF : Overseas Fishery Cooperation Foundation
- PTI : Pacific Tuna, Inc.

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CHAPTER 1. BACKGROUND OF THE PROJECT

The US federal assistance under the terms of the Compact of Free Association between the Federated States of Micronesia (FSM) and the United States, which had been comprised nearly half of the annual revenue of the FSM government, is worried to be drastically reduced when the agreement expires in 2001. Unless the domestic industries can be developed rapidly, there is no way to avoid a sharp decrease in the per capita GDP. The domestic industries for which is expected to increase local employment and income include the fisheries, agriculture, and tourism. Among these, the fisheries provides approximately 30% of the federal revenue in the form of fishing license fees obtained from foreign fishing boats to harvest the tuna from the economic waters of the FSM. In addition, land-based facilities to handle the fresh tuna make a considerable contribution to generating local employment and income. Fishing is also one of the most important production activities for securing essential food in the life, where the traditional subsistence economy still dominates. For these reasons, the fisheries is considered to be the most important industry for the FSM.

In Kosrae State marine products account for more than 80% of the exports. This is almost entirely the fresh tuna for transshipment by air and partly frozen products, both unloaded by the foreign fishing boats, so the income and employment opportunities for Kosrae State are furnished only by the handling business of the land-based facilities. In contrast, the artisanal fisheries play an important role in assuring a stable life of people in Kosrae, where subsistence economy is still important. Therefore, the Kosrae State Government has established artisanal fishery support stations in three locations, i.e. at Lelu, Okat and Utwe, for supporting the artisanal fishing activities. However, with these facts as insufficient preservation means for fish, inefficiency in catching fish due to inadequate boat maintenance, deteriorated mooring facilities for the fishing boats and under developed fishermen's organization are all combined, the activities of artisanal fisheries are yet to be fully developed.

Of the three artisanal fishery support stations, the Okat station is the most actively used as the location benefits from its proximity to the fishing grounds during the northeastern tradewinds season, the large numbers of people passing to and from nearby airport and commercial port, as well as the fact that it has become the terminal for sea transportation to Walung which has no overland access. Larger numbers of the fishing boats than originally planned have gathered at this site for their activities, but the measures taken to preserve the freshness of the catch are still substandard, which hampers the distribution of the fish to the local markets except for fishermen's family consumption.

About half of the fishing boats in use in Kosrae State are made of FRP catamarans driven by outboard engines provided under a Grant-aid program from Japan. These boats have been in use for more than 10 years, and many of them have become in need of repair. The damage and wear is especially noticeable on the house mounted on the deck and on the fish hold hatches. There are workshops in Kosrae that can repair the outboard engines, but no facilities to repair the FRP hulls. These situations impede the increase of the operation time of the fishing boats, which may lead to a danger of a serious decline in the activities of the artisanal fisheries, if these situations are remained unsolved.

The floating pontoons at three artisanal fishery support stations were installed 8 years ago. The severe climatic conditions in Kosrae, including high temperature and high humidity, have advanced the degradation with higher levels than usually expected. The structural members are heavily corroded, and seawater has seeped into the floats causing most of them to list, making the floating pontoons unstable. This creates a hazardous situation when the work is performed on the floating pontoons before and after fishing, and also makes it difficult to secure safety while the boats are moored.

Most of the fishermen in Kosrae have engaged in other forms of employment than fishery, and go out for fishing after or before their works, making them difficult to communicate with the other fishermen. There is also a lack of an appropriate meeting place to hold discussions between the fishermen, administrative agencies, and the management of the artisanal fisheries support stations. Inadequate communication among fishermen, and between the administrative agencies and the fishermen, retard fishermen's organization to progress, creating one of the factors to hinder the promotion of the artisanal fisheries.

In order to promote the artisanal fishing activities and to ensure the safety of the fishing boats, the FSM Government has drawn up a plan for "Project for Improvement of the Facilities for Artisanal Fisheries Support Stations in Kosrae State", with a goal of improving the capabilities of the existing artisanal fisheries support stations by renovating and expanding the functions of the facility and equipment and making effective use of the existing facilities and equipment.

The FSM Government has requested a grant-aid from the Japanese government to implement the subject project. The contents of the request from the FSM Government include the following.

Table 1.1-1 Contents of the Request from the FSM Government

Site	Facilities	Equipment
Lelu	<ul style="list-style-type: none"> •Artisanal Fisheries Support Building (300m²) Office, Meeting Rm., Changing Rm., Fish handling space, Processing Rm., Freezer(10 tons), Blast Freezer (200kg) •FRP Workshop Bldg.(124 m²) 	<ul style="list-style-type: none"> Vacuum Packing Machine Butcher's Table Water Tank Workshop Equipment
Okat	<ul style="list-style-type: none"> •Artisanal Fisheries Support Building (300m²) Office, Meeting Rm., Fishermen's Locker, Fish handling space, Workshop, Ice making machine (2 tons/day), Ice storage (14 m³) 	<ul style="list-style-type: none"> Water Tank Workshop Equipment
Utwe	<ul style="list-style-type: none"> •Artisanal Fisheries Support Building (240m²) Office, Meeting Rm., Fishermen's Locker, Fish handling space, Workshop, Ice making machine (2 tons/day), Ice storage (14 m³) 	<ul style="list-style-type: none"> Water Tank Workshop Equipment

Upon receiving the request from the FSM government, the Government of Japan has decided to conduct a basic design study on the subject project and dispatched a basic design study team to the FSM from September 15 through October 11, 1998.

The team validated the contents of the request with respect to the subject project and, for purpose of evaluating appropriateness of the plan as well as deciding the scale of the Plan facilities and equipment, carried out a field survey to gain an understanding of the fisheries conditions and problem areas in Kosrae, with particular reference to artisanal fisheries, administration of the support stations, operating plans, and maintenance management systems.

After returning to Japan, the Team analyzed the survey findings, evaluated the socioeconomic benefits that the Plan would bring to FSM, and prepared a basic design, including the optimum scale of the Plan facilities and equipment specifications. The contents of this basic design have been compiled into the Draft Basic Design Report.

In order to explain the contents of the Draft Report on the basic design, JICA dispatched a second study team to FSM from December 9 to 20, 1998.

Based on the above findings, this Report incorporates the Basic Design for the Artisanal Fisheries Support Stations which have been deemed most appropriate for Plan implementation along with a project implementation plan and project evaluation. Team members, discussants in FSM, the field survey itinerary, and the Minutes of Discussions are shown in the Appendices 1-3 following the body of the Report.

CHAPTER 2. CONTENTS OF THE PROJECT

2.1 Objectives of the Project

(1) Stable Supply of Ice

The artisanal fisheries support stations constructed under the grant-aid from Japan at Lelu, Okat, and Utwe had the initial goals to establish a fish distribution system in the Kosrae island with the Lelu station as the center to supply ice to the Okat and Utwe stations, and to distribute the catch according to the demand and supply situation in the respective areas. This is the reason why the ice-making facilities and a cold storage were provided only at Lelu, while the Okat and Utwe stations have only an insulated storage for holding ice and fresh fish. After the project had been started, management and operation of the stations have been transferred to separate organizations, which, together with differences of the fisheries conditions as well as the diversity of the fishermen's interest in each area, made it difficult to keep close coordination of the operations in these three artisanal support stations.

The operations at the Okat station, in particular, is more active than anticipated in favour of its close location to the fishing grounds during the northeastern tradewinds season, larger number of people passing by to the adjacent airport and commercial port, as well as the fact that it has become the base for sea transportation to Walung which has no land access. Furthermore, as there is no housing in the vicinity of this station, the place is suitable for mooring for many boats. There are usually 15 to 20 catamarans, 10 to 15 mono-hull fishing boats, as well as canoes closely packed together and moored to the two piers of 20 m floating pontoons, so there is almost no free space for additional mooring.

Even though there are a large number of fishing boats based on this station, the Okat facilities do not have any ice-making facilities. Most of fishermen must cross over to Lelu on the opposite side in order to obtain ice, reducing the time available to spend fishing. In addition, fishermen who do not own a car or truck are compelled to go out fishing without ice. The usual trolling time is 6 to 7 hours, so if there were no way to preserve the freshness of the fish caught early in the trip, it would have no market value and would be discarded. The average catch for one boat on each trip is estimated at 124.1 kg and the estimate of the portion of the catch to be discarded or reduced to an unmarketable condition is estimated at 20% to 30%, which make a waste of 20 to 30 kg for each trip.

More than half of the fishermen in Kosrae State have other jobs, and it is common for them to go to work somewhere during the day, and use the time before or after their working hours to go fishing, such as early mornings, at night, and on days off. The fish that are

caught are sold commercially whenever possible, but most is consumed at home or distributed to relatives and neighbors. There is a strong preference for the reef fish and bottom fish in Kosrae State, and once the market is saturated with the migratory species, like skipjack tuna and barracuda, there is a tendency for people to stop going out for fishing for a while because of a storage problem. In spite of guidance by the Department of Fisheries and Marine Resources, the handling of the catch by the fishermen is well below acceptable standards. Almost none of the basic means to preserve the freshness of the catch (killing fish immediately after catch and icing) are used after the fish are harvested. The Pacific Tuna Industries, Inc. (PTI) in the Okat harbor has ice-making equipment with a total production capacity of 50 tons per day, and there is a system for supplying the ice in 1 ton lots to boats that berth alongside the dock. However, the minimum supply quantity is too large for the artisanal fishermen to make use of this.

There were about 30 fishing boats using the Okat fisheries support station when the Team surveyed. The methods of fishing operation were varied, but there are many good reasons for having the ice, including making it possible to extend the fishing time, keeping freshness to improve the marketability of the fish, and reducing the post harvest loss. It is crucial to install the ice plant in order to keep the freshness of the catch so that the markets outside of the island can be accessed.

The cooling system for the ice-making and refrigeration facilities at the Lelu station uses a sea-water cooling method. The pumps for the seawater are corroded from the exposure to the salt, and various mussels and shells growing inside the cooling water pipes, which make the operation of the facilities difficult, and on several occasions operation has been suspended for long periods of time. For this reason, the cooling system for the ice-making facilities at Lelu must be changed to an air-cooled method in order to ensure a stable supply of ice for the Lelu and Utwe artisanal fisheries support stations.

(2) FRP Boat Hull Repair

Most of the fishing boats being used in Kosrae State are catamarans with outboard engines, provided under a grant from Japan in 1987. The remainder are mainly mono-hull type FRP boats with outboard engines. The Kosrae state is divided into 4 municipalities, and the number of fishing boats (excluding outrigger canoes) in each village is 20 in Lelu, 28 in Okat, 22 in Walung, 13 in Utwe, and 2 in Malem.

In Kosrae State, typically the fishing activity is trolling for migratory species and spear-fishing and line fishing for reef fish and bottom fish. The fishing operations are usually centered within several miles of the shore, and even for trolling of skipjack tuna and spanish

mackerel, the fishing area is on the reef edge. The line and spear fishing activities are performed inside the reef, and usually at night, so the boats often collide with the rocks and reef, causing a lot of damage. After returning from the fishing, the boats are moored at the beach; so at low tide the bottoms of the boats are dragged along the sand and become scratched and abraded. This is why the damage to the FRP catamarans is so severe after 10 years of use, and only about 60% of the boats registered are currently being used. Since there is currently no facility for FRP hull repair in Kosrae, in case this percentage would continue to decline, it would seriously jeopardize the existence of the artisanal fisheries in this region. Therefore, facilities to repair and maintain the FRP hulls are required.

(3) Outboard Engine Maintenance

All of the fishing boats that come to the Okat fisheries support station have outboard motors. The majority of mono-hull type boats use 8 to 25 horsepower motors, and the catamarans use 25 to 40 horsepower models. The cooling system mechanism for the outboard motors (2-cycle engines) makes use of the sea water for cooling, so the cooling system should be flushed with fresh water after the motor is used in order to prevent corrosion and rust on the electrical components caused by the sea water. This is essential to keep the outboard motor in good working condition over a long period of time. However, there is no space at the existing fisheries support station for performing this kind of work, or for performing the regular maintenance work like lubrication and cable adjustments. This means the outboard motors are left mounted on the fishing boats. It is inconvenient and costly to transport the outboard motors to the workshop at Lelu for daily checks and maintenance, so the Lelu workshop is not used for this, instead, it is used only for repairing engines with malfunction or for major overhauls. Omitting the daily servicing not only reduces the service life of the outboard motor, but also is a cause of engine failures, which degrades the efficiency of the fishing operations. There is a strong need to provide a place in Okat where the fishermen can check and maintain the outboard motors by themselves.

(4) Fishermen's Lockers

At Okat, unlike the Lelu and Utve sites, the homes of the fisherman are some distance away from the support station. Even in Kosrae state, which has one of the lowest crime rates in the Federated States of Micronesia, the fishermen must carry their outboard engines and fishing equipment back to their homes for fear of having them stolen. The time and effort wasted in arranging transportation, making the preparations before going out, and

packing up again after returning to the marina makes it difficult to raise the efficiency of the fishing operations.

There are usually 30 fishing boats moored at the Okat marina. The fishermen have no choice but to carry their gear back to their own homes. If a storage area is reserved as well as the outboard engine workshop is built, it would be possible to store the fishing gear and serviced outboard motors at the fisheries support station, making it unnecessary to carry them from their home, which should help improve the efficiency of the fishing operations.

(5) Meeting Room

The floating pontoons at Okat used as the mooring for fishing boats is quite crowded, and there have been cases of trouble arising between users. The fishermen come to the Okat station from a variety of different villages. Since there is no house adjacent to the station, a meeting and assembly space is required in order to hold meetings and discussion on efficient ways to utilize the station, including the management and operation of the support station. Another issue is that there are projects for marine resource management in Kosrae, particularly for the reef and bottom fish, including enacting laws to limit and regulate the fishing methods, fishing seasons, and to protect the coral reefs. There are also activities to deploy Fish Aggregating Devices to promote the fisheries activities. Nevertheless, there is no appropriate means of informing the fishermen of these policies, and few effective introductions have been implemented. This has delayed both the resource management activities as well as establishment of a fishermen's organization to promote the artisanal fisheries development.

Under this Plan, the Okat support station facilities will be under the operation of Marine Food Inc. (MFI). Based on the past experience, the trust between MFI and the fishermen is very tenuous, and the communication does not seem to have been adequate. One of the reasons for this is that there are no public facilities where the fishermen can meet in Kosrae. Parking lots or facilities at the high school have to be borrowed, making it difficult to hold a regular meeting. Since the purpose of this project is to stimulate the artisanal fisheries, there is a strong need for a meeting room in order to hold conferences and discussion between the fishermen and the facilities operation agency, and to provide a center for dissemination of information and training to the fishermen.

(6) Renovation of the Floating Pontoons

The floating pontoons for mooring of the fishing boats at the 3 sites in Lelu, Okat, and Utwe provide the most fundamental and valuable function of the artisanal fisheries support

stations, and make the largest contribution to promoting the fishing industry in these areas. However, the harsh climate in Kosrae State, with the average temperature throughout the year of 26~27°C in direct, intense sunlight, the annual rainfall exceeding 4,000 mm, and the humidity of 78~95% all the time, has accelerated the corrosion of the structural members and caused water to enter the floats. The pontoon jetties list dangerously, making it hazardous to work on these platforms. If these platforms are left in their current condition, there is a risk that the floating pontoons themselves will sink or become swamped. Therefore, the renovation of the floating pontoons at the 3 sites is urgently required.

The primary objective of this Plan is to rectify the problems stated above. Therefore, the Plan proposes to renovate and expand a part of the functions of the facility of the artisanal fisheries support stations provided in the past, make effective use of the existing facilities and equipment, and improve the capabilities of the artisanal fisheries support stations in order to promote the activities of the artisanal fisheries in Kosrae State.

2.2 Basic Concept of the Project

2.2.1 Review of the Request

Artisanal fisheries play a substantial role in making an adequate living of people in Kosrae, where the subsistence economy remains very important. Though Kosrae State Government has been promoting development of artisanal fisheries through providing the artisanal fisheries support stations at Lelu, Okat and Utwe, the artisanal fisheries are facing such problems as lack of appropriate facilities for keeping freshness of the catch, insufficiency of boat operation due to improper boat maintenance, insufficient degree of organization of fishermen and deteriorated mooring pontoons.

For the purpose of minimizing these obstacles and developing the artisanal fisheries, the FSM Government has requested a grant-aid from the Japanese government to implement the subject project. The contents of the request from the FSM Government are shown on Table 1.1-1 in the Chapter 1. BACKGROUND OF THE PROJECT.

The original requests of this project included the construction of the artisanal fisheries support building at Okat and Utwe comprising an office, meeting room, fish handling space, fisherman's lockers, etc. The plan also included a processing room and a workshop for repair of the FRP boats at the Lelu station, as well as providing ice making machines and the related equipment to each building.

Due to a failure of the business operations by MFI, the operation body of the existing Utwe and Lelu support stations, activities were suspended at the time of the field survey, and the Government of Kosrae State is trying to restructuring the organization of MFI for its revitalization. The basic design study team deems that if the operation of the Lelu and Utwe support stations would be restored, the existing functions and capacity of the two stations could satisfy the requirements of artisanal fishermen based on Lelu and Utwe. Therefore, the construction of the processing plant at Lelu and the new facilities at Utwe were removed from the scope of this Project. As for the fish processing plant at Lelu, another consideration was made to exclude from the Plan as it should be confirmed and justified the proposed plan with trial production and markets research for the new products prior to construction of the processing plant. There are the office of the Department of Fisheries and Marine Resources and the boat ramp at the Lelu site, it is appropriate to include in this project a FRP boat maintenance workshop for repairing the hull of the FRP for fishing boats.

2.2.2 Basic Concept of the Project

(1) Artisanal Fisheries Support Station at Lelu

For the Lelu support station, an FRP Boat Maintenance Workshop will be constructed on the existing boat ramp to enable the repair and maintenance of the FRP hulls, which is one of the critical issues for the artisanal fisheries in Kosrae. The cooling system of the existing ice making and refrigeration equipment will be changed to air-cooled system to enhance the capacity of fresh fish distribution at the Lelu artisanal fisheries support station. Furthermore, renovation work will be done on the existing tilted floating pontoons, caused by corrosion of the structural members and water seepage into the floats.

(2) Artisanal Fisheries Support Station at Okat

The operations at the Okat station is more active than anticipated because of the fact that it has become the base for sea transportation to Walung which has no land access, larger number of people passing by to and from the adjacent airport and commercial port, as well as its close location to the fishing grounds during the northeastern tradewinds season. Therefore it is necessary for supporting present fishing activities at Okat by providing with this Plan a handling space for the catch, fishermen's lockers for fishing gear storage, an outboard motor maintenance space for cleaning and inspecting the outboard engines after use, and a meeting room for nurturing fishermen's organization and for propagation of information of the marine resources management. Since larger number of boats than

originally planned are gathering at the Okat marina, it becomes more beneficial to have an ice making facilities at the Okat station than transporting from the Lelu station. Thus, a handling space, an ice making facilities, fishermen's lockers, an outboard motor maintenance space, a meeting room and appurtenances will be constructed under this Plan. Renovation work will be also done on the existing tilted floating pontoons, caused by corrosion of the structural members and water seepage into the floats.

(3) Artisanal Fisheries Support Station at Utwe

For making good use of the existing facilities as well as for avoiding the decline in future fishing activities, renovation work will be done on the existing tilted floating pontoons.

(4) Equipment

This Plan does not include the equipment and materials related to the facilities excluded from the original request, since the requested equipment and materials were supposed to be installed and used in these requested facilities. The equipment and materials to be studied in this Plan are machine tools for daily maintenance of outboard motors at the Okat station and equipment and materials for FRP boat repairs at the FRP Boat Maintenance Workshop at Lelu.

2.3 Basic Design

2.3.1 Design Conditions

The basic considerations for the design of the facilities are as specified below. These have been established in consideration of the natural and social conditions in Kosrae State, the construction materials supply situation, and the characteristics of this Project.

- (1) The planned sites face the sea and receives abundant precipitation throughout the year. Given the tropical climate, with a high temperature and humidity, the design must adequately consider the anti-corrosion for the structure and finishing of the planned facilities.
- (2) Since this project includes repairs and improvements to existing facilities, the engineering and technical methods of the existing facilities must be respected. In addition, the plan must adequately consider the points requiring improvement that can be evaluated from the current status of the existing facilities. Since the operation of the existing facilities (such as

the boat ramp and floating pontoons) will be closed during the construction period, there must be a plan to minimize the effects of the construction on the fishing activity as much as possible by making the repair schedule which allows fishermen to use the floating pontoons in other sites during the repairing works.

- (3) There are no special permits or licenses required for the work, and no standards applicable to the design; therefore, the design shall be based on the standards used in Japan. With regard to the grade of the facilities, the design and specifications shall adopt the principles that allow easy maintenance and management, in consideration of the existing facilities.
- (4) Since the Project will be implemented under the grant-aid program from Japan, the structure, building methods, and materials will be chosen to adequately reflect the construction situation in Kosrae, in consideration of the limited construction period. In addition to making efforts to meet the short construction schedule, the construction work should make use of local labor, building materials and equipment as much as possible, which should also make a contribution to stimulating the local economy during the construction.
- (5) The workshop equipment will be chosen to be appropriate for the current technical level in Kosrae State.

2.3.2 Basic Design

2.3.2.1 Capacity of the Major Components

(1) FRP Boat Maintenance Workshop at Lelu

The workshop of Department of Fisheries and Marine Resources at Lelu has the capacity for repair of outboard engine but not for FRP hull. The majority of the boats in Kosrae State are the FRP catamarans that were entered into service over 10 years ago, and many of them now require repairs. The damage to the house mounted on the deck and to the fish hold hatches is quite noticeable. As these catamarans weigh about 700 kg, about twice as much as the mono-hull type FRP boats, a suitable repair method would be the utilization of the existing boat ramps to pull them up into a workshop. To accomplish this, it is necessary to build a FRP boat maintenance workshop on an extended area of the boat ramp.

The materials for the FRP repair work, such as the polyester resin and hardening agent, are also required. These materials must be kept in a cool location, so it will be necessary to build a special storage area.

(2) Fisheries Support Station at Okat

1) Ice-making Facilities

a. Ice plant

There are presently two types of ice-plants installed at the Lelu fisheries support station, flake ice makers and plate ice makers. It is reported that the fishermen prefer the flake ice, but the flake ice melts faster, clumps more easily, and is difficult to break up once it becomes clumped. In addition, the blades of the flake ice-maker must be regularly adjusted, and the adjustment is not easy. Therefore, it has been determined that the plate ice is more suitable for the situation in Kosrae, because the structure is simple and the thickness of the ice plates can be adjusted.

Based on the current usage conditions at the Okat fisheries support station, the scale of the ice-making units is designed based on the conditions described below.

- Target number of fishing boats: 30 (Total number of the registered boats at Okat is 28 excluding wooden canoes, thus the target number is regarded as 30.)
- Average catch per boat: 120 kg/trip
- Average frequency of trips: 5 boats/day (Each boat makes about 1 trip per week)
- Time spent fishing: 5~6 hours
- Outside temperature: 30°C
- Required quantity of ice: Fish:Ice =1:1 (Ratio of fish and ice recommended by FAO to keep a typical 1-day catch in a tropical region.)

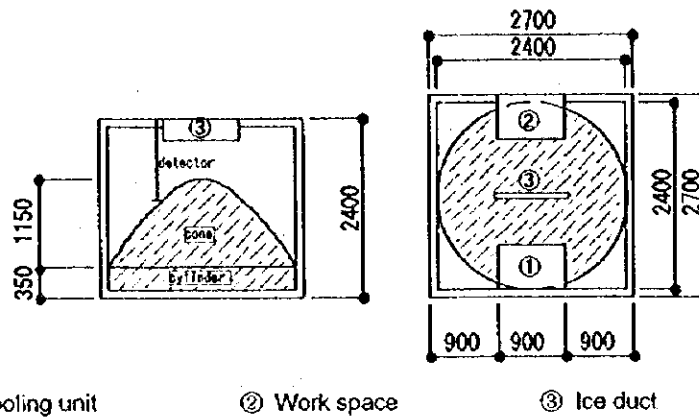
This indicates that the required average daily quantity of ice is $120 \text{ kg} \times 5 \text{ boats} = 600 \text{ kg}$.

The smallest model of plate ice plant has a daily production capacity of 1000 kg. To fill a demand for 600 kg/day, a production capacity of 1000 kg/day is required. However, the quantity of ice calculated above is an average required quantity. On days of good catch, or during a good fishing season, the numbers of boats fishing out can triple, so the one-day demand for ice can be expected to increase to 1800 kg. This situation can be solved by storing the ice produced during low demand for use on days of high-demand.

b. Ice storage bin

The capacity of the ice storage bin for a small ice plant is typically about 2 or 3 days of production. For this plan it has been decided to use an ice storage bin that can store 3 tons of of plate ice produced from the 3-day operation of 1-ton/day capacity ice plant.

The required dimensions for an ice storage bin that can hold 3 tons is determined from the standard panel size, as illustrated in Fig. 2.3-1 below.



① Cooling unit ② Work space ③ Ice duct

Figure 2.3-1 Required Dimensions for an Ice Storage Bin

The calculation for the ice storage capacity is shown follows.

Since thickness of the protection wooden panel and the insulation panel is 150 mm, this must be subtracted from the external dimensions to obtain the effective size. Assuming that the stored ice forms a mound that is a combination of a cylinder and a cone.

Where the external dimensions of the ice storage bin is 2700 W x 2700 D mm,
the radius of the cylinder and the cone is $(2700 - 300) / 2 = 1200$ mm

As shown below, capacity of the ice storage bin is calculated at 3.3 tons, thus satisfies the required capacity of 3 tons.

Accordingly, a unit with a width 2.7 m x depth 2.7 m = 7.3 m² is chosen.

Ice volume of cylinder portion	Volume of cylinder = $\pi r^2 h$, (where π : circular circumference factor, r: radius, h: height of the edge (m)). $= \pi \times 1.20^2 \times 0.35 = 1.583$ tons
Ice volume of cone portion	Volume of cone = $(\pi/3)r^2 h$, (where π : circular circumference factor, r: radius, h: height of the apex of the cone) $= (\pi/3) \times 1.20^2 \times 1.15 = 1.734$ tons
Total	3.317 tons

It will be suitable to install the ice storage bin beneath the ice-maker. The ice storage bin is generally a prefab type that is designed to be fitted with the ice-maker. The prefab insulation panel use a sandwich structure with the inside composed of urethane foam and outside surfaces of aluminum sheet, stainless steel sheet, colored steel sheet, or vinyl chloride-coated steel sheets. The insulation panel thickness ranges from 40 mm to 200 mm. Considering the climate in Micronesia, it is recommended to select a unit with a thickness of 100 mm, and to install a cooler unit inside the bin to maintain the temperature at -5°C.

2) Meeting room

Usually 3 to 4 people are fishing in one fishing boat, and with the targeted number of boats of 30 units, it is estimated that about 100 fishermen will use this support station.

It is expected that the meeting by fishermen would be attended by the members of the Project Steering Committee of the Government of Kosrae State, MFI management, and the fishing boat owners. The target number of people is thus calculated as follows.

- Members of the Project Steering Committee : 4

(1 head of the Dept. of Commerce and Industry, Dept. of Administration, Dept. of Fisheries and Marine Resources, and Dept. of Agriculture and Land)

- MFI representatives : 1 or 2

- Representatives from each fishing boat (60% to 70% of 30 boats) : 20

This makes the total planned number for the meeting room about 25 people.

3) Outboard Engine Maintenance Room

Out of 30 boats regularly staying in the Okat marina it is estimated that 5 boats go out for fishing in one day. It has thus been decided to reserve a maintenance space in which two outboard motors can be serviced simultaneously.

4) Fishermen's Locker

The total number of fishing boats that would use the fishermen's locker is 30, however, it is concluded that 24 lockers can be arranged as a result of the arrangement in the rooms.

5) Fish Handling Space

The annual rainfall is about 4300 mm in Kosrae, and the days with rain exceeds 20 days in a month. There is a strong need for a covered work space which can be used for making and repairing of fishing gear during rain. In addition, a covered work area would also be an asset when the weather is clear with strong direct sunlight, allowing such work as preparations for fishing, re-packing of ice and weighing, to be performed under the covered area. A space will be reserved for fish handling work like sorting, cleaning, weighing of the catch as well as for sales activities. There will also be an area reserved for placing the insulated boxes for selling the fish and for working at a processing table. The work area will have no exterior walls, and will be the common space that can be used for various work.

6) Machine Room

The Government of Kosrae State has an emergency generator of 35 KVA acquired in the early 1990s when the electricity supply condition was poor. In order to accommodate the generator as an emergency power source for Okat sation, a machine room will be provided in the Plan. However, the transport and installation work of the generator shall be the responsibility of the Kosrae State Government.

2.3.2.2 Facilities Plan

(1) Plot Plan

The layout plan for the facilities has been made based on the following points.

- The planned facilities must be so arranged as the relationship to the existing facilities is maintained, but with certain degree of independence.
- Since the arrangement must be made within a limited space, effective use of the space must be attained through intensification and multiple-utilization of the facilities, while maintaining the independence of each room.

1) Lelu site

The facility is intended to support the existing boat ramp, and the layout plan calls for the arrangement at the rear of the existing facilities.

The plot plan is shown in figure 2.3-2.

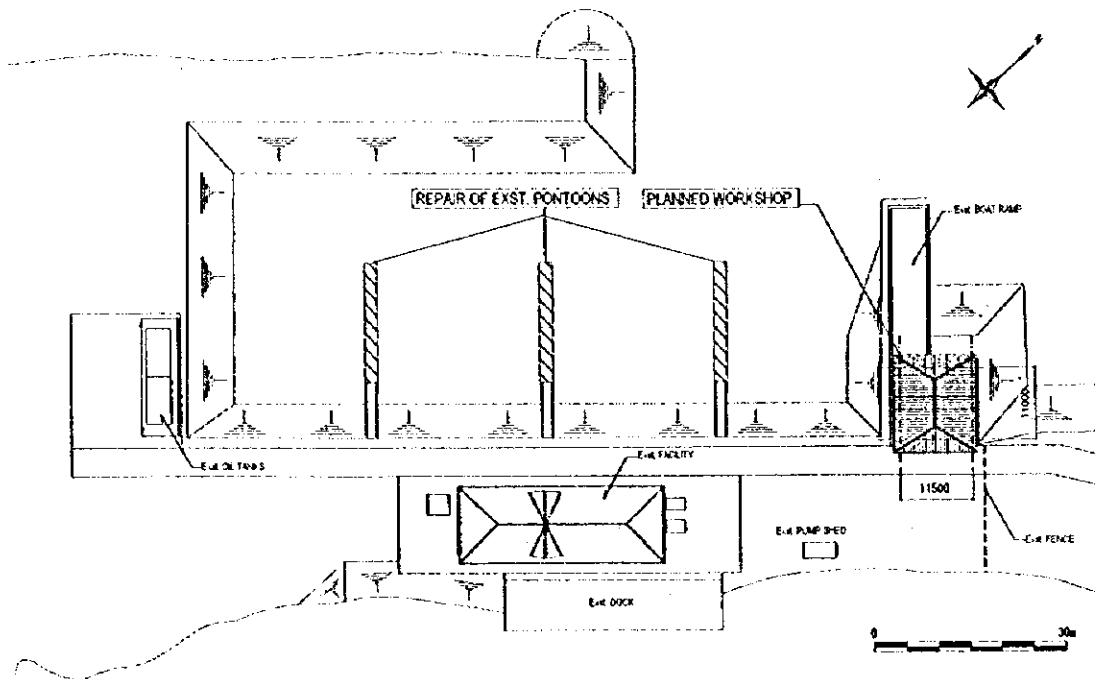


Figure 2.3-2 Lelu Site Plot Plan

2) Okat site

There are two floating pontoons that project on the sea, a cold storage and an oil tank on land at the existing Okat site. Since space in between the pontoon and the existing building is used as an access road leading to the slipway for large vessels, there is no choice for plot plan, i.e. the facility should be constructed between the existing cold storage and oil storage facility. The plan facility and the existing facilities will be used interactively. It will be inconvenient if the two facilities are located separately. Close arrangement of the related facilities will facilitate management of the both facility, and in addition, an efficient use of appurtenant installations can be possible. Therefore, this layout plan seems to be the most appropriate plan.

The facilities plot plan is shown in figure 2.3-3.

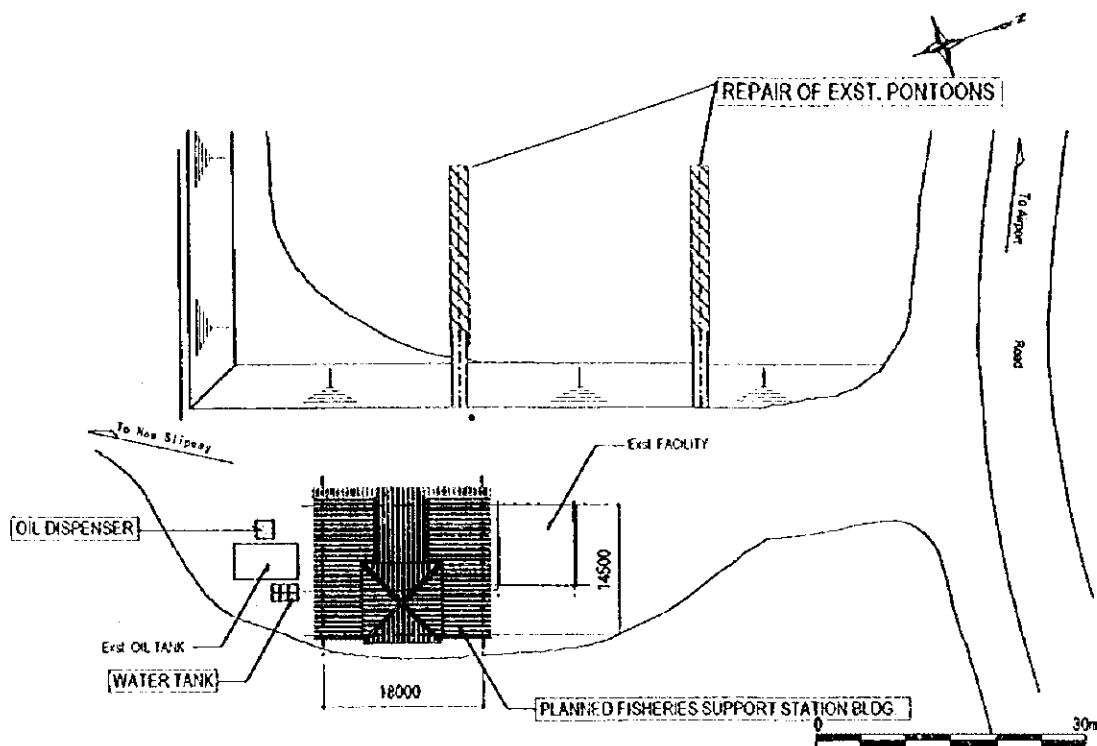


Figure 2.3-3 Okat Site Plot Plan

(2) Building facilities

The scale of the planned facilities is determined in accordance with the following procedure.

- ① Determine the function and capacity (number of people) of the room.
- ② Specify the necessary equipment and furnishings.
- ③ Verify the appropriateness of the calculated floor space by checking related regulations and standards, and comparisons to similar facilities.
- ④ Add the common spaces to the total calculated floor space, obtaining the scale of the facilities.
- ⑤ Make the plan so that there is no duplication of rooms, equipment, furnishings, etc. with the existing facility

The required space for each building is shown in the following section.

1) FRP Boat Maintenance Workshop

There is a boat ramp for small boats at the Lelu plan site, but there is no roof over the work space. Since the plan site has much precipitation, a roof is needed for the boat hull repair work, in consideration of the effectiveness and workability. In addition, in the FRP boat maintenance workshop, a storage area for the FRP material is also required.

a) FRP boat hull repair space

A roof will be constructed above the work space on the existing boat ramp, so that the work can be carried out in any weather. An overhead rail and a chain block will be installed. A dolly will be provided on which the catamaran can be loaded, and a motorized capstan will be installed to pulled up the boat. Worktables (W = 600) will be installed for preparation for the repair work. Based on the structure and layout conditions of the existing boat ramp, the floor area is set at 66.0 m².

The size of the target boat is 7.7 L x 2.7 W, and the space designated above is adequate considering the space for movement.

Layout plan is shown in figure 2.3-4.

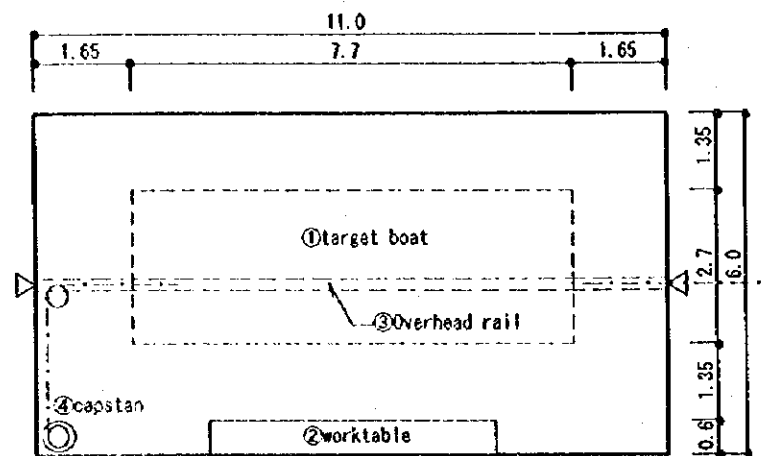


Figure 2.3-4 Boat Hull Repair Space

b) Workshop

Tools, materials and work table for the FRP boat hull repair work (FRP repairs), as well as the special tools, general tools, and worktable for simple maintenance of the parts, will be provided in this workshop. A floor space of about 27.5 m² is required in consideration of the fixtures and the space for movement. A covered area of 16.5 m² connected to the workshop will be allocated for outdoor work like welding and cutting.

c) Storage

This is a room for storing the FRP repair materials. The required area is 16.5 m².

Layout plan is shown in figure 2.3-5.

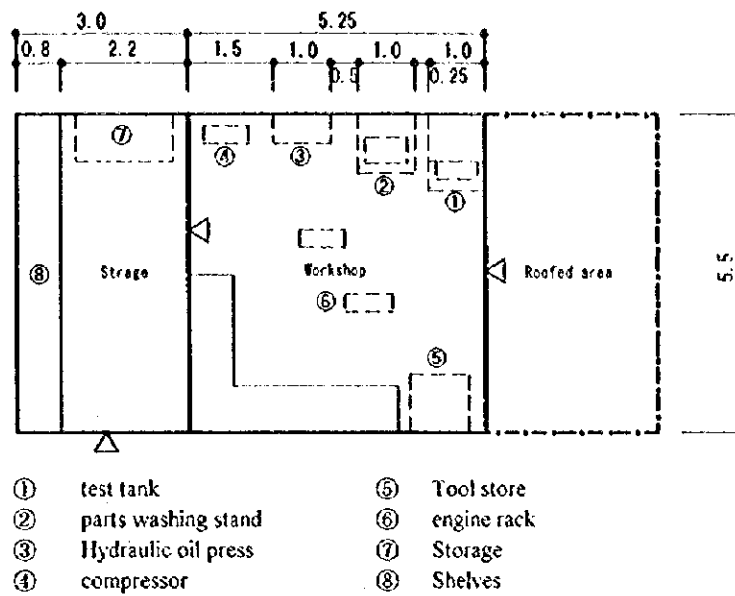


Figure 2.3-5 Workshop, Storage Plan

Table 2.3-2 shows the area of the planned facilities.

Table 2.3-2 Floor Area of Workshop Building

Room	Required Area
FRP repair area	66.0 m ²
Workshop	44.00 m ² (incl. Roofed area 16.5 m ²)
Storage	16.5 m ²
Total	126.50 m ²

The FRP boat maintenance workshop plan is shown in Figure 2.3-6.

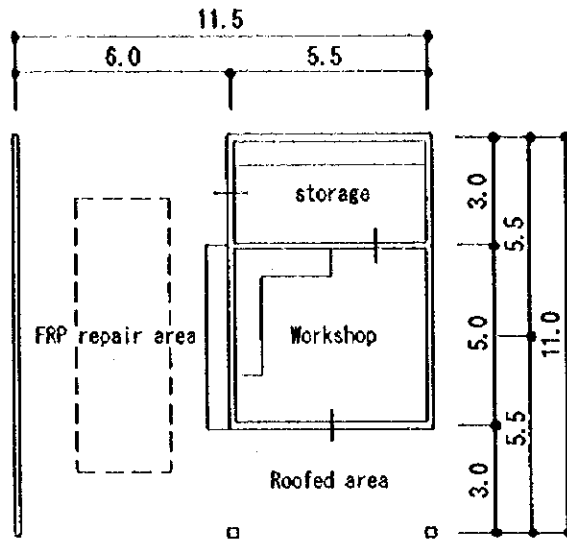


Figure 2.3-6 FRP Boat Maintenance Workshop Plan

1)-2. Modification of the existing cooling system at the Lelu site

The existing cooling system for the ice-making and refrigeration facilities uses a seawater cooling method. Shells are formed inside of the intake pipe, which impedes the exchange of the cooling water. The seawater intake pumps are exposed, and has been replaced twice due to corrosion. It is necessary to replace the pumps and the intake pipe periodically.

In order to solve this problem, the existing seawater cooling equipment for ice-making and refrigeration plant will be changed with an air-cooled system. However, for the blast freezer, it has not been operating, and will not in operation in the near future, the change of the cooling system will not be included in this Plan.

2) Artisanal Fisheries Support Station at Okat

a) Ice-making room

A plate-type ice making unit with a daily production capacity of 1 ton and an ice storage bin will be installed. The ice-maker (2.2 L x 1.2 W x 2.0 H m) will be placed on top of a steel frame platform, and the ice storage bin will be installed in the lower portion of the platform. Considering the layout of the machinery and the space required in front of the ice storage bin for shoveling out the ice, an area of about 30.25 m² will be required.

Layout plan is shown in figure 2.3-7.

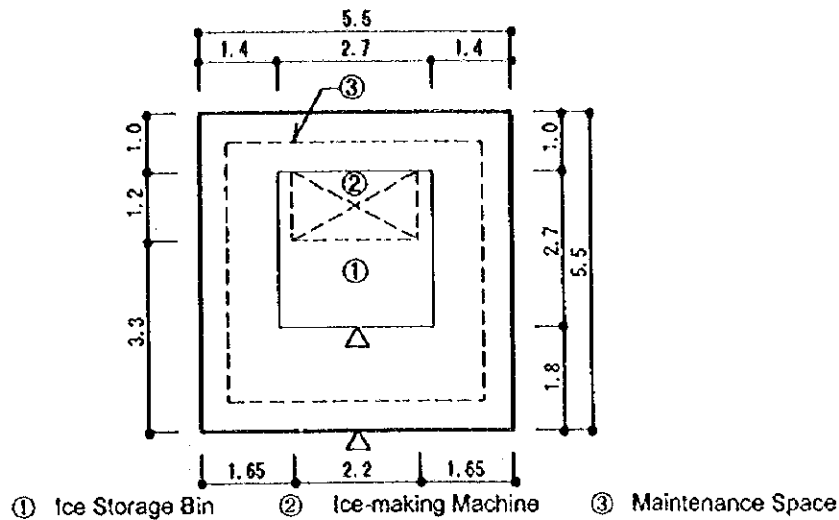


Figure 2.3-7 Ice Making Room Layout Plan

b) Outboard Engine Maintenance Room

There is a need for facilities for performing the maintenance of the outboard motors including repair, flushing with fresh water and other servicing. A tool storage will be provided for storing tools and parts, as well as worktables, outboard motor racks, standard and special tools for outboard motor maintenance. In consideration of the placement of the furnishings and the access space around the racks, the area comes to 24.75 m². The adjacent covered area for welding and cutting work will be 30.25 m².

Layout plan is shown in figure 2.3-8.

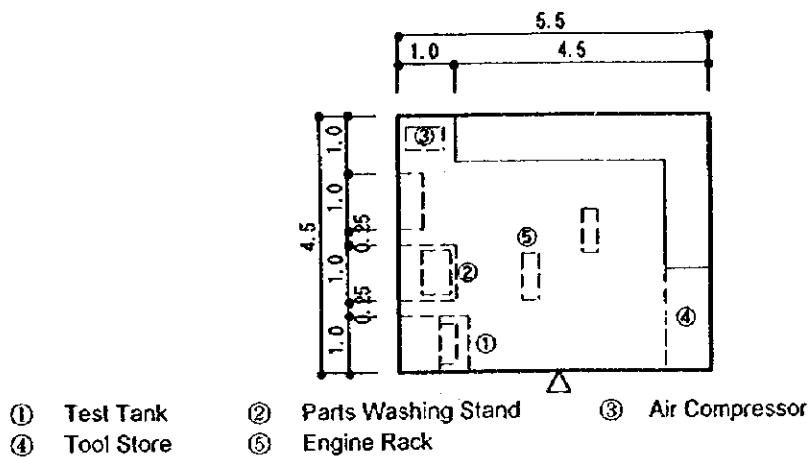


Figure 2.3-8 Outboard Engine Maintenance Room Layout Plan

c) Fishermen's Locker

Presently, each fisherman brings his equipment and gear back to his home except the outboard motors, which are left mounted on the anchored boats. The fishermen's

lockers are to store the fishing gear and the outboard motors for fishermen. Though independent space for each fisherman is desirable, the plan applies each room to be shared by 6 people due to availability of the space. The planned arrangement of fixtures leads to a floor space of 12.375 m². With 4 rooms for 6 people, total space for 24 people will be prepared. Layout plan for one room of lockers for 6 people is shown in figure 2.3-9.

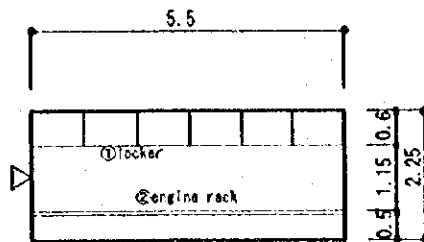


Figure 2.3-9 Fishermen's Locker Layout Plan

d) Work area

This is a space for cleaning and gutting the catch, and for packing of ice before and after fishing operations, as well as for preparation of fishing gear. As the work space for cleaning the catch, the plan incorporates a processing table of about 1.8 m x 0.9 m, with space for 2 people to work on one side. Considering the movement and layout, the area is set to 31.5 m². When the space for the preparation work for fishing will be arranged next to the work space for cleaning the catch, the area should be 70 m². The total for both areas is 31.5 m² + 70 m² = 101.5 m². This includes the stairs and passage to the toilets and meeting room, and is judged to be appropriate. Layout plan is shown in figure 2.3-10.

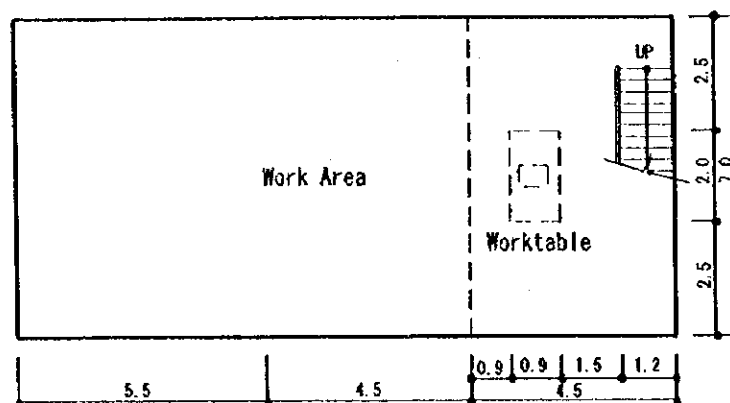


Figure 2.3-10 Work Area Layout Plan

c) Machine room

The machine room accommodates the power switchboard and an emergency generator (35 KVA, existing). To allow for the service and maintenance space for the generator, a space of about 11.00 m² is required. The power switchboard is included in the Plan, but installation of the generator unit shall be carried out by the Kosrae State Government. Layout plan is shown in figure 2.3-11.

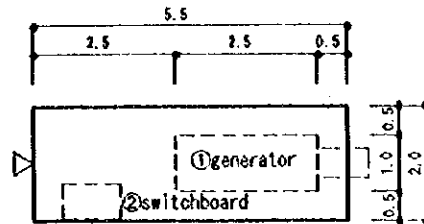


Figure 2.3-11 Machine Room Layout Plan

f) Toilets

The planned toilet facilities are a western-style toilet and urinal for men, and a western-style toilet for women, as well as a wash basin in each. The required area is 13.75 m². Layout plan is shown in figure 2.3-12.

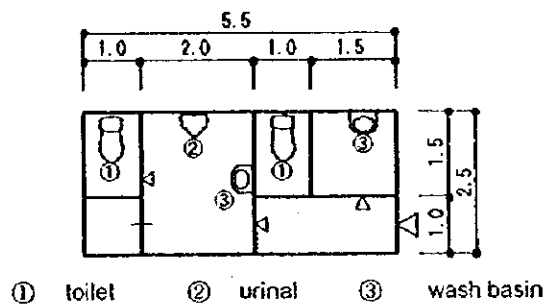


Figure 2.3-12 Toilets Layout Plan

g) Meeting Room

The area required for the meeting room varies a great deal depending on the number of people accommodated, the layout method, and whether there are tables. The meeting room is intended to be used for assembly of the fishermen, so either typical school layout or U-shaped arrangement will be appropriate.

For a meeting room to accommodate 20 or 30 people, the Architectural Design Standard of Japan indicates that the required floor space for a seat is about 1.5 to 2.0 m²/person. Thus for 20 to 30 people, $20 \sim 30p \times 1.5 \sim 2.0m^2/p = 30 \sim 60 m^2$ will be required. It is

felt that an area of 36.00 m² should be adequate for the area of the meeting room for this Plan.

Layout plan is shown in figure 2.3-13.

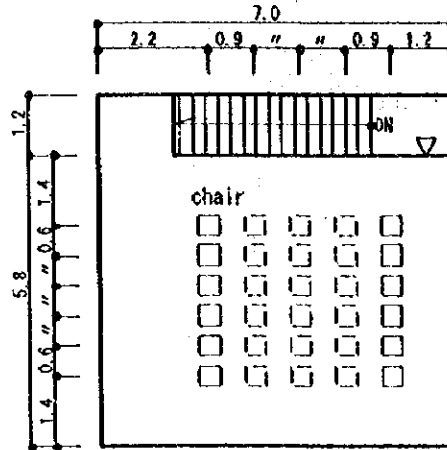


Figure 2.3-13 Meeting Room Layout Plan

h) Stairways / Halls

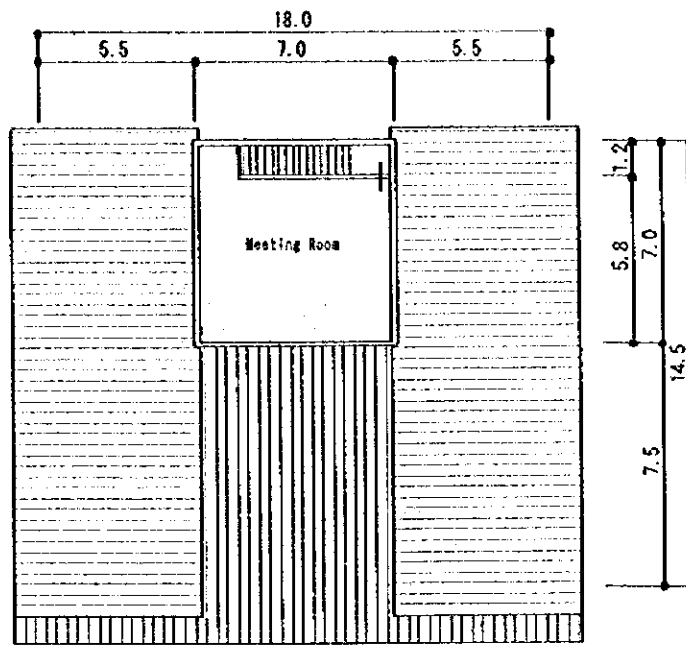
There is a stairway and hall to the meeting room, in an area of 7.00 m².

Table 2.3-3 shows the area of the planned facilities.

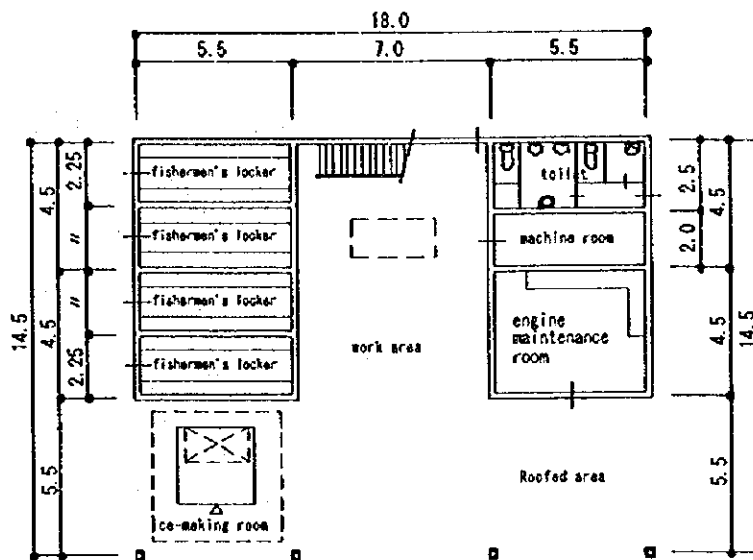
Table 2.3-3 Floor Area of Artisanal Fisheries Support Station at Okat

Room	Required Area
1st floor	
a) Ice-making room	30.25 m ²
b) Outboard maintenance room	55.00 m ² (incl. outside area 30.25 m ²)
c) Fishermen's Locker	12.375 m ² × 4 = 49.5 m ²
d) Work area	101.50 m ²
e) Machine room	11.00 m ²
f) Toilets	13.75 m ²
Sub-total	261.00 m ²
2nd floor	
g) Meeting room	42.00 m ²
h) Stairways / corridor	7.00 m ²
Sub-total	49.00 m ²
Total	310.00 m²

Figure 2.3-14 shows plan of the Artisanal Fisheries Support Station at Okat.



2nd floor plan



1st floor plan

Figure 2.3-14 Plan of Artisanal Fisheries Support Station at Okat

(3) Sectiononal plan

The cross-section plan has the close relationships with the ventilation, lighting, and insulation of each room. Considering the site for this plan is high temperature and

humidity zone, but is desirable to use as little mechanical ventilation as possible, so adequate openings must be secured in the plan to take advantage of natural ventilation.

It is usual to design high ceilings and place ventilation windows to release the heat.

The usual ceiling height in Kosrae for a small room is about 2.5 m to 3.0 m.

The ceiling heights for the facilities in this plan will be as specified below.

Table 2.3-4 Planned Ceiling Heights

Building	Room	Ceiling Height	Remark
Lelu	FRP boat hull repair room	(4.0 m)	Open ceiling
	Workshop	(4.0 m)	Open ceiling
	Storage	2.5 m	
Okat	Ice-making room	(4.0 m)	Open ceiling
	Outboard motor maintenance room	(4.0 m)	Open ceiling
	Fishermen's Locker	2.5 m	
	Work area	(4.0 m)	Open ceiling
	Toilet / Machine room	2.5 m	
	Meeting room	3.0 m	

(4) Structural design

The structural method for the Artisanal Fisheries Support Station at Okat and the FRP Boat Maintenance Workshop has been determined based on the use, scale, materials supply during construction, and ease of maintenance for the Plan facilities.

1) Structural method

Both of the Plan facilities consist of several, relatively small rooms. As the Planned facilities will be built on the seaside and do not need for a particularly large span, the concrete columns and crossbeams, and the concrete block walls will be adopted for this Plan, which do not need anti-corrosion treatment against salt damage, thus most popular structure in Kosrae.

2) Foundation method

The existing buildings of Lelu, Okat and Utwe employ direct foundation method, which have shown no defects of uneven settling. At Lelu, there is a concrete pavement area about 100 m from the planned site, and the area is in good condition without having any difference at the joints caused by settling.

The foundation method therefore will be the same as that for the existing facilities; the

direct foundation. Although there is the intermediate layers of silty clay having N values between 2 to 7 under the reclaimed land at Lelu, at least 7 years have passed since the land was reclaimed, the filled layers have adequate thickness, and above all the soil have been proved solid enough by the plate bearing tests, it has been judged that there will be no particular problems due to uneven settling. At Okat it has confirmed by the plate bearing test that the soil has sufficient bearing capacity.

3) Seismic force

No major damage by earthquake has been known in Kosrae to date. However as the base shear coefficient, $C_0=0.2$, and as the zone factor, $C_b=0.14$, have been adopted under this Plan, based on the Japanese standard with reference to the relevant US practice covering the FSM.

(5) Finishing plan

Particular attention has been paid to the following natural and social conditions in preparing the finishing plan.

- As a seaside facility, it will be subject to salt damage from the sea winds.
- Temperature and humidity are high throughout the year.
- With the exception of materials like gravel, sand, blocks, and cement, most of the basic construction materials are supplied from Japan or other countries. The plan must allow sufficient time for the procurement.
- Since this plan includes repairs and improvements of the existing facilities, the structural and engineering methods of the existing facilities must be respected. In addition, the plan must include improvement of the points evaluated from the current status of the existing facilities.

The finishing plan has been prepared on the basis of the above conditions. Unless specifically stated otherwise, this section applies to all planned buildings.

1) Exterior finish

a) Exterior walls

The material typically used in Kosrae for exterior walls is reinforced concrete or hollow concrete (H.C.) blocks, over which a mortar is applied and then painted. The reinforced concrete and H.C. blocks are the popular construction material, locally available and inexpensive.

For this plan, the materials for the wall will be the H. C. block which can be procured locally and constructed with relatively simple work. Mortar will be applied and painted for the finishing.

b) Outer Openings

Aluminum or wooden doors and aluminum jalousie windows are widely used in Kosrae. Considering that the facilities will be constructed on the shore and subject to corrosion from salt damage, aluminum doors and sashes will in principle be adopted.

Particular care shall be taken on the water runoff in planning the windows and doors, to prevent rain from blowing in.

2) Interior finish

a) Floors

Generally, the floor will be concrete slab with mortar finishing.

For the meeting room, a vinyl floor tile finish on a concrete slab with mortar will be used.

The toilets will be tiled for reasons of sanitation.

b) Wall

The wall will generally be finished with paint on H. C. block with mortar coating. The toilets will be tiled for reasons of sanitation.

c) Ceiling

The ice-making room and workshop will have no ceilings, and the ceilings of other rooms will be paint finish on a water-resistant board.

(6) Electrical installations plan

The power supply to the sites is a low-voltage of 220/110 V, brought in from the high voltage grid through a pole-mounted 10 KVA(at Okat) or 45 KVA(at Lelu) transformer.

With this Plan, the trunk lines are laid underground, and PVC conduit pipe is used for routing the wiring inside. For the planning of the electrical installations, equipment that requires complicated handling or maintenance should be avoided in order to achieve a simple, efficient design. The electrical system will be divided into a wall socket system and a power system. The maximum electrical load capacity is estimated as follows.

1) Lelu (currently equipped with 45 KVA transformer)

Existing Facilities:	Load for Outlets & Lighting	5 KVA
	Load for Power equipment	35 KVA
Planned Facilities:	Load for Outlets & Lighting	2 KVA
	Load for Power equipment	3 KVA
<hr/>		
	Total	45 KVA

Based on the above, the existing supply line has enough capacity with .

2) Okat (currently equipped with 10 KVA transformer)

Existing Facilities:	Load for Outlets & Lighting	2 KVA
	Load for Power equipment	5 KVA
Planned Facilities:	Load for Outlets & Lighting	5 KVA
	Load for Power equipment	15 KVA
<hr/>		
	Total	27 KVA

Based on the above, the pole-mounted transformer must be replaced with 30 KVA type.

3) Wall outlets and lighting

The lighting fixtures typically used at the site are fluorescent and incandescent lamps. There are 2 types of wall outlet, outlets for the designated appliance and the common use. The voltage is 110 V / 60 Hz.

4) Power equipment

Electricity supply to the ice-making equipment and workshop equipment is 220 V / 60 Hz.

5) Telephone line

A telephone line has already been installed in each of the planned sites (Lelu, Okat, Utwe). At Okat facility, interior wiring will be made with this Plan.

(7) Water supply and waste water treatment system

1) Water supply system

All of the planned sites currently have municipal water supply services. For the planned facilities, the water supply will be diverted from the existing lines.

2) Rainwater tank

Okat: The planned facilities include the installation of ice-making equipment. The water supply for this will be the municipal water supply, but a rainwater catchment tank of the same type as that in Lelu will be installed. The collected rain water will be used for making ice when the water supply is interrupted, as well as for general purpose use.

3) Waste water treatment system

Lelu: The waste water from the workshop may contain machine oil, so an oil trap will be installed, and the waste water will be released after separation processing.

Okat: The waste water from the planned facilities will include a discharge of general waste water and soil water. For this plan, the general waste water will be released in the same way as at the existing facilities. A grease trap will be installed for the waste water from the work area, and the waste water will be released after the separation processing.

A septic tank with soak-away system will be installed for the soil water treatment.

(8) Air-conditioning and ventilating system

1) Air-conditioning system

Lelu: The FRP materials shall be kept in a cool location, so the FRP storage compartment will have an air-conditioner.

Okat: The average annual temperature in Kosrae is 26 to 27 degrees C, and the humidity is extremely high, ranging from about 78% to 95%. Most of the local office spaces and meeting rooms have air-conditioners. For this Plan, an air-conditioner will be installed in the meeting room.

2) Ventilating system

Lelu: Ventilation fans will be installed in the workshop and FRP storage compartment.

Okat: Ventilation fans will be installed in the lavatory and the machine room.

(9) Fire-fighting system

At each of the planned sites, fire hydrants have already been installed and not necessary to include in this Plan.

(10) Fuel oil storage facilities

Fuel oil tanks have been installed at each of the 3 planned sites, of which the oil tank at Okat will have a new oil dispenser under this Plan.

2.3.2.3 Pontoons (Lelu, Okat, Utwe)

As shown in figure 2.3-15, most of the existing pontoons list by up to 10% in the main section. In order to clarify the reasons for this, the wooden deck was removed and the float materials were examined. As shown in the figure below, the investigation revealed that water has entered into the ballast sections which stabilize the pontoons. The accumulated water is believed to be the cause of the list.

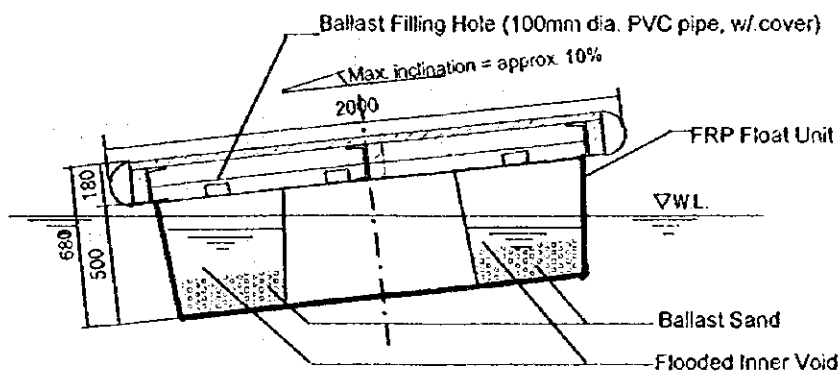


Figure 2.3-15 Present Conditions of the Existing Pontoons

Cause of water leakage may:

- (1) Cracks developed on the FRP covering
- (2) Untightness at the PVC ballast filling hole
- (3) Leakage from the deck plate.

It is assumed that the real cause may be the combination of the above three factors. Wooden deck plate (pine wood) are found to be heavily deteriorated due to severe weather condition. Since the deck frame (galvanized steel frame and wooden deckboard) and the pontoon itself is tilted, the proper freeboard (350 mm to 500 mm) is not maintained, so the sea water washes over the top, making extensive corroded sections. The metal connecting parts and fittings at some connection sections and the support beams are heavily corroded. There are also some connection sections where the rubber rollers have cracked and split due to corrosion, and have slipped out of place.

In Japan, generally pontoon jetties are used in lakes or rivers where the salinity is low; therefore, they have service life of 15 years in Japan. In Kosrae, however, in addition to the high salinity of the sea water, the high temperature and humidity make the pontoons have a faster corrosion on the metal parts and quicker deterioration of the wooden parts. Therefore, the service life of pontoon jetties in Kosrae is deemed at 7 years, same as FRP boats. In this Plan, as the anchoring piles and the access bridges can adequately withstand the use, only the pontoon units will be repaired. For the basic design study, a comparison was made between a proposal to renovate the deck and frame but recycle the existing FRP float and a proposal to renew whole structure of the pontoons.

Based on the comparison shown below, the plan to recycle the existing floats is adopted because it is economical while sufficient durability and stability will be secured.

Table 2.3-5 Relative Appraisal of the Methods of Renovation of Pontoon

	Recycling floats	New structure
Stability	○	○
Durability	○	○
Fineness	○	○
Workability	△	○
Cost	○	△
Judgment	○	△

Repairing scheme of pontoon is shown in figure 2.3-16.

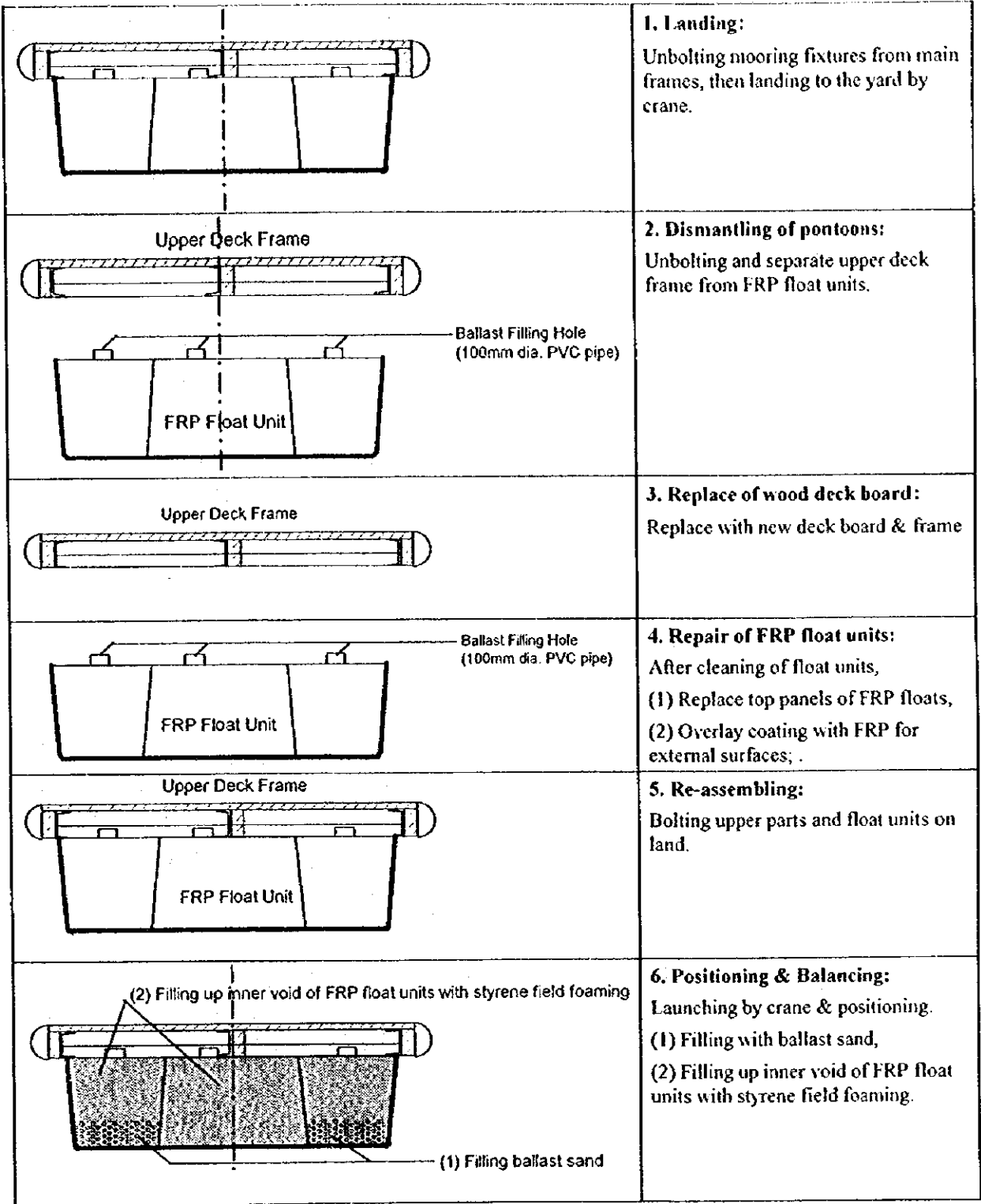


Figure 2.3-16 Repairing Scheme of Pontoons

2.3.3 Equipment Plan

The equipment and materials can be classified into 2 categories; the FRP repair equipment and materials installed in the FRP Boat Maintenance Workshop at Lelu, and the outboard motor maintenance equipment for the Outboard Engine Maintenance Room at the Fisheries Support Station at Okat.

(1) FRP repair equipment and materials (For Lelu FRP Boat maintenance Workshop)

The necessary equipment and materials for FRP repair are classified into the tools for FRP repair and material. The important points for FRP repair are the environment in which the repair is performed, the repair technique, and the selection of the fiberglass and resin materials. If this is understood and the facilities are available, FRP repair is not really difficult. However, the FRP repair materials must be kept in a cool, dark place, at a temperature of less than 25°C.

The workers responsible for the FRP repair are 3 mechanics of the Department of Fisheries and Marine Resources, including one who has received training in Japan on the techniques of FRP boat maintenance and repair. Even now, using the existing sub-standard facilities, the comparatively small mono-hull FRP fishing boats are being repaired, so there is no problem technically.

Equipment list is attached in Appendix-9.

(2) Outboard motor maintenance equipment (for Okat Artisanal Fisheries Support Station)

The maintenance equipment for Okat outboard engine maintenance room will be the minimum required for the fishermen making the repair and maintenance of their outboard motors by themselves. Complicated repairs will generally be performed by the Department of Fisheries and Marine Resources Workshop. For this reason, such machinery as hydraulic presses and hoist cranes, which would normally be provided in a full time outboard motor workshop, have been omitted.

Equipment list is attached in Appendix-9.

2.3.4 Summary of the Basic Design

The following shows a summary of the basic design of the Project.

(1) Planned Facilities

Site	Facilities	Size / Specs.
Lelu	FRP Boat Maintenance Workshop	Total Floor Area: 126.50 m ² Structure: RC construction, single-story, direct foundation Interior finishing: Floor ; Mortar Wall ; Painting on mortar Exterior finishing: Roof ; Colored aluminum roofing Wall ; HC concrete brick, painting on mortar Including: • FRP Boat Hulls Repair Space (66.00 m ²) • Workshop (44.00 m ²) • Storage (16.50 m ²)
	Renovation of existing floating pontoons	20 m x 3 piers Repair of the existing floats, deck & frame
	Repair of the existing ice making machines	Change to air-cooling system
Okat	Artisanal Fisheries Support Station Bldg	Total Floor Area: 310.00 m ² Structure: RC construction, two-story, direct foundation Interior finishing: Floor ; Mortar, (Vinyl tile for Meeting Rm.) Wall ; Painting on mortar Exterior finishing: Roof ; Colored aluminum roofing Wall ; HC concrete brick, painting on mortar Including: • Ice-making Area (30.25 m ² , 1 ton/day) • Outboard Engine Repair Space (55.00 m ²) • Fishermen's Lockers (12.375 m ² × 4 = 49.50 m ²) • Fish Handling Space (101.50 m ²) • Machine Room (11.00 m ²) • Lavatory (13.75 m ²) • Meeting Room (42.00 m ²) • Staircase & Corridor (7.00 m ²)
	Renovation of existing floating pontoons	20 m x 2 piers Repair of the existing floats, deck & frame
Utwe	Renovation of existing floating pontoons	20 m x 2 piers Repair of the existing floats, deck & frame

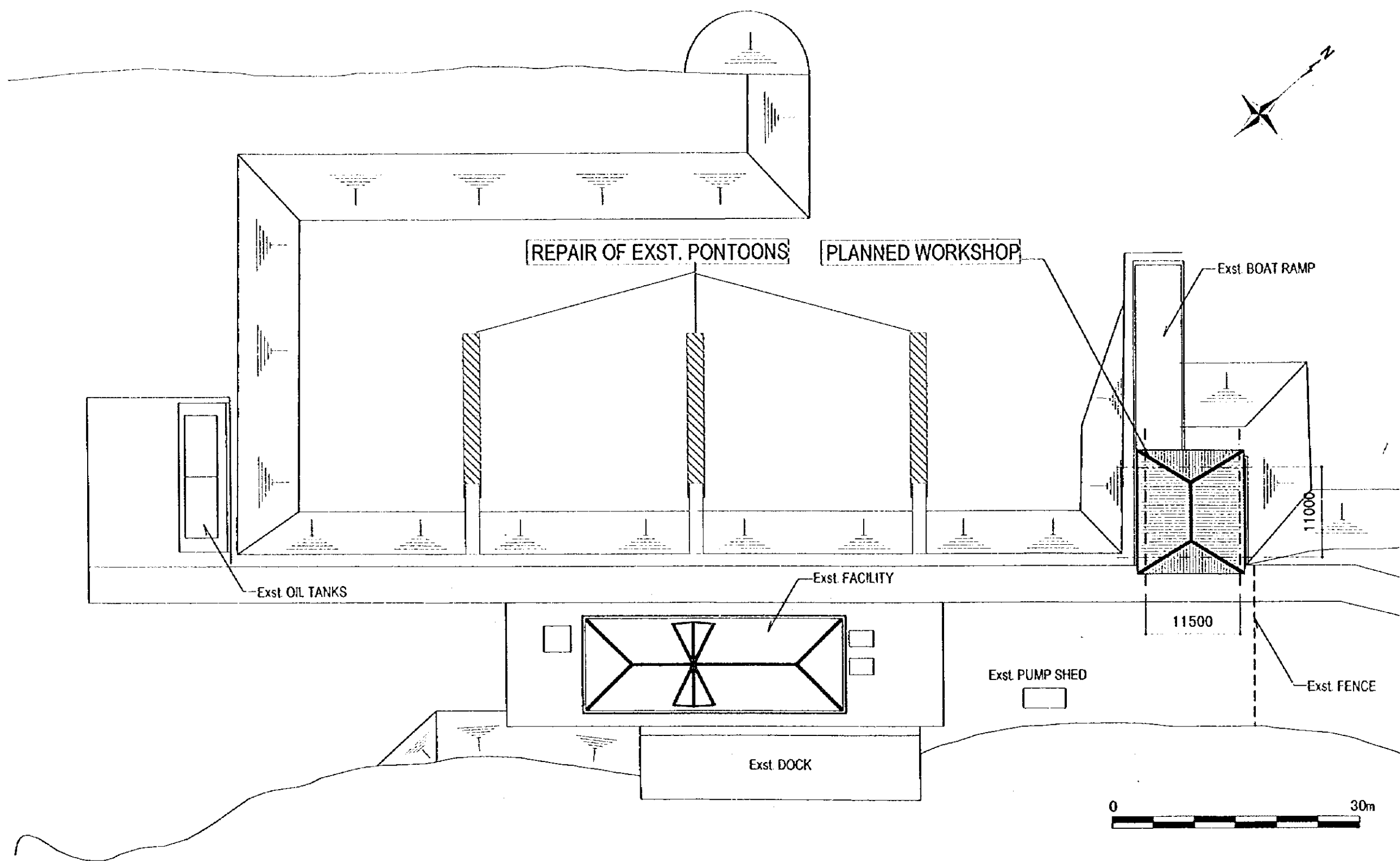
(2) Equipment (Major items)

Site	Item	Specs.	Q'ty
Lelu	Equipment for FRP Boat Maintenance Workshop:		
	FRP Boat Carrier	Dolly for catamaran type boat	1 No.
	FRP Repair Equipment	Elec. Grinder, Drill etc.	1 set
	FRP Repair Material	Polyester resin, Gelcoat, Fiberglass mat cloth, etc.	1 set
Okat	Equipment for Outboard motor maintenance:		
	Machine tools for outboard motor maintenance	Special tools for outboard motor maintenance, General tools, etc.	1 set
	Gauge & Measurement apparatus	Dial gauge, Vernier calipers, etc.	1 set

2.3.5 Basic Design Plans

- ① Lelu - FRP Boat Maintenance Workshop / Plot Plan (scale 1/500)
- ② Lelu - FRP Boat Maintenance Workshop / Floor & Roof Plan (scale 1/200)
- ③ Lelu - FRP Boat Maintenance Workshop / Elevations & Section (scale 1/200)
- ④ Okat - Artisanal Fisheries Support Station / Plot Plan (scale 1/500)
- ⑤ Okat - Artisanal Fisheries Support Station / Floor & Roof Plan (scale 1/200)
- ⑥ Okat - Artisanal Fisheries Support Station / Elevations & Section (scale 1/200)
- ⑦ Existing Pontoon / Pontoon Arrangement (N.T.S.)
- ⑧ Existing Pontoon / Details (N.T.S.)

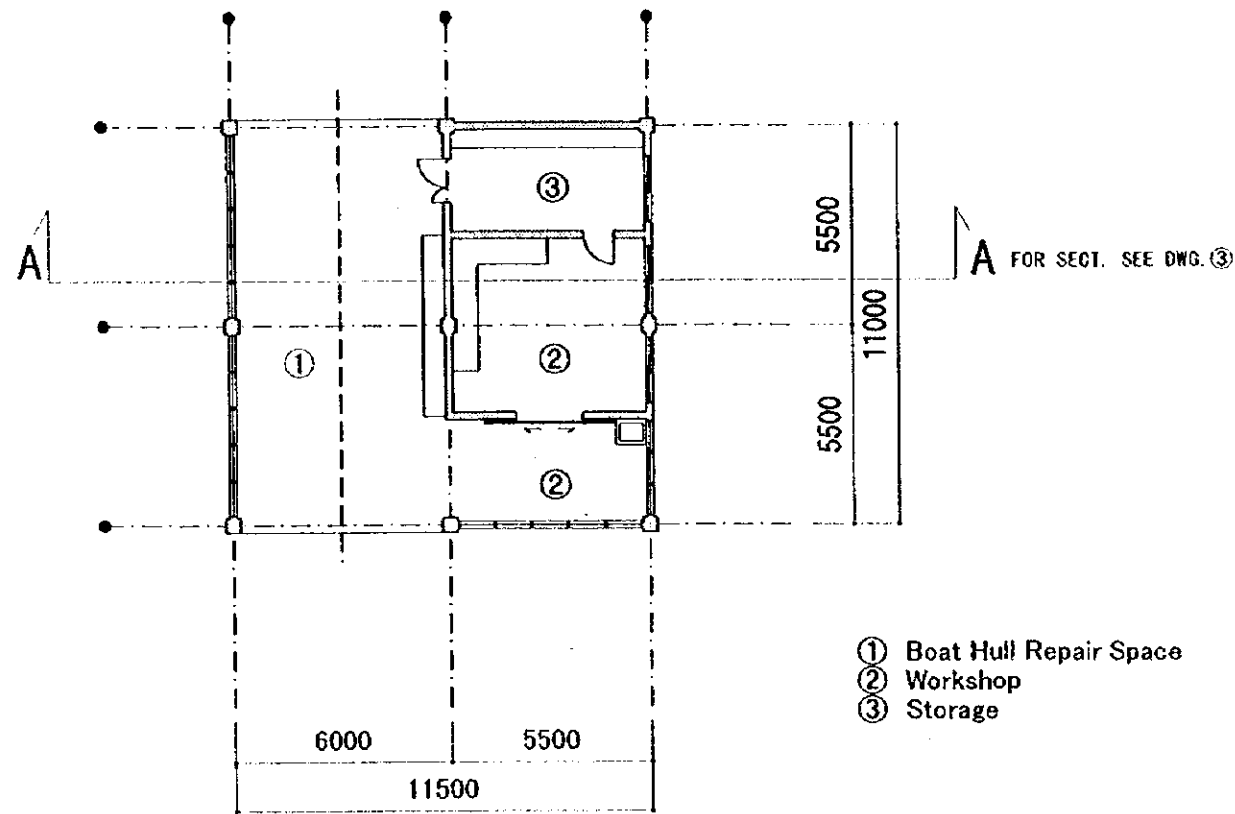
BASIC DESIGN PLAN ①



FRP Boat Maintenance Workshop at Lelu

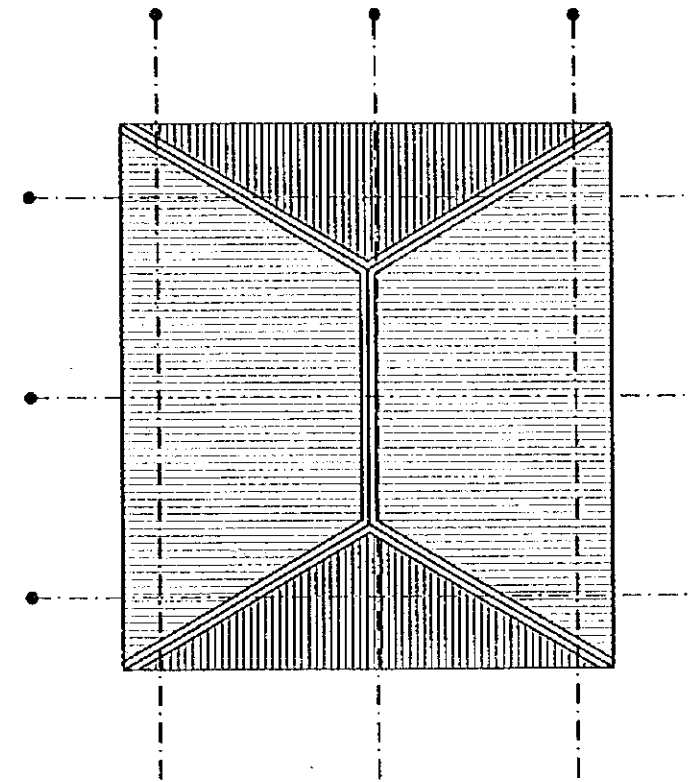
Plot Plan

scale= 1/500



- ① Boat Hull Repair Space
- ② Workshop
- ③ Storage

FIRST FLOOR PLAN



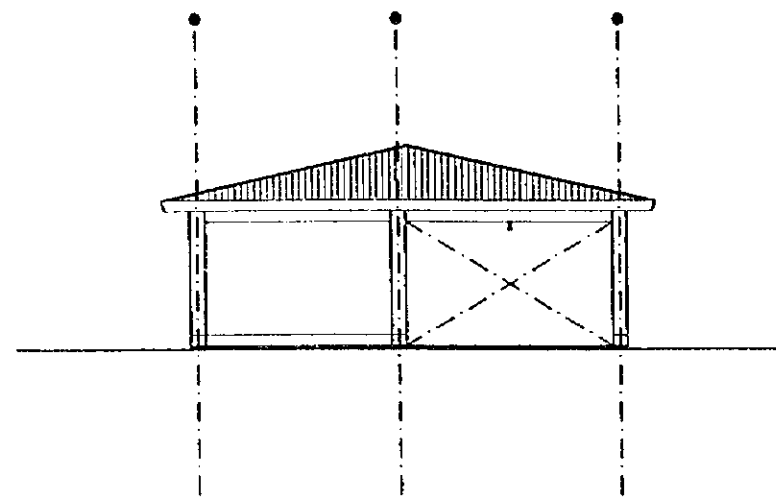
ROOF PLAN



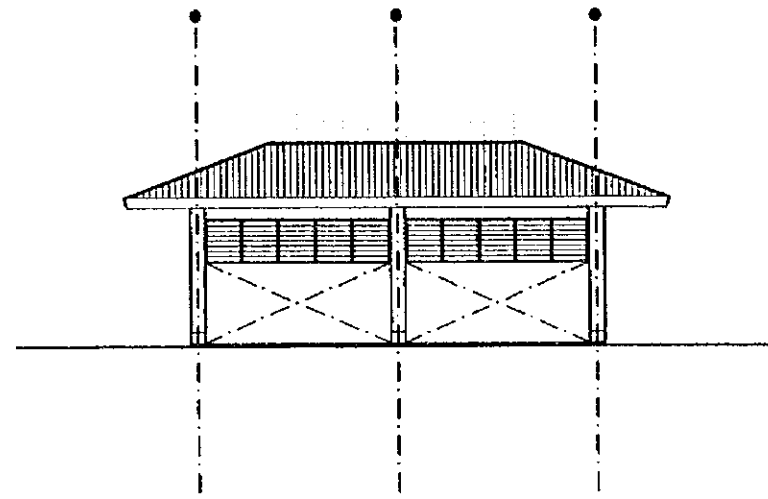
FRP Boat Maintenance Workshop at Lelu

Floor & Roof Plan

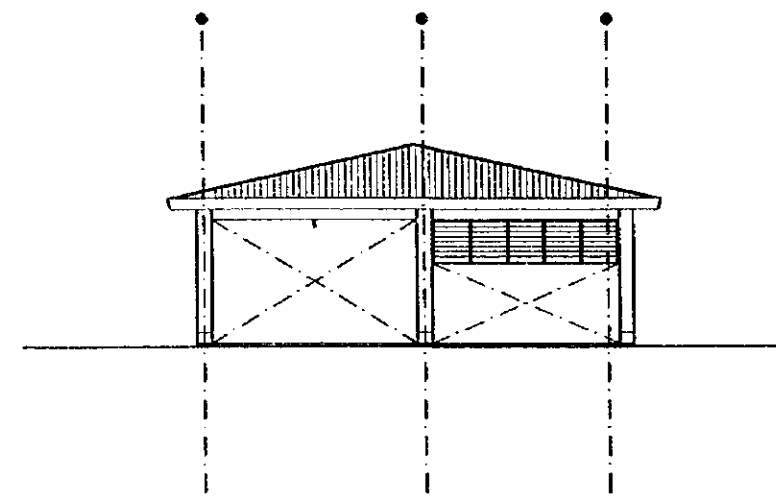
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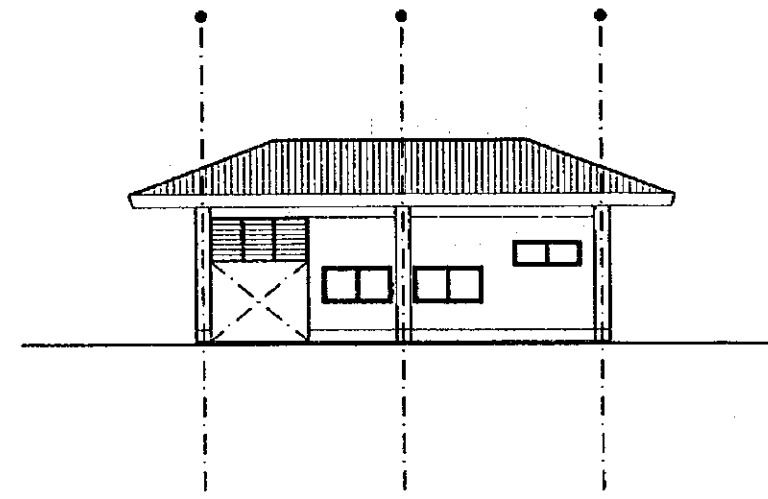
WEST ELEVATION



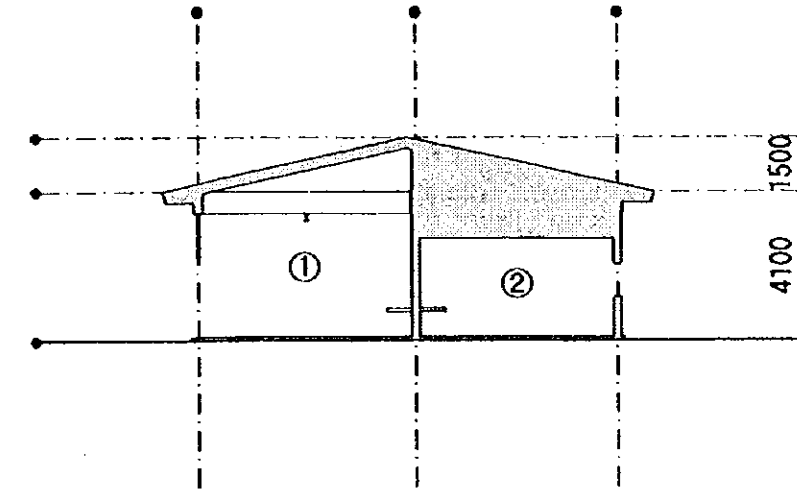
SOUTH ELEVATION



EAST ELEVATION



NORTH ELEVATION

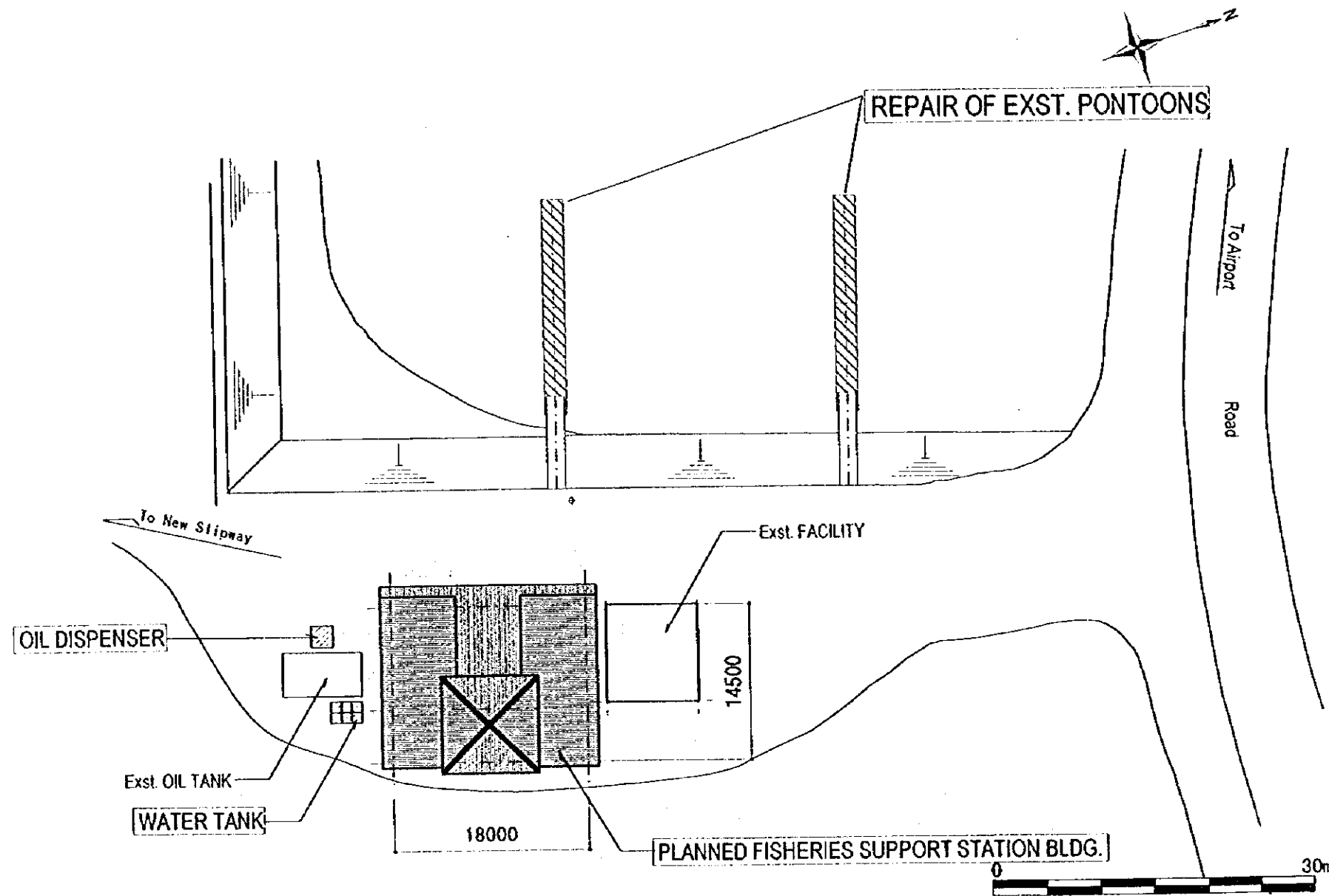


SECTION A-A

FRP Boat Maintenance Workshop at Lelu

Elevations & Section

scale= 1/200



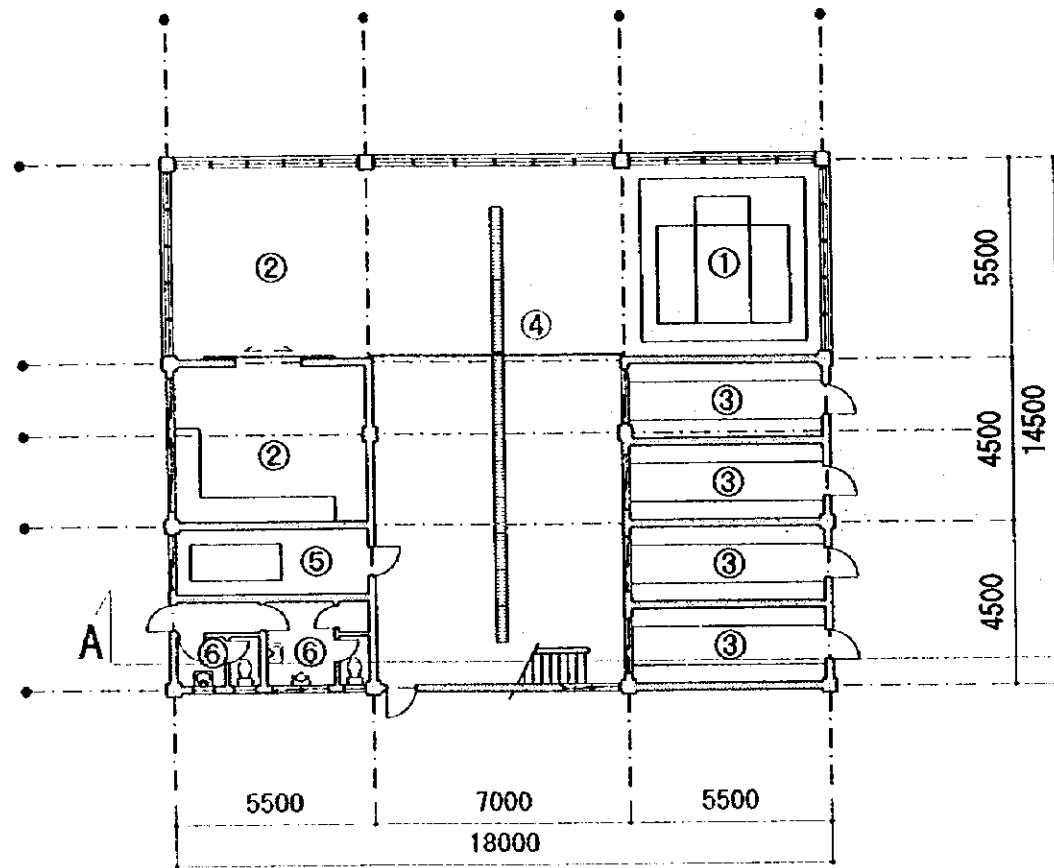
Artisanal Fisheries Support Station at Okat

Plot Plan

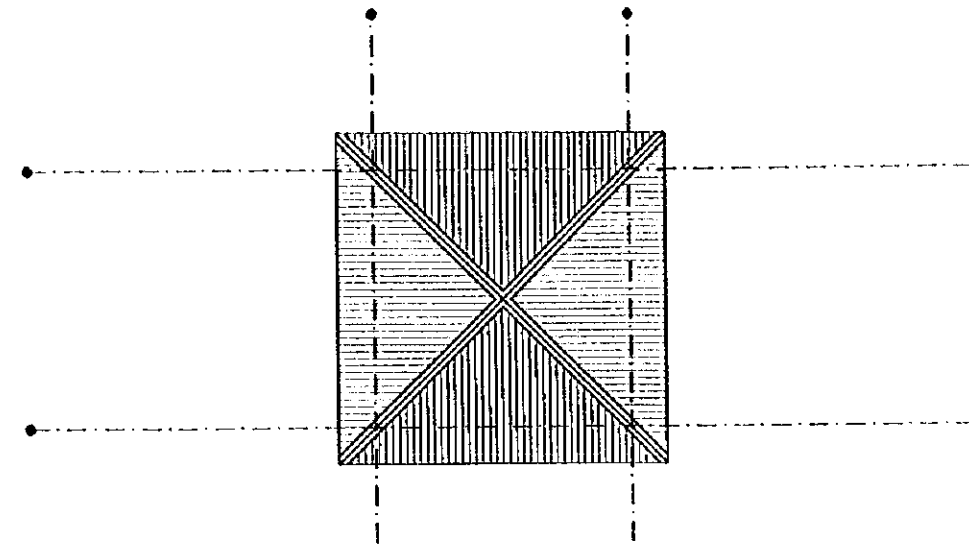
scale= 1/500

BASIC DESIGN PLAN ⑤

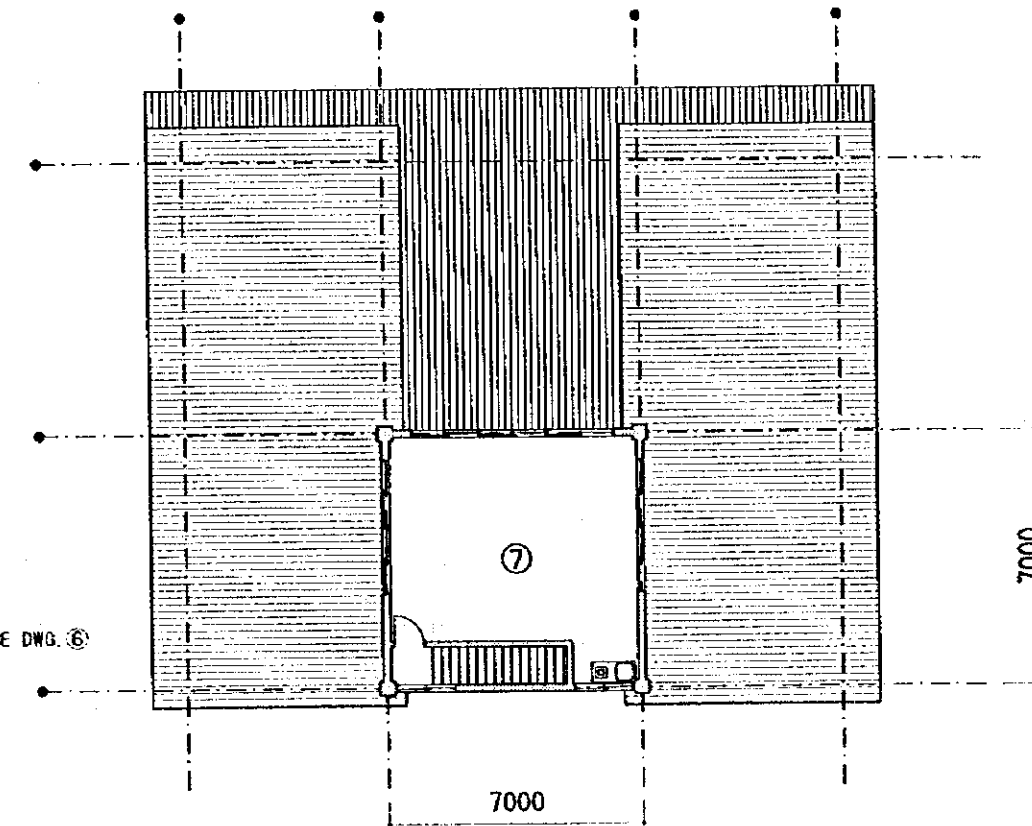
- ① Ice-making Room
- ② Outboard Motor Maintenance Room
- ③ Fishermen's Locker
- ④ Work Area
- ⑤ Machine Room
- ⑥ Toilet
- ⑦ Meeting Room



FIRST FLOOR PLAN



ROOF PLAN

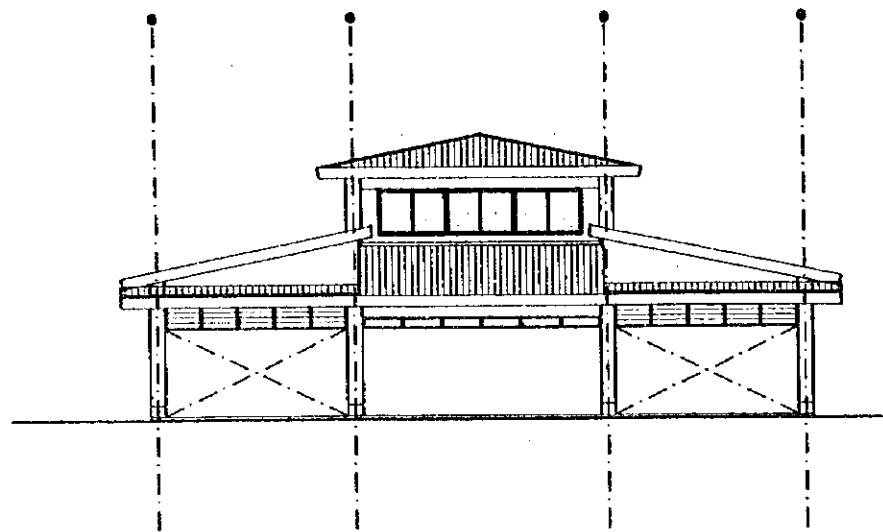


2nd FLOOR PLAN

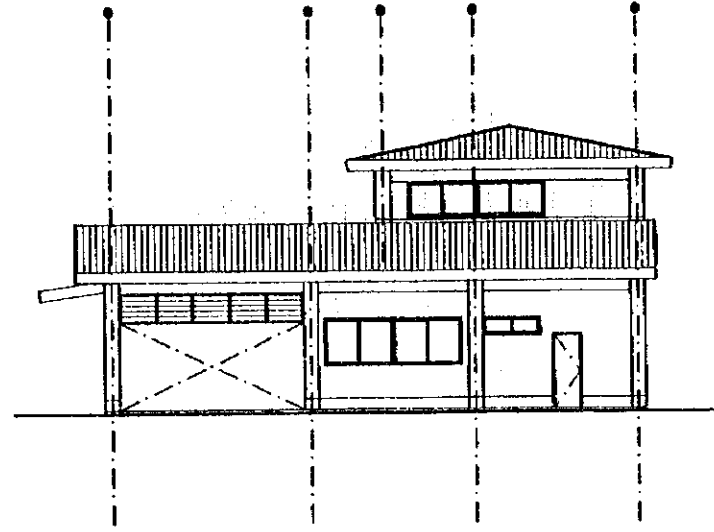
Artisanal Fisheries Support Station at Okat

Floor & Roof Plan

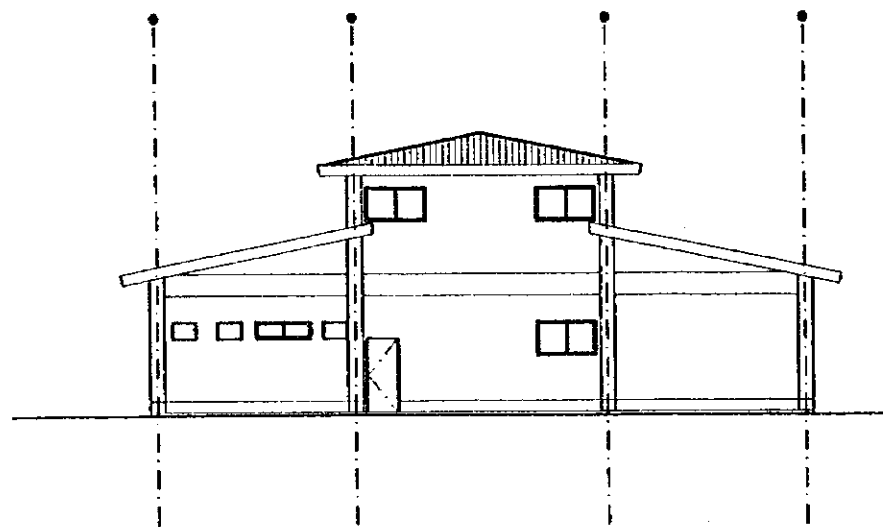
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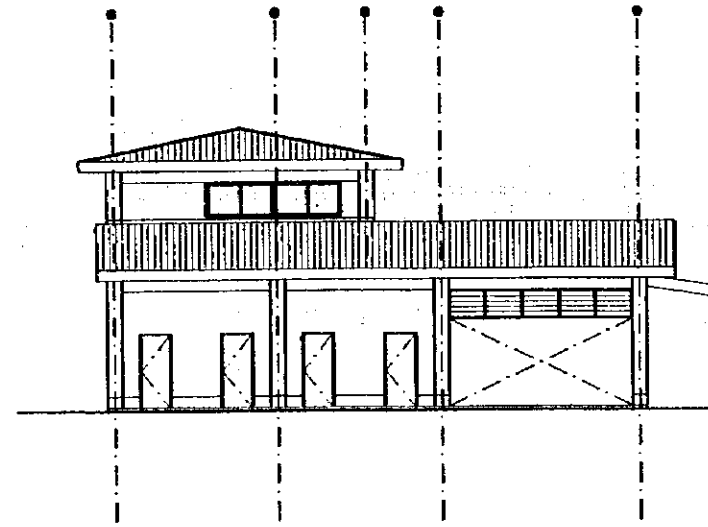
WEST ELEVATION



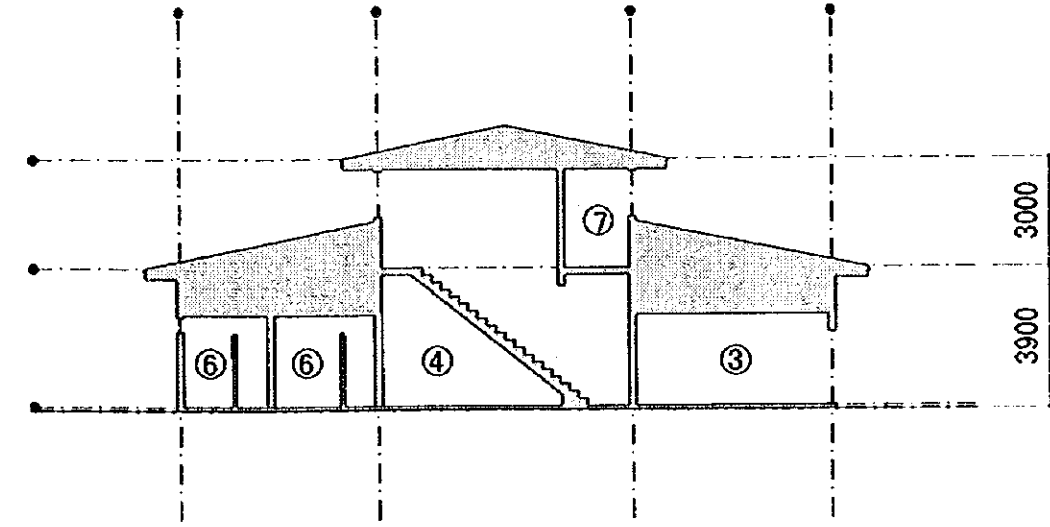
SOUTH ELEVATION



EAST ELEVATION



NORTH ELEVATION

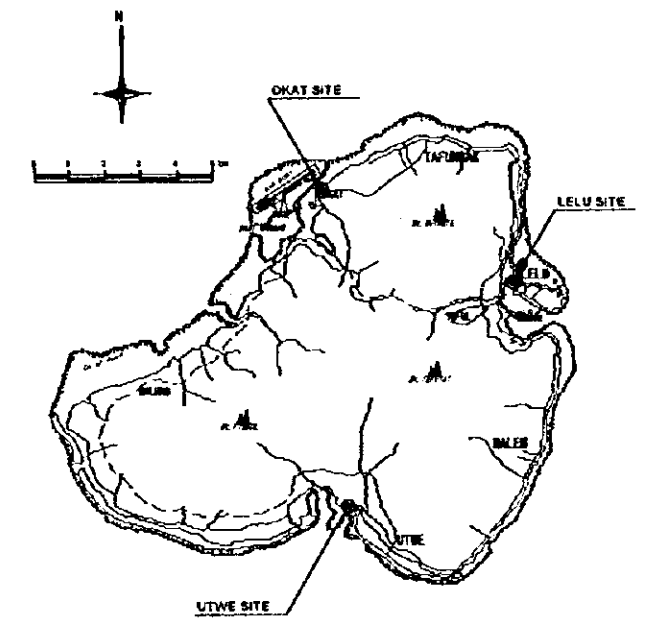
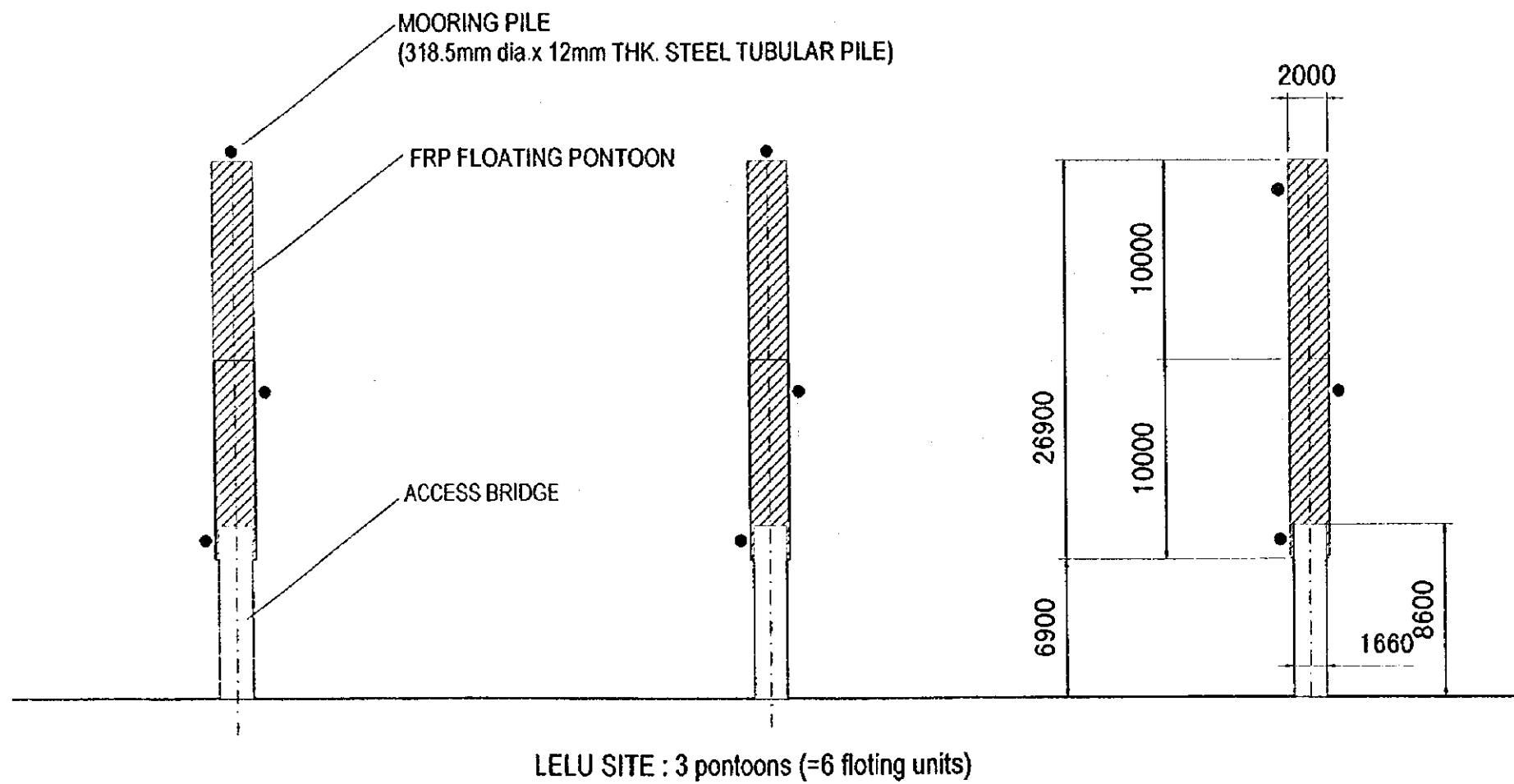
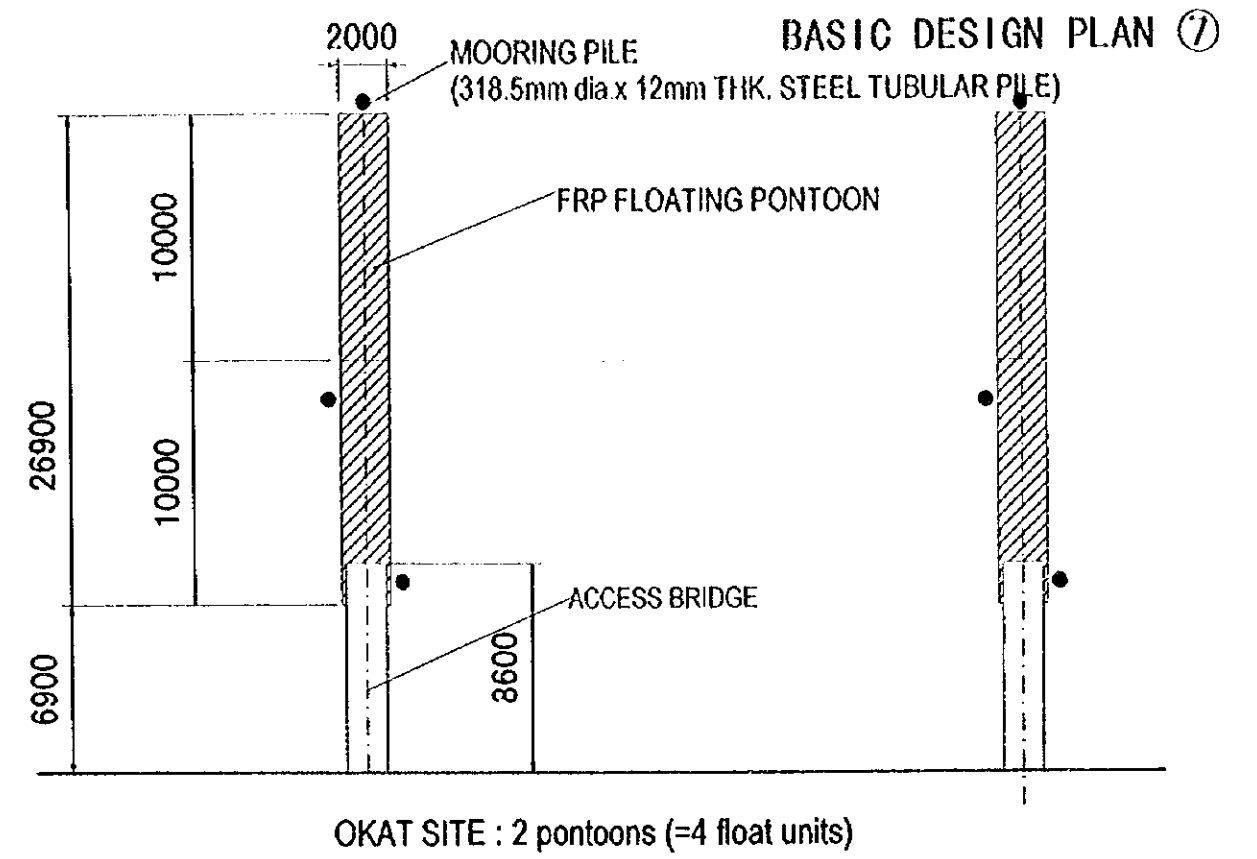
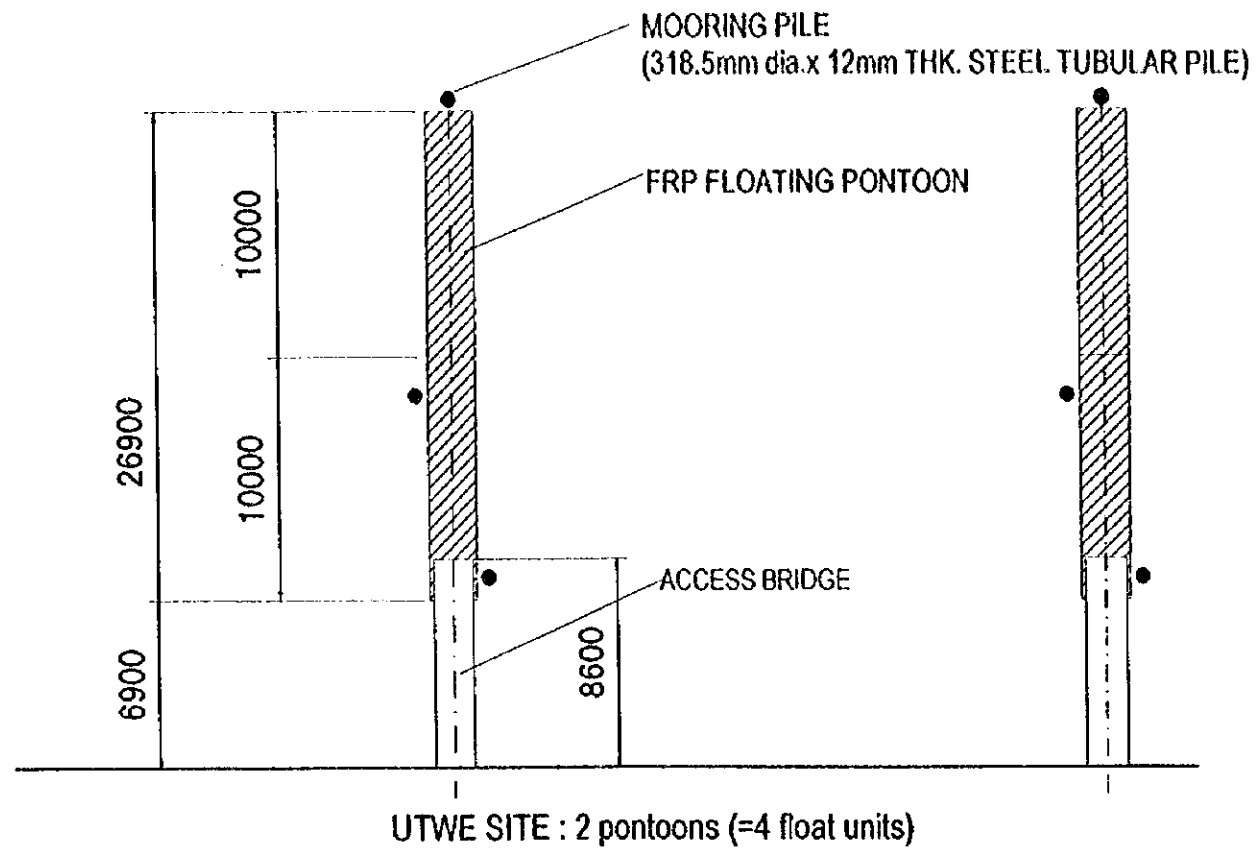


SECTION A-A

Artisanal Fisheries Support Station at Okat

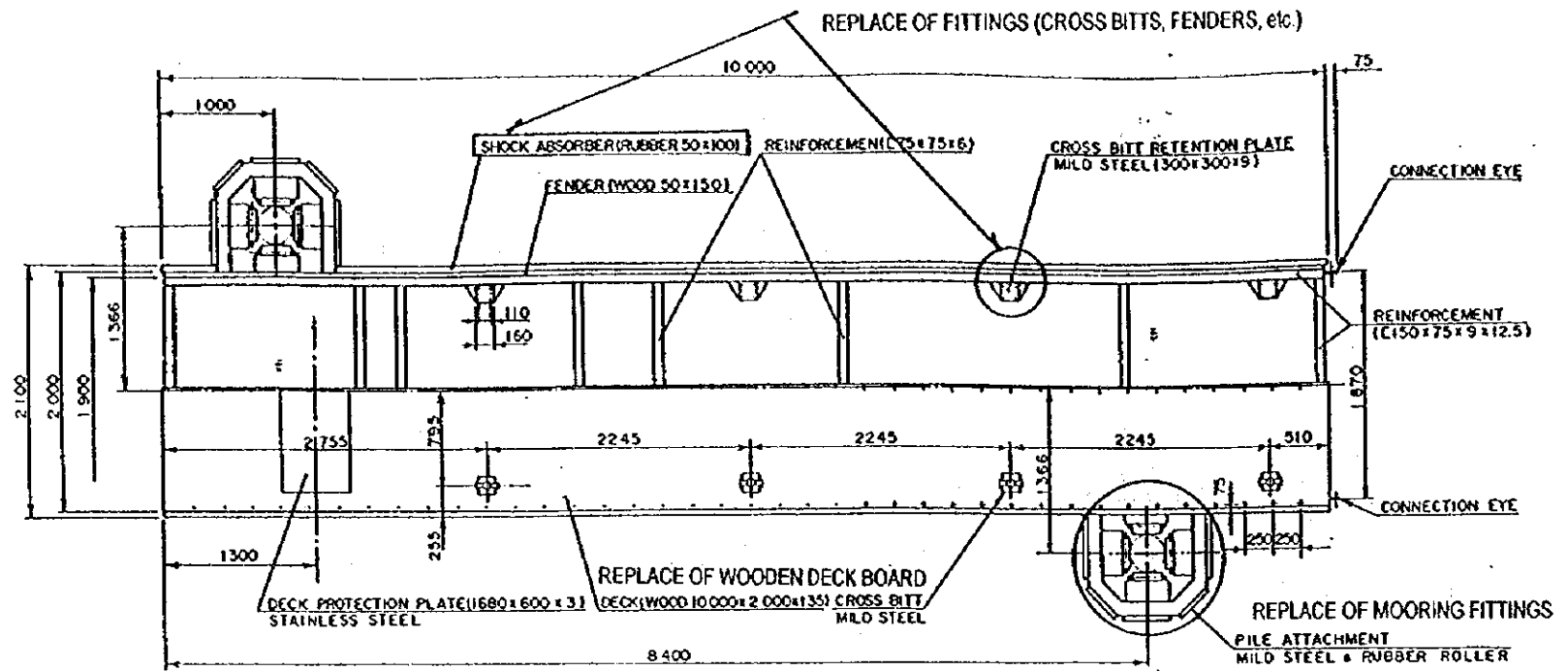
Elevations & Section

scale= 1/200

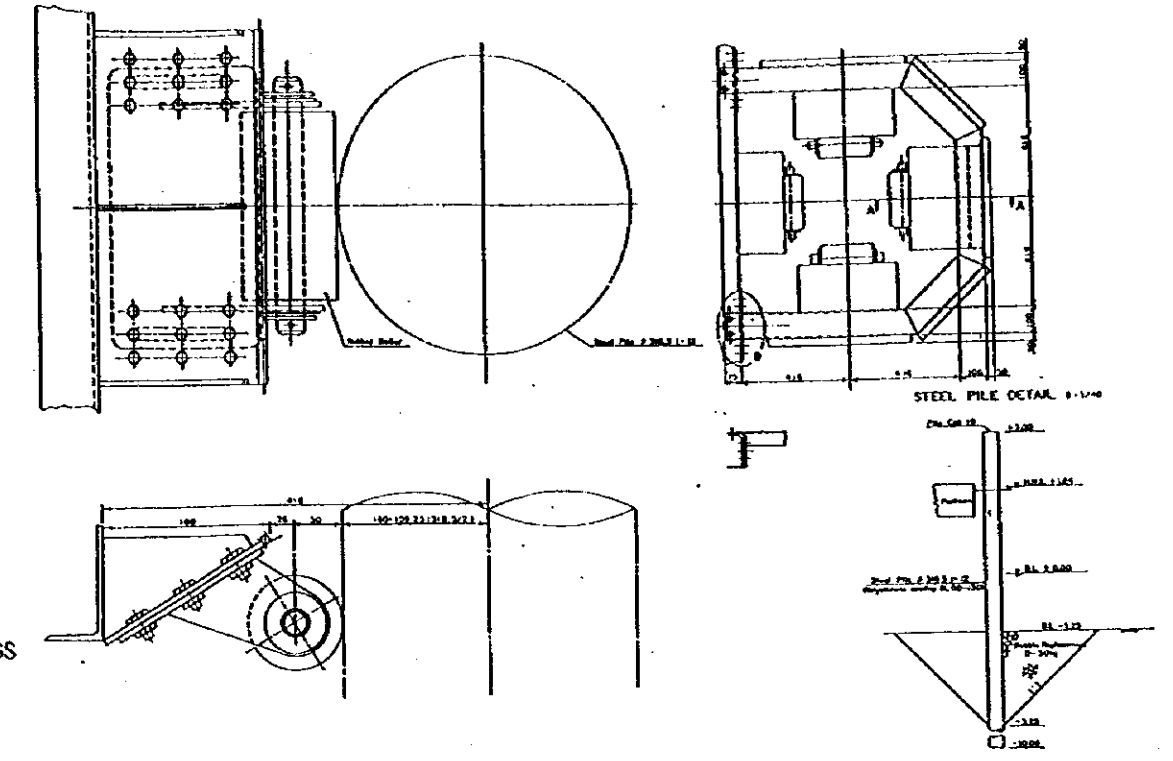


Existing Pontoons

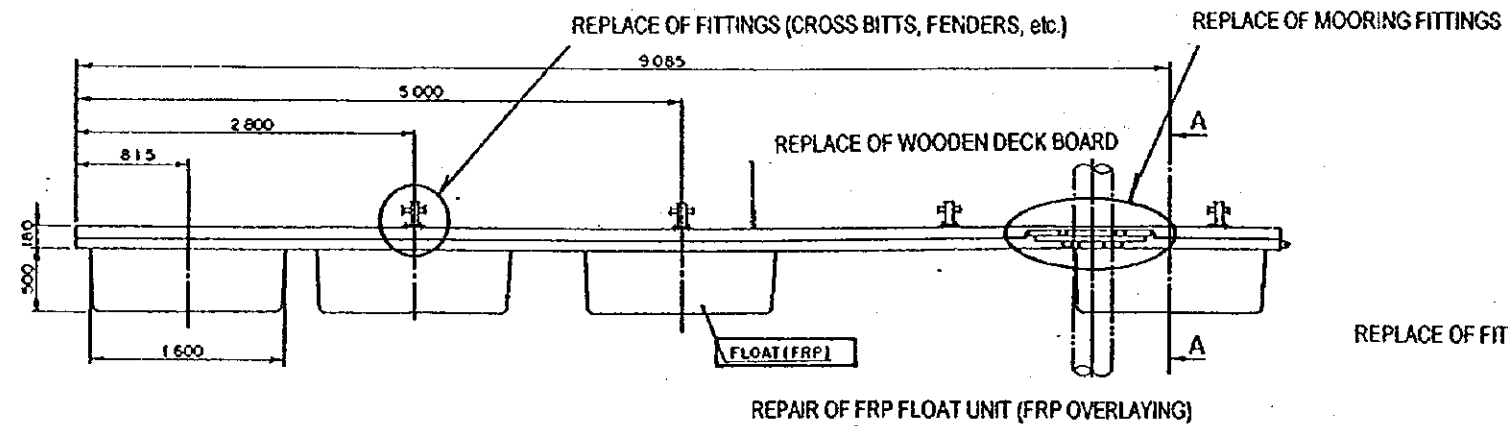
Pontoon Arrangement



TYPICAL PLAN

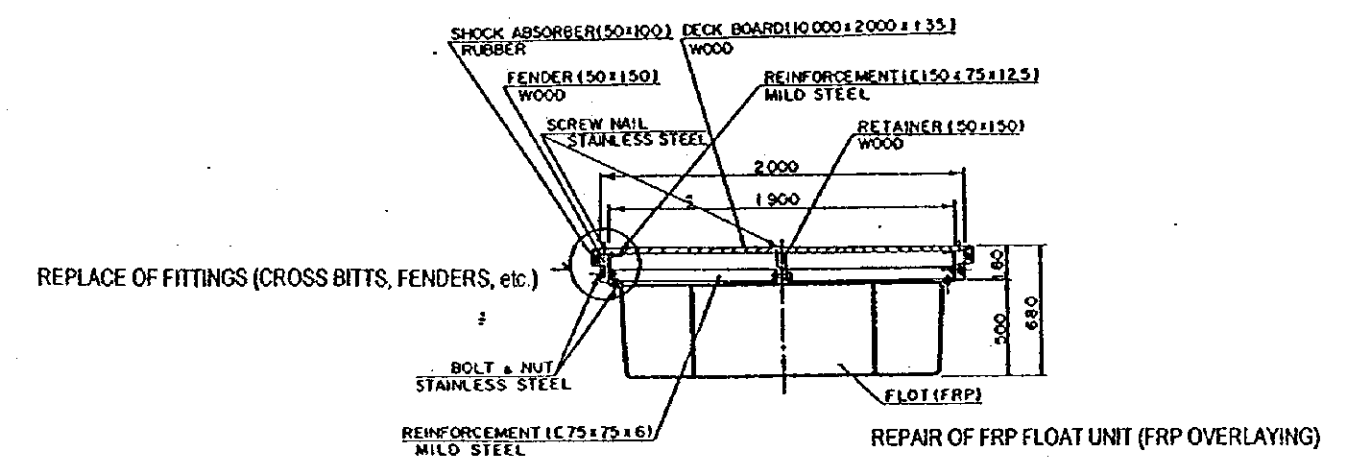


MOORING FITTINGS DETAILS



TYPICAL SIDE VIEW

APPROX. WT = 3257 kg (INCLUDING BALLAST WEIGHT OF 1420 kg)



TYPICAL SECTION A-A

Existing pontoons

Details scale = N.T.S.

CHAPTER 3. IMPLEMENTATION PLAN

3.1 Implementation Plan

3.1.1 Implementation Concept

If this Plan is carried out on the basis of a grant-aid from Japan, construction and procurement of the Plan facilities and equipment will proceed in the following sequence :

- (1) Exchange of Notes between the Government of Japan and the Government of FSM.
- (2) Conclusion of a Consultant Contract between a Consultant recommended by JICA and the Government of FSM or its designated authority.
- (3) Verification of the Consultant Contract by the Government of Japan.
- (4) The Consultant will undertake the detail design and prepare draft tender documents for approval by the Government of FSM. These will include criteria for pre-qualifications, technical specifications, drawings, project cost estimates, tender conditions, and a draft of construction contract.
- (5) With the approval, the Consultant will assist the Government of FSM to make a public notice of tender in Japan, to pre-qualify applicants for the tender, who shall be Japanese nationals, and to call for the tender for the Project in accordance with the JICA's "Guideline for Procurement under the Japanese Grant".
- (6) After opening of the tender by the Consultant on behalf of and in the presence of the FSM authority, the Consultant will prepare a tender evaluation report, in which tenders will be evaluated financially and technically. Unless otherwise conflict with the stipulations of the tender documents, the lowest tenderer will be recommended to the Government of FSM as a successful tenderer for awarding the contract for the Project.
- (7) The Consultant will assist in contract negotiations between the Government of FSM and the successful tenderer and will witness the Construction Contract.
- (8) Verification of the Construction Contract by the Government of Japan.
- (9) Based on the Construction Contract, the Contractor will furnish all labor, materials, equipment, transportation, construction and deliver the Plan facilities and equipment. The Consultant will, in accordance with the Consultant Contract, provide construction supervision, conduct tests and inspections, and be present at the hand-over of the facilities and equipment.

The following basic items must be carefully considered in connection with project implementation.

(1) The Project Implementing Bodies :

The implementing agency for the Project is the Kosrae State Government, while the Government of FSM will bear the responsibility until the Plan facilities will have been completed and delivered. The property right of the Plan facilities rests in the FSM Government even after turn over, and the Kosrae State Government will retain the right of using the facilities, and thus responsible for establishing the terms of concession, replacement of equipment, creation of fund for maintenance requirements, etc., all of which are necessary for the proper operation of the facilities. The Kosrae State Government is also bound to ensure that the Plan facilities accept any fishing boats indiscriminately. In implementing stage of the Project, the Department of Foreign Affairs will approve such documents as qualification conditions for the tender, tender documents, technical specifications and terms of contract. The Department receives the monthly report of the construction supervision and is the recipient of the completed facilities and equipment. The Department of Finance will conclude the Banking Arrangement and issue the Authorization to Pay in accordance with the verified contracts.

(2) The Consultant :

Assuming that this Plan is carried out under a grant-aid from the Government of Japan, following the Exchange of Notes, a Consultant Contract will be signed between a Consultant company, recommended by Japan International Cooperation Agency, and the FSM government. As the proxy for the FSM government, the Consultant will prepare tender documents, including technical specifications and drawings and assist the FSM Government, as required, in the bidding and contract phases, while also supervising the construction work on the sites. In the course of construction supervision, a resident engineer will be dispatched to Kosrae during the construction period.

(3) Contractor :

The Contractor will be selected in accordance with the following process. After evaluating the tender qualifications of companies of Japanese nationals responding to the tender notice, competitive bids will be solicited, based on bidding and contractual procedures established in advance. The successful bidder under this process will sign a construction contract with the Government of FSM under the lumpsum contract base. The Contractor will then construct the Plan facilities, furnish the Plan equipment, and deliver them to the Government of FSM.

(4) Construction Plan :

The most part of the construction work for the Plan facilities can be used the work methods locally available at the site.

The sequence of construction stages, following preparation of the shop drawings by the Contractor, will be as follows: temporary works, ground preparation works, reinforced concrete works, finishing works, transportation and installation of equipment. The followings points should be given careful consideration when examining the construction plan.

- ① Assuming that this Plan is implemented on the basis of a grant-aid from the Government of Japan, scrupulous adherence to the construction schedule will be a major premise. The construction plan, therefore, must be prepared so as fulfill all contract conditions within the term of validity stipulated in the Exchange of Notes.
- ② The construction plan has been developed based on the construction method used widely in Kosrae. The majority of materials and equipment shall be brought from Japan or third country, however skilled and unskilled labor can be available within the FSM.
- ③ Having abundant precipitation in Kosrae, adequate consideration must be given to the ground preparation and foundation works, which are prone to rains.
- ④ As this Plan includes improvements to the existing artisanal fisheries support stations, where the existing facilities are operating, due care shall be taken to avoid disrupting the activity at the existing facilities. Specifically, for the repair works of the pontoons, the process must be implemented in consultation with the implementing agency.

(5) Procurement Plan

Most of the basic construction materials and equipment will be supplied from Japan or the third countries. Careful considerations must be given to the delivery time and transportation period so that the disruption of the construction work flow will not occur. Tight control and exact monitoring of the construction work schedule will be essential.

3.1.2 Scope of Work

(1) Scope of responsibility of the Japanese Government

Assuming the Plan is carried out under a grant-aid from Japan, the Government of Japan will assume responsibility for the following phases :

- ① Construction of the FRP Boat Maintenance Workshop for the Lelu Fisheries Support Station

- ② Construction of the Okat Fisheries Support Station Facilities
 - ③ Renovation of the pontoons at Lelu, Okat and Utwe
 - ④ Procurement and installation of the ice-making plant and workshop equipment
 - ⑤ Consultant services, including the detail design, assistance with the bidding process as well as construction supervision.
- (2) Scope of responsibility of the Government of the Federated States of Micronesia
- Assuming the Plan is carried out under a grant-aid from Japan, the Government of FSM will assume responsibility for the following phases :
- ① To secure land necessary for the sites and to verify the boundaries of the sites;
 - ② To provide necessary permissions, licenses and other authorizations for implementing the Project;
 - ③ To ensure tax exemption and prompt unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid;
 - ④ To exempt Japanese nationals from customs duties, internal taxes and other duties which will be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
 - ⑤ To bear commissions of Japanese bank for its banking services based upon the Banking Arrangement, namely the advising commission of the "Authorization to Pay" and other payment commissions;
 - ⑥ To regulate and control fishing boats against usage of pontoons during their renovation;
 - ⑦ To transport and install an emergency generator to the Okat Artisanal Fisheries Support Station Facilities;
 - ⑧ To procure office furniture for the Project;
 - ⑨ To allocate appropriate budget from the Kosrae State Government for operation and maintenance of the facilities of the Project;
 - ⑩ To shift the electric line poles outside the boundaries of the Plan facilities; and
 - ⑪ To bear all the expenses other than those covered by the Grant aid, necessary for the Project.

3.1.3 Consultant Supervision Plan

The following basic items will be applied for the supervision of the construction.

(1) Since most of the materials and equipment for this project will be procured from Japan or the third country, the Consultant shall maintain in close contact with the Contractor and the implementing agency, to ensure a smooth implementation of the Project in line with the construction schedule.

(2) Prior to the commencement of the work, construction time schedules as well as execution plans and shop drawings shall be examined to confirm the appropriateness of the time schedule, quality of the materials and work methods.

(3) **Quality Control**

The Consultant will confirm whether or not the quality of the materials and equipment to be used for the work conforms to the standards specified in the contract documents (i.e. technical specifications, detail drawings, etc.). All documents recording the construction process shall be filed and kept for the period of 10 years after completion of the facility and equipment, ready to be submitted whenever necessary. These documents include such items as quality control record, drawings and plans, photos and other documents.

(4) **Construction Progress Control**

The Consultant shall compare the time schedule to be submitted by the Contractor upon contract and the actual construction progress every month. In case the construction progress deemed to be behind the schedule, the Contractor shall be noticed and shall submit a plan to recover for securing the completion within the contract time period.

- ① Confirmation of the construction progress in percentage
- ② Confirmation of input volume of materials and number of equipment
- ③ Confirmation of numbers of engineers, technicians and laborers

(5) Before the handing over of the facilities and equipment, the details of the construction work shall be inspected and verified in conformity with the Contract Documents, and in case of necessity, due corrections shall be instituted.

3.1.4 Procurement Plan

(1) **Construction materials procurement plan**

The construction materials used for this plan will be procured within Kosrae State whenever possible.

The sand, gravel, blocks, cement, and paint can all be procured locally. Though some of the other materials, including reinforced steel bars, metal doors and windows, lumber and roofing materials are available locally, these materials are imported from Japan or the third countries, and it is hard to secure the stable supply and the uniform quality. The procurement plan of the construction materials by country of source, for the main building and equipment is shown in Table 3.1-1.

Table 3.1-1 Source for the Main Construction Materials

	Main construction material	Japan	FSM	Other	Remarks
1	Cement		○		Locally available with reasonable price
2	Aggregate		○		
3	Concrete Block		○		
5	Form		○		
6	Paint		○		
7	Wood	○	○		
8	Reinforcing bar	○			Not available locally & considering quality, durability and time of delivery
9	Metal Doors & Windows	○			
10	Roofing	○			
11	Elec. wire/Lighting fixture	○			
12	Switchboard	○			
13	Pipe	○			
14	Sanitary Fixtures	○			

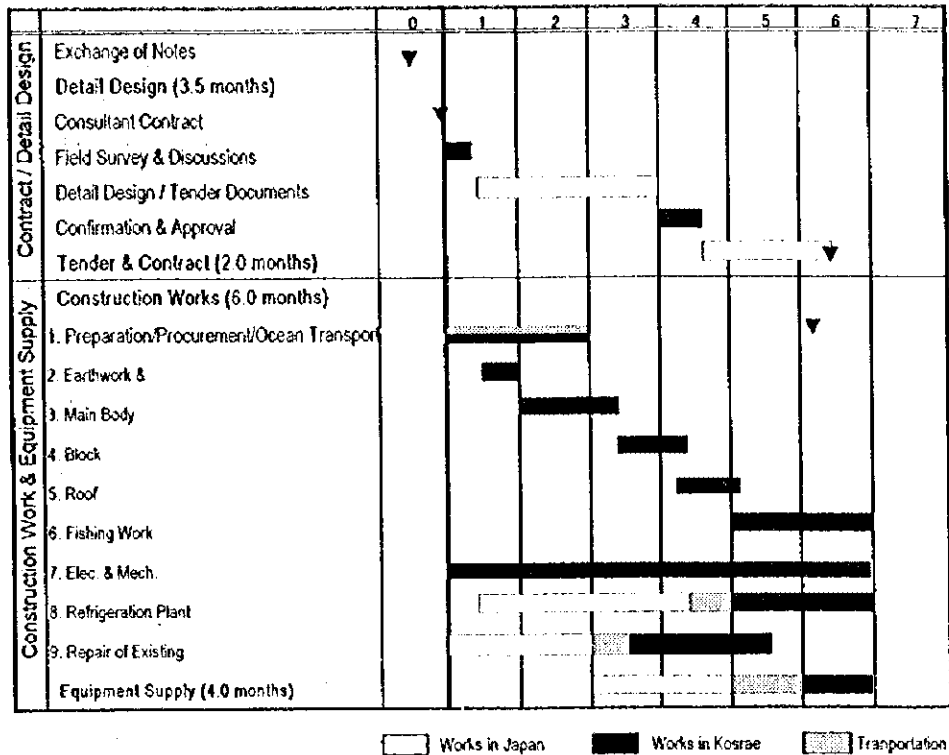
(2) Transport route

Between Japan and Kosrae, Kyowa Line provides one liner service every month and PM & O Line services one liner every two months. The sailing time from Japan is approximately 3 weeks. From Okat harbor to each of the sites, surface transportation will be used.

3.1.5 Implementation Schedule

If the Plan is carried out on the basis of a Grant-aid from the Government of Japan, following the Exchange of Notes between the two governments, the consultant contract will be concluded and detail design and the tender documents will be prepared. With the assistance by the Consultant, a tendering will be made for construction of the facilities and the procurement of the equipment. The implementation schedule will be as shown below.

Table 3.1-2 Implementation Schedule



(1) Detail Design

The detail design shall be organized based on the basic design study report, and the tender documents will be prepared. This is expected to take about 3.5 months.

(2) Tendering phase

After approval of the tender documents by the Government of FSM, the Consultant will assist the Government of FSM to make a public notice of tender in Japan, to pre-qualify applicants for the tender, and to call for the tender. After opening of the tender, the Consultant will prepare a tender evaluation report, and a successful tenderer will be recommended to the Government of FSM for awarding the contract for the Project.

The time estimated for the tendering phase, from the notice of tender to the signing of a construction contract, will be about 2 months.

(3) Construction Work, Procurement and Installation

The construction work will be commenced after the contract signing and its verification by the Government of Japan. The required construction time is estimated to be about 6 months.

3.2 Project Cost Estimation

3.2.1 Operation and Maintenance Costs

(1) Facilities operation plan

The facilities are intended to function as support stations for artisanal fisheries, providing ice-making and ice storage facilities. The operations conditions for cost estimate of the planned facilities are as assumed below.

1) Annual operation days : 250 days

In general, at the existing facilities, fish buying, selling and sales of sundry items takes place from Monday through Saturday. Allowing for Sundays, holidays, and days when the weather is poor, as well as maintenance days for the equipment, it is assumed that the annual days of operation will be 250.

2) Personnel

One manager and 2 staff members will be employed to run these facilities. The annual salaries, including social insurance is as shown below.

Manager(1 p.)	US\$6,000	(Incl. annual salaries, including social insurance, etc.)
Staff(2 p.)	US\$7,000	(=@US\$3,500 x 2)

3) Sales price of Ice

Based on the experience with ice sales at the Lelu fisheries support station, the price will be set at 20 cents per kilogram (US\$200/ton).

4) Electricity cost

The cost for electricity effective after July 1999 for an annual usage in excess of 10,000 kwh is US\$0.17/kwh.

5) Water cost

The water supply situation from the municipal water is fairly good, particularly in Okat where the water is treated before being distributed. Assuming that 70% of the water is supplied through the municipal water service and the remaining 30% is from rainwater. The current unit cost for municipal water is as follows.

Water cost	US\$ 1.6/ton
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6) Sales costs of fresh fish

Currently, at the Okat facility, the reef fish are bought at US\$1.65/pound and sold at US\$1.75/pound. This means there is a US\$0.10 margin per pound, which is equivalent to US\$0.22 per kilogram. This value will be used for the calculations. The monthly sales amount will be assumed as 300 kg, following the actual sales record.

7) Sales costs of fuel oil

The Government of Kosrae State has a plan to subsidize the price of fuel oil for the artisanal fisheries. The sales price of 1 US gallon of gasoline to fisherman would be fixed to US\$1.00, and the sales commission earned by the planned facilities will be US\$0.20 per US gallon. Based on past results, monthly sales volume is set at 2500 gallons.

A summary of the above operating conditions is given below.

Working days / year	250 days
Operating hours	10 hours / day
Operating staff	1 manager, 2 workers
Electricity cost	US\$0.17 / kwh
Water cost	US\$1.60 / ton
Ice selling price	US\$0.20 / kg
Fee from fish sale	US\$0.22 / kg
Fee from fuel oil sale	US\$0.20 / gallon

(2) Facilities operation costs

Detail of the facilities operations costs are estimated as follows.

- Electricity charge: $411.29\text{KW/day} @ \text{US}\$0.17/\text{KW} \times 250\text{days} = \text{US}\$ 17,480/\text{year}$
- Water charge: $1.2\text{m}^3 \times 1.2 \times 0.7 \times 250 \text{ days} = 252\text{m}^3/\text{year}$
 $252\text{m}^3 @ \text{US}\$1.6/\text{m}^3 = \text{US}\$403/\text{year}$
- Annual Personnel cost: (Incl. annual salaries, including social insurance, etc.)
Manager(1 p.) @ US\$6,000 = US\$6,000/year
Staff(2 p.) @ US\$3,500 = US\$7,000/year
Total US\$13,000/year

Thus, as shown below, annual facilities operations costs are calculated US\$ 30,883/year.

$$\text{US}\$17,480 + \text{US}\$403 + \text{US}\$13,000 = \text{US}\$ 30,883/\text{year}$$

(3) Facilities operation revenue

For the revenue from ice sales, an annual production of 150 tons of ice sold at US\$200/ton yields US\$30,000/year.

The revenue from the sale of fish is US\$792 as annual handling volume of fish is 3600 kg.

Fuel sales of 30,000 gallons/year brings in handling fees of US\$6000.

The annual revenue and expenditures for the planned facilities are summarized below.

Table 3.2-1 Annual Project Operating Revenues and Expenditure

Revenue		Expenses	
1) Ice sales	US\$30,000	1) Power for ice-makers / storage	US\$17,480
2) Fee from fish sale	US\$792	2) Water cost	US\$403
3) Fee from oil sale	US\$6,000	3) Personnel expense	US\$13,000
Total	US\$36,792	Total	US\$30,833
		Balance	+ US\$5,959

As described above, the direct operation costs for running the planned facilities would be covered by the operation revenue. It is recommended that the operation income be saved and used for facilities maintenance and replacement of equipment in the future.

CHAPTER 4. PROJECT EVALUATION AND RECOMMENDATIONS

4.1 Verification of Project Appropriateness and Project Benefits

The objectives of this Project are to promote the artisanal fishing activities and to ensure the safety of the fishing boat by improving the capabilities of the artisanal fisheries support stations through renovating and expanding a part of the functions of the existing facilities and equipment of the artisanal fisheries support stations, and making effective use of existing facilities and equipment.

We have summarized below the problem areas in the artisanal fisheries sector that the subject project seeks to resolve, along with the scope of the benefits that can be anticipated from project implementation.

(1) Improving the freshness of the catch

The FRP fishing boats used in Kosrae State do not have refrigeration equipment, so ice is the most effective means of preserving the freshness of the harvested fish. The Okat support station has the most active fishing activity of the three existing stations. Fifty FRP boats out of 85 in Kosrae are operating from the Okat marina. Though there are mooring, fuel supply, and refrigeration facilities, it is not possible for the fishermen to properly preserve freshness of the harvested fish without the ice-making facilities. Since these FRP boats are not equipped with fish hold, the common method is to keep the catch in the insulated boxes; but, since ice cannot be obtained or is available only in small quantities, there is a considerable deterioration in the freshness of the fish by the time the boats return to the marina, and sometimes the fish has virtually no market value. In addition, even during good fishing seasons, since there is no means for preserving the freshness of the catch, the fishermen must return to port quickly. Conversely, when the fish are scarce, and the fishermen would like to stay longer in the fishing grounds, they are forced to return by the fear of losing quality of the harvested fish. This lack of appropriate preservation means is one of the reasons for hampering improvement of the fishing efficiency. This Plan envisages installation of another ice-making plant in the existing fishery support station, which will not only make freshness preservation easy, but also improve fishing activity by extending fishing time and reducing preparation time.

(2) Increasing efficiency of fishing through improved boat maintenance

Most of the fishing boats operating in Kosrae are FRP catamarans with outboard engines, provided under the Grant-aid program from Japan in 1987. There are also monohull FRP boats equipped with the outboard motors. The catamaran boats have been in service for over 10 years, and many of them require repairs. The damage to the house mounted on the deck and to the fish hold hatches is quite noticeable. These FRP catamarans are the backbone of the artisanal fisheries in Kosrae. Presently, there are 85 of FRP catamarans and monohull fishing boats in total, and it is felt that the present level of fishing activities cannot be kept unless present number of boats is maintained. Although there are workshops managed by the Department of Fisheries and Marine Resources of the Kosrae State that can repair the outboard engines, however, there are no facilities to repair the FRP hulls. An FRP boat repair workshop provided under this Plan will sustain the existing fleet by rendering an integrated service for the boat, both in FRP hull maintenance and in engine repair.

(3) Improvement of the safety of preparation and landing works on the floating pontoons

Floating pontoons have been installed to provide mooring facilities and support fishing activities at 3 support stations in Lelu, Okat and Utwe in Kosrae. There are no other mooring facilities for the small fishing boats in Kosrae than the floating pontoons at the 3 support stations, and the artisanal fishermen have to keep their boats at the beaches near their home. The floating pontoons play an important role for facilitating the preparations work, such as loading the gear and unloading the catch, regardless of the tide level. However, the pontoons at the three stations now list by as much as 10 degrees as a result of degradation, making the work on the platform hazardous. There are great concern over the sinking of the pontoons and loss of the function for mooring in the future. If the repairing of pontoons will be materialized with this Plan, it will be possible to improve safety and to secure the mooring function for the future.

(4) Strengthening the operation basis of the facilities by organizing the fisherman and developing fishing activities

The operation and maintenance of the facilities will be managed by Marine Foods Inc. (MFI) under the guidance and supervision of the Project Steering Committee of the Kosrae State Government. Unfortunately, it is difficult to claim that the MFI's activity has been satisfactory. This Plan will improve the fishery support station facilities and increase the convenience, which is expected to lead to an increase in the member of fishermen's

association from the present 112 fishermen. A closer communication among the fishermen themselves and between the fishermen and the management of the support station will be encouraged with this Plan by provision of a meeting room, and this should benefit better MFI's activity and better facility management.

The Department of Fisheries and Marine Resources of the Kosrae State is planning to strengthen the resource management particularly for the reef and bottom fish within the limited fishing ground around Kosrae. In addition to protecting marine resources by enacting fishery regulations to limit fishing gear and seasons, and to protect coral reefs, there are also activities to encourage artisanal fisheries by deploying FADs. Nevertheless, the fishermen have not been adequately informed of these policies and activities so far. If the training and information exchange area for fishermen can be established in Okat support station as the core facility, it should be possible to advance the organization of the fishermen and to accelerate the activities of the Department of Fisheries and Marine Resources.

Through the overall effect of this Plan, it is expected that the operation conditions of the artisanal fisheries will be improved, ensuring that adequate quantities of fish can be harvested for local consumption within Kosrae. This will render a certain support to establish a self-sufficient economy. Furthermore, if a self-sufficient economy can be established, it will be possible to eliminate the reliance on imported goods, and help improve the health, welfare and standard of living for the people. Promotion of the artisanal fisheries through this Plan will provide direct benefits to all 7,400 residents of Kosrae State, it has been determined that the subject Plan is eminently appropriate for implementation under a grant aid from Japan.

4.2 Recommendations

The functions of the artisanal fishery support stations in Kosrae State will be expanded by this Plan. For more effective utilization of these facilities, it is imperative to materialize the artisanal fisheries support measures planned by the Kosrae State Government and to make efforts to meet the actual needs of the artisanal fishermen. In carrying out the subject Plan, we believe that the results could be even further entranced by adopting the following recommendations.

(1) Incentives for out fishing

Materialize a plan to provide incentives to go fishing, such as subsidies for fuel costs, and deploying FADs to attract migratory fish. These incentives may vitalize the fishing activity.

(2) Encouragement of using ice

Make effective use of the ice-making machine to be provided with this Plan, and to make it sure that the fish are iced immediately after being caught for improving the quality of fish, which will increase the distribution volume of fish in Kosrae.

(3) Appropriate operation and management of facilities

MFI has been designated in this Plan as the operation agency for the support stations. Their past performance however has not been entirely ideal. Therefore, the Kosrae Government is planning to establish a project steering committee composed of head from the Department of Commerce and Industry, the Department of Administration, the Department of Fisheries and Marine Resources, and the Department of Agriculture and Land. We suggest this committee should start working with MFI to establish a clearly-defined operations and management system as soon as possible.

(4) Establishment of a system for facility maintenance

A maintenance plan should be made covering the facilities and equipment provided in this Plan, as well as that of the existing facilities. The budget and necessary personnel should be secured so that periodic maintenance and inspection can be performed to maintain the functionality of the facilities and equipment. Since the ice-making equipment will have to be replaced after about 10 years of use, the operation surplus should be accumulated and saved for future replacement.

APPENDICIES

- Appendix - 1. Member List of the Survey Team**
- Appendix - 2. Survey Schedule**
- Appendix - 3. List of Party Concerned in the FSM**
- Appendix - 4. Minutes of Discussion**
- Appendix - 5. Cost Estimation Born by the Government of FSM**
- Appendix - 6-1. Survey Plan (Lelu)**
- Appendix - 6-2. Survey Plan (Okat)**
- Appendix - 6-3. Survey Plan (Utwe)**
- Appendix - 7. Meteorological Data**
- Appendix - 8-1. Results of Plate Bearing Test**
- Appendix - 8-2. Load - Displacement Curve**
- Appendix - 8-3. Existing Subsoil Survey Data**
- Appendix - 9. Equipment List**

Basic Design Study on
The Project for Improvement of the Facilities for Artisanal Fisheries Support Station
in Kosrae State in the Federated States of Micronesia
Member of the Study Team

<Field Survey>

1. Leader
SHIMODA, Toru
Second Project Study Division,
Grant Aid Project Study Development,
Japan International Cooperation Agency
2. Technical Adviser
OGASAWARA, Shoich
Office of Overseas Fisheries Cooperation,
International Affairs Division,
Fisheries Policy Planning Dept., Fisheries Agency,
Ministry of Agriculture, Forest and Fisheries
3. Chief Consultant cum Fisheries
Development
TAKAHASHI, Kuniaki
Fisheries Engineering Co., Ltd.
4. Architectural Planning cum
Physical Condition Researcher
WATANABE, Kunihiro
Fisheries Engineering Co., Ltd.
5. Facility Planning
TOSHIHARA, Takafumi
Fisheries Engineering Co., Ltd.
6. Engineering Work Planner
INKI, Toshihito
Fisheries Engineering Co., Ltd.

<Consultation on the Draft Basic Design>

1. Leader
TAGUCHI, Hiroto
Deputy Director,
Fisheries Marketing Division,
Fisheries Policy Planning Dept., Fisheries Agency,
Ministry of Agriculture, Forest and Fisheries
2. Chief Consultant cum Fisheries
Development
TAKAHASHI, Kuniaki
Fisheries Engineering Co., Ltd.
3. Architectural Planning cum
Physical Condition Researcher
WATANABE, Kunihiro
Fisheries Engineering Co., Ltd.

APPENDIX-2 SURVEY SCHEDULE

Field Survey

Day	Date	Activities			
1	15-Sep-98	Tue Gov. (Mr Shimoda, Mr Ogasawara), Consultants (①, ②, ③, ④) Tokyo(11:40) -> (16:15)Guam(19:40) ->			
2	16	Wed ->(20:30)Pohnpei, AM. Courtesy Call Embassy of Japan AJOCV / PM. FSM Government			
3	17	Thu Pohnpei(13:00) ->(14:05)Kosrae, Courtesy Call Kosrae State Government, Outline of Inception Report, Meeting			
4	18	Fri Field Survey			
5	19	Sat Field Survey			
6	20	Sun Member Meeting & Data Collection			
7	21	Mon Interview to Fishermen / Check up Existing Refrigerating and Ice Making Plant / Meeting			
8	22	Tue Gov. + ① Meeting Kosrae(15:05) ->(16:05)Pohnpei	Consultants (②, ③, ④) Field Survey		
9	23	Wed Meeting with FSM Gov.	Field Survey		
10	24	Thu Signing of Minutes of Meeting	Field Survey		
11	25	Fri Gov. Report to Embassy of Japan / JOCV	① Pohnpei(13:00) ->(14:05)Kosrae	③ Research in management & fisheries	②, ④ Natural Conditions & Topo. Survey
12	26	Sat Pohnpei(16:40) ->(19:00)Guam	Research in management & fisheries	Research in management & fisheries	Topographic Survey
13	27	Sun Guam(8:00) ->(10:40)Tokyo	Analyzing	Analyzing	Analyzing
14	28	Mon ① Research in fisheries activities	③ Inspection of existing equipment	② Field Plate Bearing Test	④ Field Plate Bearing Test
15	29	Tue Research in fisheries activities	Inspection of existing equipment	Field Plate Bearing Test	Field Plate Bearing Test
16	30	Wed Research in fisheries activities	Inspection of existing equipment	Inspection of existing pontoons	Inspection of existing pontoons
17	1-Oct-98	Thu Research in fisheries activities	Research in management & fisheries	Research in construction circumstance	Research in construction circumstance
18	02	Fri Research in management & fisheries	Research in management & fisheries	Research in construction circumstance	Collection of meteorological data
19	03	Sat Research in fish ground conditions	Research in fish ground conditions	Research in fish ground conditions	Research in fish ground conditions
20	04	Sun Analyzing	Analyzing	Analyzing	Analyzing
21	05	Mon Research in management & fisheries	Research in management & fisheries	Research in construction circumstance	Research in construction circumstance
22	06	Tue Research in management & fisheries	Research in management & fisheries	Research in construction circumstance	Research in construction circumstance
23	07	Wed Research in management & fisheries activities / Meeting with Kosrae State Gov			
24	08	Thu Kosrae(14:35) ->(15:35)Pohnpei			
25	09	Fri Meeting with FSM Gov / Report to Embassy of Japan & JOCV			
26	10	Sat Pohnpei(16:00) ->(19:00)Guam			
27	11	Sun Guam(06:30) ->(09:10)Tokyo			

Consultation on the Draft Basic Design

Day	Date	Activities
1	9-Dec-98	Wed Gov. (Mr. Taguchi), Consultants (①, ②) Tokyo(10:40) ->(15:15)
2	10	Thu Guam(06:10) ->(10:50)Pohnpei, Report to Embassy of Japan
3	11	Fri AM Courtesy call and Meeting with FSM Gov. Pohnpei(13:25) ->(14:30)
4	12	Sat Field Survey
5	13	Sun Analyzing & Member meeting
6	14	Mon Meeting with Kosrae State Gov.
7	15	Tue Meeting with Kosrae State Gov.
8	16	Wed Meeting with Kosrae State Gov., Kosrae(15:05) ->(16:05)Pohnpei
9	17	Thu Meeting with FSM Gov.
10	18	Fri Signing of Minutes of meeting, Report to Embassy of Japan
11	19	Sat Pohnpei(16:40) ->(19:00)Guam
12	20	Sun Guam(15:20) ->(18:00)Tokyo

*Symbols in the Table ①-④ show Consultant member in charge of following study field

- ①: Chief Consultant cum Fisheries Development
- ②: Architectural Planning cum Physical Condition Researcher
- ③: Facility Planning
- ④: Engineering Work Planner

APPENDIX -- 3
LIST OF PARTY CONCERNED IN THE FSM

Name	Title	Organization
< F.S.M. Government >		
Epel K. Hon	Secretary	Department of Foreign Affairs (DAF)
Ieske K. Iehsi	Deputy Secretary	DAF
Lorin Robert	Assistant Secretary	DAF
Larry Raigetel	Service Officer	DAF
Matt Maradol	Service Officer	DAF
Patrick Mackenzie	Deputy Secretary	Department of Economic Affairs (DEA)
Francis I. Itimai	Administrator	Fisheries Section, DEA
< Kosrae State >		
Moses T. Mackwelung	Governor	Kosrae State Government
Dais F. Aloka	Director	Dept. of Fisheries and Marine Resources (DFM)
Robert Taulung	Administrator	Div. of Marine Resources, DFM
Tonny Abraham	Administrator	Div. of Fisheries and Surveillance, DFM
Singkichy P. George	Director	Department of Commerce and Industry
Nena S. Nena	Director	Department of Agriculture and Land
Gaus Nedlik	Director	Department of Administration
Likiak Ponesley	Chief	Dept. of Administration, Planning and Statistics
Pedro Harris	Consultant	Kosrae State Government
Pete B. Olano	Administrator	Division of Construction and Engineering
Lewis S. Brooks	Executive Vice President	Pacific Tuna Industries, Inc.
Madison Nena	President	Marine Foods, Inc.
< Embassy of Japan to F.S.M. >		
YOSHIKAWA, Takeo	Charged d'Affaires ad Interim	
TSUSAKA, Kayo	First Secretary	
TORIUMI, Masayuki	Second Secretary	
KAWAMOTO, Saiko	Administrative Staff	
< JOCV Representative Office >		
NAGASAWA, Hiroaki	Senior Coordinator	
MIKUNI, Seiji	Senior Coordinator	
IZUKURA, Emiko	Coordinator	
< Overseas Fishery Cooperation Foundation (OFCF), F.S.M. Office >		
ISHIDA, Koichi	Resident Representative	

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT FOR
IMPROVEMENT OF THE FACILITIES FOR
ARTISANAL FISHERIES SUPPORT STATION IN KOSRAE STATE
IN
THE FEDERATED STATES OF MICRONESIA

(Field Survey)

In response to a request from the Government of the Federated States of Micronesia (hereinafter referred to as "FSM"), the Government of Japan has decided to conduct a Basic Design Study (hereinafter referred to as "the Study") on the Project for Improvement of the Facilities for Artisanal Fisheries Support Station in Kosrae State in the Federated States of Micronesia (hereinafter referred to as "the Project"), and entrusted the Study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

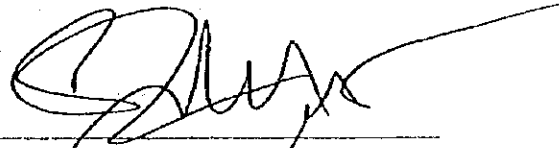
JICA sent to FSM a Basic Design Study Team (hereinafter referred to as "the Team"), which was headed by Toru Shimoda, Staff, Grant Aid Project Study Department, JICA, and is scheduled to stay in the country from September 16, 1998 to October 10, 1998. The Team held discussions with the officials concerned of the Governments of FSM and Kosrae State and conducted field surveys at the study areas.

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

Pohnpei, September 24, 1998



Mr. Toru Shimoda
Leader
Basic Design Study Team
Japan International Cooperation Agency



Mr. Lerin Robert
Assistant Secretary
Department of Foreign Affairs
The Federated States of Micronesia



Mr. Dais F. Aloka
Director
Department of Fisheries and Marine Resources
Kosrae State Government

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve fishing facilities in Kosrae State for development of its artisanal fisheries.

2. Project Site

The project sites are Okat, Lelu and Utwe Marinas shown in the map of ANNEX-1.

3. Responsible Agency and Implementing Agency

Kosrae State Government is the Responsible and Implementing Agency of the Project. The organization chart of Kosrae State Government is shown in ANNEX-2.

4. Components of the Project

The fishing facilities and equipment to be studied as components of the Project are listed in ANNEX-3.

5. Japan's Grant Aid System

- 1) The Government of FSM have understood the system of Japan's Grant Aid described in ANNEX-4 and explained by the Team.
- 2) The Government of FSM will take necessary measures described in ANNEX-5 for smooth implementation of the Project on condition that the Grant Aid from the Government of Japan is extended to the Project.

6. Further Schedule of the Study

- 1) The Team will proceed to further study in FSM until October 10, 1998.
- 2) JICA will prepare a draft report in English and dispatch a mission to FSM in order to explain its contents in December, 1998.
- 3) In case that the contents of the report are accepted in principle by the Government of FSM, JICA will complete a final report and send it to the Government of FSM in February, 1999.

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7. Other Relevant Issues:

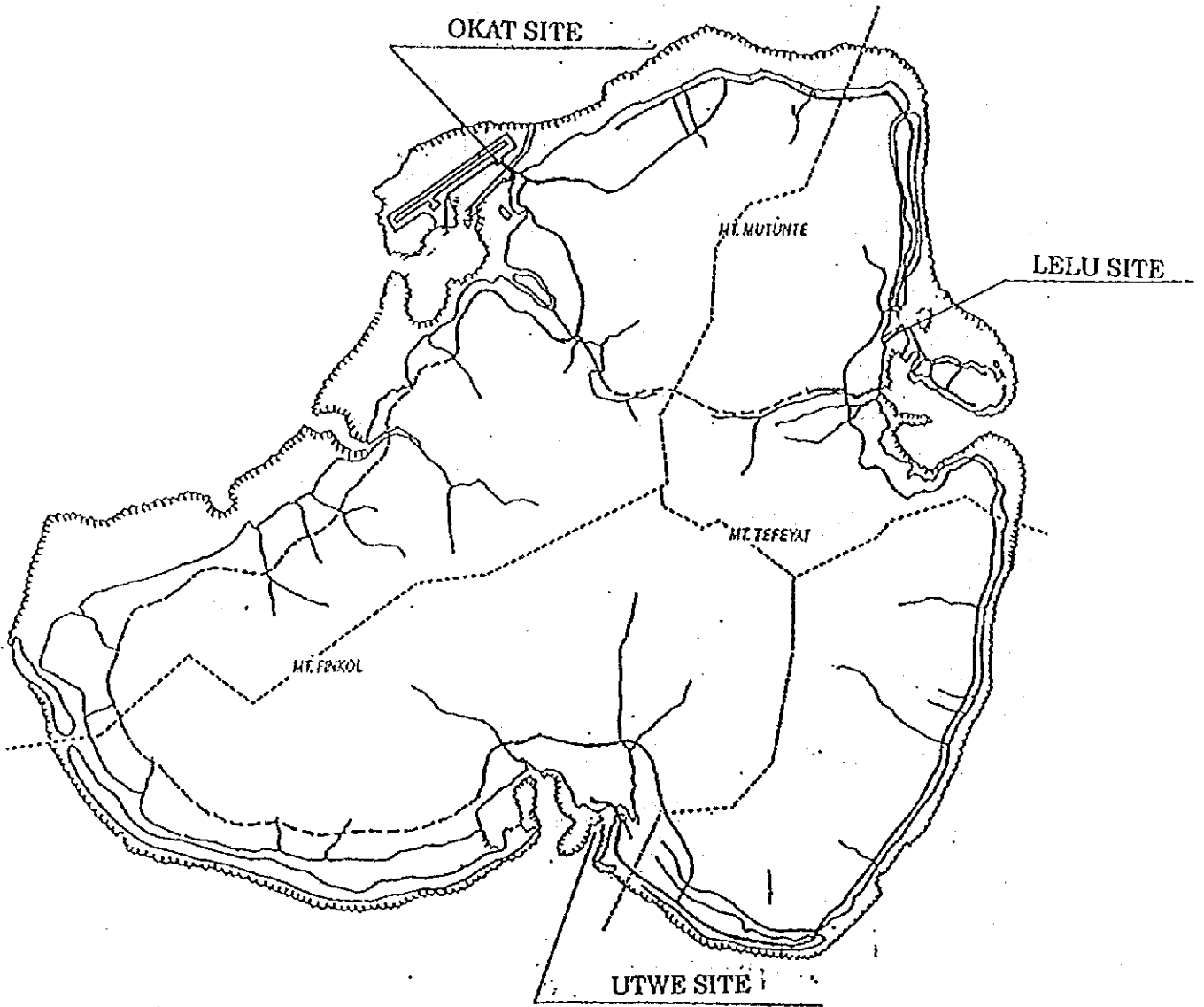
- 1) The facilities of the Project will be operated by Marine Foods Inc. in a contract with Kosrae State Government. Kosrae State Government will establish a steering committee consisted of four directors of the Department of Administration, the Department of Fisheries and Marine Resources,, the Department of Commerce and Industries and the Department of Agriculture and Land in order to supervise management of Marine Foods Inc. through the Department of Commerce and Industries.
2. The Government of FSM will keep ownership of the facilities of the Project.
3. Kosrae State Government will exercise use-right over the facility at all times.
4. The period of contract of the facility to other operators shall be for a specific period.
5. Kosrae State Government shall save funds from the facility's operation for future renovations and maintenance of the facilities.
6. The facilities shall be accessible to the public at all times.
7. The Department of Fisheries and Marine Resources of Kosrae State Government will be in charge of technical assistance for operation and maintenance of the facilities.
8. The Governor of Kosrae State Government requested strongly to install an ice plant at Utwe Marina in addition to the components described in ANNEX -3.

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ANNEX-1 PROJECT SITES

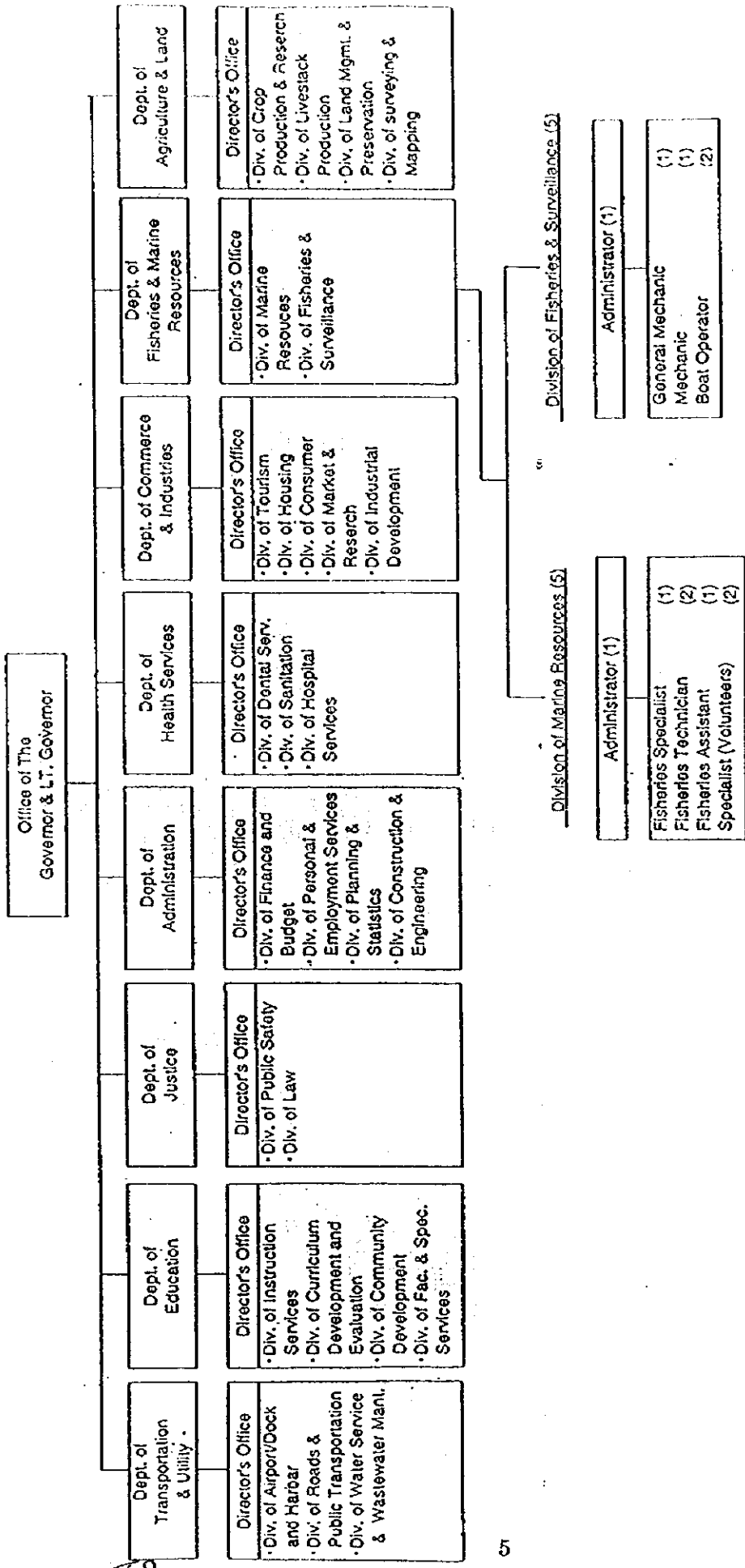


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ANNEX-2 ORGANIZATION CHART



KOSRAE STATE GOVERNMENT

ANNEX-3 COMPONENTS OF THE PROJECT TO BE STUDIED

OKAT SITE:

Construction of Artisanal Fisheries Support Station consisted of Ice Plant, Fish Handling Space, Meeting Room, Engine Repair Space, and Fisherman's Lockers with necessary equipment

Renovation of Pontoon

LELU SITE:

Construction of FRP-Boat Maintenance Workshop with necessary equipment

Renovation of Pontoon

UTWE SITE:

Renovation of Pontoon

Selection of above the facilities and equipment as components of the Project are subject to the study in Japan by the Team and a final decision on the selection will be made by the Government of Japan.

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ANNEX-4 JAPAN'S GRANT AID SYSTEM

1. Grant Aid Procedures

- 1) Japan's Grant Aid System is executed through the following procedures.

Application (Request made by a recipient country)
Study (Basic Design Study conducted by JICA)
Appraisal & Approval (Appraisal by the Government of Japan and
Approval by the Japanese Cabinet)
Determination of Implementation (The Notes exchanged between the
Governments of Japan and the recipient country)

- 2) Firstly, a request for the Grant Aid submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for the Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using a Japanese consulting firm.

Thirdly, the Government of Japan appraises the project so as to see whether or not it is suitable for the Grant Aid, basing on the Basic Design Study report prepared by JICA, and then it is submitted to the Cabinet for approval.

Fourthly, once the project is approved by the Cabinet, its implementation is officially determined by signing the Exchange of Notes between the Governments of Japan and of the recipient country.

Finally, in the course of implementation of the project, JICA will take charge of expediting the execution of the project by assisting the recipient country in such matters as preparing tenders, contracts and so on.

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2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study, conducted by JICA on the requested project, is to provide basic documents necessary for the appraisal of the project by the Government of Japan. The contents of the study are as follows:

- a) to confirm the background, objectives and benefits of the project and also institutional capacity of the agencies concerned of the recipient country necessary for the project implementation;
- b) to evaluate the appropriateness of the project from the technical, social and economic points of view;
- c) to confirm items agreed on by both parties concerning the basic concept of the project;
- d) to prepare a basic design of the project; and,
- e) to estimate costs of the project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the project. Such measures must be guaranteed even through they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the project. Therefore, the implementation of the project is confirmed by all relevant organizations of the recipient country in the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the study, JICA selects a consultant among those who registered at JICA by evaluating competitive proposals submitted by those consultants. The selected consultant carries out the Basic Design Study and prepare a report based on the terms of reference made by JICA.

At the beginning of the implementation after the Exchange of Notes, JICA recommends the same consultant who participate in the Basic Design Study to the recipient country for the services of Detailed Design and construction supervision of the project in order to maintain the technical consistency between the Basic Design and the Detailed Design.

3. Japan's Grant Aid Scheme

1) What is the Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) Period

The period of the Grant Aid means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed. However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Purchase of Products and Services

Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely consulting, contracting or procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of Verification

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This verification is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

(1) to secure land necessary for the sites of the project prior to commencement of the construction;

(2) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the sites;

(3) to secure buildings prior to the procurement in case the installation of the equipment;

(4) to ensure tax exemption and prompt execution for unloading, customs clearance at the ports of disembarkation and internal transportation of the products purchased under the Grant Aid;

(5) to exempt Japanese nationals from customs duties, internal taxes and other duties which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts;

(6) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their works.

7) Proper Use

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for this operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in a Japanese bank (hereinafter referred to as "the Bank"). The Government

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of Japan will execute the Grant Aid by making payments to the Bank in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of recipient country or its designated authority.

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