

**BASIC DESIGN STUDY REPORT
ON
FISHERIES PROMOTION PROJECT
IN
THE REPUBLIC OF KIRIBATI**

FEBRUARY, 1983

JAPAN INTERNATIONAL COOPERATION AGENCY

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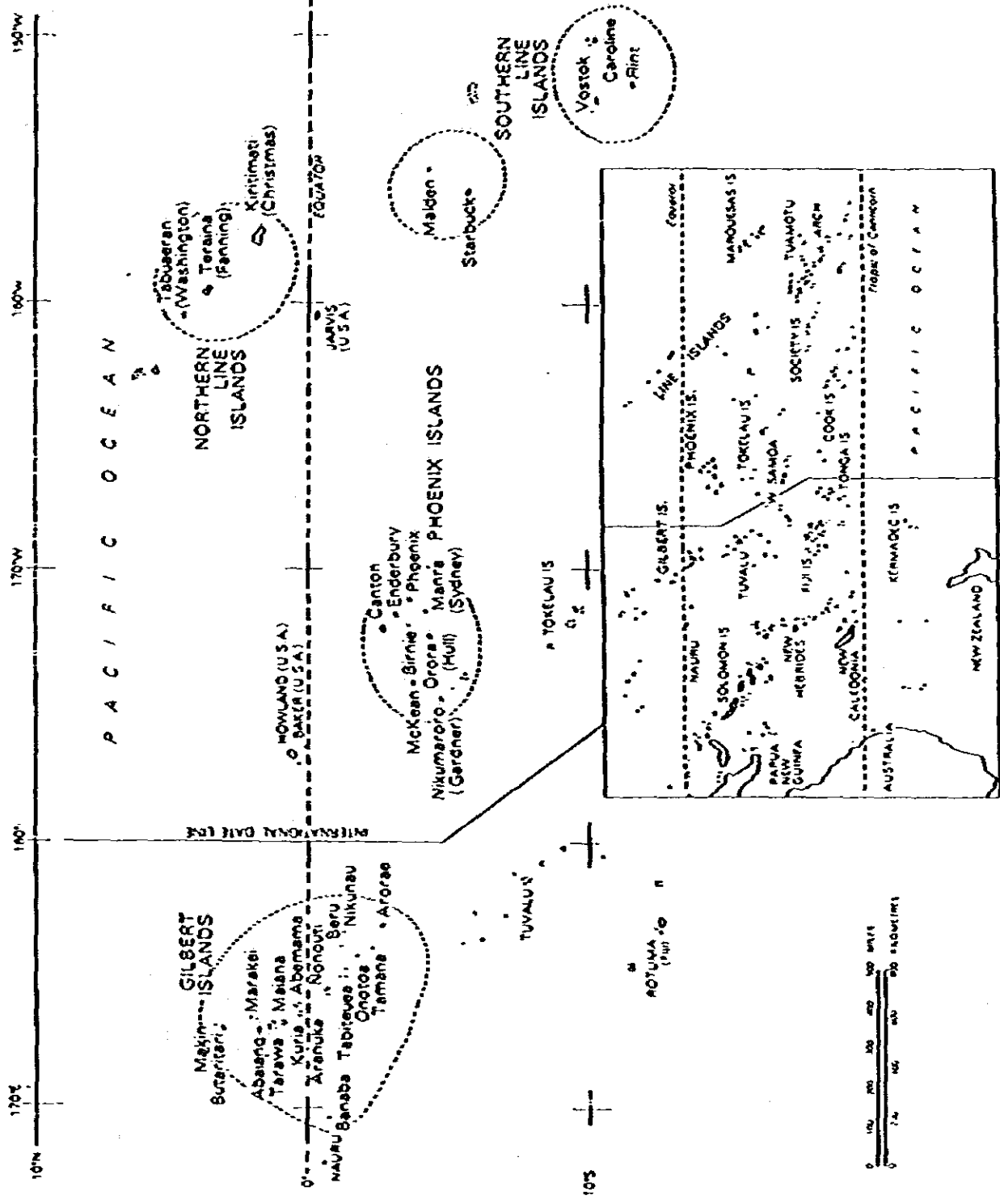
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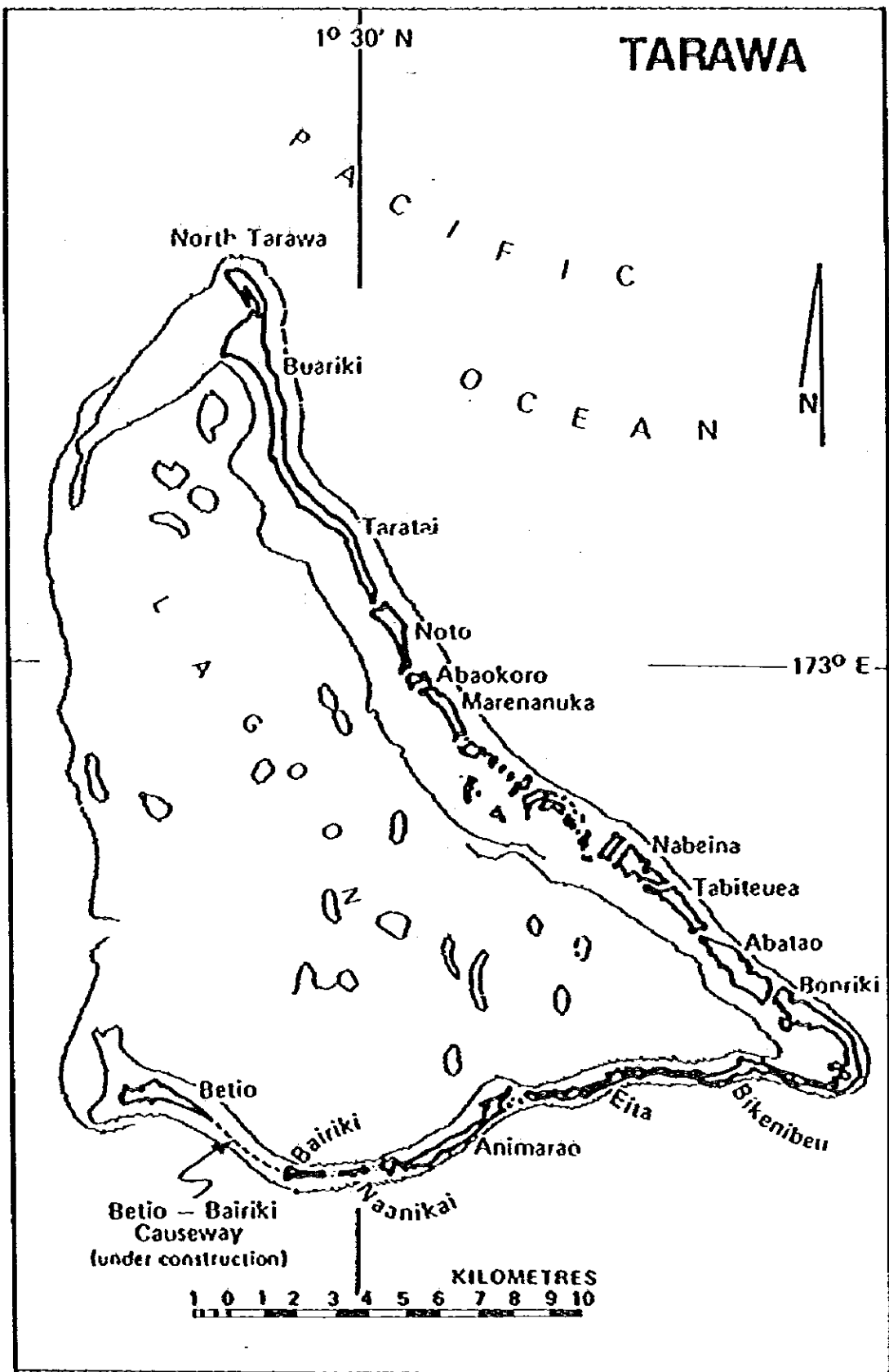
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JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

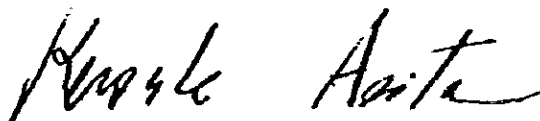
In response to the request of the Government of the Republic of Kiribati, the Government of Japan decided to conduct a basic design study on the Fishery Promotion Project and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Kiribati a study team headed by Mr. Tatsuhiko Iwasawa, Deputy Director, International Affairs Division, Oceanic Fishery Department, Fisheries Agency from February 8th to February 26th, 1982.

Based upon the result of the study, the team made and submitted a report on the fisheries training vessels and others in May, 1982. Now the team has prepared the present report on a 100-ton cold store for tuna, Fisheries office and related equipment.

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

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Kiribati for their close cooperation extended to the team.

February, 1983



Keisuke Arita
President
Japan International Cooperation Agency

SUMMARY

SUMMARY

The Republic of Kiribati, after the depletion of phosphate as its traditional economic mainstay, has given the top priority to the promotion of fisheries including export of skipjack/tuna, within the framework of its national development program (1979 - 1982).

Since 1981, the National Fisheries Corporation (Te Mautari Ltd.) has been implementing commercial scale fishery with the main aim of skipjack/tuna export, employing fishing vessels and shore facilities provided by Japan and U.K., while it was felt there should be a more massive overseas aid necessary in implementing its Fisheries Development Program.

With such background, the Republic of Kiribati requested Japan for grant aid in the form of 59 GRT pole and line fisheries training vessel, 20 GRT skipjack fishing vessel, ice making/brine freezing facilities, and fishing gears and equipment.

In response to the request, the Government of Japan, through Japan International Cooperation Agency, dispatched a basic design study team to Kiribati, in February 1982. The team discussed with the officials concerned of Kiribati and exchanged views on the project.

Based upon the survey results, the Government of Japan decided to extend the grant for the request in 1981 fiscal year and the project is now implemented.

Concurrently with the above-mentioned request, Kiribati requested Japan to provide some additional items of 200-ton cold store for skipjack/tuna, branch office of Fisheries Division and 59 GRT pole and line fisheries training vessel.

Since the cold store and Fisheries office are now deemed eligible as successive aid items, it is decided to carry out a basic design study on them, based on the results of survey in February 1982.

These cold store and Fisheries office are expected to play a significant role in promoting skipjack/tuna export toward development of Kiribati's national economy.

According to the basic design study, it is considered that the provision of the following items would be appropriate:

- | | |
|--|---------|
| 1. 100-ton cold store | One (1) |
| 2. Material handling equipment related to item (1) | One lot |
| 3. Branch office of Fisheries Division | One (1) |

The proposed site of the cold store is located on the east mole of Betio Port, neighbouring ice making/brine freezing facilities which are now under construction, so that unimpeded loading and unloading of cargo is made possible and the location would also keep fit with Kiribati's future fishery infrastructure modernization program.

The profitability of this project is such that with the cold store designed exclusively to be built for storing export skipjack/tuna, its income is subject to year – to year fish catches. It is recommended that Te Mautari Ltd., which will take charge of the cold store, will strive its utmost for enhancing the fish catch.

With the aim to modernize Kiribati's fishery sector infrastructure under its Fisheries Development Program, this project is considered to be highly effective and timely for the Republic of Kiribati which is now striving for self-supporting economy through skipjack/tuna export.

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CHAPTER 1 BACKGROUND OF THE PROJECT

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1-1 Background of the Request

The Republic of Kiribati, after the recent depletion of phosphate as its traditional economic mainstay, has focussed upon the promotion of skipjack/tuna export as the top priority policy and also a major revenue item for development of its national economy. The key-note speech made by the President of Kiribati on July 13th 1982, emphasized the utmost importance about implementation of its Fisheries Development Program including modernization of Betio Port facilities.

While the surveys for developing Kiribati's skipjack/tuna fishing were carried out quite a long ago, Kiribati had requested Japan for cooperation in fisheries since 1976.

Having responded to Kiribati's requests, Japan has extended cooperation as follows:

- 1977 to dispatch Daini (2nd) Kyoryomaru for live bait survey for skipjack pole-and-line fishing.
- 1979 to extend the grant for 120 GRT pole and line fisheries training vessel and Fish Marketing Centre.
- 1981 to extend the grant for 59 GRT pole and line fisheries training vessel, 20 GRT skipjack fishing vessel, ice making/brine freezing facilities, and fishing gears and equipments.

Concurrently with the 1981 fiscal year grant aid project, Kiribati requested Japan for provision of other items such as 59 GRT pole and line fisheries training vessel (one), cold store for skipjack/tuna (one), Fisheries office (one), to be constructed in Betio Port. As they were excluded from the 1981 fiscal year grant aid program for priority reasons, it is now decided to carry out a basic design study based on the February 1982 survey results in regard to the cold store and Fisheries office.

1-2 Development Program

1-2-1 National Development Program

Under the 1979 - 82 National Development Program which was formulated in April 1979, the Republic of Kiribati has given the top priority to development of its marine resources with particular emphasis on export promotion of skipjack/tuna, toward self-supporting national economy. In addition, the Program contemplates development of rural industries in outer islands (other than Tarawa) with better living standards of their inhabitants, control of immigrants into Tarawa through

decentralization of industrial activities, and establishment and reinforcement of regional cooperation with South Pacific nations. In the keynote speech made by President Tabai to the Kiribati parliament on July 13th 1982, he renewed his resolve to strongly promote the National Development Program.

His speech stressed the following:

- (1) Massive promotion and development of skipjack/tuna fishing, as the top priority national policy.
- (2) Increased production of coconuts for foodstuff, as well as increased export of copra.
- (3) Increased raising of poultry, hogs and goats under the supervision of the Ministry of Natural Resource Development, by regimenting existing farmer-level animal husbandry.
- (4) Promotion of tourism, while conserving the traditional Kiribati culture.
- (5) Promotion of regional small-scale industry.
- (6) As a member of the free world, establish and strengthen alliance with not just South Pacific nations but other nations (especially with South Western Asia and Europe), through aggressive diplomacy.

1-2-2 Fisheries Development Program

According to the Fisheries Development Program included in the Kiribati's National Development Program, the fully government-owned National Fisheries Corporation (Te Mautari Ltd.) was established in 1981, under supervision by Fisheries Division of Ministry of Natural Resource Development with its principal object of skipjack/tuna export. The Corporation is at present operating two skipjack fisheries training vessels and the Fish Marketing Centre at Betio Port. In addition, the Corporation plans to expand its facilities including the construction of a new jetty at Betio Port, such as:

- (1) Increased fleet of fishing vessels.
- (2) Modernization of shore facilities.
- (3) Promotion of joint ventures with foreign fishing firms.
- (4) Promotion of coastal fisheries for domestic consumption and milk fish culture to provide live bait for skipjack fishing.

1-3 Skipjack and Tuna Fisheries - current status

The Kiribati's skipjack/tuna fishing was initiated in earnest when in 1977 Japanese Government dispatched Daini (2nd) Kyoryomanu of 59 GRT to conduct a resource survey in the Gilbert Islands waters. As the survey indicated the abundance of skipjack/tuna resources in the regional waters with commercial viability of their fishing, Kiribati

Government received a donation of 99 GRT pole and line fisheries training vessel (Nei Manganibuka) from U.K. in 1978, and a 120 GRT pole and line fisheries training vessel (Nei Arintetongo) from Japan in 1980. These two training vessels are now operating with Japanese experts on board.

Further, in 1981 Japanese Government donated a 59 GRT pole and line fisheries training vessel and a 20 GRT skipjack fishing vessel. With these pole and line fishing vessels as the nucleus, the National Fishing Corporation is about to start commercial scale fishing in full swing.

For these fishing vessels to operate efficiently, however, a well-balanced fishery development would be required, but there has been a considerable delay in modernizing the fishery-sector infrastructure such as port facilities and jetties which are indispensable for the operation of fishing vessels. The present counter-measure taken is by chartering from Japan a 350 GRT carrier vessel, mooring it outside of Betio Port, acting as a floating refrigerator to take in fish catches from fishing vessels which are unable to enter into the shallow-draft Betio Port, as well as supplying fuel and fresh water to such fishing vessels. When loaded with fish catches to its capacity, this vessel travels as a transporter to American Samoa.

1-4 Problems and Prospect of Skipjack/Tuna Fishing

The Kiribati's most promising natural resource is skipjack/tuna available in its enormous territorial fishing area, as the land-scarce country is unlikely to find any other option to support its national economy.

The Kiribati's territorial fishing area, embracing 33 islands, covers 1.015 million sq. miles, which are grouped into four waters:

- (1) Gilbert Islands waters.
- (2) Phoenix Islands waters.
- (3) Northern Line Islands waters.
- (4) Southern Line Islands waters.

While the Kiribati's skipjack/tuna fishing has been recently initiated with its base located in Tarawa of Gilbert Islands, as described above, its problems and future outlook are stated below:

1-4-1 Scale of Fishing Industry

The two skipjack fishing vessels are now operating from their base in Betio, Tarawa, but the supply of live bait has been unstable owing weather and oceanographic conditions. The inferior quality of the live bait and its high mortality make long trips (more than 7 days) difficult. As this also restricts the range it is considered that vessels of not more than 70 GRT are the most economical.

In addition it is recommended that the number of vessels be restricted to four until milk fish cultured on a larger scale.

Further, while there are alternative fishing methods without use of live baits such as seine net, drift line, drift gillnet, and hand lining, some of such fishing methods may be applied to Kiribati in future, through further surveys about its fishing waters environment such as sea current, water temperature and spring layer. It is therefore recommended that the Republic of Kiribati should strive steadily to develop small-scale skipjack/tuna fishing in its respective waters.

1-4-2 Fisheries-related infrastructure

While the fisheries development is the Kiribati's key national project calling for its all-out efforts, it is beset with a number of problems in operating efficiently the foreign-aided vessels and facilities toward a healthy progress of industry. Above all, there have been conspicuous delay in constructing fisheries-related infrastructure such as port facility, cargo handling, fueling, water supply, repair workshop, and refrigerator for frozen fish etc. Its only and largest Betio Port is provided with a mere 2-meter draft, able to accommodate small fishing boats only, along with absence of an exclusive jetty for fishing boats which is by far below the minimum infrastructure requirement for a fishing industry.

While Kiribati is expected to implement a number of measures henceforth as well in pursuit of its National Development Program, it is all-evident that its land facilities will need to be augmented simultaneously with increased fleet of fishing vessels, as otherwise the existing property cannot be operated efficiently owing to partial lack of fisheries-related infrastructure.

This would call for a systematic planning and implementation, in line with the long-term projection. Economic aid and technical assistance from foreign countries will also need to be continued and implemented in harmony with the Republic's long-range outlook, regardless of the magnitude of individual aid project or item.

Of Kiribati's fisheries-related infrastructure, most urgently needed are the construction of port and jetty, for which in November 1980 Japanese Government dispatched a basic design study team for modernization of Betio fishing port, but it did not materialize.

Since then, U.K. accepted to undertake the port construction, but no progress has been made up to the date.

Second to the port construction, much needed are a cold store (for export frozen fish) and a refrigerated carrier-cum-storage ship. Such storage ship is designed to function as a jetty and refrigerator for skipjack fishing vessels. Whereas a refrigerator is for brine-freezing of fresh skipjack/tuna after unloading at *Belio Port*, and for storing them upto the time of export. Besides, cargo handling equipment of efficient performance, along with land and marine transporting equipment etc. are also needed in relation to such facilities.

While fisheries-related infrastructure in the capital city of *Tarawa* is still to be augmented as described above, the outer islands will also need to be provided with such facilities in harmony with the long-range outlook.

1-4-3 Personnel training

At present *Kiribati* has the *Seamen's Training School*, mainly catering to the training of junior class seamen serving on ocean-going vessels. Further, the foreign-licenced engineers tend to emigrate out of the country, due to their inability to find the job there, thus aggravating the shortage of qualified personnel in *Kiribati*.

Personnel training will continue to be the crucial issue for expansion of *Kiribati's* ship fishing henceforth, along with the construction of fisheries-related infrastructure.

The required personnel is classified:

- * Planning, management and research manager, for fishery management and vessel operation.
- * Supervisor for shore facilities.
- * Fishing vessel crew. Especially captain and chief engineer.
- * Technicians for freezing and refrigeration.
- * Technicians for repair to hull, engine, electro-mechanical equipment and radio etc.
- * Distribution and marketing manager.

Since *Japan* is abundant in experience with ship fishing of skipjack/tuna, it might be useful for *Kiribati's* personnel training to simulate such *Japanese* expertise.

Further, learning of basic knowledge is indispensable for the prospective technicians before they are assigned to on board training of fishing, navigation and engine operation etc.

CHAPTER 2 CONSTRUCTION SITE

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2-1 Location of the construction site and the present condition of its surroundings.

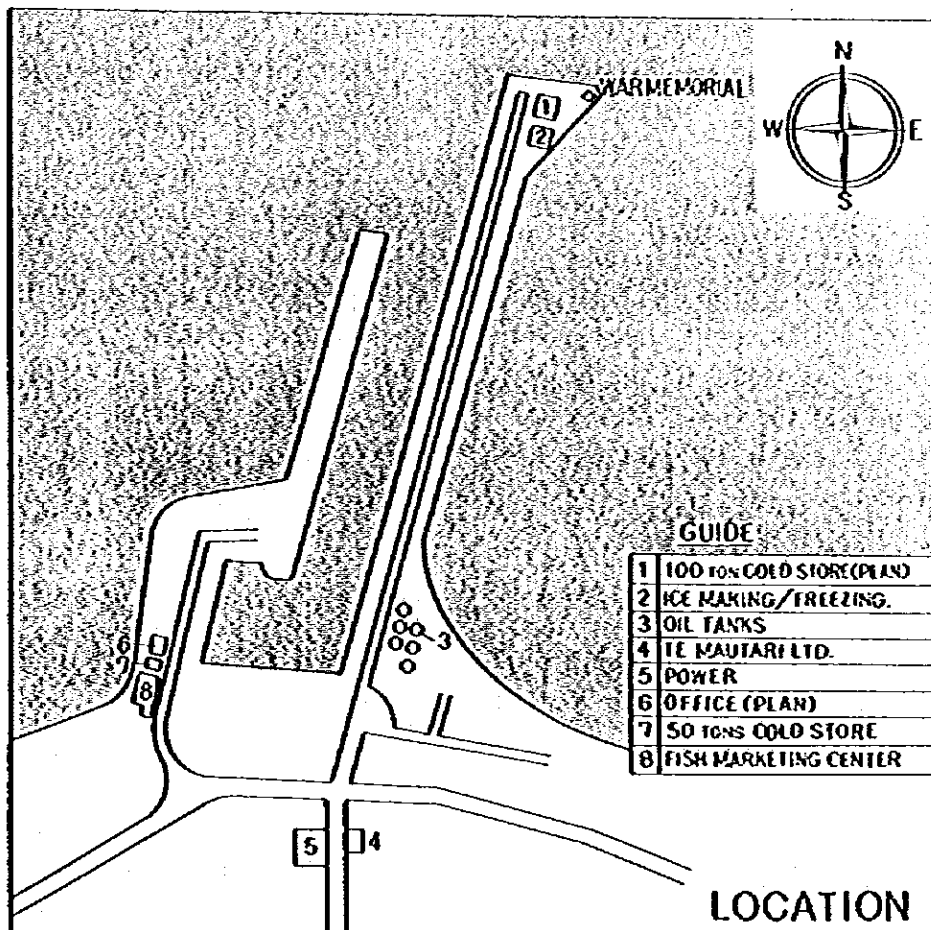
2-1-1 Location of the Construction Site

It is planned to locate the cold store on a lot bordering the north side of the ice making/brine freezing facility currently under construction.

The cold store is much needed for the storing of brine-frozen skipjack/tuna prior to loading onto the carrier Vessel by barge. This storage is particularly necessary when the carrier vessel is away.

Given its proximity to the anchorage and the scarcity of land on Betio, the proposed construction site is considered the best available, provided protection against wave action is provided.

Kiribati officials have given assurances that this will be effected.



2-1-2 Transportation

Land transportation to the site is by way of a road along the eastern mole presenting no problems for heavy vehicles.

Betio port is shallow and congested allowing access only to smaller vessels. All other vessels have to anchor off the harbour entrance and cargo is offloaded by barge.

2-1-3 Urbanization and Employment

As the Kiribati's main entrance for sea traffic, Betio has port facilities, shipyard, seamen's training school, police headquarters, marine transport bureau, public works bureau, construction bureau, postal office, banks, thermal power stations, schools, hospitals, and shops etc, although they are on primitive level, thereby forming itself as a port city. Betio's future plan includes construction of port facilities for upgrading it into a commercial and fishing port, as well as modernization of fisheries-related infrastructure, and also construction of causeway from Tarawa Island.

Further, Betio City hoards a number of immigrants coming from the outer islands and seeking employment, thereby accelerating the urban population increase.

2-2 Natural Conditions

2-2-1 Topography

Betio is a narrow island at the west end of Tarawa. It is about 3.8 km long and 500 m wide at its widest point and tapering at both ends. The construction site is located at the tip of the east mole which stretches 600 m to the north of Betio port at the center of the island. Betio port is a man made port built by the U.S. Forces in the post war period. The entry to the port is by a channel 50 m wide between two moles the eastern one of which is 600 m long and the western one 400 m long. The port has a small slipway and a ferry terminal.

2-2-2 Geological Condition

The construction site consists of coral sand and rock. While boring data is not available concerning the rock foundation, construction on the site is considered safe judging from the existing facilities currently under construction.

2-2-3 Climate

The annual temperature range is between 26°C and 32°C. For most of the year the wind is from an easterly direction but from November to January there is a likelihood of strong westerly winds.

Past rainfall records indicate an average of 200 – 300 mm during the period December to April but as was seen in 1982 occasional downpours of 100 mm can be experienced at other periods.

2-3 Infrastructure

2-3-1 Electricity

Electrical power is diesel generated and supplied from a central power station which has two 700 kw units and two 300 kw units making a total of 2000 kw. Present demand is about 1000 Kw including domestic and industrial consumption. There is already a transformer installed 100 m from the construction site supplied by an underground cable. Given these circumstances Public Utilities Board Officials see no problem in supplying power to the proposed cold store.

2-3-2 Communications and telephone network

Betio, Bairiki and Bikenibeu are provided with overseas telephone, telegram and mail services. Overseas calls are via Sydney, Australia, with sub-standard line conditions and restricted working hours.

2-3-3 Water supply and Sewage

Throughout south Tarawa, including Betio, all buildings and dwellings are provided with storage tanks for rainwater. The Government is laying a water pipe network to supplement the present system of supplying by tanker. Recently a salt water sewage system has been installed.

2-4 Construction conditions

2-4-1 Transport of imported equipment/material

(1) Transport in Betio Port

The equipment and material shipped from Japan are transhipped onto the barges in the offing of Betio Port and then landed by the port-owned 15-ton crane. In between the out-mooring ship and Betio Port, 4 units of barges, each accomodating three 8' x 8' x 20' containers, and 2 units of tug boats travel back and forth. Latest evidence has shown that 450 m³ cargo handling was accomplished in a day, in the case of unloading ice making/brine freezing plant and material which are now being erected in Betio Port.

Barges being of steel-made pontoon type, the cargo is likely to get wet by wave etc. during handling. Export packing needs to be done with extreme care.

(2) Custom clearance and storage

The unloading area is classified as bonded area. Containers are stored outdoor, while some of the machinery may need to be sheet-covered additionally. The cargo needing protection against rain and weathering is temporarily stored in bonded warehouses, but liable to be charged storage fees, if it exceeds more than two weeks. Since the customs documents are complicated, cooperation from National Fishing Corporation (Te Mautari Ltd.) should be sought for to realize the custom clearance quickest possible.

(3) Inland transport upto the construction site

Transport of equipment and material upto the construction site is done by trailers and trucks over a distance of about 800 m.

However, as mobile cranes available in Betio are 1 unit of 15-ton and two units of 10-ton, transport of heavy cargo requires prior consultation with related officials, not to lose the time.

(4) Material stockyard for cold store

The tip of east mole being too narrow, the material stockyard should be located with an ample space, either 100 m or more away from the construction site.

2-4-2 Local procurement

(1) Labour

In Betio, the private recruiting firm D.K. Construction Co., is making the labour supply contract with Te Mautari Ltd., dispatching the personnel to individual sites. The firm can recruit upto 30 - 40 unskilled workers, who are sincere and dependable.

Their standard wage is A\$0.80 per hour, with 5 working days a week and working hours of 08:00 - 12:00, 13:00 - 17:30 (8 working hours a day). On the following days after two pay-days a month, their attendance is reduced to a half. Attendance on sundays and national holidays is nearly unexpectable.

(2) Raw material

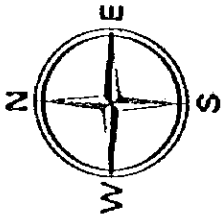
The raw material available locally is sand, aggregates and water etc. Sand is available in Betio, while aggregates are excavated in Bonriki, crushed into the required size by use of crusher, and transported within lagoon via small barges. Since sands and aggregates contain salt, however, they need to be de-salted by rain cleaning. Further, where they are used in contact with steel bars or structure, the steel materials need to be protected with anti-corrosive treatment. Occasionally, cement and concrete block become available locally, but their stable supply cannot be relied upon.

(3) Construction equipment

Public Works Division is supervising and operating a variety of construction equipment provided with overseas aids. Its fleet includes: truck (several units), dump car (several), tractor (2), mobile crane (3), bulldozer (1), concrete mixer (3) and belt conveyor (2).

2-4-3 Regulatory government offices related to construction

- Ministry of Natural Resource Development
- Ministry of Finance
- Ministry of Works & Energy
- Public Utilities Board
- Public Works Division
- Shipping Corporation of Kiribati



SITE

BETIO PORT

TAKORONGA

TEMAKIN

1.100 M

3.800 M

BETIO ISLAND MAP SCALE - 1:14000

CHAPTER 3 CONTENTS OF THE PROJECT

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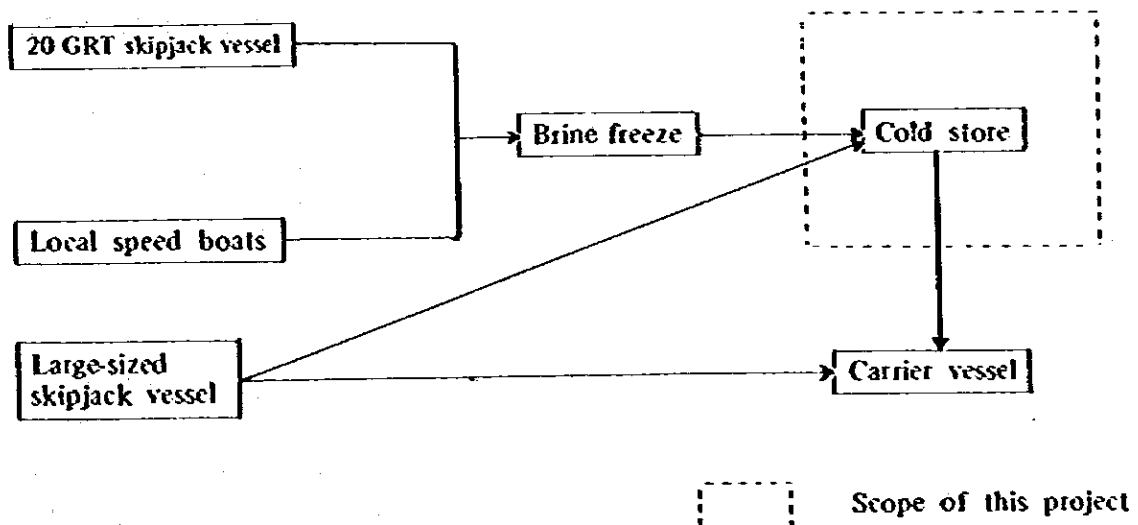
3-1 Object and Contents of the Project

This project is closely related to the 20 GRT skipjack fishing vessel and ice making/brine freezing facilities which are to be delivered to the Government of Kiribati in February 1983 under the Grant Aid Project of the Japanese Government. The fresh fish—skipjack and tuna—caught by 20 GRT skipjack fishing vessel and by local speed boats are to be brine frozen and eventually exported by carrier vessel, but in the meanwhile the frozen fish will be stored in the cold store of this project. At present in Betio port there is a 50-ton cold store constructed in 1979 at the back of bonded warehouse which is located 850 meters away from the ice making/brine freezing facilities at the end of eastern Mole, and this cold store is used for the storage of skipjack/tuna and reef fish. Taking into account of the distance from the freezing facilities and its small capacity of storage compared with daily freezing capacity, it is preferable for the existing cold store to be used for domestic distribution.

In terms of efficiency, it is most appropriate to construct a cold store adjacent to the freezing facilities, while its capacity and arrangement should correspond with the demand (fish catch performance) and cargo handling plan.

Flow chart of skipjack and tuna to and from the proposed cold store is shown below.

To achieve the integral efficiency, this project include not just a cold store but also its peripheral transportation and handling.



As for Fisheries office, it will be used as a Betio branch office of Fisheries Division, Ministry of Natural Resource Development. While Betio port is now acting as a central fishing base of skipjack and tuna, Fisheries Division has no office in Betio so that it has been felt inconvenient for the Division to supervise or get in touch with Te Mautari Ltd. as well as to give instructions to the outer islands' fishermen. Therefore to solve these problems the construction of a branch office is planned.

3-2 Policy of the Project

Since this project is planned as a part of infrastructure upgrading programme for the fishing port in Betio, it is not enough to provide only the function of storing of frozen fish. Therefore to analyze the present infrastructure of Betio port and grasp its problems are essential for making the most appropriate design.

The present problems are described earlier in Chapter I, 1-4-2 "Infrastructure related to the fisheries":

- (1) Due to lack of port facilities, a carrier vessel is unable to moor alongside the pier, so whereby 6-meter class FRP boats are used for loading the fish to the carrier, which is found extremely inefficient and also time consuming.
- (2) Consequently, under the severe weather conditions of Kiribati (nearly 40°C under direct sunlight) hours-long cargo handling ends up having the frozen fish thawed and the quality deteriorated.

Given such conditions the main policies for making the basic design are set up as follows:

- (1) Studying the local situations and taking into account of present port facilities, the most efficient cargo handling should be made possible.
- (2) It should be able to cope with the increase of cargo handling owing to the implementation of the future infrastructure construction program and increase of the fish catch.

3-3 Basic Design

3-3-1 Determination of Capacity

To determine the capacity, the 1981 total volume of fish catch by two pole and line fisheries training vessels of 100-ton type was used as a basis. However in 1981 the training vessels occasionally stopped fishing to carry the fish catch to Majuro Island of Marshall Islands. Since, April, 1982 a 350-ton carrier vessel has been chartered from Japan for such transportation. Therefore the number of working days of the training vessel is likely to increase by 50 days per vessel per year. This fact is also added to the decision making.

(1) Estimated tonnage of annual fish catch

Daily fish catch was based upon the 1981 performance (2.41 tons). Number of working days are set at 176 days, namely 151 days (actual results in 1981) + 25 days, on the assumption that additional catchable days will be 25 days (50 days x 1/2 = 25 days). Thus the annual tonnage of fish catch by type of boats are estimated as follows:

Manganibuka (99-ton Type)	2.41 tons x (151 days + 25 days)	424 tons
Arinletongo (120-ton Type)	2.41 tons x (151 days + 25 days)	424 tons
Pole and Line Fisheries Training Vessel (59-ton Type)	2.41 tons x (151 days x 1.1 + 25 days)	...	460 tons
Skipjack Fishing Vessel (20-ton Type)	2.41 tons x 20/30 persons x 200 days	...	320 tons
Local Speedboat	100 kg x 16 boats x 200 days	320 tons
Estimated annual fish catch (in tons)			1,948 tons about 2,000 tons

(2) Operation plan of carrier vessel (from Tarawa to American Samoa)

1) Number of voyage

At present the loading capacity of the carrier vessel chartered by Te Mauri Ltd. is about 200 tons and number of voyage per year is at

$$\frac{2000 \text{ tons}}{200 \text{ tons}} = 10 \text{ voyages}$$

2) Duration of voyage

o Voyage period = 1,350 nautical miles (from Tarawa to Samoa) ÷ 240 nautical miles (daily milage) x 2 (return trip) = 11.25 days.

o Lay days at Samoa port = 3 days (unloading) + 3 days (loading and waiting) = 6 days

Consequently,

o Duration per voyage = 11.25 days (voyage) + 6 days (lay days) = 18 days

(3) Estimate of the annual cargo demand

The followings are the estimated annual tonnage of the frozen skipjack and tuna for loading into the cold store:

- 1) Fish catch by 20 GRT skipjack fishing vessel 320 tons
- 2) Fish catch by local speed boats 320 tons

- 3) Temporary storage from the large-sized fishing vessels with freezing facilities 161 tons

Item 3) above is the surplus of fish catch by three large-sized fishing vessels and exceeding their hold capacity, at a time when the carrier vessel is away to Samoa out of Tarawa.

Computation was made on the following basis:

- o Manganibuka (99-ton Type)
 - 2.41 tons (fish catch per day) x 18 days x 0.6 (operation ratio) = 26.0 tons
 - 43.5 M³ (Maximum loading volume) x 0.5 (stowage factor) = 21.75 tons (loading tonnage)
 - Surplus 26.0 tons – 21.75 tons = 4.25 tons
- o Arintetongo (120-ton Type)
 - 2.41 tons x 18 days x 0.6 = 26.0 tons
 - 45.3 M³ x 0.5 = 22.65 tons
 - Surplus 26.0 tons – 22.65 tons = 3.35 tons
- o Pole and Line Fisheries Training Vessel (59-ton Type)
 - 2.41 tons x 18 days x 0.6 = 26.0 tons
 - 35.0 M³ x 0.5 = 17.5 tons
 - Surplus 26.0 tons – 17.5 tons = 8.50 tons

Therefore frozen skipjack and tuna stored temporarily in the cold store are estimated as follows:

$$(4.25 \text{ tons} + 3.35 \text{ tons} + 8.50 \text{ tons}) \times 10 \text{ voyages (number of voyage by the carrier)} = 161 \text{ tons}$$

The basis of the computation of operation ratio is shown below:

$$\frac{\text{Catchable days per year (1981's results)}}{\text{working days per year}} = \frac{151 \text{ days (1981's results)} + 25 \text{ days (increase of catchable days)}}{365 \text{ days} - 30 \text{ days (docking)} - 35 \text{ days (anchoring)} = 300 \text{ days}} = 0.6$$

From above computations the total cargo tonnage into the cold store per year is estimated at 320 tons + 320 tons + 161 tons = 801 tons. The maximum cargo intake of the proposed cold store is estimated at 801 tons ÷ 10voyages= 80.1 tons.

Judging from the past fish catch performance, and also allowing for some increments in future, the capacity of the proposed cold store is determined at 100 tons from the view point of making initial investment and working capital to the minimum.

3-3-2 Transportation and Storage Plan

(1) Transportation and cargo handling

Flow chart of cargo handling for skipjack/tuna to and from the cold store is shown at Chart I. (attached) The methods of handling cargo were determined respectively after analysing individual processes.

Basically cargo loading will be done by manpower, because daily entry to the cold store is a small amount and labour force is relatively easily obtainable. On the other hand unloading work should be done in a large lot by partly employing machinery to improve the efficiency so as to prevent the deterioration of quality.

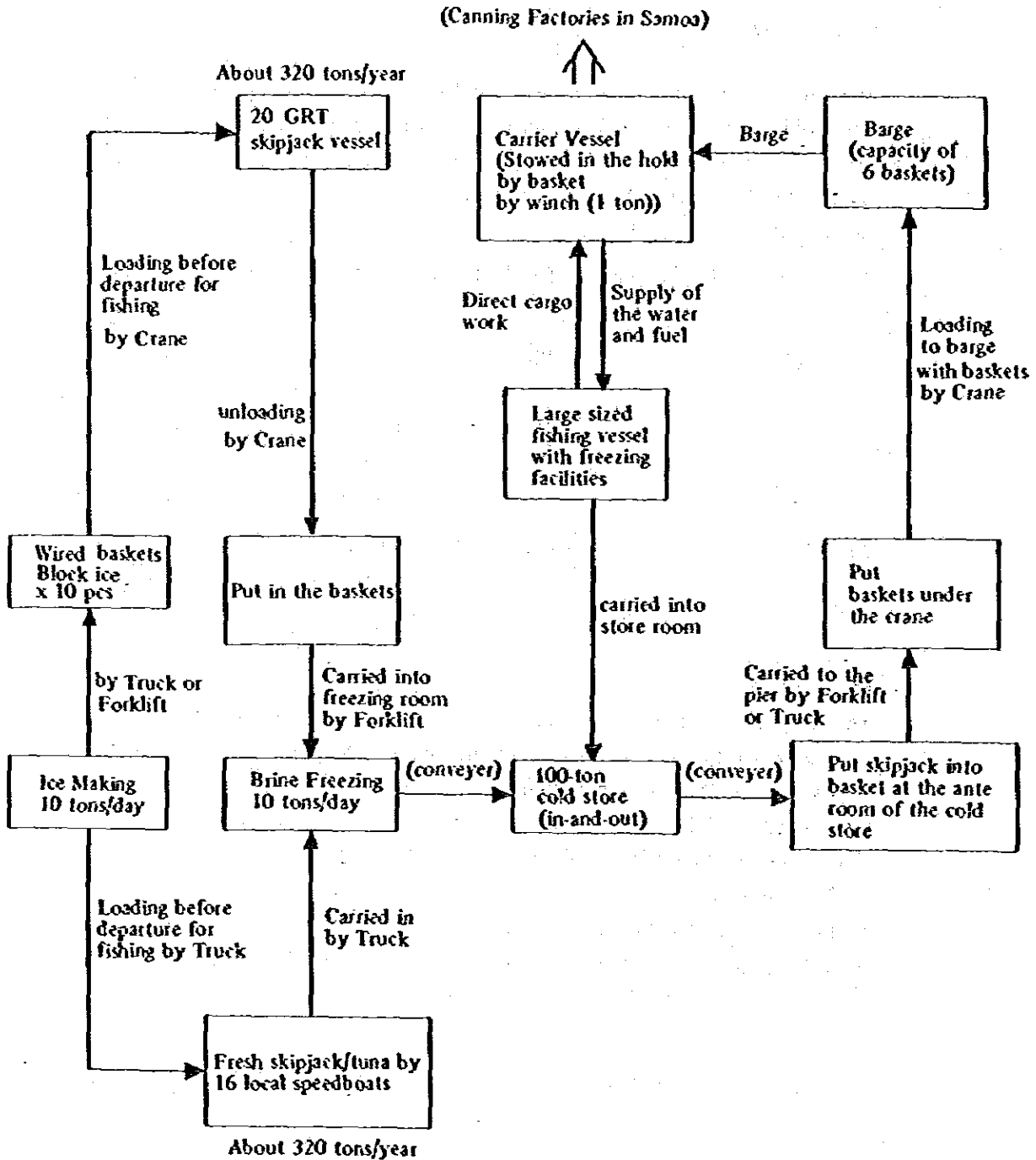
- 1) Freezing facility ~ Cold store: Transfer by belt conveyer and manpower
- 2) Cold store ~ Pier: Take out to the ante room of cold store by belt conveyer and manpower, just like entry to the cold store, and load into purpose-built baskets, then transfer to a pier by fork lift or truck.
- 3) Pier ~ Carrier vessel: Using a crane, place the basket on the exclusive steel barge and then load on the carrier.

(2) Storage Plan

The way of storage of skipjack and tuna in the cold store is determined according to the method of cargo handling. As the fish are piled up by hands from belt conveyer which runs through the cold store, the inside of store room will be divided into several sections and designed with full consideration of prevention against cargo collapse and provision of circulation of cooling air etc.

As export price varies by fish species, clear classification of skipjack and tuna by species is essential to avoid the mixed load at the time of delivery.

CHART 1 Flow Chart of Transportation and Handling of Skipjack and Tuna etc.



3-3-3 Basic Plan

(1) Outline of Basic Design

According to previous sections of "Determination of Capacity" and "Transportation and Storage Plan", the basic design is executed setting up the following design conditions:

- 1) Ambient temperature: 35°C
- 2) Temperature inside the cold store: -35°C
Frozen skipjack and tuna are stored. In order to maintain the quality it is necessary to reduce the risk of a blood change in fish body. So temperature should be kept at -35°C.
- 3) Cargo incoming per day: 10 tons/day in accordance with the maximum capacity of freezing facility.
- 4) Incoming cargo temperature: -15°C
because the freezing facilities adjoin to the cold store and loss of time will be very little by means of belt conveyer.
- 5) Central body temperature of the fish: Final temperature of the fish 20 hours after the entry to the cold store is set at -25°C and thereafter is left as it goes.

(2) Location Plan

The following points are taken into consideration for making the location plan.

- 1) The facilities of this project, with the ice making and brine freezing facilities under construction, are functionally inseparable. Therefore the following points are taken into account to determine the location of the facilities;
 - (i) Skipjack and tuna are brought into the cold store after being frozen, and
 - (ii) delivery routes to the carrier vessel and overall efficiency.
- 2) Tarawa district usually suffers from strong westerly wind from November to around March, so wave protection guards need to be constructed to protect the proposed facilities.

(3) Construction Plan

1) Outline of the Facilities

The facilities to be constructed at the end of Mole is a steel-structure and one-story cold store with a preparation chamber (ante room) and its temperature is maintained at -35°C. The floor space of the ante room is 16.0M x 4.5M and the fish are carried into this room by belt

conveyer from adjacent brine freezing facility. The floor space of the cold store is 16.0M x 13.5M, and with a central 2M passage there are three sections on each side where fish are stored classified by species and size. At the time of delivery they are transferred from the cold store by belt conveyer to the ante room, then they are put into baskets and carried by the fork lift to the pier.

2) Design Plan

Ventilation pipes with exhaust fan for the purpose of protection against frost heaving are installed underneath the floor of the cold store. The floor is insulated by four layers of hard polyurethane and vinyl to protect from heat and humidity as well as to enhance the cooling efficiency. The surface of the floor is concreted on the heat-proof layer, and the surface treatment is done to enhance the strength of the floor and to prevent the workers from slipping at work. The building is protected against wave by concreting outside of insulation wall panel up to 1.2 meter high from the ground level. The upper part is metal-sheeted wall.

The gateway is provided with two motor-operated insulation doors which open on both sides and a small door for belt conveyer will be installed at some part. Above the doors air curtain will be provided to cut off outer air and heat. The air space above and side of insulation panels are force-ventilated by exhaust fan so as to enhance the cooling efficiency. The insulation pannels are installed on the ceiling and roof is covered by ribbed steel plate.

3) Structure Plan

Steel-structure was chosen as the most suited judging from the following factors;

- (i) As cold store, inside space has to be utilized most efficiently.
- (ii) Most of the materials and machineries for constructions are imported from Japan.
- (iii) Construction period should be minimized.

As the ground is made of aggregates and compacted sands and the bearing capacity is secured at 5 tons/M², direct foundation system is adopted. Regarding the design for the short time loading, wind load is taken into account rather than seismic load, for the facilities is located in the farthest end of Mole. The pavement work of outdoor works and the construction of wave protection guards are considered as essential to the facilities.

(4) Equipment Plan

1) Cooling equipments' basic specifications

a) Cooling equipments:

- package type 2 units (10% more than the maximum load)
- o easy operation and easy maintenance, energy-saving/low cost type
- o small installation space, small noise, and small vibration
- o Auxiliary equipments:
 - o a pressure gauge
 - o a thermometer
 - o a ammeter
 - o a safety device
 - o a thermostal

b) Condenser:

- air-cooling type
- with condensing pressure regulator
- (maximum external temperature at 45°C)

c) Evaporator:

- cooling by circulating the cooled air
- hot-gas-defrost type

d) Control circuit:

- automatic and manual change-over

e) Refrigerant: Fron 22

f) Construction laws:

- subject to the Japanese domestic laws and regulations

2) Electric equipments' basic specifications

a) Power generating plant: 1 unit

(equal capacity to the maximum load)

- o for power use
3φ x 4W x 50 HZ x 415 V
- o for lighting use
3φ x 4W x 50 HZ x 230 V
- o Engine
easy handling,
simple structure and energy-saving type
- o Automatically synchronize according to load variation.
- o Generator
Greaseless, self-ventilated type and tropical specification.

- o Accessory apparatus
 - Fuel Tank: Steel tank for outdoor use
(capacity of storing fuel for 20-day-full operation)
 - Fuel Pump
 - Distribution Board

Above equipments are for ordinary use and in case of emergency electric power is supplied from the municipal power station.

- b) Distribution Panel, Branch Box: Water-proof type
- c) Electric Wire: Equal or better than IV, CV
- d) The capacity of the electric equipments are mentioned below.
 - o Cooling apparatus
(refrigerator, cooler fan, air condenser fan) 2 sets
 - o Belt conveyer (tilted conveyer, flat conveyer) 5 units
 - o Ventilation Fan 2 units
 - o Ceiling Fan 2 units
 - o Air curtain 2 pieces
 - o Motor-operated door 1 set
 - o Floor Heater 1 set
 - o Lighting (water-proof incandescent lamp
used inside the cold store) 8 lamps
 - o " (Fluorescent lamp for the ante room) 3 lamps
 - o " (Floodlight) 2 lamps
 - o Receptacle outlet (230 V) 2 places
- e) Construction laws:
In conformity with the related laws and regulations of Japan.

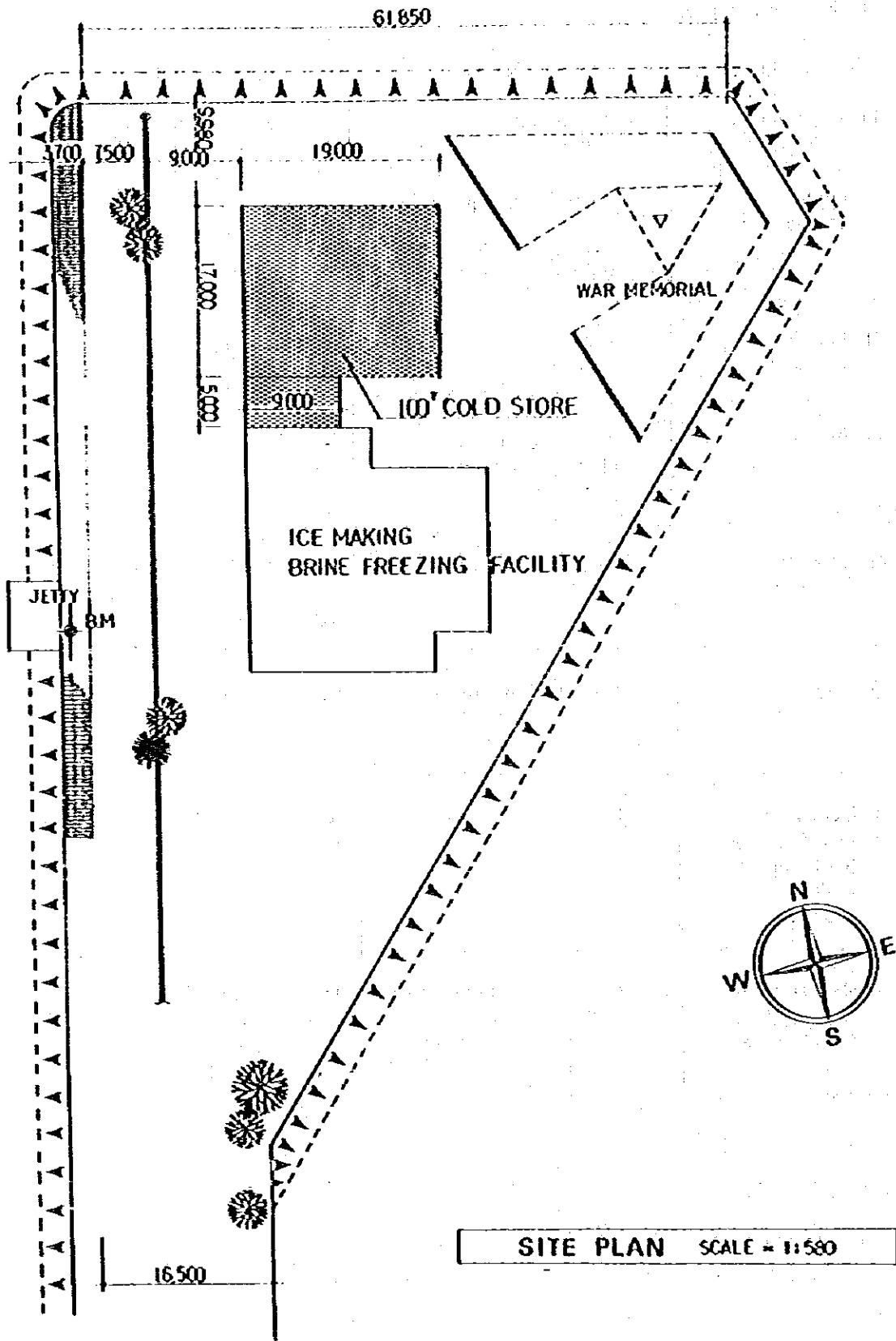
3) Basic Specifications of water supply and drainage facilities

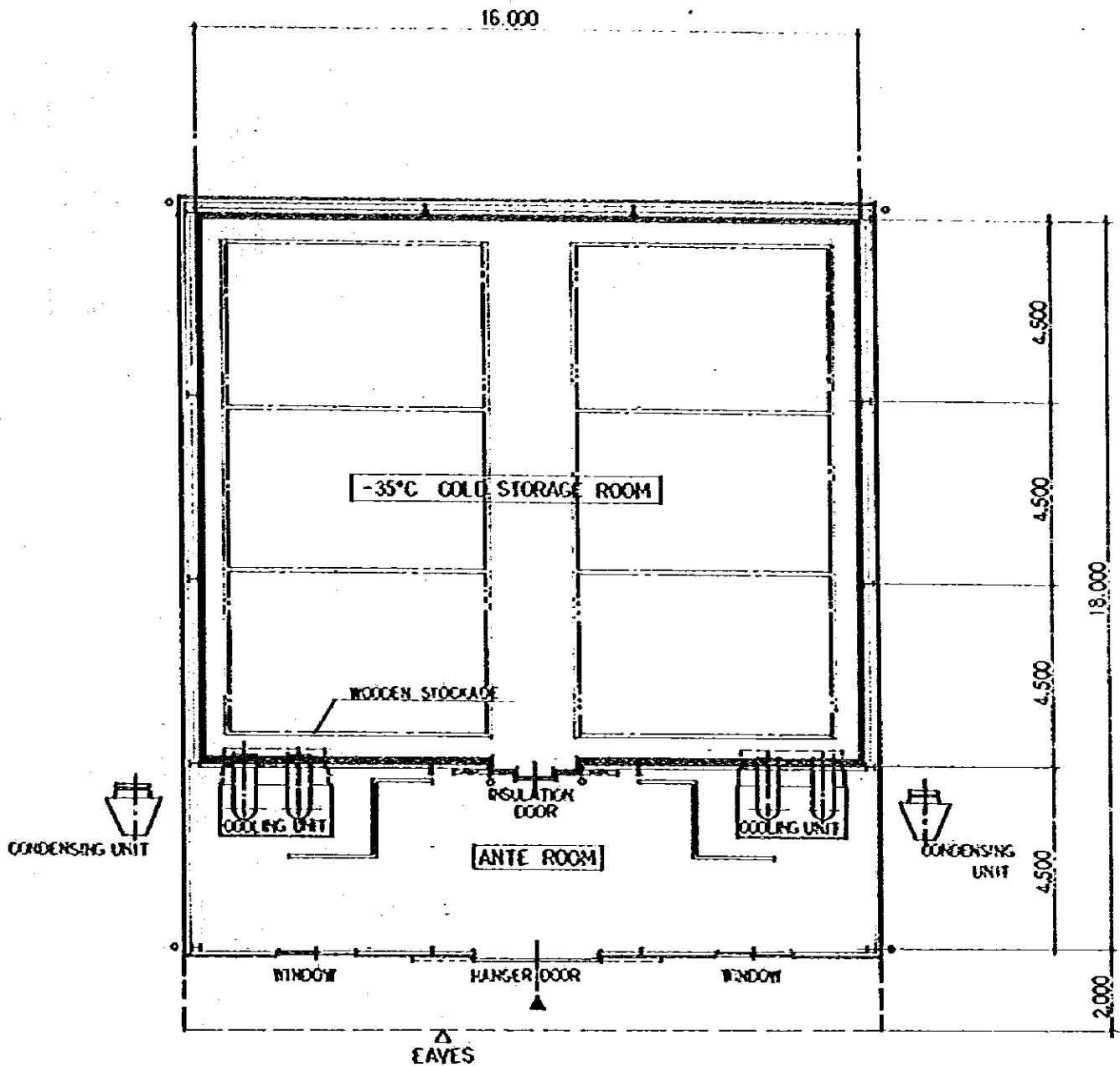
- a) Rainwater on the roof of the cold store is led into the rainwater tank installed near the freezing facilities.
- b) In the ante room of the cold store, a washbasin is installed, to which the water supply and the drainage facility is attached.
- c) The waste water is led back to the ground through the purifier.
- d) The rain water tank is installed at the office building, by which water is supplied to washbasin and waste water is drained through sewage.

(5) Equipment Plan

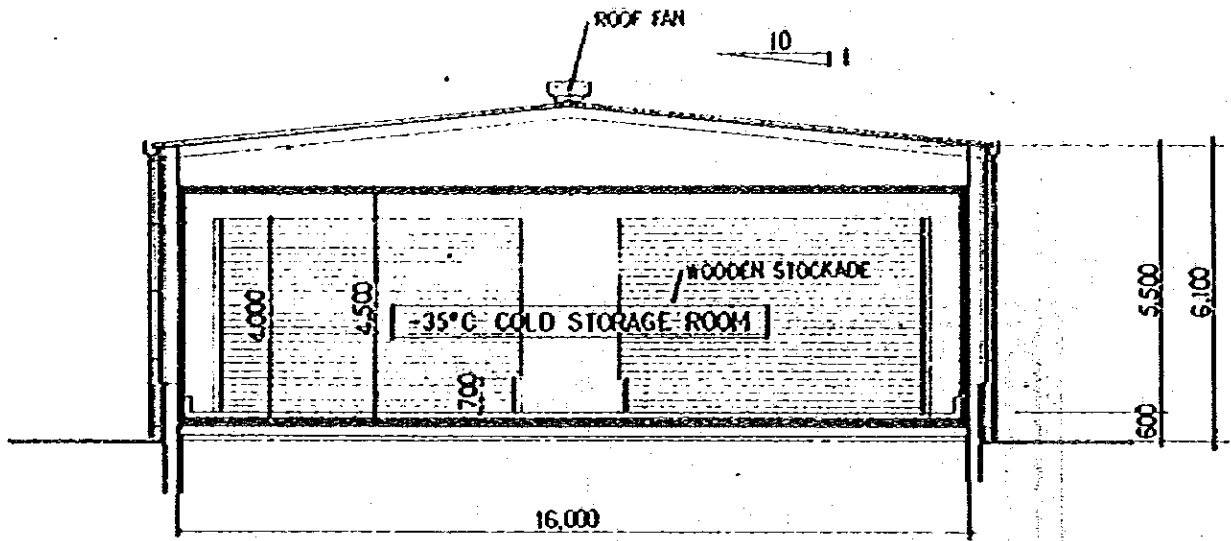
Item & Quantity	Specifications	Condition & reason for selection
1) Belt Conveyer : 5 units Chute : 1 unit	1 tilted unit equipped with caster. 2 units of cold proof type. 2 units of ordinary type (60 cm-wide belt)	For the purpose of efficient carriage of frozen fish from the freezing facility to the cold store.
2) Fork lift : 1 unit	2,000 kg with engine	To carry baskets out swiftly (from the cold store to the barge).
3) Basket : 15 units	Stainless container (1000 mm x 1000 mm x 1000 mm)	To speed up packing frozen fish into baskets and carrying them out.
4) Track Crane : 1 unit	Capacity of 5 ton	To lift baskets to and from the barge and to use for landing from 20 GRT skipjack fishing vessel.
5) Barge : 1 unit	Capacity of 6 baskets	To use for carrying baskets between the pier and the carrier vessel. It can be utilized for carriage of other goods.
6) Outfits for cargo handling (cold-protection clothe) : 15 sets	LL size	A full line of cold-protection work wear to get prepared for the work inside the cold store with temperature of -35°C .
7) Maintenance equipment for cold store	1 unit each of lathe, drilling machine, power tool, measuring apparatus and other tools.	They are used for minimum repairs to maintain freezing facilities and electric facilities.

3-3-4 Basic Design Drawing

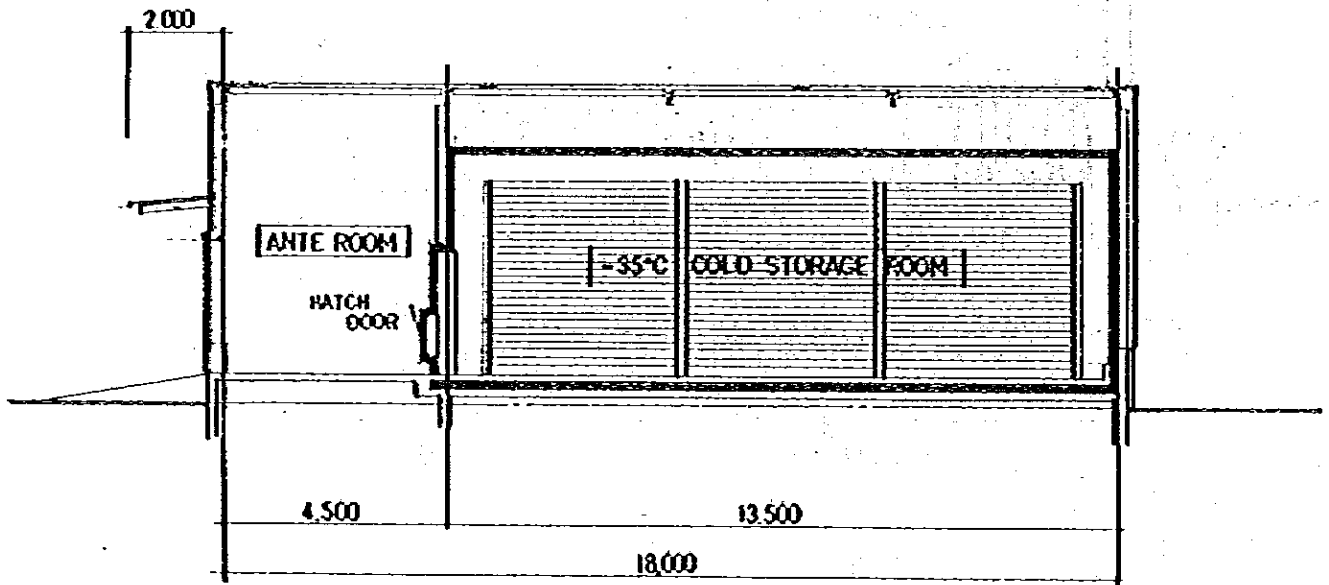




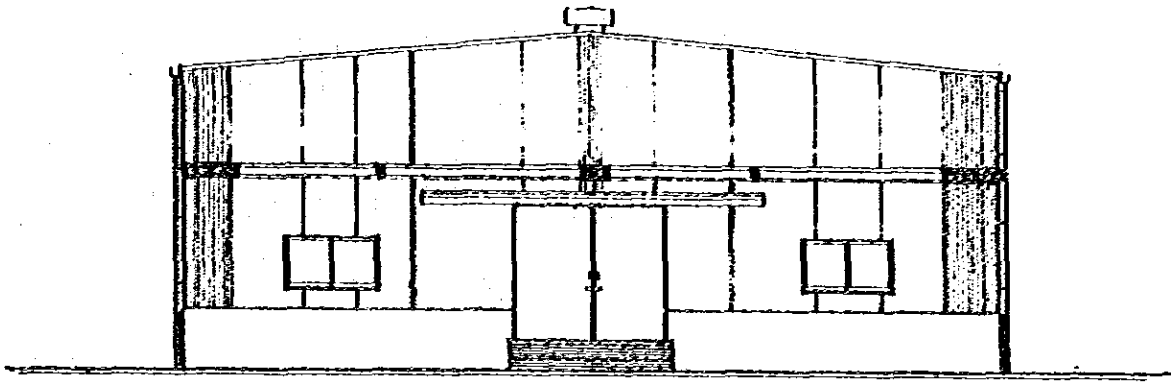
PLAN SCALE = 1:150



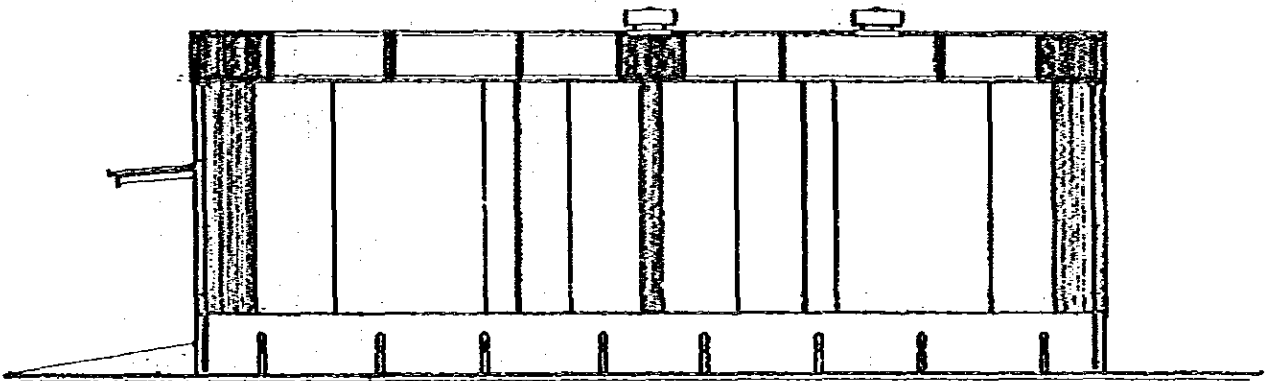
SECTION SCALE = 1 : 150



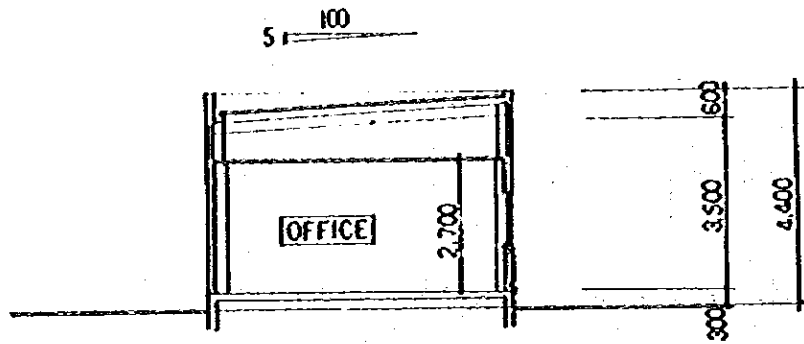
SECTION SCALE = 1 : 150



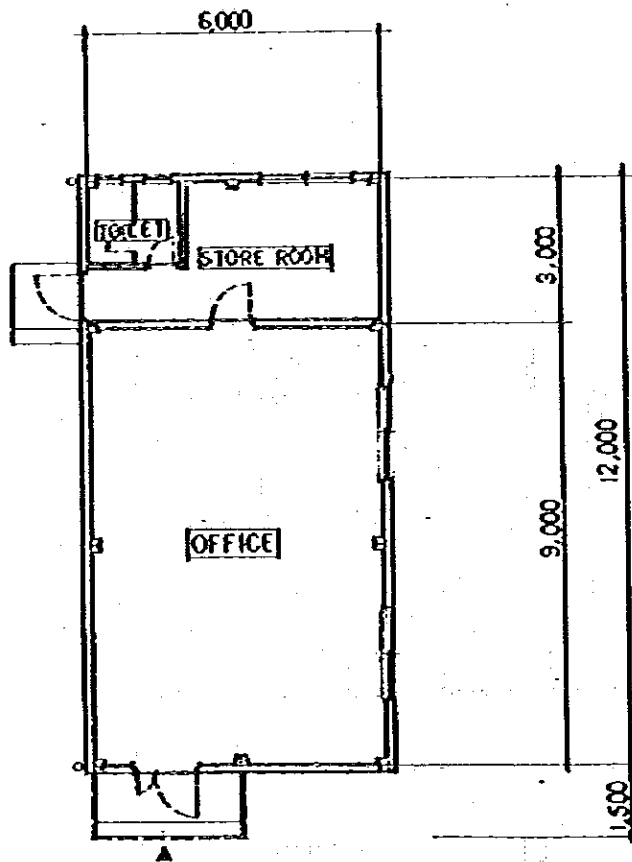
FRONT ELEVATION SCALE = 1 : 150



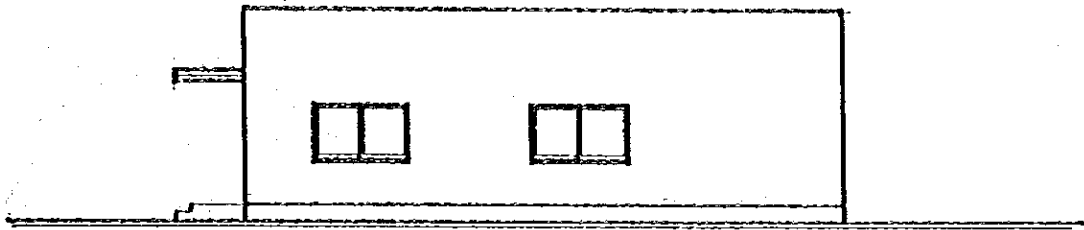
SIDE ELEVATION SCALE 1 : 150



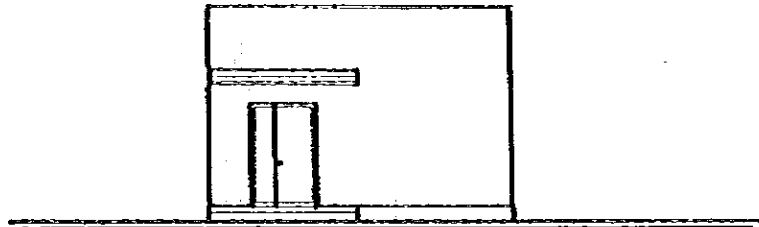
SECTION SCALE = 1:150



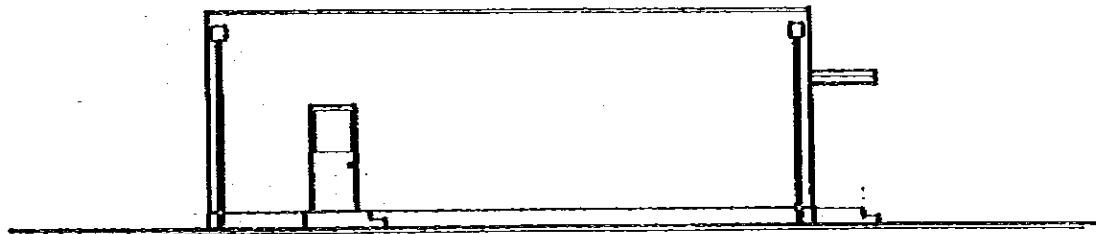
PLAN SCALE = 1:150



SIDE ELEVATION SCALE - 1:150

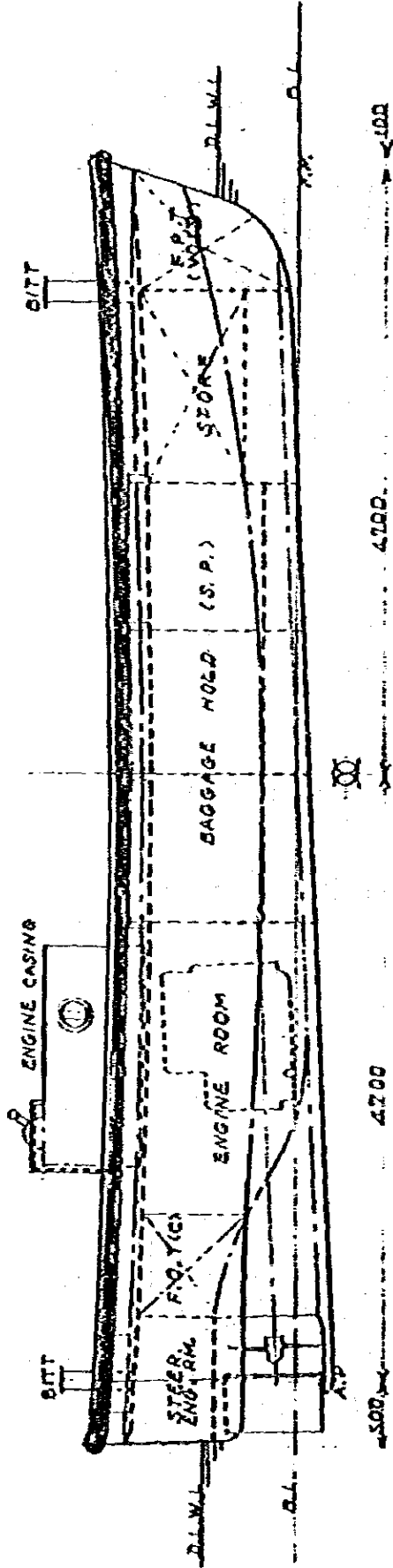


FRONT ELEVATION SCALE - 1:150

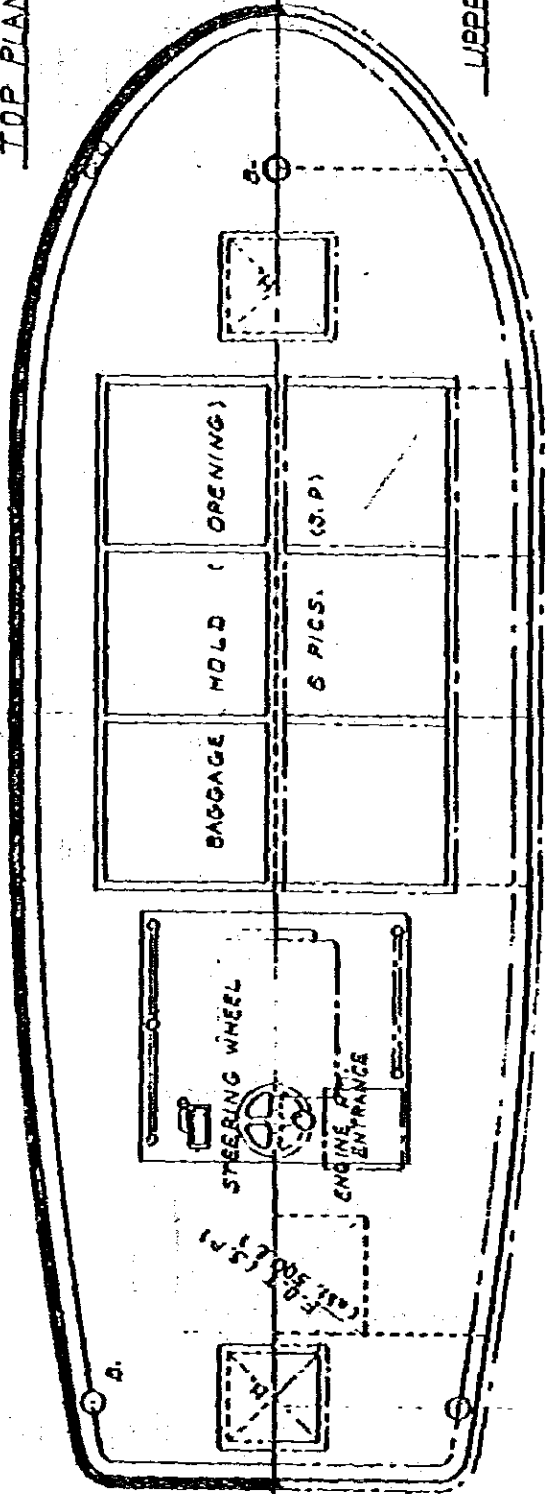


SIDE ELEVATION SCALE - 1:150

ROUGH GENERAL ARRANGEMENT
 5.0 D.W.T. BARGE
 Loa x B x D = 10.0 M x 3.40 M x 1.10 M



TOP PLANE



CHAPTER 4 IMPLEMENTATION SCHEME

CHAPTER 4 IMPLEMENTATION SCHEME

4-1 Executing Agency

4-1-1 Organizational Structure

Ministry of Natural Resource Development (MNRD) is the responsible body for this project, and Fisheries Division of the said Ministry is in charge of its implementation.

The Ministry is obligated to communicate and coordinate with other Ministries and agencies as mentioned under 2-4-3.

TE MAUTARI Ltd. (National Fisheries Corporation) fully owned by the Government, located in Belio, belongs to the Ministry of Natural Resource Development and renders all-out cooperation for executing this project.

The construction of ice making and brine freezing facilities is now under way. The setup and system on Kiribati's side seem to be well functioning without any special problems with regard to the maintenance and control of cold store and office building after construction completion. As TE-MAUTARI is in charge of operating the Fish Marketing Center, there seems to be no problems in its maintenance of the cold store as well. The office building will be used for a branch office of Fisheries Division, and belong to the MNRD.

4-1-2 Personnel Training and Placement Plan

Fisheries Division is in charge of making up personnel placement plan for the construction and management in executing this project. It is recommended that an official who is exclusively responsible for pushing this project forward and assist Chief Fisheries Officer should be nominated in MNRD. Its management after construction may well be carried out smoothly as the staff of Fish Marketing Center have already enough experiences in management of this kind and only if refrigeration technicians are competent enough. At present all these works are being carried out by Kiribati technicians, but their repair skill needs still to be upgraded.

4-2 Construction Plan

This plan covers a wide range, such as building, cooling equipments, cargo-handling machineries and materials, but a greater part is occupied by building work.

Consequently if proper subcontractors can be arranged under the main contractor, smooth execution of the work will be assured. All the engineers are to be dispatched from Japan, for the number of technicians available from labor supply companies in Kiribati seems in short of the requirements for this project.

Judging from the point of the work process, the time for starting the construction work of the cold store and the office building, which constitutes the main part of the plan, will be five months after the date of E/N, for a lead time should be taken for making up detailed design, bidding, contract, approval of drawings, and procurement and manufacture of machinery and materials. The term of construction is to be six and a half months anticipating a slight delay due to rain. Therefore, the period of 11.5 months would be necessary for executing the entire project.

In view of the fact that the buildings and facilities are comparatively simple, there seems to arise no troubles in executing the construction. Accordingly supervision plan is by spot check system which mainly consists of inspection. Appropriate periods are specified on respective occasions;

i) the time of starting-up, ii) intermediate time (completion of foundation work), iii) the time of completion
and one consulting engineer each of architecture and cooling equipment are assigned at the site to supervise the work.

4-3 Scope of Works

Arrangements to be taken by Kiribati's side toward the implementation of this project are as follows:

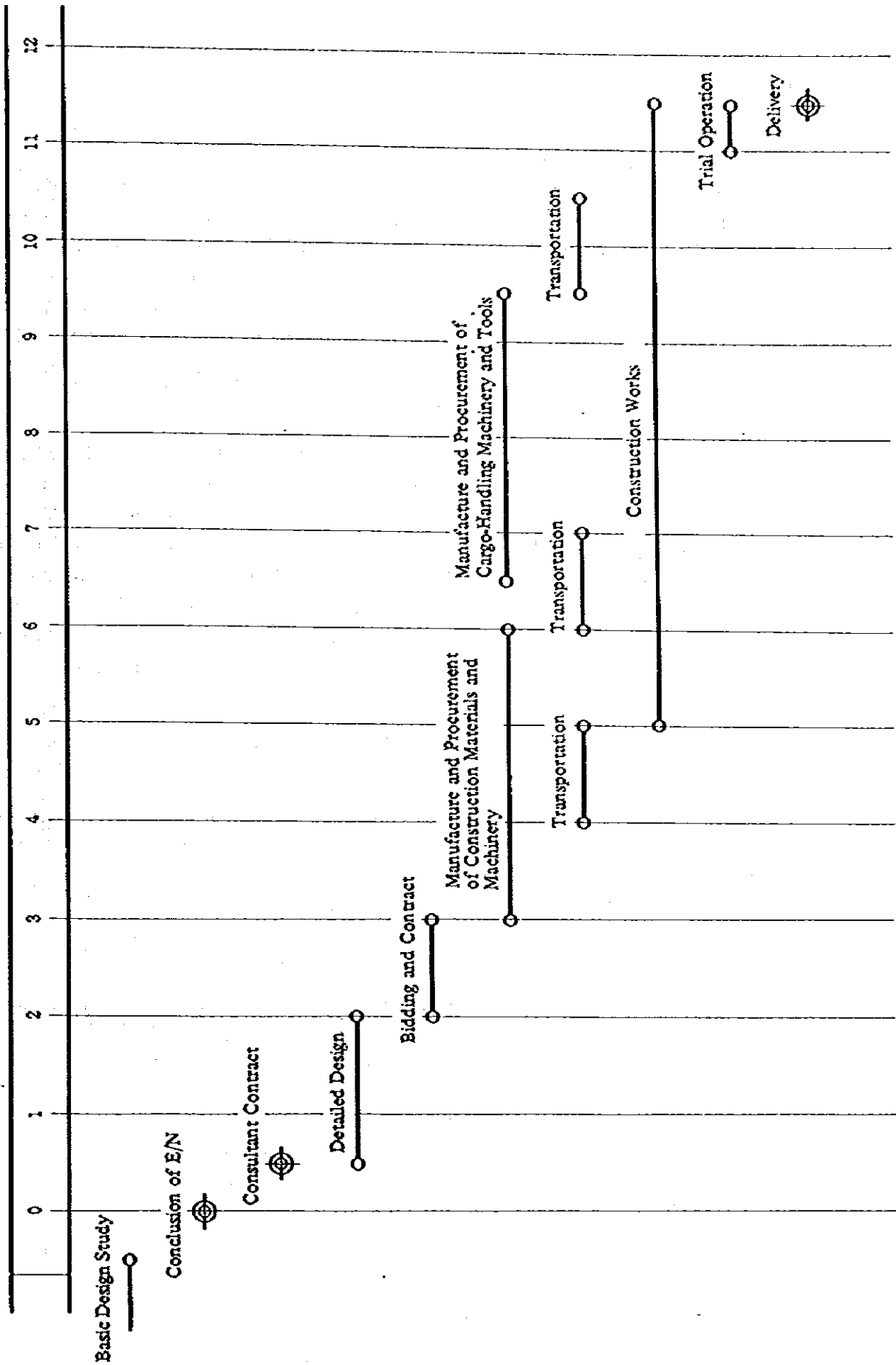
- (1) To secure a lot of land necessary for the construction of facilities.
- (2) To secure a temporary work stockyard and a material stockyard.
- (3) Clear and level the site for item (1 ~ 2), and fill as needed.
- (4) To provide facilities of electricity, water supply and drainage outside the building.
- (5) To provide telephone network to the office, along with phone sets.

Due to the fact that the proposed site is quite limited in area, securing a temporary work stockyard inside it is impossible. Therefore, item (2) is a essential condition for smooth execution of the works. Kiribati's share of the fund required for items (3) (4) (5) is estimated to be about AS\$12,500.

4-4 Execution Schedule

This plan takes 11.5 months from the conclusion of E/N through completion and delivery of the facilities. Its work schedule is mentioned below.

Schedule for Implementation of Project



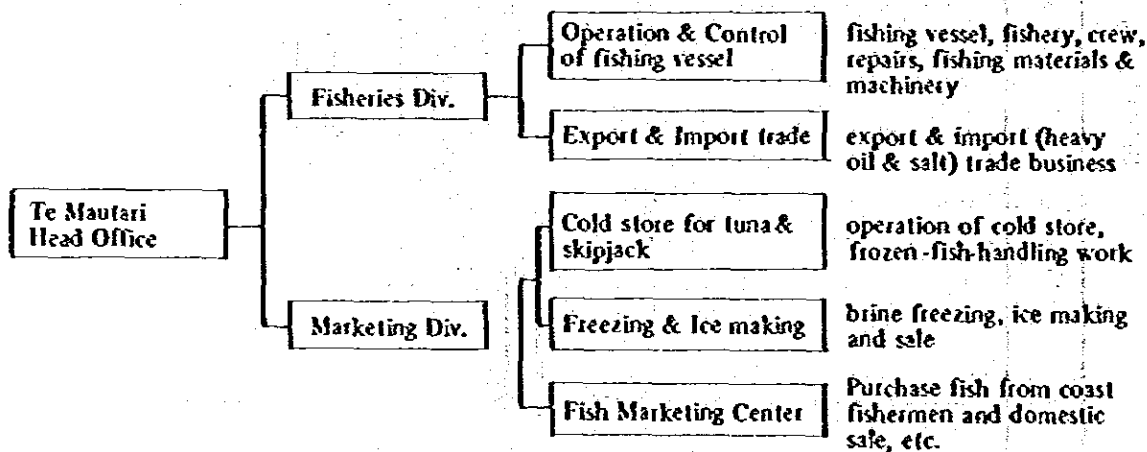
4-5 Maintenance and Operation Plan

4-5-1 Management Plan

(1) Management System

After completed, the cold store will be owned and operated by Te Mautari Ltd. The present system of the Corporation, under the structure of the head office, comprises Fisheries Division and Marketing Division. The former is in charge of management and operation including ship fishing and export of skipjack and tuna, and the latter covers the domestic distribution business such as purchasing reef fish from coast fishermen, freezing of marine products, and ice making and selling. In addition it is responsible for operating the shore facilities.

Therefore the proposed cold store is naturally to belong to the Marketing Division. But aiming at more efficient management, the following reorganization is advisable, i.e. this opportunity of the project completion should be taken to subdivide the Marketing Division, whereby a new cold store will be utilized for storing and shipping tuna and skipjack for export. Freezing and ice-making, which is utilized for export-fish and domestic distribution as well, will be regulated by another newly created unit. The existing Fish Marketing Center covers the same job as before, i.e. purchasing, freezing domestic sale of reef fish.



(2) Personnel Plan

The required number of personnel computed by types of work in accordance with the new management system mentioned above is tabulated as under.

(Personnel Plan List)

Classification	Ico-making Freezing Facilities	Cold Store	Total	Type of Work
Nabager	1		1	Overall management
Maintenance Staff	2		2	Freezing facilities Electrical facilities
Foreman	2	1	3	Superintendent on cold store, ice-making and freezing work.
Checker	1	2	3	Check on quantity tuna & skipjack by grade.
Labour	6	6	12	freezing, ice-making & cold store work
Cargo-handling Operator	4		4	fork lift x 1, crane x 1, barge x 2.
Clerk	2		2	general affairs, accounting clerical work
Total			27	

10 persons are estimated to be assigned for the ice making and brine freezing facilities which are now under construction. The number of increase concerning the cold store is 17. In addition, 18 temporary cargo-handling workers are necessary in case frozen tuna and skipjack are shipped out for export. The total number required annually is shown below.

The total number of temporary cargo-workers per year = 3 days (work day) x 10 voyages (number of trips of carrier vessel) x 18 workers = 540 man days

4-5-2 Maintenance and Control Expenses

(1) Personnel Expenses

The personnel expenses of the Fish Marketing Center for fiscal 1981 was A\$ 46,203 per 16 workers. Monthly average was A\$ 240 per worker. The expenses estimated for this plan is computed by 10% increase as under on the assumption that the cost will rise by 5% over 1981.

Regular worker

A\$ 240 x 110% workers x 12 months = A\$ 53,856

Temporary cargo-handling workers

At the estimate that loading 100t tuna and skipjack from the cold store on to the carrier vessel would take 3 days,

3 work days x 10 voyage x 18 workers x 8 h x A\$ 0.80/h =
A\$ 3,456.

Total annual personnel expenses for both regular workers and temporary workers A\$ 57,312

(2) Power Expenses

1) Generator fuel for the cold store (gas oil)

The amount of fuel consumed yearly by the generator with the capacity of 77.5 KVA for the refrigerator attached to the cold store and the cost with a load factor of 100% are as follows:-

19.2 L/h x 24 h x 365 days = 168,192 L

But the load rate to maintain the inside temperature at -35°C is 57%. Accordingly the fuel consumption per KVA/h is 13 L per hour. The yearly consumption is

13 L x 24 h x 365 days = 113,880 L

113,880 L x 0.53A\$ = A\$ 60,356

2) Power expenses for barge, crane and fork lift

a) Fuel for barge (gas oil)

50 HP x 175 g x 8 h x 1 barge = 70 L the consumption per day

3 workdays x 10 voyages = 30 days yearly work days

70 L x 30 days x A\$ 0.53 = A\$ 1,113 yearly cost

b) Fuel for crane (gas oil)

100 HP x 40 g x 8 h = 32 L the consumption per day

3 work days x 10 voyages = 30 days yearly work days

32 L x 30 days x A\$ 0.53 = A\$ 509 yearly cost

- c) Fuel for folk lift
 44 HP x 40 g x 8 h x 1 forklift = 14 L consumption per day
 3 workdays x 10 voyages = 30 days yearly work days
 14 L x 30 days x AS 0.53 = AS 223 yearly cost
 a) + b) + c)
 1) + 2) total power expenses AS 62,201

(3) Heat and light expenses & water expenses

Electricity for lighting is supplied from the generator of the cold store. Rain-water in the tank is used for drinking purpose. Therefore the expenses of both items is not earmarked for this plan.

(4) Depreciation

- 1) Cold Store Building (323 M²)
 ¥110,312,000/¥240 x 0.0833 AS 38,287
- 2) Attached machines such as refrigerator and generator
 a. refrigerator (10 RT x 2 units) ¥56,827,000/¥240 x 0.0833
 b. generator (77.5 KVA x 1 unit) AS 19,724
 c. attachments
- 3) Cargo-handling machines
 a. Barge (10M x 1) ¥10,926,000 ¥24,523,000/¥240 x 0.0833
 b. Crane (5t x 1) ¥10,508,000 AS 8,516
 c. Fork lift (2t x 1) ¥ 3,089,000
- 1) + 2) + 3) Total amount of depreciation AS 66,527

(5) Repair Cost

- 1) The price of the cold store x 1%
 and other machines x 1% AS 2,368
- 2) The price of cargo-handling machine x 1% AS 1,011
- 1) + 2) Total cost of repairs AS 3,379

(6) The Maintenance & Control Expenses in the initial year

	(in A\$)
1) Personnel Expenses	57,312
2) Power Expenses	62,201
3) Heat & light and Water expenses	—
4) Depreciation	66,527
5) Repair Expenses	3,379
<hr/>	
Total	189,419

Note: Depreciation factor is set at 8.33% in accordance with Te Mautari's accounting rules.

4-5-3 Profitability of Cold Store in Relation to Te Mautari Ltd.

As described earlier in Chapter 4-5-3 "operation and Maintenance Expenses" the 1st-year aggregate amount totals A\$ 189,419.

With the 1st-year fish store tonnage of 801 tonnes, unit-cost of storing tuns into A\$ 236 a tonne, which seems slightly more than to be absorbed into export skipjack/tuna prices.

In the event the annual fish catch could be increased to 3,000 tonnes from the present estimate of about 2,000 tonnes, it is felt that Te Mautari will be able to pay off the above mentioned operation and Maintenance expenses on its own.

It is therefore recommended that Te Mautari Ltd. should immediately formulate and implement fundamental measures toward increased fish catch, centering upon enhanced capacity utilization of fishing vessels.

Fathemore, while in 1981 Kiribati Government budgeted the A\$ 250,000 Development Fund toward Te Mautari's operation funds which was then appropriated by its parliament, the present project also will need a significant amount of personal and financial support from Kiribati Government, untill it get under way.

4-6 Procurement Plan of Equipment & Material

Except for sand and aggregates which are locally available, all of the required equipment and material to be used for this project will be procured from Japan and delivered to Kiribati.

While a variety of building materials are available in Kiribati, their supply is found totally dependant upon imports and seems rather precarious in terms of delivery period, specification and quantitative requirements. Regarding the local procurement of sand and aggregates, their transport vehicles are in short supply, causing frequent delay in delivery. This aspect will need to be carefully attended to before initiating the construction under this project.

Additionally, equipment for temporary work, cranes and concrete mixers and other heavy equipment are presently leased by the Public Works Division to the contractors. Their procurement will have to be done in the most efficient possible way after making out detailed work flow programming.

Furthermore, there is one labour recruiting company in Betio, and labour recruiting through this company will continue to be the most reliable. Incidentally, labour recruiting for the ice making/brine freezing facilities which are now under construction, was contracted with the intermediary of Te Mautari Ltd., to avoid the risk of conflicts with the local recruiting company.

CHAPTER 5 OVERALL EVALUATION OF THE PROJECT

CHAPTER 5 OVERALL EVALUATION OF THE PROJECT

5-1 Priorities of the Project

The Kiribati's skipjack/tuna fishing industry has been given the top priority in pursuit of its self-supporting national economy, and in February 1983 it is about to initiate promoting the modern ship fishing with 4 units of skipjack fishing vessels as its nucleus. Considering its national economy which lacks in any other significant natural resources, according of the top priority to skipjack/tuna export promotion is more than natural reasoning, and the overseas aid project in this sector is valued as accelerating the republic's self-supporting efforts.

This project is aimed at strengthening Betio Port as a fishing base under Kiribati's Fisheries Development Program, maintaining a close relation with the on-going construction of brine freezing facility there. Considering that this project will constitute a major component of the planned integrated fishing base, and also judging from the total flow of skipjack/tuna in Betio Port, the location of cold store in neighbourhood of brine freezing facility is recommended as the best suited to quality preservation of frozen fish, while assuring a well-organized transport upto carrier vessel and thereby increasing cargo handling efficiency. This will make possible the unimpeded storage, transport and export of skipjack/tuna.

Meanwhile, the proposed office building will be used for a Betio Branch Office of Fisheries Division, Ministry of Natural Resource Development. By setting up a branch office in Betio, Fisheries Division is expected to strengthen its ties with National Fishing Corporation (Te Mautari Ltd.), grasp problems involved in fishing operations, so as to accelerate its efforts toward a profitable fishing industry.

In addition, the proposed branch office is also obligated to instruct and supervise the outer islands' fishermen as well.

In view of the above, the construction project of cold store and Fisheries office is evaluated as the most viable.

5-2 Estimation of the Effects

Since the cold store included in this project will be operated by National Fishing Corporation (Te Mautari Ltd.) exclusively for its own refrigeration of skipjack/tuna catch, it is assumed that there will be no income such as storage fees etc.

Accordingly, while its direct effects seem hardly visible and economical benefits of cold store alone cannot be singled out, its overall effects are estimated below, taking into account its indirect effects on fishing industry:

(1) Effectiveness on quality control

After brine-frozen in the neighbouring freezing facility, the frozen skipjack/tuna will be transferred via conveyor into the cold store, without risk of getting exposed in the open air, and then efficiently loaded into the carrier vessel thereby enhancing the quality control of export fish.

(2) Increased efficiency in transport

Fish transport from the cold store upto the carrier vessel will be effected by machinery along with baskets, thereby reducing damages to fish and increasing the transport efficiency.

The same will also hold for unloading operation of fish catch, making possible the hourly performance of more than 5 tons, against the current level of about 15 – 20 tons a day.

(3) Increase of employment opportunities

Direct employment alone, such as transport from the cold store to the carrier vessel and heaping operation in the cold storage room, will number at about 20 people. If indirect employment is included, this is likely to provide a considerable number of employment in the region.

(4) Shipping adjustment to cope with changing overseas market, and increased income due to introduction of by-fish classification.

The provision of cold store will make possible shipping adjustment to suit overseas market price fluctuations of skipjack/tuna.

In addition, this project will enable classification by fish and size which has so far been not possible, thereby increasing the income.

(5) Technology transfer

Technology transfer will be accelerated in aspects of cold store management and export cargo handling operation, notably operation and maintenance of fork lifts and mobile cranes.

(6) Others

Kiribati's fresh food requirements are mostly dependant upon imports. While the cold store will be installed mainly for fisheries, its surplus space, if any at all, may be utilized for temporary storage of frozen foods (rice etc) and others.

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

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Kiribati's Fisheries Development Program has so far made steady progress in line with its National Development Program (1979 -- 1982) formulated in April 1979.

As an extension of this program, the JICA carried out basic design study recently on the construction of cold store and Fisheries office in Betio Port, which are expected to serve their purposes in close relation with the ice making/brine freezing facilities provided by Japan in 1982.

The basic design study indicate that the proposed construction of cold store and Fisheries office will be extremely significant to the Kiribati's skipjack/tuna export promotion, and that their post-construction operation and maintenance will not present any problem in the light of the current operation of Fish Marketing Centre provided by Japan previously.

According to the basic design study, the provision of a Cold Store will include the supply of cargo handling equipment such a barge and basket which will facilitate the operation of a well arranged system in the event the project is implemented.

The expanded fleet of fishing vessels will lead to increased fish catches and exports which judging from past fishing performance, will require a cold store of 100 tonnes capacity.

While this project will play a significant role in Kiribati's current National Development Program, it is evident that the project will need to be supported by Kiribati's integrated development program and its well-balanced implementation program including personnel training.

In the event when this project has been implemented, it is hoped that this will enlarge economic effects resulting from a series of grant aid projects which Japan has provided for Kiribati's Fisheries Development Program since 1977, contributing significantly to the Republic's National Development Program.

The project itself is considered as lacking in immediate productivity and only acting in a supplementary role under the Fisheries Development Programme. It is stressed that an increased catch of skipjack/tuna (a major target of the Fisheries Development Programme) is necessary for the full potentiality of this Project to be realized.

Recommended counter-measures are:

- (1) A refrigerated transporter ship should be provided, equipped with refrigerator and repair workshop, and fuel tank etc. which will make possible increased operating efficiency of fishing vessels, along with easier quality control of frozen fish. A refrigerated transporter ship with a 300 – 400 ton payload is considered the most suitable type.
- (2) Regarding a stable supply of live bait, availability of live baits in Tarawa is never dependable qualitatively and quantitatively.

The milkfish culture will need to be promoted aggressively so that the milkfish supply can meet with live bait requirements of skipjack/tuna fishing.

- (3) Maintenance crew training and repair facilities will need to be implemented soonest possible, in order to keep moving parts of fishing vessels always in good order.

It is also recommended that for the efficient operation of fishing vessels, production and marketing control, management staff are required who should be management conscious and able to supervise the shoreside and sea-going operation of the fleet.

Further, as this project is considered the most promising in supporting Kiribati's national economy, it is hoped that Kiribati government will set up an administrative back-up system centering upon this project.

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