


BASIC DESIGN REPORT
ON
THE FISHERY DEVELOPMENT PROGRAM
IN
THE UNITED REPUBLIC OF TANZANIA

JANUARY 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

Upon the request of the Government of the United Republic of Tanzania, the Government of Japan has decided to carry out a basic design study concerning the fishing boats, equipment, and facilities to be donated for the fishery development programme of Tanzania under our grant-aid with non-reimbursible funds, and the Japan International Cooperation Agency (JICA) conducted the study.

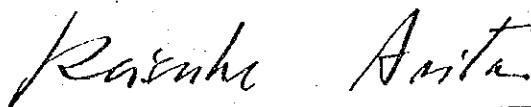
JICA dispatched to Tanzania from November 29 to December 12, 1979, a study team headed by Mr. Kazuo Takayama, fishing boat inspector, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries.

The field survey was carried out very smoothly with the extensive cooperation of the ministry and other public organizations of Tanzania.

The present report is based on the findings of the survey in Tanzania and the analysis made by the team upon its return to Japan. I hope this report will contribute to the fisheries development of Tanzania and to the strengthening of the friendly relations between our two countries.

I wish to express my deep appreciation to the government and people concerned of Tanzania for their close cooperation extended to the study team.

January, 1980



Keisuke Arita,

President,

Japan International Cooperation Agency

SUMMARY

The United Republic of Tanzania is the biggest fisheries nation in East Africa, positively promoting the development of sea-water fisheries in addition to fresh-water fisheries. This country has a narrow belt-like coastline extending about 800 km along the Indian Ocean with such islands as Pemba, Zanzibar and Mafia scattered from the North to the South. There are many good fishing grounds between these islands and the mainland. It is estimated that the present catch of fish is about 46,000 tons (1977). If the fish resources were developed, it would reach several times as much as of present, indicating that there are many fishing grounds left for the development of sea-water fishery.

From the national economic point of view, the ratio of fishing output in terms of GNP is very small at 1.7% (1975). But fish in general is regarded as an important and easily available protein source and also as an important earner of hard currency, so that the Government is positively promoting the fishing industry.

The list of equipment, such as fishing boats, fishing materials, etc., as requested by the Government of Tanzania, was prepared with the Government-founded Tanzania Fisheries Corporation (established in 1974) taking direct charge of the technical cooperation in fishery from Japan. The fishing

industry is mainly limited to prawn fishing, so that fishing boats, nets, and prawn sorters etc., were primarily requested as her main concern. The request was also extended to gill nets and purse seine boats which will be able to develop the new types of fishing in the future.

Based on these requests, this survey aimed at probing into technical and economic adaptability and feasibility as to the items stated above, at appraising the whole aspect of the plan, including the effects of the offer, and at drawing up the optimum plan necessary for Japan to extend cooperation in terms of grant aid.

The survey team consulted with officials of various Tanzanian ministries and agencies and the Embassy of Japan in Tanzania, for 11 days from November 29 to December 9, 1979. The team surveyed the shipyard of the TAFICO which will take direct charge of the management and control of materials and mechanical equipment to be offered from Japan, a processing plant of prawns, fishing villages, a fishing research facilities, etc.

The survey team examined the contents of the request with the TAFICO personnel acting mainly as its counterparts.

Concerning the fishing materials and equipment as finally agreed between two parties concerned, a basic design was conducted in due consideration to the request pertaining to the local environments of a fishing ground, the technical level,

and the control and maintenance system of the TAFICO.

The materials and equipment mutually agreed upon are as follows:

- (1) FRP fishing boats:
 - Trawlboats 5
 - Purse seine boat 1
- (2) Fishing nets and fishing implements:
 - (i) Trawl-nets for prawn
(spare materials included) 20 sets
 - (ii) Purse seine for sardines
(spare materials included) 3 sets
 - (iii) Drill net Complete set
(spare nets, ropes and floats
included)
 - (iv) Spiny prawn trammel nets,
finished products 200 sets
 - (v) Long line 10 sets
(glass floating balls, floating
beacons)
- (3) Radio station complete set
- (4) Prawn grading machines 1
- (5) Insulated truck for fresh fish
transport 1
- (6) Ice-making equipment complete set
(1 ton/day × 2)

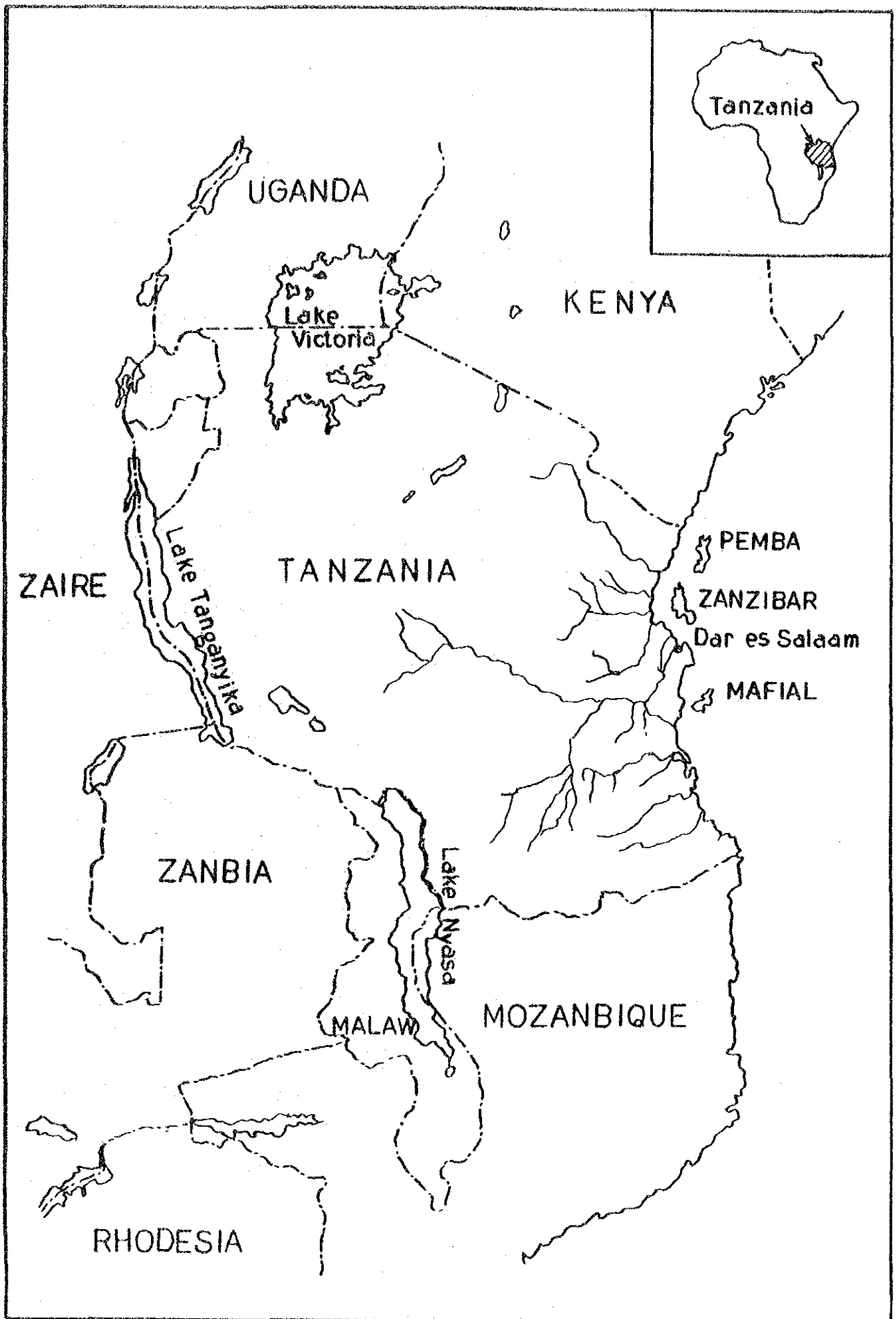
In designing the materials and equipment, a special consideration was made for providing the spare parts for 2-3 year's use and technical guidance enough to cope with the need in the country.

As for ice-making facilities, it was agreed that the cost for the basic materials, labor, transport, etc., necessary for the execution of the work, shall be borne by us on the assumption that the Government of Tanzania would secure a plot of land prior to the commencement of the installation work.

Many of these materials and equipment under the direct control of the TAFICO, are to be used for catching prawn in sea water fishery along the coast, also securing the nation's protein resource, and earning foreign currencies in the effective and adequate manners. This will help her promote the fishing industry in Tanzania.

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Chapter 1. Purposes and Details of the Survey

1-1 Purposes

To accelerate the development of its fishing industry, the United Republic of Tanzania requested Japan for the offer grant for materials, equipment and facilities necessary for the development of fishery.

In response to this request, the Japan International Cooperation Agency has carried out an on-the-spot investigation to collect various data and information indispensable for a basic plan relevant to realize the eventual offer of equipment and materials for the fishing industry as requested by the United Republic of Tanzania and also to talk with the competent Government authorities over the matter.

1-2 Composition of Survey Team

The survey team led by Mr. Kazuo Takayama, Fishing Boats Inspector, Fishing Boats Div., Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, and composed of the below-mentioned persons, was dispatched to Tanzania for 11 days from November 29 to December 9, 1979.

Mr. Kazuo TAKAYAMA (Leader)

Fishing Boats Inspector
Fishing Boats Div.
Fisheries Agency
Ministry of Agriculture
Forestry & Fisheries

Mr. Yoshihisa KONDO, M.B.A.

Councillor
Development Survey Div.
Social Development Cooperation Dept.
Japan International Cooperation Agency

Mr. Hitoshi TAMAKI

Engineer
Ocean Development Dept.
World Ocean System Inc.

Dr. Akio KOYAMA

Marine Biologist
Ocean Development Dept.
World Ocean System Inc.

Mr. Seiji KIKUCHI

Ocean Development Dept.
World Ocean System Inc.

Chapter 2. Outline of Contents of Request

2-1 Background and Details of Request

Tanzania's fishing industry is roughly divided into two categories of sea-water fisheries operated on the continental shelf along the approx. 800km coastline facing the West Indian Ocean, and of fresh-water fisheries carried out in Lake Victoria and Lake Tanganyika as the central fishing grounds. The Tanzania Fisheries Corporation (TAFICO) is in direct charge of fishing technical assistance from Japan, which has its main office in the capital city of Dar es Salaam and focuses its efforts on sea-water fisheries by dealing with the active businesses of prawn freezing and its enporting.

The purposes of the lines of business now carried out by the TAFICO are:

1. to carry out fishing management, among other things, on a commercial basis to increase the fish catch which is an important protein source for the nation,
2. to increase the prawn catch which facilitates the acquisition of hard currency as all the nation's foreign reserves were exhausted in a war against the Amin Regime in Uganda; and

3. to improve fishing gear and fishing methods to attain the above-mentioned two objects.

For an early realization of these goals, the Government of Tanzania is expected to build fishing bases in various parts of the country, appropriating a considerable amount in the national budget. But as it is difficult to achieve the above-mentioned purposes under the limited capacity of the budget, the Government of Tanzania requested Japan to provide fishing boats, materials and equipment for fishing to accelerate the promotion of fishing development.

The fishing boats, fishing gear and radio stations as requested by the Government of Tanzania, are all expected to be operated by the TAFICO for prawn trawling, a prawn grading machine, etc. in the list. Above all, the prawn grading machine is indispensable for ensuring a uniformed quality of prawn and an adequate price setting in carrying out prawn catching, so that the Government of Tanzania has earnestly requested Japan to provide the fishing materials and equipment as follows;

- 1) FRP small fishing boats
- 2) Outboard engines for FRP small fishing boats
- 3) 2 year's spare parts for outboard engines
- 4) FRP fishing boats

- 5) Echo sounders
- 6) Trawling nets
- 7) Prawn trawling nets
- 8) Prawn grading machines
- 9) Outboard engines for small wooden fishing boats

2-2 Progress of Consultations with the Government of Tanzania

The survey team visited the Ministry of Foreign Affairs, Fishery Agency and Ministry of Natural Resources and Tourism in Tanzania and explained to the Director of the Agency and other officials about the purpose of the survey team, the schedule for the survey, the contents of the grant aid, and a cooperation system of the Government of Japan. Following this consultation, talks were held with the Tanzania Fisheries Corporation (TAFICO) concerning the contents of the request made by the Government of Tanzania. The talks are outlined below:

- (1) In the beginning, the survey team outlined the plan (Table 1) in respect to the contents and quantity of the Tanzanian request for fishing boats, fishing nets, and engines. In order to response the team's proposal, the Tanzanian side made a request, which had largely modified it

(Table 2). After discussions among its members, the survey team decided to obtain the approval of the Ministry of Foreign Affairs and the Japan International Cooperation Agency in Japan. The team then obtained the consent of the Tanzanian side to hold further discussions on the basis of the contents which had officially been instructed by telegram or telex from Japan.

- (2) The survey team again asked for a full explanation from the Tanzanian counterparts concerning the proposed mechanical equipment and confirmed the quantity and contents of the following equipment and facilities as stated in Table 3.
- (3) Concerning ice-making facilities in the proposed equipment, the survey team explained that civil engineering work is not included in the scope of work (i.e. the expenses on the foundation work of construction, materials, labour forces, transport, etc.) to be carried out by the Japan's side, to obtain the understanding of the Government of Tanzania.

Table 1 Tanzanian Side Original Request

1. FRP Small Fishing Boats		30 units
Length overall	abt. 9.92 m	
Width overall	abt. 2.36 m	
Depth	abt. 0.92 m	
2. Outboard Engine for Above FRP Small Fishing Boats		60 units
Capacity	abt. 40 HP	
3. 2 Year's Spare Parts for Above Outboard Engines		30 sets
4. FRP Fishing Boats		10 units
Length overall	abt. 14.08 m	
Width overall	abt. 3.00 m	
Depth	abt. 1.73 m	
Capacity (Inboard Engine)	90 HP	
5. Echo Sounders		10 sets
6. Trowling Nets		10 sets
7. Prawn Trowling Nets		10 sets
8. Prawn Grading Machines		2 sets
9. Outboard Engines for/Wooden Small Fishing Boats		100 units

Table 2 Revised Request

<u>Item</u>		<u>Quantity</u>
1.	FRP Fishing Boats	6 sets
	Length overall abt. 14.00 m	
	Width overall abt. 3.00 m	
	Depth abt. 1.70 m	
2.	Fishing Gear and Fishing Net	1 set
	Trawling nets, purse seine nets, gill nets, ropes, floats, etc.	
3.	Wireless Telephone	1 set
4.	Prawn Grading Machine	1 set

Table 3 Items and Quantities of the Materials
and Mechanical Equipment Finally Agreed

<u>Item</u>	<u>Quantity</u>
1. FRP Fishing Boats	
1) Trawling fish boats	5 sets
2) Purse seiner fish boats	1 set
2. Fishing Gear	
Trawling nets, gill nets, long lines, ropes, floats, twine, etc.	1 set
3. Wireless Telephone	
SSB - 150 W	1 set
4. Prawn Grading Machine	1 set
5. Insulated Trucks	5 sets
2 ton type and spare parts	
6. Ice Making Units (1 ton/day)	2 sets
Spare parts and trial fee included	

Chapter 3. Basic Design

3-1 Keynotes

In making a basic design for the fishing materials and equipment, the keynotes are as follows:

- (1) The materials and equipment shall be selected in such a manner not only to contribute to the promotion of fishing industry in the Democratic Republic of the Sudan but also to help fishermen train.
- (2) In determining the quantity and the specifications of the materials and equipment, it is fully adaptable to fit the local environments of fishing grounds, fishermen's technical level, and the maintenance and control system.
- (3) Finished goods shall be mainly mobilized as many as possible so as not to create troubles for the local works of installation and assembly.
- (4) The materials and equipment shall be selected so as to maintain, inspect, and repair easily.
- (5) The sufficient quantities of spare parts shall be included for 2-3 years.
- (6) The types of machines shall be selected to minimize the running costs as much as possible like fuel expenses.

- (7) The expenses on local training for handling, repairing, etc. of the materials and mechanical equipment shall be included in advance.

3-2 Details of Mechanical Equipment

The materials and equipment were listed up in accordance with the quantities and the specifications. The following points were worth examining in designing the basic design for the materials and equipment.

(1) Fishing Boats

Out of the nine fishing boats offered by various foreign countries to Tanzania, only four boats are actually serviceable, while the remaining five are not operated due to the breakdowns of main engines and reduction gears.

The main engines mounted on those idle boats were made by Caterpillar Co. of U.S.A., but it is reported that the supply of spare parts has been suspended for more than one year. The following possible causes are conceivable:

As the engines now mounted on those boats were originally manufactured for construction machines like land bulldozers, they had to be remodeled for a maritime service before being installed on boats. For this reason, when piston

rings, piston-pin metals, crank-pin metals, etc., should be replaced, the whole engine must be overhauled by turning the engine upside down and removing the oil pans from the bottom. Accordingly, a great deal of effort and skill is required to arrange cranes to lift the engine and to provide a space to overhaul the inside and outside of the boats. And when remounted, the axis centers for the propeller shaft and engine should be readjusted. This factor has also been pointed out by members of the Japan Overseas Corporation Volunteers who presently station there.

In Japan, the fishing boat engines are roughly divided into high- and medium-speed diesel engines as Caterpillar's.

The high-speed diesel engine is of the almost same construction as Caterpillar's, but in the case of the conventional medium-speed diesel engine, to overhaul the piston can be dismantled at the state where the engine was placed to the original position simply by removing the upper cylinder cover and both side covers of the crankcase, so that the overhauling, maintenance, and control can thus be carried out without difficulty.

As for fuel, high-speed engines are used light oil and medium-speed engines are used heavy-oil A, which means that fuel expenses are lower. This will also reduce the running cost. To use fishing boats without trouble for a long time, the primary important factor is easy to maintain and control. Accordingly, medium-speed engines were selected.

(2) Fishing Nets

Since the TAFICO had an intention to catch high class fish like prawn and others, to sell them earn foreign currencies, fishing nets and supplemental implements for 5 trawl boats and one purse seine boat were decided to provide in accordance with her request regarding the kinds and the quantities.

The finished goods of prawn trawl net, were included four sets per trawl boat, 20 sets in all, plus spare parts, and laying-in materials for five trawl boats.

The finished purse seine nets were included three sets per boat, and spare parts and laying-in materials per boat.

The finished drift grill nets were included 500 pieces with 150 mm meshes by 35 m long, 255

pieces with 125 mm meshes by 23 m long, and also a full set of spare parts for drift drill nets.

Furthermore, there included 200 finished spiny prawn trammel nets with the overall length of 50 m, 10 finished bottom long lines, 10 finished long lines for tuna fishing, 100 electric light buoys, and 100 buoys. The fishing nets and the laying-in materials could be fit to the proposed use and the long period of preservation.

(3) Radio Telephone

Radio telephones are expected to use communications from a land station to five trawl boats and one purse seine boat which were requested to. The land station is scheduled to be equipped with a SSB communications system, a 150W voltage regulator, emergency power source equipment (rectifier, inverter, storage batteries with 24V and 200AH), and antenna units (14 m high aluminum pole, stay wire, earth plate), and the station capacity is limited to 10 channels.

(4) Prawn Grading Machine

A prawn grading machine requested by the Government of Tanzania is of the double row type and has a capacity of three - four tons/day (seven service hours/day). It consists of washing

tank, conveyor, sorter, chute and frame with constant conveyor speed and the constant revolution of the sorter roller. The grading machine can be regulated to sort various prawn in a uniformed size by adjusting the roller gap manually. The electric motors and the conveyor are of the waterproof types. For the prawn washing tank, conveyor frame, chute, etc., stainless anticorrosive steel is used, and the steel roller tube of the sorter is coated with vinyl to provide a durable anticorrosive structure.

(5) Insulated Trucks for Transporting Fresh Fish

In response to a strong request of the Government of the Sudan (APPC) for the insulated trucks which shall be mobilized to transport fresh fish in ice, the team shall select them durable for the long-term preservation of fresh fish, the outer cover of which shall be light and made of anti-corrosive coating aluminum, the inner walls, be of the well qualified adiabatic, and be durable in a long service life together with the spare parts for three years.

(6) Ice-making Facilities

The Government of Tanzania (TAFICO) has strongly requested ice-making facilities to keep

fish fresh. The facilities with an ice-making capacity of three tons/day were expected to be granted originally. But this request was studied from various angles later including the local conditions. Viewed from the use of ice, ice-making equipment can be divided into two categories: plate ice-making equipment capable of producing ice continuously and block ice-making equipment for 12 hours as one cycle. Although the equipment for plate ice-making does not require a workshop, plate-ice has a drawback of melting quickly unless some insulated device should be well made since it is 25 mm thick at maximum. However, in the case of block-ice, it weighs about 25 kg per block and is easy to transport and slow to melt away. Moreover, it can be applied for keeping fish in the on board ice-boxes and also for other purposes. This will fit to the needs of the Government of Tanzania. However, for making block-ice, a workshop is required.

In consideration to the use of ice and the budget, the capacity of ice-making equipment was reduced from three tons/day to two tons/day. But all that could be available in fitting, were included housing equipment, indoor ventilation

equipment, lighting system, electric wires, piping materials, cement, and reinforcing bars as the basic materials.

For the workshop, the prefabricated type of heavy weight ferro-structure was adopted to shorten the term of works at site. Besides, powerful anticorrosive outer walls, roofs, etc., were scheduled to furnish due to the close vicinity of the seaside, and thus to increase the ice-making efficiency.

The outer walls and the roofs were made of the materials with a low heat transmission rate. And Freon for cooling, indirect refrigerant, machine spare parts, lubricating oil, etc., for three years' use were included to operate the ice-making equipment smoothly.

Regarding the scope of cooperation of the Government of Tanzania, she'll be responsible for a procurement of land, supplies of fresh water and electric power necessary for ice-making, drainage facilities, basic materials like sand and pebbles, labour forces, and the domestic transport of the granted ice-making equipment and materials from the port of Dar Es Salaam to the construction site.

The specifications and the quantity are shown as follows:

3-2-1 Fishing Boats

1) Trawlboat (The below-mentioned quantities are for 1 boat) 5

a) Principal items of hull

Type	Deck type
Material of hull	F.R.P. (Fiberglass reinforced plastic)
Hull dimensions	Overall length: approx. 14.0 m
	Overall width: " 3.0 m
	Depth: " 1.4 m
	Gross tonnage: " 5.0 T
Capacity of tank	Ice hold: approx. 2.0 m ³ x 1
	Fish hold: " 4.0 m ³ x 1
	Fuel tank: " 1,200ℓ x 1
	Fresh water tank: " 500ℓ x 1
	Oil hydraulic tank: " 400ℓ x 1
Number of crew members	5 persons
Speed	Max. trial speed: approx. 12 knots
	Cruising speed: " 11 knots
Steering installation	Manual hydraulic 1 complete set

b) Principal items of engine

Type	Vertical 4-stroke diesel engine
Number of engines	1
Max. continuous rating output	approx. 120 HP x 1,200 - 1,900 rpm
Starting method	Electric or compressed air starting

Cooling system	Freshwater or sea water cooling
Fuel oil	Light oil or A Heavy Oil
Reduction gear type	Reduction gear with wet type disc clutch

c) Propelling equipment

Propeller shaft (material: stainless steel)	1 complete set
Propeller (material: high-strength brass casting)	1

d) Principal particulars of electric equipment

Generator for lighting	DC 24 V, 1 kW x 1
Lighting equipment for navigation	1 complete set
Lighting equipment for inboard and outboard	1 complete set
Switch panel	1 complete set

e) Radiotelephone and navigation instruments

Radiotelephone	1
Fish echo sounder	1
Radar for navigation	1

f) Deck machinery and fishing machinery

Hydraulic trawling winch (about 2 tons x 60 m/min)	1 complete set
Gantry mast	1 complete set
Stern roller	1 set
Hydraulic warping ends (about 1 ton x 30 m/min)	2

g) Machine tools and spare parts

Machine tools (makers standard)	1 complete set
Spare parts (for 3 years use)	1 complete set

2) Purse Seiner Boat 1

a) Principal particulars of hull

Type	Deck type
Hull material	F.R.P. (Fiberglass reinforced plastic)
Hull dimensions	Overall length: approx. 15.8 m
	Overall width: " 3.6 m
	Depth: " 1.5 m
	Gross tonnage: " 10 T
Tank capacity	Ice hold: approx. 3 m ³
	Fish hold: " 6 m ³
	Fuel tank: " 1,600 liters
	Fresh water tank: " 500 liters
	Oil hydraulic tank: " 300 liters
Number of crew	6 persons
Speed	Max. trial speed: approx. 10 knots
	Cruising speed: " 9 knots
Steering installation	Manual hydraulic 1 complete set

b) Principal particulars of engine

Type	Vertical type 4-stroke diesel engine
Number of engines	1
Max. continuous rating output	approx. 120 HP x 1,200 - 1,900 rpm
Starting method	Electric or compressed air starting
Cooling system	Fresh water or sea water cooling
Fuel oil	Light oil or A heavy oil
Reduction gear type	Reduction gear with wet type disc clutch

c) Propelling equipment

Propeller shaft (material: stainless steel)	1 complete set
Propeller (material: high-strength brass casting)	1

d) Principal particulars of electric equipment

Generator for lighting	DC 24 V, 1 kW x 1
Lighting equipment for navigation	1 complete set
Lighting equipment inboard and outboard	1 complete set
Switch panel	1 complete set

e) Radiotelephone and navigation instruments

Radiotelephone	1
Fish finder	1
Navigation radar	1

f) Deck machinery and fishing machinery

Hydraulic trawl winch for purse seiner (about 1 ton x 35 m/min)	1 complete set
Derrick post and boom	1 complete set
Hydraulic warping ends (about 700 kg x 30 m/min)	2

g) Machine tools and spare parts

Machine tools (makers standard)	1 complete set
Spare parts (for 3 years use)	1 complete set

h) Skiff boat

1

Type	Deck type
Hull material	F.R.P. (Reinforced plastic)
Hull dimensions	Overall length: approx. 6.5 m
	Overall width: " 1.8 m
	Depth: " 0.8 m
Type of engine	4-stroke diesel engine
Max. output	approx. 20 HP x 2,000 - 2,900 rpm
Starting method	Manual starting type
Fuel oil	Light oil
Capacity of fuel oil tank	approx. 80 liters
Machine tools	Makers standard
Spare parts	For 3 years use

3-2-2 Fishing nets

- 1) Prawn trawlnets, finished goods 20 sets
(including otter board and hand rope)

4 sets per 1 boat

quantity for 5 boats

(The below-mentioned quantities are for 1 boat)

Texture of net used	Polyethylene 380D/24-60 pieces
	Meshes: 45, 57 mm
Head rope	Polytex 10 ϕ mm x 19.22 m x 1 piece
Float	200 ϕ mm x 2 pieces
Grand rope	Compound rope 18 ϕ mm
	9 ϕ mm short chain attached
Otter board pendant	Wire rope 12 ϕ mm x 3 m x 4 pieces
Quarter rope	Polyethylene rope
	16 ϕ mm x 25 m x 1 piece
Otter board	0.6 x 1.2 m x 2 pieces

- 2) Spare parts and laying-in materials for 5 boats
for prawn trawlnets

(The below-mentioned quantities are for 1 boat)

Net texture (polyethylene)	380 ^d /24 pcs x 57mm x 100 ^{MD} x 151.5m x 2 pcs
"	380 ^d /30 pcs x 57mm x 100 ^{MD} x 151.5m x 2 pcs
"	380 ^d /60 pcs x 45mm x 100 ^{MD} x 151.5m x 2 pcs
Twine for net repair	380 ^d /24·2.5kg/pce x 20 pcs
"	380 ^d /30·2.5kg/pce x 20 pcs
"	380 ^d /60·2.5kg/pce x 20 pcs

Connecting twine for net and rope	2.5kg, 2.5g/m x 2 pcs	
"	2.5kg, 4g/m x 2 pcs	
"	2.5kg, 7.5kg/m x 2 pcs	
Rope for miscellaneous uses	10 ϕ mm x 200m x 1 pce	
"	12 ϕ mm x 200m x 1 pce	
"	14 ϕ mm x 200m x 1 pce	
"	16 ϕ mm x 200m x 1 pce	
Quarter rope	16 ϕ mm x 200m x 2 pcs	
Compound rope	18 ϕ mm x 200m x 2 pcs	
Serving wire-rope	10 ϕ mm x 200m x 2 pcs	
Wire-rope for warping	12 ϕ mm (6 x 24) x 200m x 6 pcs	
Wire rope for miscellaneous uses	12 ϕ mm (6 x 24) x 200m x 1 pce	
"	10 ϕ mm (6 x 24) x 200m x 1 pce	
Float	200 ϕ mm x 20 pcs	
Short link chain	9 ϕ mm x 25m x 4 pcs	
Other laying-in materials necessary for fishing operation (Metal fitting and tools)		1 complete set
3) Finished good of purse seine netting		3 sets
(The below-mentioned quantities are for 1 set)		
Float net	approx. 270m x approx. 70m deep	
Main texture of net	Nylon: 210 ^d /9 - 21 pcs	
	Meshes: 17 - 23mm	
Float net	Polypropylene: (22 ϕ mm x 273m x 1 pce) + (16 ϕ mm x 273m x 1 pce)	
Float net	Polypropylene: (18 ϕ mm x 292m x 2 pcs)	

4) Spare parts of purse seine netting, 1 boat
laying-in material

Including net texture, twine, rope, float, weight and
metal fittings, Mackintoshes, etc.

5) Drift gill net, finished goods

(a) Nylon, 210^d/21 pcs x 150 mm mesh used, 500 pcs
finished goods

Length of finished goods: 35 m

(b) Nylon, 210^d/18 pcs x 125 mm mesh used, 255 pcs
finished goods

Length of finished goods: 23 m

6) Spare material for drift gill net

(a) Nylon texture 210^d/18 pcs x 125mm x 60^{MD} x 50m,
100 pcs

(b) " 210^d/21 pcs x 150mm x 60^{MD} x 75.75m,
100 pcs

(c) Polypropylene rope 19 g/m x 200m 50 pcs

(d) Polypropylene rope 100 g/m x 200m 50 pcs
with lead wire twined

(e) Float Material: Synthetic resin 2,000 pcs

Length: 197 mm

Width: 60 mm

Thickness: 40 mm

7) Finished goods of prawn trammel net 200 sets
catching (Total length 50 m)

(The below-mentioned quantities are for 1 set)

Inner net 210^d/6 pcs x 84mm x 1 pce

Outer net 210^d/12 pcs x 360mm x 2 pcs

- 8) Finished goods of bottom long line 10 sets
(The below-mentioned quantities are for 1 set)
- Hook Finished goods of 100 pieces
- Trunk rope 20 count/210 pieces x 163m
- 9) Finished goods of long line for tuna fishing 10 sets
(The below-mentioned quantities are for 1 set)
- Finished goods with 5 hooks.
- Length of finished trunk rope: 300 m
- 10) Electric radio buoy: Ordinary type, painted 100 sets
(Voltage: 6 V with batteries)
- 11) Glass float: 330 ϕ mm 100 sets
- 3-2-3 Coastal Radio Station for Radiotelephone 1 complete set
- SSB (Single Side Band) Output: 150 W
- 10 channels, 1.6 - 18 MHz
- 3-2-4 Prawn Grading Machine 1 set
- Type Double type
- Electric motor Conveyer
- AC 240 V, 3 phases, 50 Hz, 0.75 kW
- Grading machine
- AC 240 V, 3 phases, 50 Hz, 1.5 kW
- Capacity 400 - 700 kg/hr

3-2-5 Insulated Truck for Transportation of Fresh Fish 5 sets
 (right-hand drive)

Principal particulars	Overall length:	approx. 6.00 m
	Overall width:	" 2.00 m
	Overall height:	" 2.70 m
Weight	Refrigerator vehicle:	approx. 2,600 kg
	Loadage:	" 2,000 kg
Loading volume (maximum)	approx. 12 m ³	
Engine output (")	approx. 75 HP x 4,500 rpm	
Speed of insulated truck(")	100 km/hr	
Material of refrigerator	Outer wall and floor:	aluminum plate
	Insulation:	polyurethane foam
Spare parts	for 3 years use	

3-2-6 Ice-making Facilities

2 complete sets

Ice-making capacity 25 kg x 20 pcs.
Twice/day (per 1 complete set)
2 tons/day (per 2 complete sets)

1) Freezing equipment assembly (Refrigerant: Freon gas)

a) Condensing equipment 2 sets

Compressor capacity approx. 17.5 m³/h

Electric motor for the above 3.7 kW x 220 V x 50 Hz

b) Freon gas receiver 2 pcs.

Dimensions approx. 270 ϕ x 1,000 mm L

2) Indirect refrigerant tank equipment

a) Brine tanks (including insulation) 2 sets

Outer dimensions of tank approx. 1,070 mm W
x 2,750 mm L x 939 mm H

Outer dimensions of ice can approx. 300 mm W x 130 mm L x 900 mm H

Weight of ice block per ice-making can 25 kg

Number of pieces per set of Brine tank 20 pcs.

b) Evaporator 2 sets

Type Hair-pin type

c) Brine agitator 2 sets

Type Horizontal type

Propeller diameter approx. 300 ϕ mm

Electric motor 0.75 kW

3) Attachments

a) Dip 2 pcs.

Dimensions approx. 500 mm W
x 350 mm L x 1,200 mm H

b) Ladder for ice handling 2 pcs.

c) Ice shoot 2 pcs.

d) Filling water hose 2 pcs.

4) Electric equipment

a) Distribution board and control panel 1 complete set

b) All electric wiring materials
inside the ice-making plant 1 complete set

5) Water facilities

- a) Pressure water tank 1 set
- Water supply pump 0.75 kW x 2 sets
(of which one is a spare)
- b) Cooling tower 2 sets
- Fan 0.05 kW
- c) Cooling water pumps 2 sets
- Capacity approx. 50 L/min x 9.5 mH x 0.25 kW
- d) Piping materials between cooling tower and cooling pump
and items deemed necessary for the inside ice-making
plant room

6) Chemicals necessary for ice-making plant

- a) Freon gas for refrigerant, R-22 approx. 200 kg
(of which about 140 kg is for a spare)
- b) Lubricating oil for refrigerating machine approx. 60 liters
(of which about 40 liters is for a spare)
- c) Indirect refrigerant (calcium chloride, CaCl₂) approx. 5 tons
(inc. 4 tons as a spare)
- d) Silicagel approx. 10 kg
(inc. 9 kg as a spare)

7) Measuring instruments

- a) Gas detector 2 pcs
- b) Hydrometer 2 pcs
- c) Bar type thermometers 10 pcs

8) Spare parts

- Compressor for freezing 1 set
- Spare parts for various machinery and tools for 2 years use

9) Structure of ice-making plant 1 unit

Heavy steel frame type including materials and construction work at the actual site.

10) Guidance of installation and handling of machines at the actual site.

3-3 Rough Calculation of Cost of Machine Parts

The costs of materials and equipment and of the facilities in accordance with the present basic design plan are estimated on the bases of the following conditions.

- 1) The price shall be estimated on the basis of CIF up to Dar es Salaam as of January 1980.
- 2) For the importation of the materials and the equipment, customs duties and all other taxes in Tanzania shall be exempted.
- 3) As far as facilities and other relevant equipment were concerned, the Government of Tanzania shall acquire a plot of land necessary for the construction prior to the commencement of the construction works, and shall bear the expenses of basic construction materials, labor, transport, etc., required for the construction works.

The estimated costs for this basic design plan are as shown in the following table.

(Unit: 1000 yen)

Item	Description	Q'ty	Price	Amount
1. FRP Fishing Boat				(203,000)
(1) Boat a.	Trawling Fish Boat	5	31,600	158,000
1) Hull	Length overall abt. 14.00m	units	11,830	59,150
2) Engine			4,030	20,150
3) Stern Equip- ment			1,300	6,500
4) Engine Accessor- ies			1,455	7,275
5) Fishing Gear			8,000	40,000
6) Electric Accessories			1,400	7,000
7) Navigation Equipment	SSB, Echo Sounder		2,120	10,600
8) Accessories			425	2,125
9) Spare Parts			1,040	5,200
(2) Boat b.	Purse Seiner Fish Boat	1 unit	45,000	45,000
1) Hull	Length overall abt. 15.00m		19,600	19,600
2) Engine			4,100	4,100
3) Stern Equip- ment			1,300	1,300
4) Engine Accessories			2,100	2,100
5) Fishing Gear			12,700	12,700
6) Electric Accessories			1,370	1,370
7) Navigation Equipment	SSB, Echo Sounder		2,100	2,100
8) Accessories			600	600
9) Spare Parts			1,130	1,130

Item	Description	Q'ty	Price	Amount
2. Fishing Gear & Fishing Net				(91,700)
(1) Prawn Trawl Net				21,045
1) Trawl Net	120 HP Type	20 sets	505	10,100
2) Spare Parts	5 sets			
1 PE Net	380d/24x57mmx100MDx151.5m	10 sets	8	80
	30x57 "	10 "	10	100
	60x45 "	10 "	23	230
2 PE Twine	380d/24 25kg Set	100 sets	3.5	350
	30 "	100 "	3.5	350
	60 "	120 "	3.5	420
3 Polytex Twine	2.5 kg 2.5g/m	10 sets	3.9	39
	" 4g	10 "	3.9	39
	" 7.5g	10 "	3.9	39
4 Polytex Rope	10 [∅] mmx250m Set	5 sets	13	65
	12 "	5 "	19	95
	14 "	5 "	26	130
	16 "	5 "	33	165
5 PE Rope	16 [∅] mmx200m Set	10 sets	27	270
6 Vinylon-Poly Compound Rope	18 [∅] mmx200m	10 "	90	900
7 Polytex Serv- ing Wire	10 [∅] mmx200m	10 "	65	650
8 Wire Rope 6x24	Warp 12 [∅] mmx200m	30 "	55	1,650
"	12 [∅] mm "	5 "	55	275
	10 [∅] mm "	5 "	42	210

Item	Description	Q'ty	Price	Amount	
9	Float	200 ^φ mmx500m	100 sets	2.2	220
10	Net Needle	No. 2	150 sets	0.14	21
		No.4	150 "	0.14	21
		No.6	150 "	0.14	21
11	Top Roller	10 ton	20 sets	26	520
12	Snatch Block	5 ton	10 "	41	410
13	Cargo Hook	2 ton	5 "	5	25
14	Dog Hook	1 ton	10 "	3.5	35
		3 ton	10 "	4	40
15	End Ring	19mm	20 "	1.3	26
16	Square Head Shackle	13mm	50 "	0.3	15
		16mm	50 "	0.4	20
		19mm	50 "	4.6	230
17	Endless Shackle	16mm	100 "	0.4	40
		19mm	100 "	0.6	60
18	Bow Shackle	16mm	50 "	0.5	25
		19mm	50 "	0.7	35
19	Wire Thimble	16mm	100 "	0.2	20
		19mm	100 "	0.3	30
20	Swivel Single Eye	16mm	30 "	2.5	75
		19mm	30 "	2.8	84
21	Cod Ring	9x50mm	250 "	0.2	50

Item	Description	Q'ty	Price	Amount
22	Short Link Chain	9mmx25m 20 sets	13	260
23	Endless Driver	Y-Type 10 "	0.8	8
24	Hammer	1 lbs 5 "	1	5
		10 "	5	25
25	Measure Tape	2m 5 "	0.6	3
		50m 5 "	6	30
26	Let Go Bar	22x100 5 "	6	30
27	Chiesel Hammer	5 "	1.6	8
28	Anvil Rail Tape	5 "	4.4	22
29	4-Nail Anchor	2kgs 5 "	2.4	12
30	Hyd.Wire Cutter	B-20 5 "	81	405
31	Bolt Clipper	900mm 5 "	13	65
32	Pipe Wrench	350mm 5 "	4.8	24
		600mm 5 "	8.2	41
33	Monkey Wrench	200mm 5 "	1.6	8
		300mm 5 "	2.8	14
34	Plier	200mm 5 "	1.8	9
35	Spanner Set	mm Size 5 "	2	10
		Inch Size 5 "	2	10
36	Spike	Wooden 350mm 5 "	1.2	6
		Iron 450mm 5 "	1	5

Item	Description	Q'ty	Price	Amount	
37	Knife (Band, Case)	100 sets	3.6	360	
38	Scissors	100 sets	1.1	110	
39	Rope Net	5 sets	41	205	
40	Rain Coat & Trousers	50 sets	14	700	
41	Rain Boots	50 sets	4.7	235	
42	Gloves	Nylon 50 sets	1.4	70	
		Leather 25 sets	1.8	45	
43	Helmet	50 sets	2.8	140	
(2)	Sardine Purse Seine Net			22,395	
1)	Net	120 HP Type	3 sets	6,605	19,815
2)	Spare Parts	1 set			
1	Nylon Net	210d/21x18Fxl00MDx 151.5m	2 sets	87	174
		12x14F	3 sets	37	111
		9x14F	9 sets	28	252
2	PE Net	380d/45x90mmx100MDx 50m	1 set	62	62
		45x90mmx5MDx 377.87m	1 set	29	29
3	Nylon Twine	210d/21	20kg	1.8	36
		12	20"	1.8	36
		9	20"	1.8	36
4	Cork Line	PP22mmx200m	1 set	52	52
5	Float Line	PP16mmx200m	1 set	27	27
6	Sinker Line	PP18mmx200m	2 sets	34	68
7	Guide Rope	PP Braid 22mmx50m	1 set	18	18
8	Rope	Vinylon 22mmx200m	1 set	99	99
9	Rope	PP22øx200m	1 set	51	51

Item	Description	Q'ty	Price	Amount	
10	Joining, Net End Rope	PP20mmx200m	1 set	51	51
11	Rope	Vinylon 12mmx200m	1 set	27	27
		16 "	1 set	48	48
12	Purse Wire 6x24	ϕ 12mmx500m	1 set	136	136
13	Wire 6x24	ϕ 12mmx200m	2 sets	55	110
		ϕ 10mm "	1 set	42	42
14	Float	K-7	240 sets	0.7	168
		A-0	3 "	10	30
		A-3	2 "	13	26
15	Lead	375g	90 "	0.3	27
16	Purse Ring		20 "	4.2	84
17	Purse Block		2 "	26	52
18	Snatch Block		3 "	41	123
19	Endless Shackle	16mm	10 "	0.4	4
		19mm	10 "	0.6	6
20	Swivel Both Eye	16mm	2 "	3	6
		19mm	2 "	4	8
21	Square Head Shackle	16mm	10 "	0.4	4
		19mm	10 "	0.5	5
22	Wire Thimble	16mm	20 "	0.2	4
		19mm	20 "	0.3	6
23	Net Nettidle		50 "	0.4	20
24	Endless Driver	Y-Type	2 "	1	2
25	Hammer	1 lbs	1 set	1	1
		10 lbs	1 set	5	5
26	Measure Tape	2m	1 set	1	1
		50m	1 set	6	6
27	Let Go Bar	22x100	1 set	6	6
28	Chiesel Hammer		1 set	2	2
29	Anvil Rail Tape		1 set	5	5
30	Hyd. Wire Cutter	B-20	1 set	80	80
31	Bolt Wrench	900mm	1 set	13	13

Item	Description	Q'ty	Price	Amount	
32	Pipe Wrench	350mm	1 set	4	4
		600mm	1 set	9	9
33	Monkey Spanner	200mm	1 set	2	2
		300mm	1 set	3	3
34	Plier	200mm	1 set	2	2
35	Spanner Set	mm Size	1 set	2	2
		Inch Size	1 set	2	2
36	Spike	Wooden 350mm	1 set	2	2
		Iron 450mm	1 set	1	1
37	Knife (Band Case)		20 sets	3.6	72
38	Scissors		20 sets	2.1	42
39	Rope Net		1 set	42	42
40	Rain Coat & Trousers		10 sets	14	140
50	Rubber Boots		10 sets	4.7	47
51	Gloves	Nylon	10 sets	1.4	14
		Leather	5 sets	1.8	9
52	Helmet		10 sets	2.8	28
(3)	Drift Gill Net				33,710
1)	Net a.	210d/18x125mmx23m	255 sets	31	7,905
2)	Net b.	210d/21x150mmx35m	500 sets	43	21,500
3)	Spare Parts				
1	Spare Net	Nylon 210d/18x125m x60MDx50m	100 sets	8.8	880
"	"	" /21x150m x60MDx75.75m	100 sets	16	1,600
2	PP Rope	19 g/mx200m Set	50 sets	5.5	275
3	PP Rope	100g/mx200m Set	50 sets	23	1,150
4	Float	Synthetic resin L=197mm, W=60mm T=40mm	2,000 pieces	0.2	400
(4)	Spiny Prawn Trammel Net	Inner net 210d/6 pcs x 84mm x 1pc Outer net 210d/12 pcs x 360mm x 2pc	200 sets	30	6,000

Item	Description	Q'ty	Price	Amount
(5) Long Line				8,550
1) Bottom Long Line	Hook 100 pcs, Rope 163m	10 sets	55	550
2) Tuna Long Line	Hook 5 pcs, Rope 300m	10 sets	30	300
3) Glass Float	330 ϕ mm	100 sets	7	700
4) Light Buoy	Battery, Float Spare Parts(4 years)	100 sets	70	7,000
3. Wireless Telephone	SSB 150W Antenna Spare Parts (2 years)	1 set	5,800	(5,800)
4. Prawn Grading Machine	Spare Parts(4 years)	1 set	6,000	(6,000)
5. Insulated Truck	2 ton Type Spare Parts(3 years)	5 sets	4,100	(20,500)
6. Ice Making Plant	2 ton/day			(73,000)
	Ice Making Machine (1 ton/day)	2 sets		37,000
	Steel Structure and Material	1 set		24,000
	Technical Guidance	1 set		12,000
Total				(400,000)

Chapter 4. Feasibility of the Present Program

Fishing activities in Tanzania are mostly dealt in small-scale coastal fishing and the total output of fishing industry against the GNP shares only 1.7% (1975). However, fish is attracting great interest as an easily available protein source.

In particular, the coastal waters around the Zanzibar Island and the Pemba Island are regarded as the best fishing grounds in East Africa and, thus, as the promising potentials of seawater fishery in the country.

Consequently, the Government of Tanzania has strongly determined to promote the nation's fishing industry, as she had established the Tanzania Fisheries Corporation (TAFICO). And the Government is anxious to obtain economic and technical aid from foreign countries including Japan.

On the other hand, although the long-term fishing policy of the country is not clear yet, the country has already decided to establish a 200-sea mile fishing zone. Close relations between Tanzania and Japan shall be necessary in terms of ocean-going fishery as Japan has already been in fishing operations in the territorial waters of Eastern Africa.

The Tanzania Fisheries Corporation (TAFICO) is the actual implementation organization that will be responsible for the management and control of the materials and equipment

to be granted under the basic design plan. This organization has its main office in Dar es Salaam with business departments and freeze-processing departments under the control and has its emphasis on seawater fisheries.

Of the total staff of 100 working at the TAFICO, 10 persons are desk workers and the remaining 90 are crew members of fishing boats and/or fishing engineers. Although the TAFICO has nine fishing boats at present, three of which are offered by England (small), four by Ireland and two by Australia (large). After all, only four are actually operational (two small and two large). This is because the technicians in charge of the boat's engines are not sufficiently experienced and they find it difficult to obtain a supply of parts when the machines like the engines once break down. In the past, three boats from Romania and one boat (survey boat) from the Netherlands became unusable in the fishing performance of three to four years.

Generally speaking, the aid terms are strict in the case of European countries and there is no follow-up at all after the term of a contract is expired. Such being the case, almost all the machines and equipment become unusable when the Government of Tanzania, as previously mentioned, cannot afford to buy various parts on her own account.

In addition, machine parts mounted on fishing boats provided by European countries are not always manufactured

by a single manufacturer in one country, but many makers in different countries. In order to solve this problem, too much time and labor are required for the purchase of some machine parts, to leave her something good to devise out.

Engines and other machines differ from country to country every time when a donor country varies its assistance, and therefore engineers take much time before they become accustomed to the machines. Even if there are engineers capable of repairing, they are apt to obtain works ashore when they lose enthusiasm for their works as they are unable to receive any necessary parts to repair or operate boats. Thus engineers do not settle down in their workshops, so that techniques are not successfully transferred.

The desire to solve the above problems can be described as one motivation to request boats from Japan.

As for the boats built in Japan, all the machines including engines are entirely made in Japan. As the Japan Overseas Corporation Volunteers work at the TAFICO, parts can be requested more than they ought to be as part of machine parts used by these volunteers. If there are sufficient parts, engineers will work smoothly and consequently they will settle down at their works and the transfer of techniques will be possible domestically under the stable business management. All in all, increased fish catches will be promising in a long run.

As for granted fishing nets and other auxiliary equipment of the machine parts, some are finished goods usable immediately, some are raw materials (unfinished goods) for making nets by themselves to train engineers working for the TAFICO, and ordinary fishermen, whereas others are trawl nets and laying-in materials.

The Government of Tanzania recognizes the necessity to improve proposed equipment, such as, the ice-making units with refrigerator, a prawn grading machine, and a coastal radio station. The TAFICO operates the prawn grading plant which was once established by Mwanza Inch Ocean Product Co., Ltd. and Taiko Suisan Co., Ltd. as a Japanese joint venture enterprise (already withdrawn), in which 10 female workers sort prawns 500 kg/day (7 hours). Tiger prawns are processed in the rainy season and white prawns, in the dry season as shown in Table 4-1. Prawns are sorted large, medium, and small sizes, packed one kg bag each, frozen, and shipped overseas in the form of a case with 12 bags.

However, manually sorted prawns are apt to be irregular in size and often lost freshness due to the time consuming sorting work, which tends to incur claims from the abroad. Besides, the total output is small in quantity at present and not well branded, so that foreign importers' purchasing powers are rather stagnant.

The existing ice-making machines are about 15 years old and it appears that they have become worn out. The present ice-making capacity of about one ton per day is insufficient in proportion to the increase of fish catches. To keep their freshness, ice is indispensable to take them on board fishing boats to freeze them at the fishing grounds and unloaded after the boats return to ports. For the above reasons, ice-making machines with a bigger capacity are required. As workers in charge of ice-making machines, there will be no problem of operating any proposed ice-making machines even if they have improved the capacities.

Table 4-1 The Prawns handled by the TAFICO

Season	Kind	Size	Number of Headless Prawns/kg	Selling Price
Rainy season	Black Tiger	Large	under 20	65 shillings/kg
		Medium	20 - 30	
		Small	31 - 40	
Dry season	White Queen	Large	41 - 60	
		Medium	61 - 80	
		Small	81 - 100	28 shillings/kg

Although the prawns are mostly caught by the TAFICO, a portion of which is bought from fishermen in general. In this case that prawns are bought at the fishing grounds around Dar Es Salaam, River Panguni Rufigi south of Tang, and Mt. Wara, insulated trucks are indispensable in order to collect them. In an event that large prawn trawl boats are in fishing operation at the fishing grounds except near Dar Es Salaam, prawn catches are to be unloaded at the local ports within the interval of 5 to 10 days, from which they shall be transported to the processing plant in Dar Es Salaam by insulated trucks. On the other hand, since a large number of automobiles are already in services in Tanzania, the government will find it easy to repair them locally at any time when they are broken down.

In this connection, offshore fisheries are limited to three day operation by small boat (provided by the U.K.). In an event that offshore fisheries are to be conducted for a long time, an intermediate report shall be carried out by radio, which is therefore essential to mount on board so as to report the brief sketch of fishing operation.

Chapter 5. Views and Recommendation of Survey team

In the Tanzanian fishing industry, the positions of staff members and technicians were mostly occupied by foreign specialists in the past, but not now exclusively. Capable working local nationals are steadily increasing in number and thus supporting the fishing industry so long as our eye can see the existing state concerning the fishing research institutes, training institutes, and shipyards, etc. However, if she plans on increasing the production of export-oriented marine products like salted dried and/or frozen large fishes, prawns, crabs, etc., foreign aids concerning funds and techniques will be indispensable for her to receive in the future.

It is considered that the proposed materials and equipment will be most effective when it comes to promoting Tanzania's fishing industry, provided that it is hoped that the Government of Tanzania will take an adequate measure to facilitate the procurement of basic construction materials, labour forces, transport, and the like concerning the ice-making facilities as they are exempted from the grant aid.

Judging from the technical level of the Government of Tanzania, there is no problem to manage and control the fishing materials and equipment. It is certain that the TAFICO under the direct management and control of the Govern-

ment should exclusively make the best use of them effectively. If the Government conducts systematic fishery under the guidance, fishermen's productive will and the national economy will be leveled up corresponding to the improvement of a circulation system and the increased quantity of fish catches.

Consequently, it is necessary to extend technical cooperation to foster leaders who are competent in modern fishery, as a form of technical assistance in the future. In addition, it is certainly that technical cooperation should be pinned to improve the scale of a fishing boat (small to large), ice-making equipment, processing plants, material supply facilities for fishing boats, circulation systems so as largely to contribute to the development of fishing industry in the future.

DRAWING LIST

- FIG. 1 TRAWLING FISH BOAT
- FIG. 2 PURSE SEINER FISH BOAT
- FIG. 3 PRAWN TRAWL NET
- FIG. 4 SARDINE PURSE SEINE NET
- FIG. 5 DRIFT GILL NET
- FIG. 6 SPINY PRAWN TRAMMEL NET
- FIG. 7 TUNA LONG LINE
- FIG. 8 BOTTOM LONG LINE
- FIG. 9 INSULATED TRUCK (2 TON TYPE)
- FIG. 10 ARRANGEMENT OF ICE MAKING PLANT
- FIG. 11 STEEL STRUCTURE OF ICE MAKING PLANT

PRINCIPAL PARTICULARS	
OVER ALL LENGTH	abt. 14 ^m 000
OVER ALL BREADTH	abt. 3 ^m 000
DEPTH	abt. 1 ^m 400
MAIN ENGINE	abt. 120 ^{HP} x 1200 ~ 1900 ^{rpm}

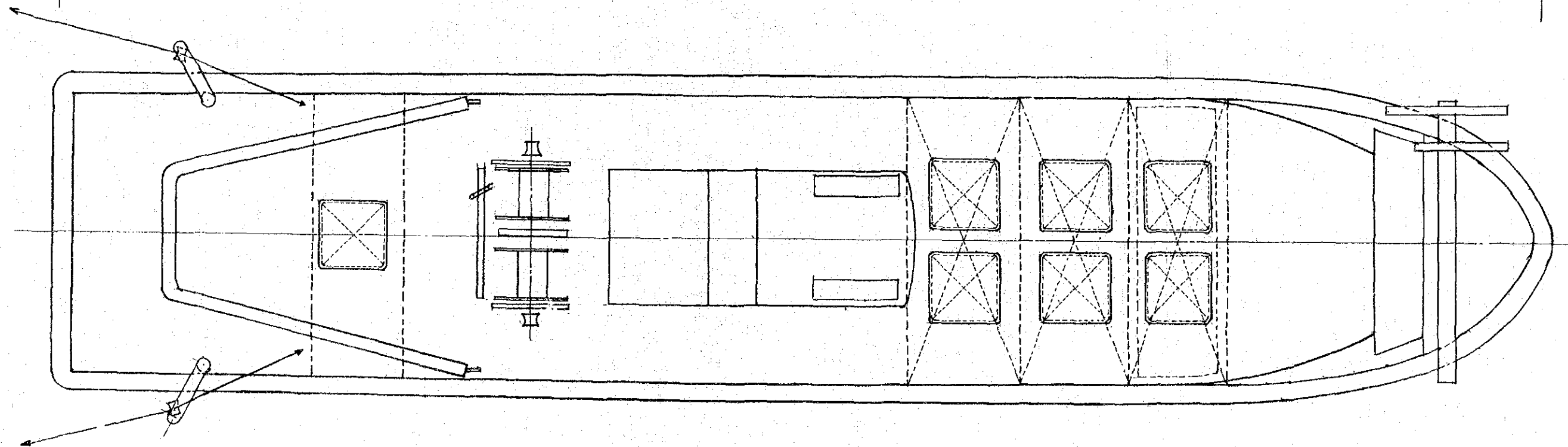
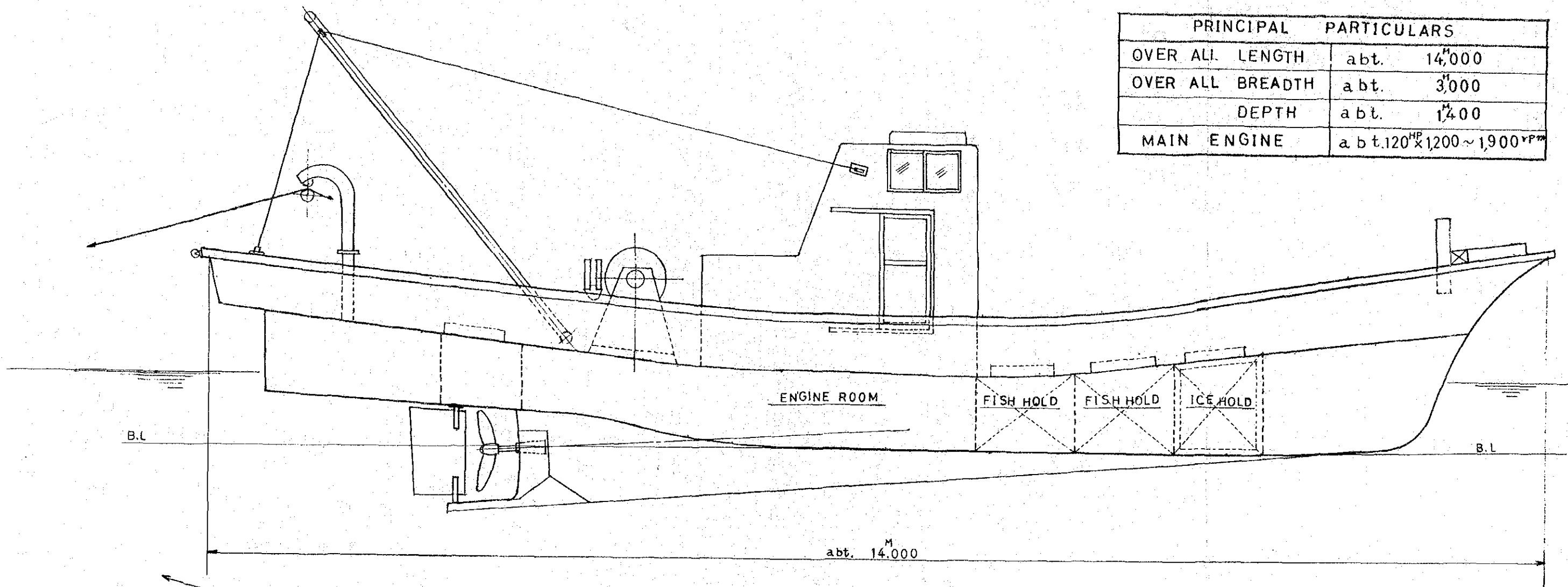
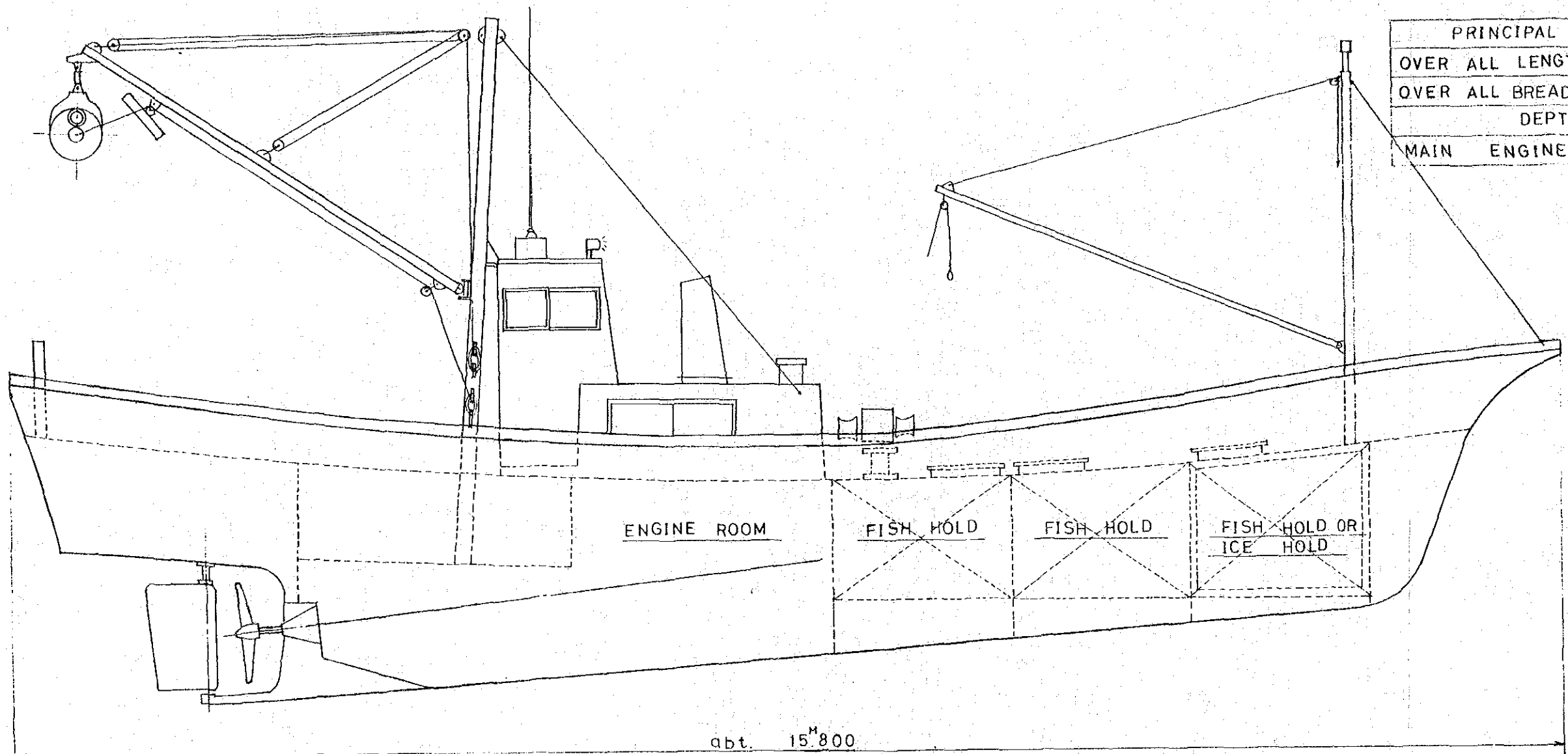


FIG. 1 TRAWLING FISH BOAT

FRP FISH BOAT (TRAWLER)
 JAPAN INTERNATIONAL COOPERATION AGENCY



PRINCIPAL PARTICULARS	
OVER ALL LENGTH	abt. 15.800
OVER ALL BREADTH	abt. 3.600
DEPTH	abt. 1.500
MAIN ENGINE	abt. 120 ^{HP} x 1200 ~ 1900 ^{mm}

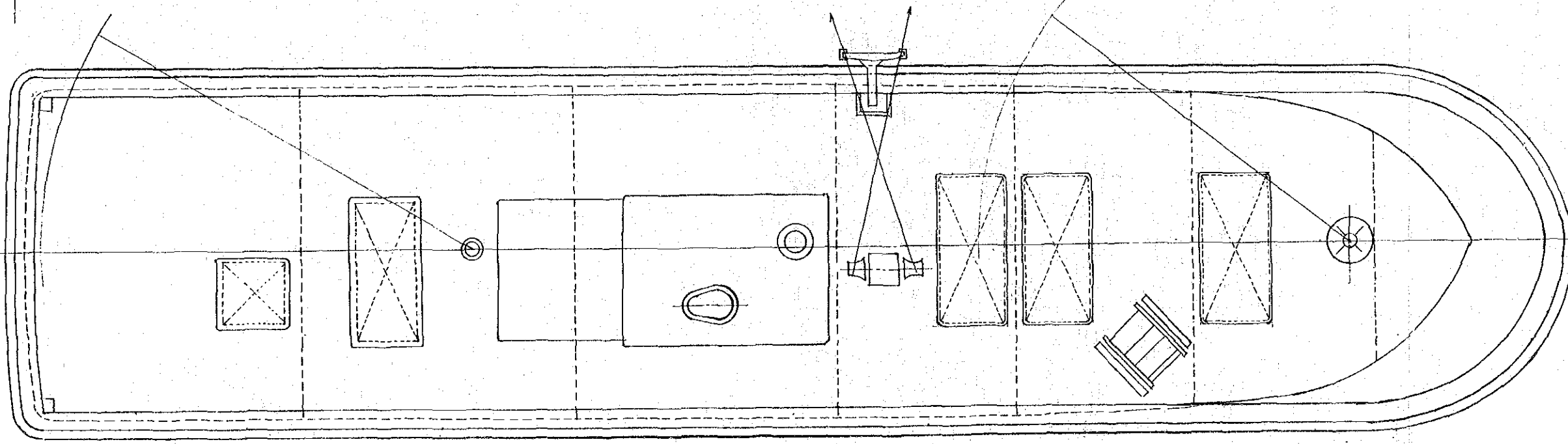
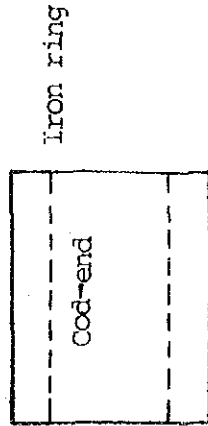
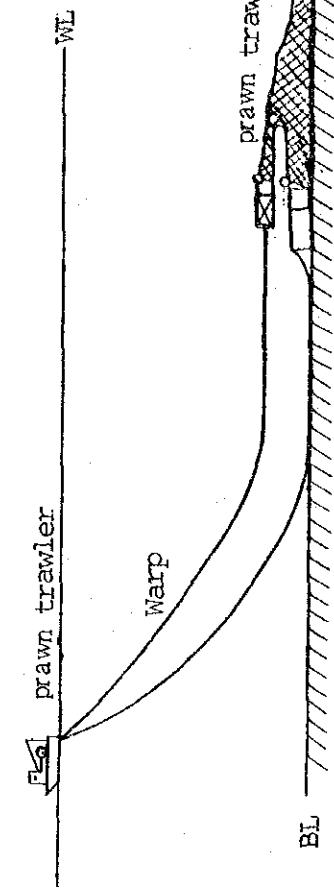
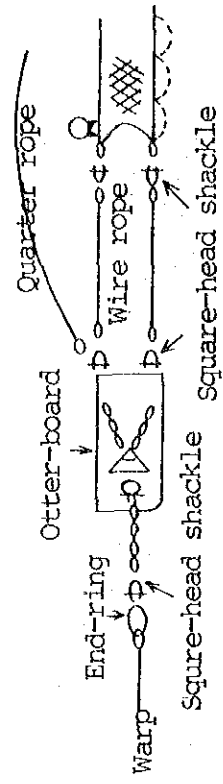
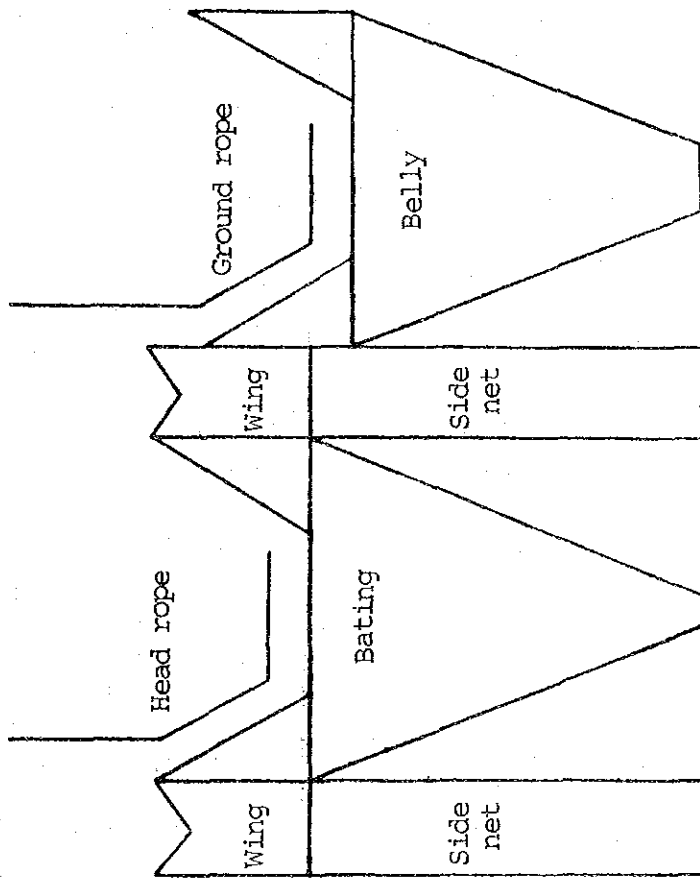


FIG. 2 PURSE SEINER FISH BOAT

F. R. P. FISH BOAT (PURSE SEINER)
 JAPAN INTERNATIONAL COOPERATION AGENCY

PRAWN TRAWL - NET



Material: Polyethylene net

FIG. 3 PRAWN TRAWL NET

SARDINE PURSE SEINE NET

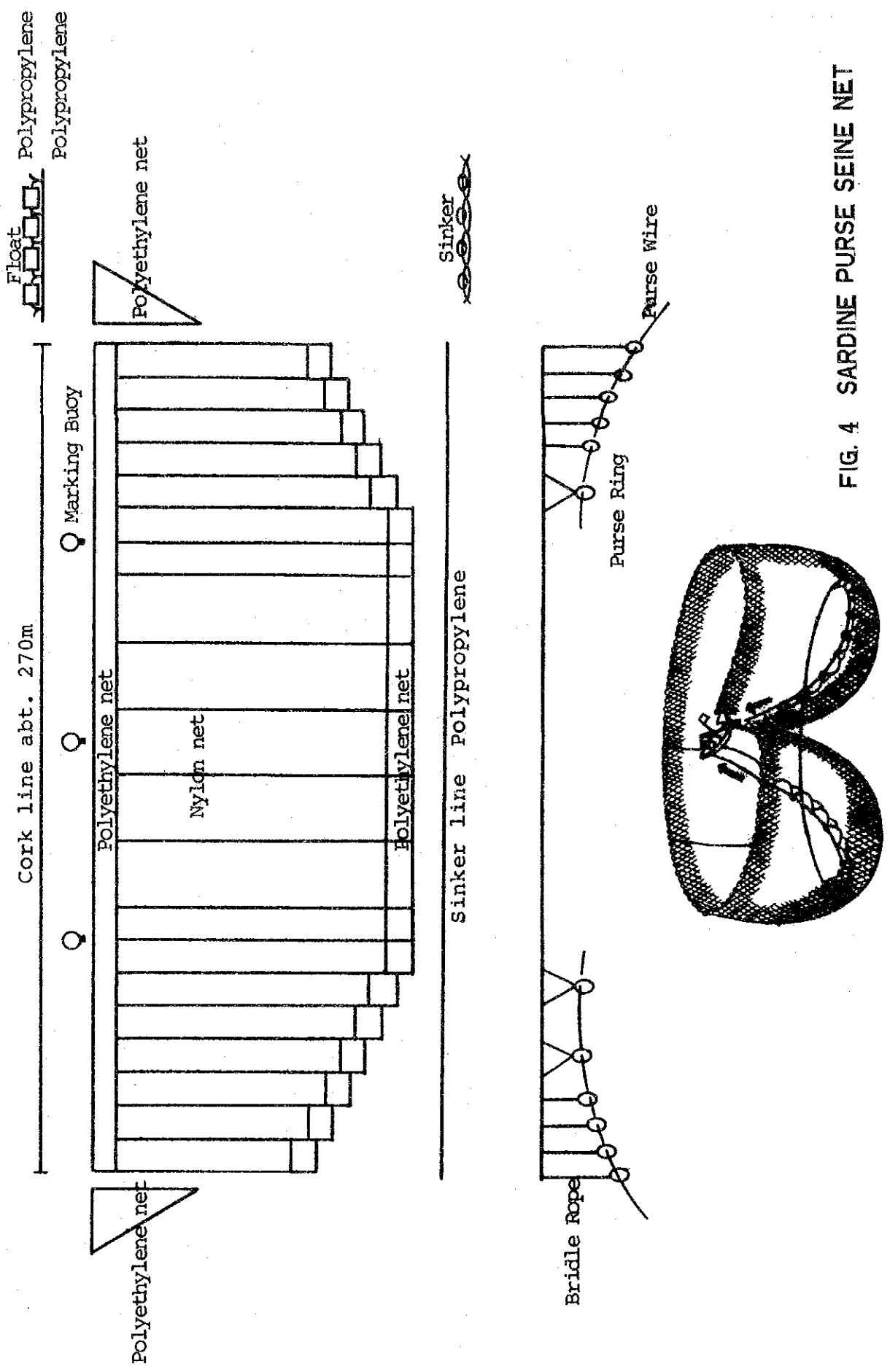


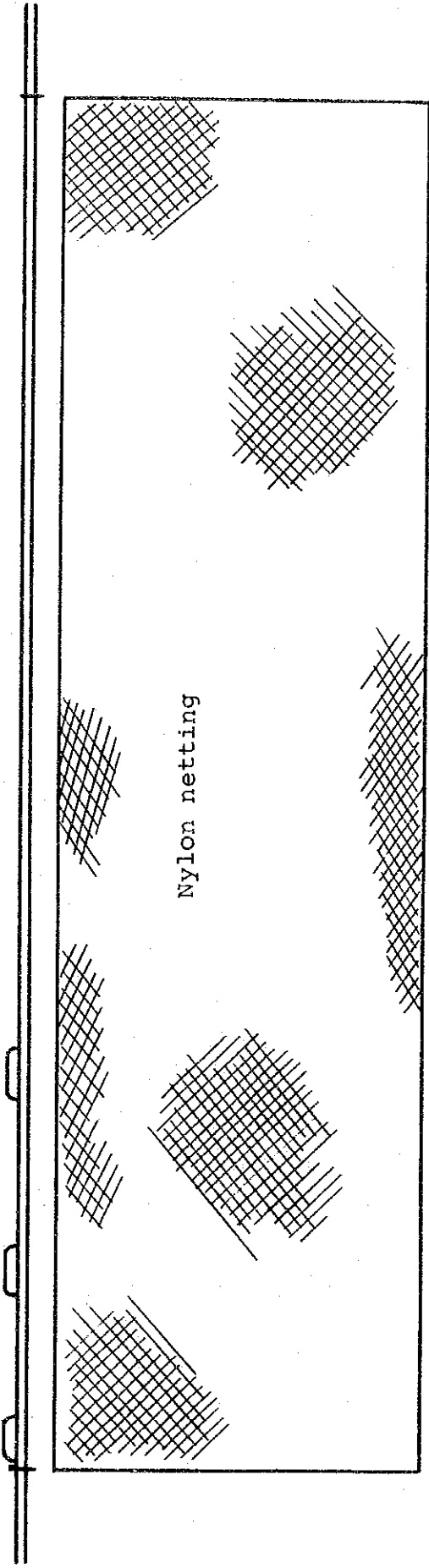
FIG. 4 SARDINE PURSE SEINE NET

DRIFT GILL NET

Float rope

Polypropylene length 23m

Float



Nylon netting

Sinker rope

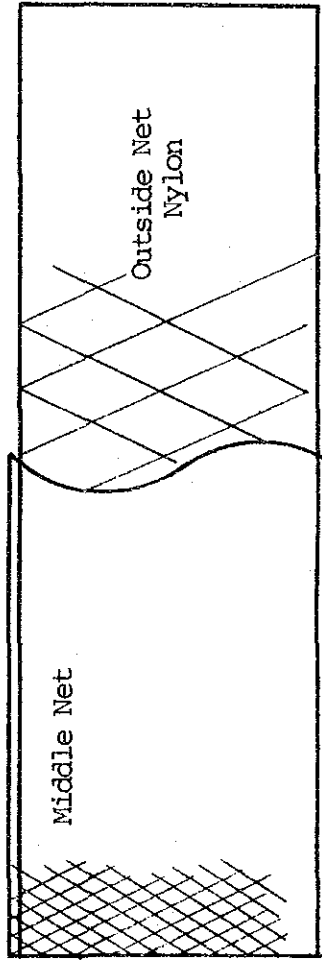
Polypropylene rope with lead line L & R 100g/meter 2 pcs



FIG. 5 DRIFT GILL NET

SPINY PRAWN TRAMMEL NET

abt. 50 MTR Float Line



abt. 50 MTR Sinker Line

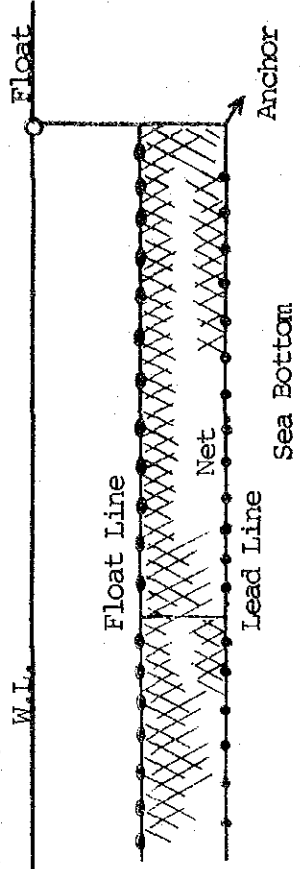


FIG. 6 SPINY PRAWN TRAMMEL NET

TUNA LONG LINE

Standard Type

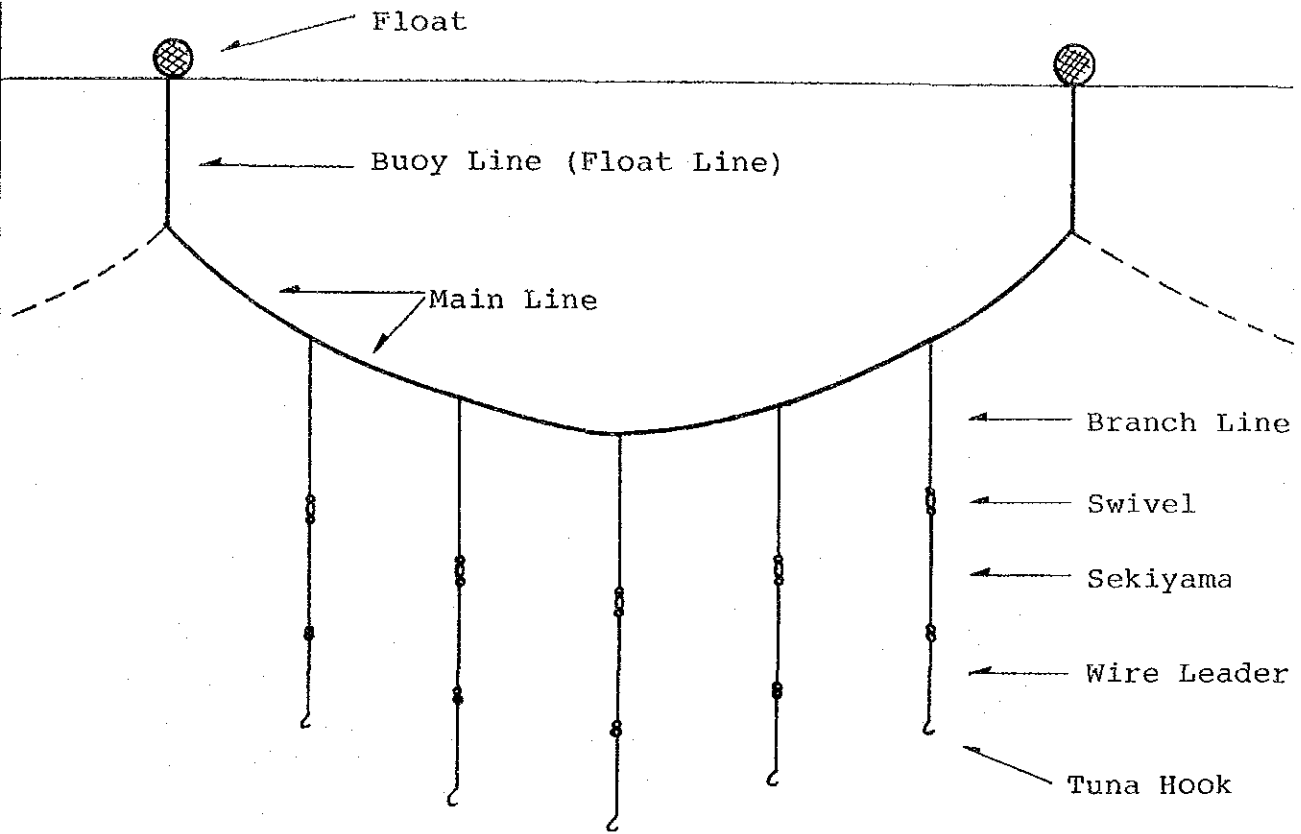


FIG. 7 TUNA LONG LINE

BOTTOM LONG LINE

Specification for one set

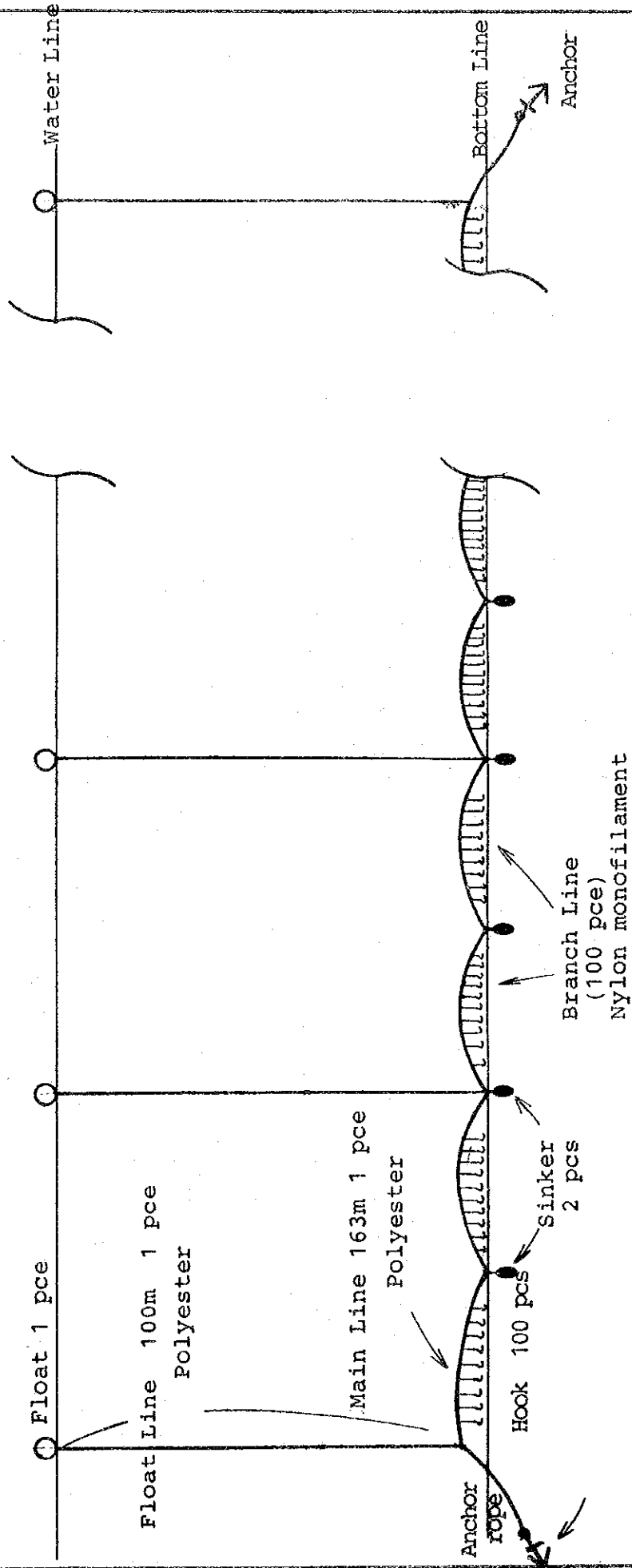
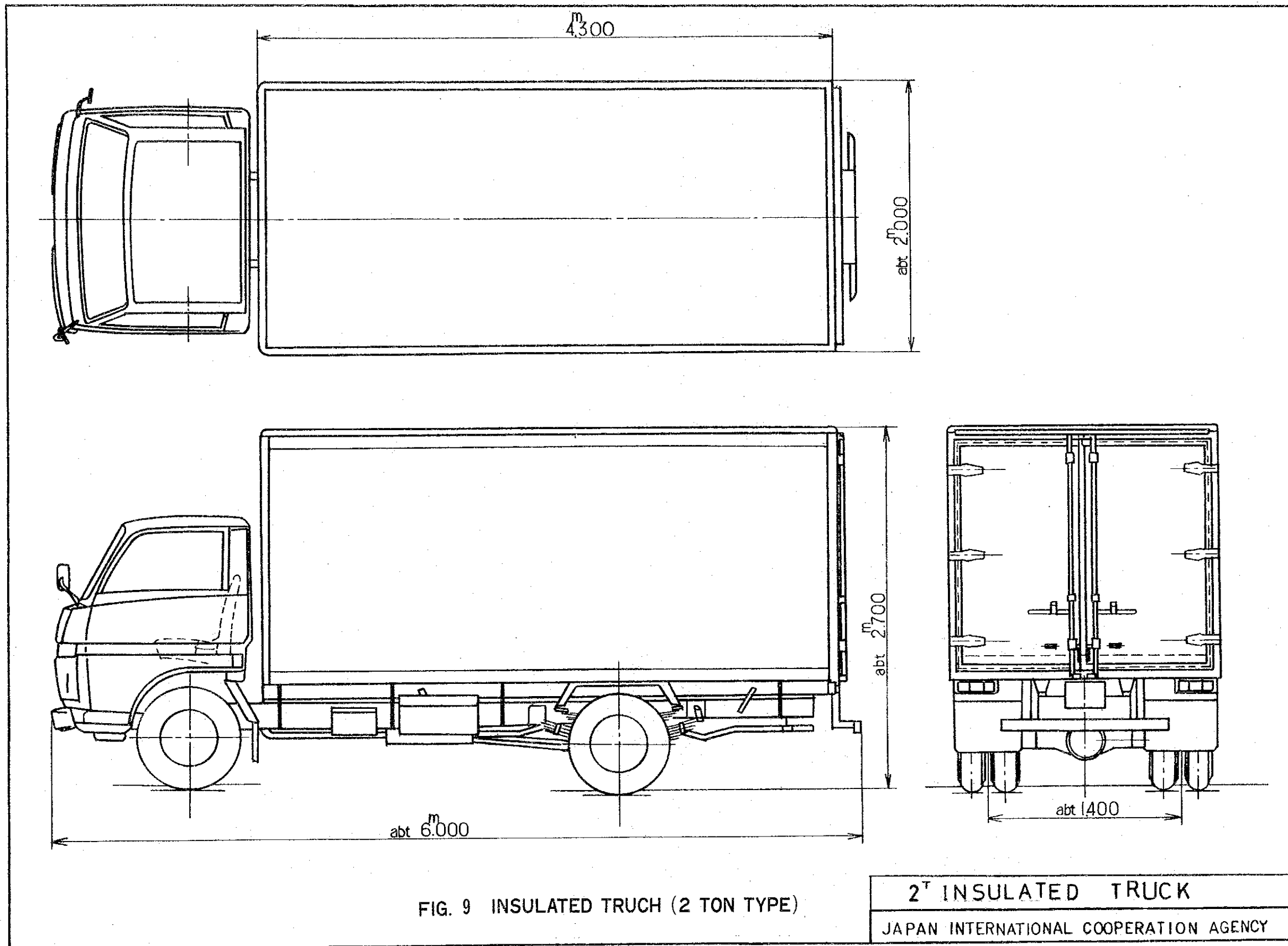
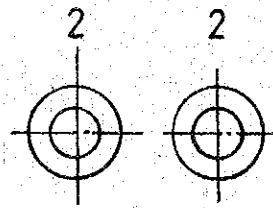
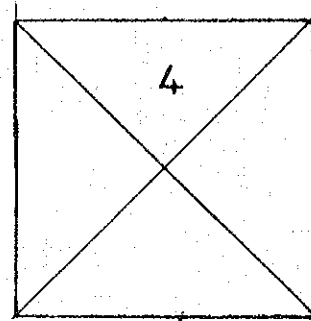


FIG. 8 BOTTOM LONG LINE





NO	DISCRIPTION	REQD
1	ICE MAKING UNIT	2
2	COOLING TOWER	2
3	COOLING WATER PUMP	2
4	WATER TANK, 5 ^{TONS}	1
5	DIP TANK	2
6	ICE SHOOT	2
7	SWITCHBOARD	1

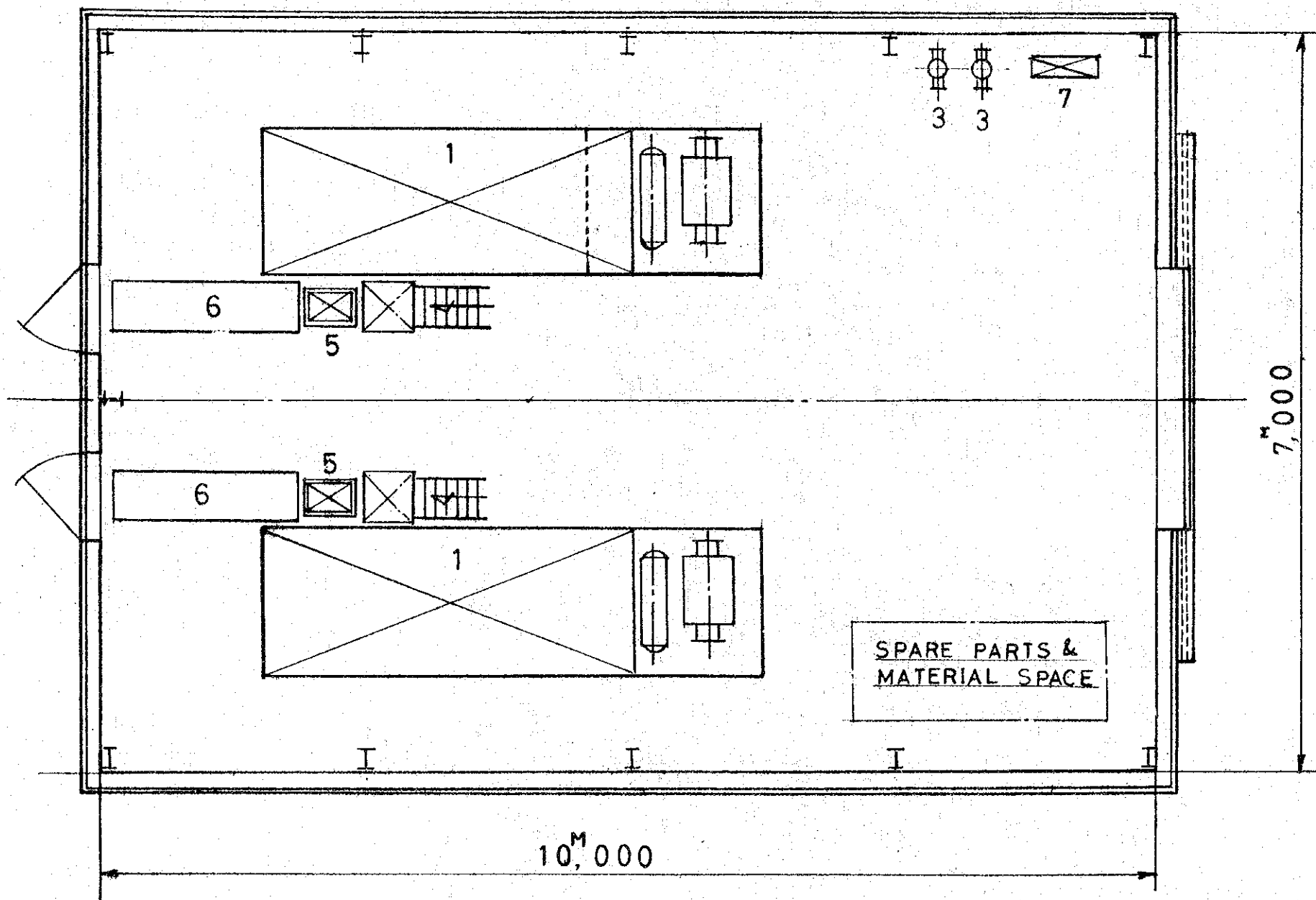


FIG. 10 ARRANGEMENT OF ICE MAKING PLANT

ARRANGEMENT OF ICE MAKING PLANT

JAPAN INTERNATIONAL COOPERATION AGENCY

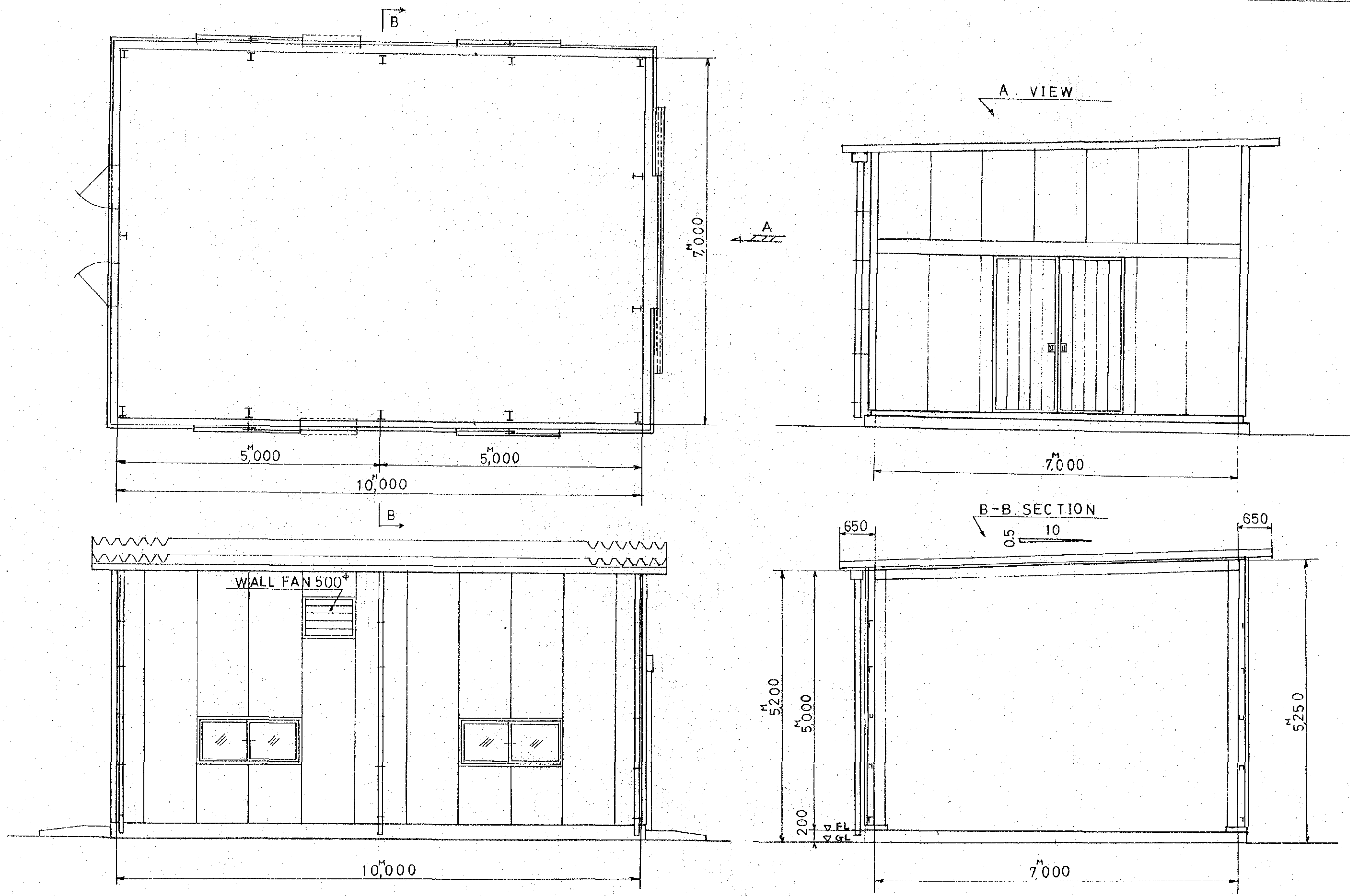


FIG. 11 STEEL STRUCTURE OF ICE MAKING PLANT

STELL STRUCTURE OF ICE MAKING PLANT
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