4.2 Establishment of the Scale of Facilities and Equipment

First, a technical study will be made to determine the scale of the necessary facilities and equipment included in this project, following which their structural strengths and the utilities required for their construction and installation will be examined.

4.2.1 Fishing Technology Laboratory

(1) Outline

The fishing technology laboratory building will consist of laboratories and facilities having the functions described as follows. By effective use of the facilities and their integrated activities with the laboratories, an attempt will be made to improve NIOMR's fisheries technology pertinent to research, investigation, development, training and extension of fishing gear and fishing methods. Administratively, this building will be under the control of the Fishing Technology Section (which will be upgraded to the fishing Technology Division with the launching of this project), but there are definite plans to maximize use of this building by sharing it with NIOMR's other divisions and sections.

1) Flume tank room:

Scale models of nets will be experimented with in the tank and photographed, recorded on video tape and measured for various data. The room will also be used for training and extension activities. For instance, it will be used to show the students of the Federal Fishery School, trainees from abroad and local fishermen the configuration of the net in water. A room for fabricating model nets and a storing them will be attached to this laboratory.

2) Fishing net material testing room:

Due to Nigeria's strict import control measures, inferior quality fishing nets are being smuggled in from Taiwan, Korea, etc. and distributed through unofficial channels. In view of

this, the quality (strength, elongation, weather resistance, etc.) of fishing nets currently sold on the market must be examined first before engaging in research and development of fishing gear and fishing methods at this research installation. In other words, in developing a fishing net it is not enough to stipulate only the thickness and twisting strength of the material used for the net; the net would not be effective as designed unless the quality of netting and thread are standardized. Therefore, dimensions, strength, composition and other physical characteristics of a variety of ropes, twines, nettings, floats, sinkers, etc. will be inspected and experimented using various equipment and apparatuses. (Placed under the supervision of the Fishing Gear Section)

3) Fishing gear laboratory:

Research and training vessels will be used to test the fishing nets developed by this research installation. Various measuring instruments will be necessary at this time to check and study whether the new types or the improved types of fishing net developed in the laboratories and the flume tank are actually achieving the anticipated results. These measuring instruments which will be used primarily aboard ship for the testing of nets in actual fishing operations will be kept in the custody of this laboratory which will be responsible for adjusting the instruments before and after each test operation and for analyzing the measured data. (Placed under the supervision of the Fishing Gear Section)

4) Fishing method laboratory:

The reaction of fish to fishing gear will be tested by changing the size (mesh, etc.), form, thickness of netting, color, etc. of the fishing gear to obtain the data necessary for improving it from the viewpoint of fish ethology. Range of visibility and other ecological reactions of fish in response to changes in external conditions such as turbidity of the water, light, sound, etc. will also be investigated. Accord-

ingly, most of the experiments will be fundamental ones and the fishing gear used in the experiments will also be simple ones like the gill net used by small scale fishermen. This laboratory will be a wet laboratory supplied with sea water and fresh water and laid out in such a way that experiments on scale models of nets can be carried out inside a small tank. This laboratory will be placed under the supervision of the Fishing Method Section.

5) Net loft:

A net loft for fabricating actual fishing gear developed or improved by this research installation will be provided. Also, as there is no place to mend and adjust the trawling nets of the currently operating trawler type research and training vessel, M.V. Okion, a space large enough to accommodate the trawling nets that will be the main focus for study and development by this research facility will be secured for this Net loft. The Net loft will also be provided with ancillary facilities such as fishing net storage, a stock control room and a tool crib for custody of the tools necessary for net fabrication and mending. A small truck with a crane for hauling the trawling nets to the jetty and for hauling heavy items to Maintenance Shop for Vessel, which will be discussed later, will also be included in the equipment for this Net loft.

6) Fishing gear design room:

A small fishing gear design room as a place for designing model nets and working nets will be provided.

7) Dark room:

In experimenting with the scale models of nets in the flume tank, each part of the net and the form of the net are photographed for measurements, and to analyze the measured data it is necessary to be able to freely enlarge the photographs. The provision of a dark room coupled with a flume tank is therefore indispensable for the analysis of the data.

8) Data room:

The data room of this research installation, which is to become the first and the only research institution of fishing technology in Africa, will keep custody of the data on fishing technology already collected or which will be collected in the future. The reading room space will be of a limited size. NIOMR plans to eventually expand the activities of this data room to include reference services on fishing technology in Africa (The Africa Regional Aquaculture Center of NIOMR is already offering such services).

9) Classroom for extension service:

This research installation which is centered on the flume tank has another purpose besides conducting research and development of fishing technology and that is, education and extension utilizing its facilities. A classroom with video and other equipment will be provided for extension service. It will accommodate 15 persons at a time for short-term training which will consist mostly of observation studies of the flume tank and studies on the principles of fishing technology and methods for improving it. Participant will be students of the Federal Fisheries School, local fishermen wishing to receive training and trainees from abroad.

10) Office rooms:

This laboratory building was designed to be of a scale that could be operated without increasing the staff (the few supporting staff which will become necessary will be procured by NIOMR's internal reshuffling of personnel) in view of NIOMR's current budgetary situation. Accordingly, only three office rooms are planned, one private office each for the manager of the Fishing technology Division cum Fishing Gear Section and the Manager of the Fishing Method Section and a common office for a staff of four.

Each individual laboratory will be examined next before making a final examination of the fishing technology laboratory building as a whole.

1) Flume Tank Room

1)-1 Flume Tank

The larger the size of the model gear, the more accurate the experiments would be, but on the other hand, it would require a large flume tank and lead to an increase in experimental costs and maintenance costs. In this project, therefore, the size of the model gear will be determined with due consideration given to the degree of difficulty in fabricating the model nets, tolerance of errors in the measured values of the experiments intended, the ratio of scale reduction of model nets adopted in Japan and other factors. First of all, in determining the scale of the tank for experiments, the fishing gear will be classified according to its relative urgency to be experimented on into those which are currently in use and those which are to be developed in the future. Fishing gear which is currently in use and for which improvement is needed will be set at a size for which the scale reduction ratios of 1/20 to 1/30 are applicable, and fishing gear to be developed in the future of a size for which a scale reduction ratio of 1/50 or more is applicable so that the size of the flume tank will not become overly large.

Fishing gear subject to experiment and applicable scale reduction ratio

a) Experiments on fishing gear currently in use (scale reduction ratio 1/10 - 1/30

In the case of a model with the scale of 1/10, the width, length and height of the net will all be scaled to 1/10 of actual net size and the volume scaled down to about 1/1,000 and the resistance to about 1/100.

Shallow water trawling net (20 - 25m in length)
Resource conserving type trawling net (20 - 40m in length)
Deep sea trawling net (40m in length)
Gill net (including large mesh drift net)

b) Fishing gear to be developed in the future (scale reduction ratio 1/10 - 1/60)

Deep sea trawling net (20 - 40m in length)
Mid-depth trawling net (80 - 120m in length)
Pelagic fish gathering place, live well for stocking live bait, aquaculture net, etc.

As a result of a comparative study of the degree of importance of each of the various above fishing gear in the present fisheries situation in Nigeria, based on the size, degree of complexity, and the degree of their importance in future plans for experiments, the various trawling nets currently in use have been taken up as the principal fishing gear to be experimented on and according to, which to determine the size of the flume tank. The configuration and dimensions of each part of the trawling nets are shown below (Fig. 4.1a-c).

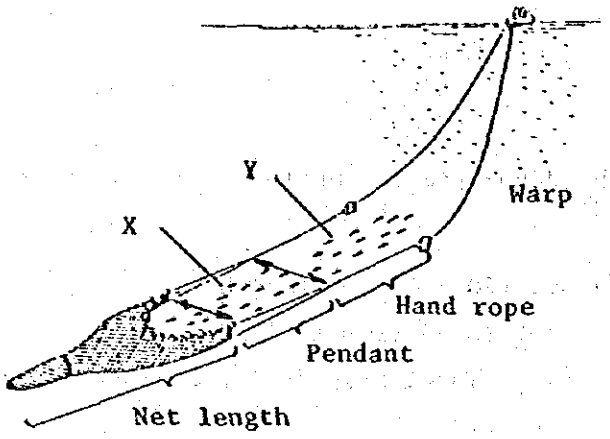


Fig. 4.1a Overall Structure of Trawl Net

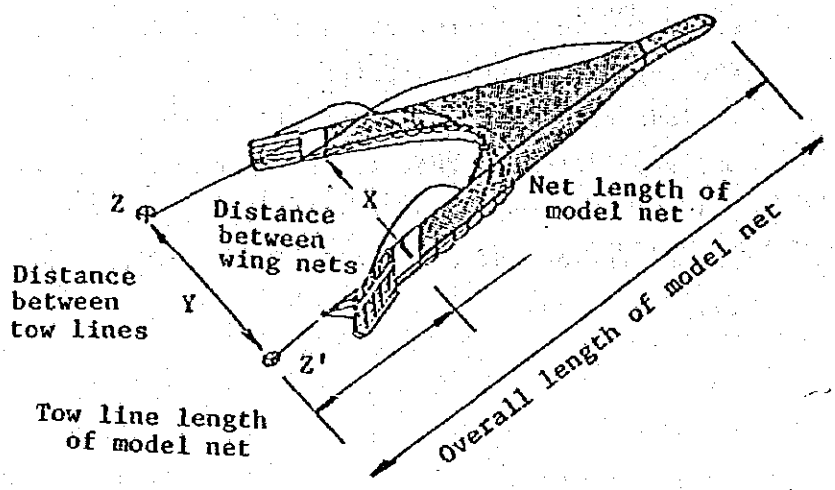


Fig. 4.1b(A) Structure of Shrimp Trawl Net

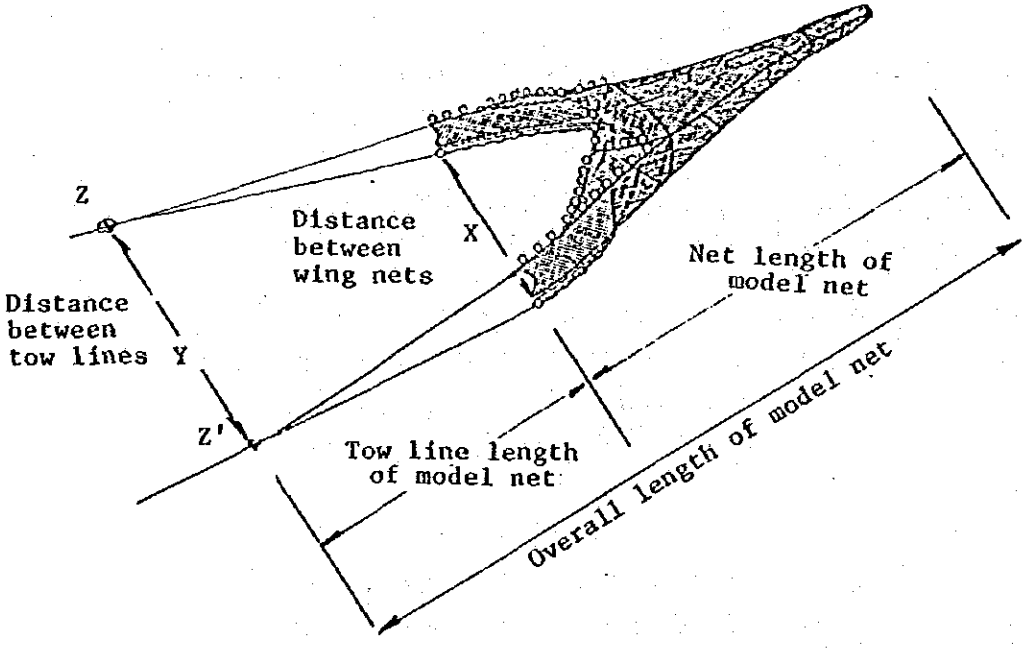


Fig. 4.1c(B) Structure of Medium-Scale Trawl Net

Model nets are set so that the parts indicated on Fig.5 will be in the measuring section of the flume tank, and points Z and Z' are connected to the measuring fulcrums in the flume tank. Accordingly, the size of the measuring section of the flume tank is determined by the size of the distance Y between the towing ropes and by the total length of the model net.

The types and sizes of trawling nets used in Nigeria and the assumed sizes of the model fishing gear are summarized in the table below.

Table 4.1 Assumed Size of the Model Fishing Gear

Size	Dimension				Distance between Tow Lines	
	Net Length	Wing Net Length	Tow Line Length	Overall Length	$\theta = 10°$	$\theta = 15°$
Shrimp Trawling (A)						
Net (A)	20 m	8 m	12 m	30 m		
Model Net (Scale: 1/10)	2.0 m	0.8 m	1.2 m	3.0 m	1.15 m	1.34 m
Medium-Scale Trawling (B)						
Net	40 m	17 m	50 m	90 m		
Model Net (Scale:1/30)	1.3 m	0.6 m	1.7 m	3.0 m	1.15 m	1.50 m

Sizes of the model nets based on the above table are shown on the figure below.

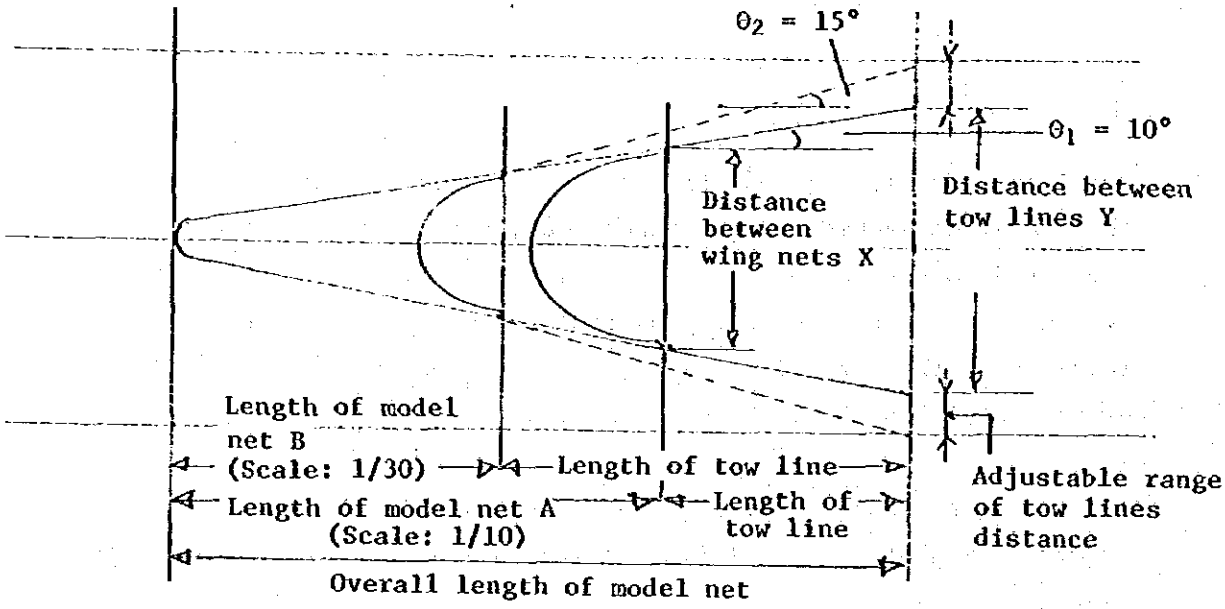


Fig. 4.2 Size of Model Net

The size of the flume tank was determined as follows according to the results of the foregoing study.

a) Width of the measuring section

Towing ropes of the model net will be connected to the measuring fulcrums so that they extend outward at θ = 10 - 13° relative to the stream lines within tank. The angle (θ) of the towing ropes will have to be changed during the experiment. Accordingly, the width of the measuring section was determined by assuming the angle θ = 15° in this project. Consequently, the width of the measuring section shall be 1.5m according to the above table.

b) Length of the measuring section

In addition to the total length of the model net of 3.0m, gaps of 0.5m each in the setting positions of the measuring instrument and fulcrums and of the model net were taken into account, so that the length of the measuring section was determined to be 4.0m.

c) Length of the observation window

As the total length of the model net is 2.0m, the length of the window was set at 2.5m to make observation easier by allowing a 10% margin at both ends.

d) Water depth of the measuring section

Experiments with trawling-type fishing nets do not require much water depth, but as this flume tank will be used also for experiments with fishing gear that requires higher net height like the gill net, the water depth has been set, on the basis of past records, at 0.9m to balance with the length of the measuring section.

e) Height of the observation window

As the water depth is 0.9m, the height of the observation window is set at 1.1m.

f) Bottom surface moving device

The popularly used bottom surface moving device will be provided for experiments on trawling-type fishing gear in order to reduce errors in the vertical distribution of flow velocity within the tank caused by the resistance of the bottom surface boundary layer and of fishing gear.

g) Flow velocity

A study will be made to determine the range of the flow velocity in the flume tank so that experiments on trawling nets, beach seines, gill nets, etc. can be made. The towing speed of trawling-type fishing gear is normally 3.5 knots (1.8m/sec.) up to a maximum of 4.5 knots (2.3m/sec.). Accordingly, the flow velocity in the flume tank should desirably be set to 2.3m/sec., but it was decided that it should be set within the range of 0.1m/sec. to 1.0m/sec. and that the data obtained

from experiments should be adjusted with respect to flow velocity by a calculation formula, because the chosen range of flow velocity makes possible a more reasonable size of flume tank and because the flow velocity in this range can be easily regulated, which are two important considerations.

h) Type of flume tank

Two types of flume tanks are used in Japan, the horizontal type (water current circulates in the horizontal direction and observations are made and also measurements taken in a parallel portion on one side of the flat doughnut-shaped tank body) and the vertical type (water current circulates vertically from up to bottom and observations are made and measurements taken in the upper part of the flat doughnut-shaped tank body), but installation of the vertical type is becoming more prevalent lately. The vertical type is somewhat more expensive and somewhat larger in terms of required output than the horizontal type, but the vertical type flume tank will be adopted for this project in consideration of the following four points.

① While the horizontal distribution of flow velocity in the horizontal type flume tank tends to be faster on the inside compared to the outside, the distribution of flow velocity in the vertical type flume tank tends to be uniform in the horizontal direction even though it might be uneven in the up and down direction. Since this flume tank will primarily be used for experiments on trawling-type fishing gears, the vertical type is preferable.

② In the case of the vertical type, a pit is normally dug in the ground in which the lower half of the tank is housed for reasons related to the place of observation. In this case, even if the observation window (glass window) should break by accident, at least a certain amount of the water that will gush out will flow into the pit to confine the accident to a minimum.

③ The power and other mechanical portions are housed inside the pit so that there is less danger and worry even when a lot of people unfamiliar with the machine are in the flume tank room while the tank is being operated for training and extension purposes.

④ When setting a model net inside the tank, the vertical type is easier to work with since it permits working from both sides of the tank.

Accordingly, the specifications for the flume tank to be included in this project would approximately be as follows:

Specifications:

Type - vertical type
Total length: About 8m (about 9.2m including motor)
Total width : About 1.9m (about 2.9m including accessory equipment)
Height: About 3m
Motor : 15 kw
Length of measuring section : About 3.5m
Width of measuring section : About 1.5m
Depth of measuring section : About 1.3m
Length of observation window: About 2.5m
Height of observation window: About 1.1m

With a complete set consisting of bottom surface moving device, filter, measuring instruments, flow velocity control panel, wave breaking device and other necessary equipment.

1)-2 Flume tank room

a) Determination of scale

In the experiments of model nets in the flume tank, the most usual method is to photograph the configuration of the net and enlarge that photograph to measure the dimensions of each part

and its angle relative to the water current. Because of this, picture taking by video-recorder and camera are important elements of the experiments. The 35mm camera uses a standard 50mm focal distance lens, but because distortions are generated on the picture, a telephoto lens of long focal distance is generally used in photointerpretation. When a lens of long focal distance is used the accuracy of measurement improves, but a larger laboratory space becomes necessary.

The configuration of the model net is characterized by the fact that the difference in angle of each part is smaller on the plane surface than on the side surface. The scale of the flume tank room is determined on the basis of this characteristic in form and the accuracy of the photographs.

The relationship between the distance to the subject to be photographed from the observation window and the focal distance of commercially sold lenses is shown in the table below.

Table 4.2 Required Distance to the Subject

Focal Distance	Angle of View	Required Distance to Subject
50 mm	45°	3.0 m
85 mm	28°	5.0 m
100 mm	24°	5.9 m
135 mm	18°	7.9 m
200 mm	12°	11.9 m

For photographing the side surface of a model net with a large change in form, a 85mm telephoto lens is planned for use and for plane surface with a small change in form, a 50mm standard lens is planned.

For maneuvering, a space of 1 to 1.5m must be left open behind the camera. Thus, for photographing a model net, a space of about 6m in front of the observation window of the flume tank and a space of about 4.5m above the measuring section of the flume tank are necessary.

Therefore, the required size of the flume tank room is determined to be 14m x 12m = 168 m^2 and the height about 6.2m. Entrances and exits will be provided at three places, one which connects with the ground floor of the main building, the second a large door that opens on a 8.5m wide road and which will be used for the hauling in and out of materials, and the third which connects with the offices on the first floor of the main building. The one which connects with the first floor section of the main building will be connected to a cat walk. On the cat walk will be a small flow velocity control room and photographic equipment for shooting from above so that the flume tank can be observed from above. To facilitate photographing, the room will be shielded against natural light by providing a blackout curtain. Overhead rail and chain blocks for experiments and maintenance work will be provided on the ceiling.

As annexes to the room, a model net fabricating room and storage for model nets will be installed close by.

1)-3 Model net fabricating room

Used for fabrication of model nets for experiments in the water tank and for model net modification that becomes necessary as a result of experiments. The room will be of a size large enough to fabricate a model net of about 2m. Hence, it shall have a floor space of 4.5m x 5m = 22.5 m^2. The following equipment and furnishings will be housed in said room.

Worktable 1.8m x 2.4m	1 set
Hand tools for fabrication	1 set
Locker for tools	2 sets
Video recorder including a video camera to be used in the flume tank	1 set
Camera (50mm, 85mm), tripod and other accessories	1 set

1)-4 Storage for model net material

A storage room for materials used in fabricating model nets will be provided. The size shall be the same as the model net fabricating room, 4.5m x 5m = 22.5 m^2. The following materials and furnishings will be provided or stored here.

Rack for storing model nets	1 set
Locker for daily issue of model net materials	2 sets
Completed model nets as teaching materials	1 set

(Nigeria has had no experience in experimenting with the flume tank. Therefore, various types of completed model nets will be included among the items to be granted as accessories of the flume tank in order that experiments may be carried out smoothly once the materials have been provided under the grant.)

Materials for model nets	1 set

2) Fishing gear material testing room

This is the laboratory for testing and measuring the fundamental physical properties of the raw materials used for gill nets, beach seines, trawling nets, etc. used currently in Nigeria. The laboratory requires the following equipment.

a) Required equipment

①	Weighing instruments 0 - 100 kgs, 0 - 10 kgs	1 complete set each
②	Vernier calipers, micrometers, measuring rule	1 complete set each

③ Water tank, dead weight, small pulley, etc. — 1 complete set each

④ Stereomicroscope and camera — 1 complete set

⑤ Twist counter — 1 complete set

⑥ Fiber abrasion tester — 1 set

This is a tester for testing yield strength against abrasion of rope, twine, netting, etc. It will be capable of judging the suitability of materials and the quality of processing. It will also be capable of using metal pieces, grindstones, and sandpaper of different grain sizes as abrasives and of testing under both wet and dry conditions.

⑦ Breaking strength tester for rope — 1 set

It will be a model with an electrically driven hydraulic cylinder which pulls the test rope from the top end and the bottom end to measure the breaking strength and elongation of the test rope. Its capacity will be 5 tons (rope diameter about 18 - 22m). The tester will be capable of calibrating and correcting the tension meters used elsewhere.

⑧ Breaking strength tester for twine — 1 set

It will be a model capable of measuring the breaking strength and elongation of test twine by an electrically driven motor with a capacity of 50 kgs (equivalent to a net thread diameter of about 2mm).

⑨ Other furniture and furnishings

Locker for storing small utensils, desk for measuring experiments, blind, etc. will be provided.

b) Determination of scale

The necessary space for the fishing gear materials testing room is 6m x 9m = 54 m^2, including the space required for installing the above listed equipment and space in which to work.

3) Fishing Gear Laboratory

This laboratory measures the fishing gear improved or developed by the fishing technology laboratory to confirm that they operate as designed before they are subjected to a test fishing operation by the research and training vessel. It also stocks and maintains the research equipment for development of new fishing grounds, puts them into good condition before and after each test operation and analyzes the data obtained from test operations. Accordingly, the laboratory requires the following research equipment.

a) Necessary equipment

①	Small portable fish finder	1 ea
②	Depth recorder (mechanical type)	1 ea
③	Log	1 ea
④	Submarine inclinometer (mechanical type)	1 ea
⑤	Warp angle meter and tilt angle meter (protractor)	1 set
⑥	Net height meter (mechanical type, for shallow water)	1 ea

A hydraulic type used mainly in water depths of 10 to 20m. It will be a model suitable for measuring net heights of beach seines, gill nets, etc.

⑦ Net height meter (acoustic type, portable) 1 ea

A net height meter utilizing ultrasonic waves, and a model suitable for measuring the net heights of mostly trawling-type nets used in water depths of 20m or deeper.

⑧ Tension meter (portable type) 3 sets

Models suitable for measuring the towing resistance of beach seines and trawling-type nets, and the tensile force for extending gill nets as well as other measurements will be selected.

0 - 2 tons	for beach seines	1 set
0 - 4 tons	for small trawling boats	1 set
0 - 4 tons	for deep sea trawling boats	1 set

⑨ Acoustic type fishing ground bottom material probe 1 ea

An ultrasonic depth sounder capable of judging the conditions of bottom material of fishing grounds where beach seine, trawling net, and gill net fisheries are carried out will be selected.

b) Determination of scale

Said laboratory shall consist of an anteroom to accommodate equipment and a research room, and shall have a space of 6m x 9m = 54 m^2 to accommodate a storage rack for keeping custody of the above listed research equipment, a locker, a worktable for conditioning of equipment and data analysis, and space for working.

4) Fishing method laboratory

An experimental device for observing the behavior of fish in response to fishing gear in the static water tank of the laboratory will be installed. Equipment for outdoor experiments on the effects of fish attracting lamps and for other experiments will also be included. The necessary equipment for this laboratory is as follows.

a) Necessary equipment

①	Water tank, etc. for experiments and fish raising 500 ltr., 200 ltr., 100 ltr.	1 set
②	Small circulating pump, filter, lighting, fixture, submersible thermometer, water cooler for fish raising, etc.	1 set
③	Small submersible pump, transformer, etc.	1 set
④	Small pulley, arm, weight, etc.	1 set
⑤	Dyeing agent for fiber of fishing gear	1 set
⑥	Diving apparatus	2 sets
⑦	Underwater camera (35 mm)	1 ea
⑧	Current meter (propeller type)	1 ea
⑨	Surface and underwater fish attracting lamp 2 kw, 500 w	1 set
⑩	Small generator, 3.5 KVA	1 ea
⑪	Surface and underwater illuminometer	1 set

b) Determination of scale

This laboratory shall be the wet laboratory type with concrete floor and adequate waterproofing work on both floor and interior as experiments will center on the raising of fishes. Taking into account the space required for installing the water tanks and the space for working, the laboratory will require a floor space of 6m x 9m = 54 m^2. The floor shall be provided with drainage ditches, and both sea water and fresh water shall be supplied. Windows will be provided with blackout curtains for experiments that use light. A locker for storing small instruments and desks for measurements, experiments and recording, etc. shall also be installed.

5) Net loft

It shall be of a scale capable of fabricating and mending the trawling nets, beach seines and gill nets used in Nigeria. The trawling-type fishing nets of NIOMR's research and training vessel, M.V. Okion, are about 40m in total length, and for ease of work, it is desirable that the net loft be of the same length as the fishing gear. However, as it is also possible to work separately on the wing net and main net, the scale of the net loft shall be half the length of the fishing gear, or about 20m long. The width shall be 12m, taking into account a space of 3m x 2 = 6m required for spreading the net and 2m x 3 = 6m in which to work. The net loft, therefore, shall have a floor area of 20m x 12m = 240 m^2. It shall be provided with a big door on the south side high enough to permit the hauling in and hauling out of fishing gear on a truck. For loading and moving the fishing gear, an overhead travelling hoist (manually operated) shall be provided on the ceiling. As the fishing gear is estimated to weigh about 800 kgs, the capacity of the hoist shall be one ton. As the work in this facility will basically be performed during the daytime under natural light, consideration will be given to adequately taking in natural light. As no airconditioning system will be provided for this facility, the outer wall shall be designed to provide adequate ventilation (perforated brick or grid). Ancillary facilities shall include a tool crib, fishing gear storage and a control room.

5)-1 Tool crib

A tool crib enclosed by a metal grid for storing tools used for mending nets will be provided in a corner of the net loft. A space of about 7.5 m^2 is needed for storing the necessary tools and equipment. Tools to be stored in the tool crib are as follows.

①	Gas cutter	1 set
②	Bench grinder	1 ea
③	Hand tools for metal working	1 set
④	Hand tools for working with netting, rope, etc.	1 set
⑤	Weighing and measuring instruments	1 set

5)-2 Fishing gear storage

A small storage area for storing fishing gear materials used in the net loft will be installed next to the net loft. It shall have a floor space of 26.25 m^2 and be provided with shelves on the inside. Also, the provision of an appropriate quantity of fishing gear materials for fishing gear development is included in this project.

5)-3 Control room

A control room will be provided to monitor the fishing gear materials and tools being used or borrowed. It shall have a space of 8.75 m^2 and be provided with a desk and a service counter.

6) Fishing gear designing room

A fishing gear designing room shall be provided for designing model nets and actual service nets. For designing, the following equipment is necessary.

a) Necessary equipment

①	A-1 sized drawing board set	1 set
②	Drawing instruments for above	1 set
③	A-3 sized drawing board set	1 set
④	Drawing instruments for above	1 set
⑤	Lettering aids, lighting fixture, desk calculator, etc.	1 set
⑥	Cabinet for safekeeping	1 ea.

b) Determination of scale

The fishing gear designing room shall have a space of 3.5m x 6m = 21 m^2 to accommodate the above equipment and supplies and space for working.

7) Darkroom

It shall be of an area large enough for developing black and white film taken with a 35mm camera, enlarging of the positives and contact printing. Accordingly, it will require such equipment as a tank developer, enlarger, printer and dryer besides a sink, a darkroom lamp and a table. The size of the darkroom therefore shall be 3.5m x 6m = 8.75 m^2.

8) Data room (Library)

Research results obtained by the fishing technology laboratory, various other data and documents and materials collected shall be compiled and made available to the public, such as NIOMR's staff, students of the Federal Fisheries School, fishing gear and net manufacturers and public relations personnel. The room shall be provided with four reading tables, book shelves and lockers. Other necessary equipment includes a copying machine (A-3 size), a cine-projector set, an overhead projector, a slide projector, etc. The size of the data room shall be 6m x 9m = 54 m^2.

9) Classroom for extension service

This research installation shall also be used for training and extension activities. It will therefore be provided with a classroom for giving lectures and briefing the students of the Federal Fisheries School, fishermen, foreign trainees and fishing gear manufacturers, etc. who visit this research installation for observation and practical training. Five 1.8m x 0.6m tables will be provided in the classroom to accommodate 10 to 15 persons to whom lectures will be given with the aid of video and other means.

10) Office rooms

Three office cum study rooms will also be provided. For the Fishing Gear Section manager and the Fishing Method Section Manager, a private office of 13 m^2 which is of the same size as the ones assigned currently by NIOMR to its senior staff in the existing buildings will be provided, and for the other staff (four persons), a large common office of 30 m^2.

Besides the laboratories described above, an entrance hall, corridors, stairways, lavatories (to match the local custom, some Arabian style sanitary wares will be installed. Shower will also be made usable in the toilet room), hot-water supply rooms, etc. shall be designed and laid out in a functionally efficient way for the fishing technology laboratory building to be built on site A. The scales of the major facilities are summarized below.

Table 4.3 Fishing Technology Laboratory Building Floor Area

Name of room	Floor area (m^2)		Name of room	Floor area (m^2)	
		Subtotal			Subtotal
1. Flume tank room	168.0	171.0	6. Net loft	232.5	
Flow velocity control room	3.0		Tool crib	7.5	275.0
			Fishing gear storage	26.25	
2. Model net fabricating rorm	22.5	45.0	Control room	8.75	
Storage for model net materials	22.5		7. Fishing gear designing room		21.0
			8. Darkroom		8.75
3. Fishing gear material casting room		54.0	9. Data room		54.0
			10. Classroom for extention service		33.0
4. Fishing gear laboratory		54.0	11. Office room		56.0
			12. Others (corridors, etc.)		314.25
5. Fishing method laboratory		54.0			
			TOTAL		1,140.00

The minimum of outdoor structures on roads surrounding the fishing technology laboratory building are also included in this project. Also included is a small truck mounted with a crane for transporting fishing gear, mending materials and equipment.

4.2.2 Equipment for Skipjack Fisheries Development

(1) Small FRP boat for research on live bait for skipjack

While the small boat for live bait fishing carried on the skipjack fishing vessel which travels with the research and training vessel is capable of extensive research, its shortcoming is that it restricts the movement of the mother ship while it is engaged in research on live bait. The small boats included in this project will therefore be moored in the harbors of the fishing villages near the live bait fishing grounds which have been confirmed by past research and will be used for studying and ensuring live bait independent of the mother skipjack fishing vessel. The method employed for fishing for live bait shall be by round haul net towed by two boats and with the use of fish attracting lamps suitable for small boats.

1) Determination of scale

a) Study on the length of the small boat

The fishing gear which will be used for this small boat is the small sized round haul net currently being used in Nigeria (round haul fishing net with about 150m of floating section assuming that a net of 15m in net height is used). The boat will require the following space to be able to engage in fishing operation by loading this net.

Space for fixing ladder and dead space in the stern	about 0.6m
Space for loading net	1.6
Engine section	1.5
Working space in the bow	0.8
Dead space in the sloped section of the bow	1.0
Total	5.5m

b) Study on width

To secure adequate righting during operation, the ratio of the ship's length to width shall be 3.0. Hence, the width of the boat shall be about 1.85m.

c) Study on depth

Estimating a fully loaded displacement of about 1.7 tons and a maximum draft of 0.4, the depth of mold shall be 1.0m.

d) Engine output

The engine shall be a marine diesel engine with an output of about 20 Hp which is normal for this class of boat.

e) Others

Fish attracting lamp and generator equipment, line hauler and small portable fish finder will be equipped. To make the boat seaworthy against surging breakers along the shore line it shall be designed to adequate large shearing strength in the bow.

4.2.3 Equipment for Aquaculture Development

To reinforce the activities of the Africa Regional Aquaculture Center in Port Harcourt, the following equipment shall be included in this project.

1) Laboratory equipment

Device for destructive distillation of protein, turbidimeter, oven, spectrophotometer, calorimeter, various types of microscopes, muffle furnace, microtome, culture vessel, centrifuge and other laboratory equipment.

2) Press machine

For ease of operation and maintenance, this machine shall be of the press type. Its required capacity was determined to be 125 kgs/cycle based on the assumption that the operating time is 15 minutes per cycle and that judging from the allocated working hours, four-cycle operation is possible.

3) Dryer

The dryer shall be of the type that burns heavy oil for good thermal efficiency. In view of the allocated working hours, one cycle operation is possible, assuming that the time required for one cycle of drying is two to two and a half hours, and as the weight after boiling and pressing 400 kgs. of raw material ranges between 60 - 65%, the required capacity of the dryer was determined to be 260 kgs/2.5 hours.

Feed manufacturing process

The fish meal manufactured is ground in a pulverizing machine and made into fine particles, then mixed with binders, corn, rice bran, mineral and other ingredients and formulated into pellets. Hence, a pulverizing machine and a pelletizer are necessary.

The area of said plant shall be 6m x 8m = $48m^2$ to accommodate the foregoing equipment and apparatuses and space for working. The plant will also require drainage ditches and sewage treatment facilities to discharge effluent from the boiling and pressing processes.

The feed manufacturing mill in question is not only highly necessary for aquaculture but is indispensable as the disposal facility for the fish scraps discharged from the experimental cannery which is included in this project

4.2.4 Development of Processing Technology of Fish Catches

(1) Experimental Cannery

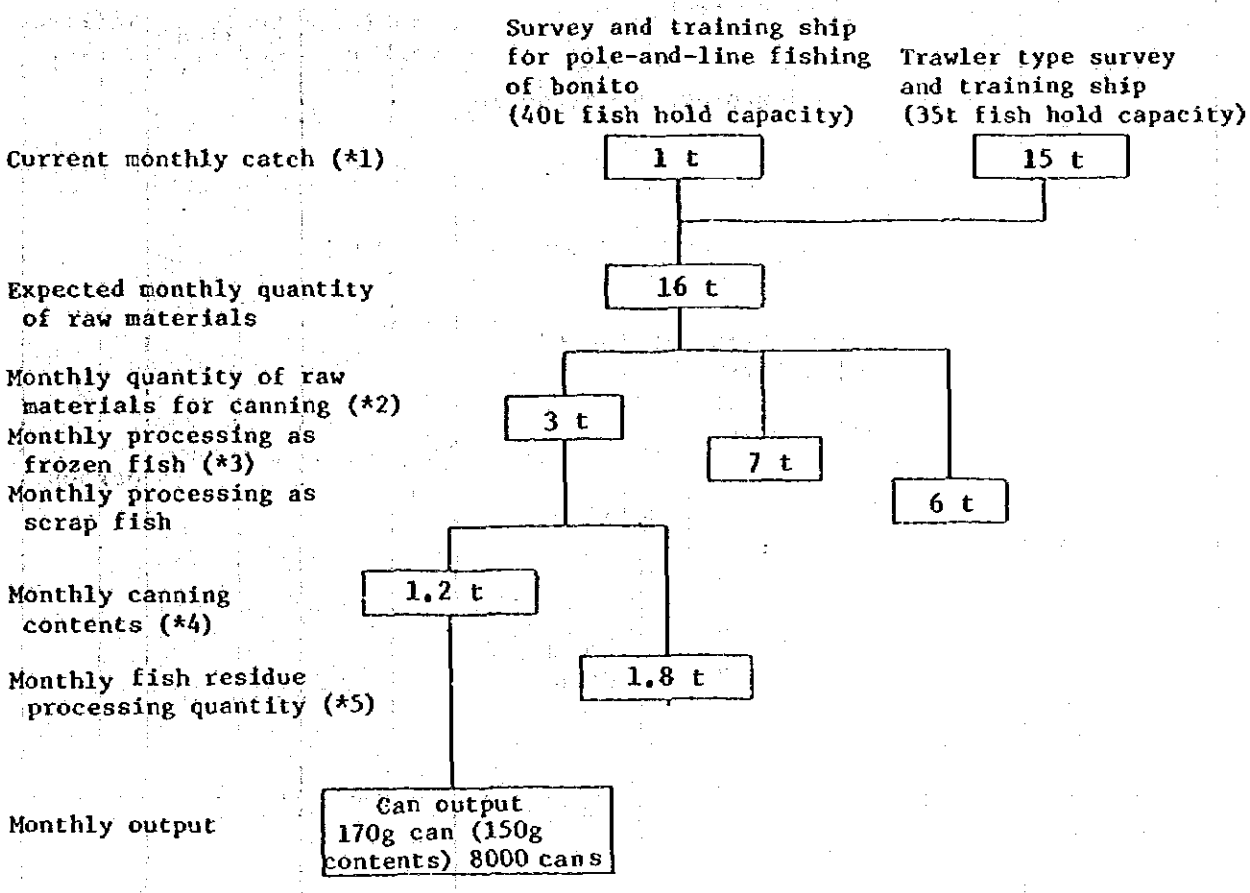
In order to start experimental production of canned food utilizing Nigerian fish, equipment for an experimental cannery and equipment for processing fish residue which will be discharged during the canning process are installed on the first floor of the existing building of the Fish Technology Division located at Site C of NIOMR. (300 m^2 can be utilized for this purposes.)

As to material for canned food, meat of the skipjack, which is currently scheduled for exploitation by NIOMR, is ideal. However, skipjack is caught only in small quantities. Therefore, the scale of the equipment for the cannery is designed in accordance with the amount of the skipjack catch which is presently secured by the operation of the two vessels. The processing pattern for fish catches is diagrammed in Fig. 4.3. It is reasonable to design canning equipment which can process 1.2 tonnes of fish per month according to the program. Although, the Fishing Industry Division presently owns a refrigeration plant, it does not function well (-10°C). Whereas fish for canning have to meet strict quality control requirement (-20°C). Insulation panels are also broken. In this connection, a new refrigerating plant has to be included in the Project also as a part of the equipment of the experimental cannery. The scale of the refrigeration plant is designed as 16 tonnes capacity in accordance with the amount of secured materials. As this equipment is installed on the first floor of the existing building of the Fishing Industry Division, it is not necessary to include construction of a building for this purposes. As fish residue and polluted water which are discharged during the canning process may, however, cause environmental pollution, appropriate drainage and a water treatment system and equipment for the processing of this fish residue into an appropriate form have to be provided in addition to the cannery.

1) Determination of Scale

Since the objectives of the production of canned food, namely, research and extension to the public as a result of the efforts of NIOMR, the process and activities of this cannery have to be different from those of private canneries especially in terms of efficiency. It is possible to repeat the production process 6 times in a month, if working days number 21 and one production process takes 3.5 days as shown in Fig.3. In this connection, the scale of the experimental cannery should be that which can process 500 kg of materials in one day, since 3 tonnes of materials are currently available.

Fig. 4.3 Catch Processing Scheme (expected)



*1: The research and training vessel for skipjack pole-and-line fishing is capable to secure at least 1t of skipjack per navigation (monthly), in view of the catch record attained in 1986, but future increase in the production is expected concurrently with the development of better baits. As for trawler type research and training vessel, they are realizing catches averaging 15t in each navigation (monthly), and it consists of 60% of useful fish and 40% of trash fish. Of the useful fish, approximately 2t (1/3) is presumed to be suitable as canning material (approximately 2t of abyssal sardines were caught in the operation carried out in March 1986).

*2: A total of 3t of catches, consisting of 1t of skipjack and 2t of the catch of the trawler, is being used as raw material for canning.

*3: Of the useful fish caught by the trawler type research and training vessel, those not used for canning are frozen and smoked as NIOMR for research.

*4: When canning the fish, approximately 60% of the total weight, consisting of head, bones, intestines, etc., are scrapped, and the remaining 40%, corresponding to approximately 1.2t, is used as raw material for canning.

2) Canning process and manpower

Table 4.4 Canning Process and Manpower

Schedule, time	Work contents	Manpower required		
		Unskilled worker	Semi-skilled worker	Skilled worker
First day	Frozen fish destorage & defrosting	3 persons		1 person
Second day				
08	Raw fish cutting & water-washing Scrap disposal	10 persons	2 persons	2 persons
12				
13	Boiling			
14				
	Cooling down			
17				
Third day				
08	Cutting & shaping Meat packing & seasoning	10 persons	3 persons	3 persons
12				
13	Blank can cleaning			
	Can lid stamping / Can Seaming			
15	Retort			
	Cooling down			
17				
Fourth day				
08	Can washing, cleaning & packing	3 persons		1 person

3) Necessary Equipment

①	Scale	1 set
②	Working table	1 set
③	Roller conveyor	1 set
④	Water tank for washing and defreezing of fish	1 set
⑤	Plastic box	1 set
⑥	Blower	1 set
⑦	Electric soup kettle	1 set
⑧	Sealing machine	1 set
⑨	Cooker	1 set

The cooker can cook 350 kg of fish in an hour. Heat can be provided by boiler.

⑩ Seamer 1 set

The seamer is selected under following conditions.

ⓐ Cans which are available in Nigeria and other type of cans can be seamed using attachment.

ⓑ Seaming process is conducted in a vacuum.

ⓒ Safety operation type is selected.

ⓓ The equipment can seam 30 - 40 cans per minute. Accordingly about 1,300 cans can be produced if seaming process is allocated 1/2 - 1 hour of the total operation process.

⑪ Retort 1 set

Simple equipment is selected. The equipment can sterilize 1,300 can/hour. Necessary steam can be provided by boiler.

⑫ Boiler 1 set

The pipe system boiler heated by diesel oil is selected due to easy operation. The capacity is designed so as to provide enough steam to the cooker and retort. Evaporating volume is calculated as 450 kg/hr/10 kg/cm^2.

⑬ Refrigeration plant 1 unit

Plant can store 17 tonnes of fish. If storing rate is estimated as 0.5 and 30 m^3 is allocated as a passage way, the volume of storage is about 70 m^3. The two sets of doors are provided considering the pattern of the canning process. The temperature of the storage area is set at -20°C in order to adjust the capacity of the vessels.

Since fish residue discharged during the canning process may cause pollution of the environment, fish residue is usefully converted into feed for aquaculture development. As 1.8 tonnes of fish residue are expected to be discharged, the necessary capacity of the equipment is to process 100 kg of fish residue a day or 2.0 tonnes/20 days. Processing equipment is composed of the following series of equipment.

a.	Mincer	1 set
b.	Cooker	1 set
c.	Pressing machine	1 set
d.	Drier	1 set
e.	Pulverizer	1 set

This processing equipment for fish residue is also installed in the existing building of the Fisheries Industry Division. Accordingly special treatment of odor and polluted water is necessary.

4.2.5 Intensification of Training Activities

One classroom building complete with mock-up bridge, chart room and classrooms is included in the Project in order to strengthen the training activities of the Federal Fisheries School of NIOMR.

(1) Mock-up Bridge

The Federal Fisheries School processes sets of navigation equipment provided by the Japanese Government. This equipment is currently installed in a temporary room. Therefore, this equipment is to be reinstalled in a mock-up bridge which is similar to the actual bridge of a vessel. Since the training program on board ship is limited, trainees of the nautical science and fishing course and the marine engineering course can obtain semi-on-the-job training utilizing these facilities. It will be especially useful in training on the total and systematic operation of navigation equipment. The mock-up bridge can accommodate 15 trainees at a time. The existing equipment is installed in the room. The mock-up bridge, with an area of 6m x 45m, 27 m^2 is located on the third floor of the classroom building so as to ensure clear sight from the window.

(2) Chart Room

In order to strengthen the training on navigation technology, a Chart room is also included in the Project. Since the chart room is to accommodate 15 trainees at a time, the area of the room is to be set at 7.8m x 7.5m, 58.5 m^2.

(3) Lecturer's Room

In order to supervise activities on the mock-up bridge and in the chart room, a lecturer's room is allocated to the second floor of the classroom building. The floor space of the room is set at approximately as 13.5m^2.

(4) Classrooms

In accordance with the addition of two new courses being started this year, two classrooms are provided, one each on the first and second floor. Since the new courses are planned to accommodate 30 trainees, it is reasonable to design classrooms which have the capacity for 30 trainees. However, relatively more space can be allocated for the classroom on the first floor for architectural reasons.

Following are the areas of each classroom:

Classroom I (for 30 trainees) 10.8m x 9.3m, 100.4 m^2

Classroom II (for 30 trainees) 8.1m x 7.5m, 60.75 m^2

The area of each room in the classroom building is summarized as follows:

Table 4.5 Classroom Building Floor Area (m^2)

Floor	Room Name	Floor Area (m^2)
Ground floor	Classroom-I	100.40
	Corridor, etc.	11.40
First floor	Classroom-II	60.75
	Lecturer's room	13.50
	Corridor, stairway, etc.	37.55
Second floor	Chart room	58.50
	Mock bridge	27.00
	Stairway, deck, etc.	15.38
	T o t a l	324.48

Since the building is constructed adjacent to an existing building, the existing staircases are utilized for entering the new building in order to save space. Therefore passages connecting the new building with the existing building will also be constructed.

4.2.6 Improvement of Infrastructure Facilities

Improvement work on the existing jetty and the construction of a maintenance shop for vessels are included in the Project.

(1) Improvement of the Jetty

Improvement of the jetty was urgently requested by the Nigerian Government during the basic design study, and since it was judged that the component was necessary for NIOMR it was included in the Project. However, a detailed survey will have to be undertaken during the implementation stage of the Project since necessary information could not be obtained during the basic design survey. Therefore, improvement of the jetty is assumed to be subject to the following conditions.

1) Design requirement

a) Since information on the tidal range at the site could not be obtained, the following conditions are assumed to exist.

H. W. L.; + 2.00m
L. W. L.: ± 0.00m

b) As the structure of the existing jetty is unknown, the following conditions are assumed.

Height of jetty + 2.50m
Piling structure

c) Soil condition: Based on available information the following conditions are assumed.

GL - 5m : coarse sand + silt
5m - 30m : fine sand
Inclination of bottom up to 500m from shore line :
3 - 5°

2) Determination of Scale

Out of the 4 units of research and training vessels owned by NIOMR, M.V. Sarkim Baka and M.V. Okion are being fully utilized. Both vessels annually navigate for 150 days and are moored for 200 days at the existing jetty. As the existing jetty is not appropriate for these vessels in terms of length and scale, these vessels have to be moored offshore using buoys. However, it is necessary to improve the existing jetty so as to be able to moor these two vessels simultaneously in consideration of mechanical maintenance, preparation for navigation and security reasons. Accordingly, the planned jetty is of a size which can moor the following 2 vessels.

M.V. Sarkim Baka

Overall length	42 m
Overall width	7.1 m
Draft	2.9 m

M.V. Okion

Overall length	32 m
Overall width	7.3 m
Draft	2.9 m

The project site is located inside Lagos Lagoon. Therefore, the effect of waves is rather small compared with the jetty which faces the open sea. However, as the site faces the route of ships going to Lagos port, waves caused by ship movements can be expected. For this reason, the structure of the jetty is designed to be the piling type which can absorb wave force.

Since the direction of wave movement is perpendicular to the shore line, the direction of the extension of the jetty in is the same direction as the waves coming in, taking into consideration the maneuverability of the vessels and the stability of moored vessels. The vessels can be moored at both sides of the extended jetty. 20 sets of fixed fenders are attached in order to handle the vessels bumping. 11 sets of borado, 1 set of dolphine, and 10 sets of lighting equipment are provided.

The scale of the improvement work on the jetty is estimated to be around 3,406 m^2 based on above examination. However, as some information which is necessary for its design is unknown, 15% of the direct construction cost is included in the Project as a contingency in order to cover unexpected costs due to any change in design after detailed examination during the implementation stage.

(2) Maintenance Shop for Vessels

In order to repair and maintain the mechanical parts of the vessels owned by NIOMR, a maintenance shop for vessels is included in the Project. This shop can also be utilized for the maintenance of other equipment included in the Project. In addition, the shop can also function as storage for the spare parts and equipment of the vessels which are currently kept onboard.

1) Necessary equipment is shown as follows:

①	Electric welder	1 set
②	Gas cutter	1 set
③	Boring machine	1 set
④	Grinder	1 set
⑤	Lathe	1 set
⑥	Milling machine	1 set
⑦	Spot welding machine	1 set
⑧	Electric tools for carpentry and for metal work	1 set
⑨	Hand tools	1 set
⑩	Tools for electric work	1 set
⑪	Materials for repair	1 set

A moving hoist is installed on the ceiling of the maintenance shop for moving heavy materials.

2) Determination of Scale

The facilities are composed of a tool room, working space and storage. The tool room will be sized 8.5m x 9m = 76.5m^2, by taking into consideration the installation of the equipment and the requirement of working area. On the other hand, the working space will be an open space sized approximately 9m x 11.5m = 104m^2, used for repairs and maintenance of various kinds. As for the storage, it will be sized 9m x 3.5m = 31.5m^2, used to keep spare parts. A small administrative room will be provided with the object of controlling the access to the storage and the tool room, and it will be used to control the equipment and spare parts. Special attention will be paid to the ventilation of the working space and the tool room because they will not be provided with air-conditioning, and on the other hand special precautions to prevent pilferage will be taken in the storage.

4.3 Basic Plan

4.3.1 Site Layout Plan

(1) Site A

The construction site of the fishing technology laboratory building is a flat area of about 60m x 50m surrounded by NIOMR's headquarters building, the Technical Service Division and two roads of 7.0m and 8.0m in width. At a corner on the southwest side of the site stands a tree of about 80cm in trunk diameter and about 16m in foliage spread. This tree will not be felled. A 6m wide road (the road for construction) will be laid along two sides of the proposed construction site where there is no road yet to connect with the 7.0m wide road that leads from the front gate. The laboratory building will thereby be surrounded by roads on all four sides to facilitate the hauling of equipment, materials, etc. for its operation. As the wind predominantly blows from southeast to northwest throughout the year at this site, the fishing gear workshop, which will not be provided with an air-conditioning system, will be extended towards south on the south-north axis to secure ventilation. On the west side of the site, the flume tank room which does not require any window will be constructed to avoid the site being exposed to the westering sun. The entrance to the fishing technology laboratory building is planned at a place where it can be easily seen from the front gate of NIOMR and where it is convenient for traffic to and from the existing NIOMR headquarters. Also, as the existing generator equipment on the northeastern corner of the site generates a high level of noise which could disturb research activities, it will be relocated along with the oil tank as far as the seaside southeast of the compound, as a part of the work to be undertaken by the Nigerian side.

(2) Site B (Federal Fisheries School)

Existing facilities on this site are four two-story RC structure buildings (three buildings for classrooms and one building for practical training in machine operation), two single-story steel-

framed guest house buildings, etc. The Government of Nigeria's current request is to add a third floor including a mock-up bridge, classrooms, etc. on the southwestern corner of the roof of the classroom building on the south. However, as a result of investigating the structure and strength of the existing building, the addition of a third floor was judged to be impossible. Also, although it is best to construct the mock-up bridge on the southwestern tip of the site as it must be constructed at a location commanding a view of the sea so as to obtain the best educational effect, the only plot left there is the triangle-shaped plot on the southwestern tip which is too small to accommodate a building of the necessary scale. An additional three-story high classroom building will therefore be constructed on the northeastern side (which is currently used as a part of the athletic ground) of said classroom building. The drainage tank located on this site will be removed as a part of the work to be undertaken by the Nigerian side.

3) Site C

The cannery equipment and equipment for processing fish residue processing equipment included in this project will be installed on the ground floor of the present laboratory building of the Processing Section of the Fisheries Industry Division. Maintenance shop for vessel will be constructed on a site near the existing jetty for mooring of vessels. The parts to be repaired will be hauled by truck into the open space for working. As no air-conditioning system will be installed in these workshops, consideration will be given to the exposure of the buildings and location of windows to secure adequate ventilation. The jetty for mooring scheduled for modification in this project is located at the western tip of this site.

4.3.2 Building Element Design

In regard to building element design, it is necessary to give adequate consideration to local climatic conditions such as strong sunshine, high temperatures, high humidity, abundance of rainfall and harmattan that strike during the dry season, as well as to brine damage

as the site is located on the beach. In respect to maintenance and upkeep, every element will be planned to be as maintenance-free as possible while paying due consideration to ventilation, heat insulation, moisture prevention and dust prevention. Also, efforts will be made at energy conservation and creating an amenable and healthy environment.

The structure of every component will basically be reinforced concrete construction which is the building technique generally adopted in Nigeria. Steel frame construction which may be considered as another possibility is disadvantageous in terms of durability against brine damage and ease of maintenance. Principal components designed with due consideration to the above are as follows.

(1) Roof

Heat insulation of the roof surface is considered important for the fishing technology laboratory building and classroom buildings, so that synthetic rubber water proofing, on the heat insulating material will be placed.

As ventilation is considered more important than heat insulation for maintenance shop for vessel, it will have a sloped roof consisting of a wooden roof truss covered with corrugated asbestos slate to secure ventilation through the roof truss. Also, the projection of eaves canopy will be made large enough to protect this shop from sunshine and rainfall.

(2) External walls

Materials with superior heat insulating and water proofing properties which do not become easily soiled and which are easy to clean will be used. Specifically, besides reinforced concrete, locally produced bricks, concrete blocks, etc. will be adopted as appropriate. For some walls, hollow bricks and concrete hollow blocks will be used to secure ventilation.

(3) Window

To fully utilize natural light, large windows will be provided on the north and south sides. However, to avoid direct rays of the sun louvers and canopy to regulate sunshine will be provided as appropriate. As the site is close to the sea, steel fittings that are liable to corrode will not be used. Wooden fittings will not be used either. Instead, aluminum fittings will be adopted to prevent dust carried by harmattan. Iron grills to prevent burglary will be installed on the windows of some rooms where valuable things are kept.

(4) Ceiling

Ceilings of structures which will not be air-conditioned will be made adequately high to obtain a large interior air volume so that a more amenable environment may be secured under natural conditions. Appropriate materials will be used in accordance with the conditions required for each room, for example, cleanliness, moisture resistance, sound proofing.

(5) Partitioning wall

Basically, reinforced concrete, locally produced bricks, concrete blocks, etc. may be considered for use; but wooden partitions will be used for rooms that must consider future flexibility. Finishing materials for use in each laboratory will be selected with due consideration to water resistance, chemical resistance, heat resistance, fire resistance, etc.

(6) Floor

The floor of the ground level of the fishing technology laboratory building is planned to be about 80cm above the surface of the ground to facilitate drainage from the pit for installing the flume tank. It will also be effective in affording the necessary piping space for utilities and will facilitate future maintenance, too. It will also improve the ventilation underneath the flooring and prevent the

transmission of heat from the ground. In places that require waterproofing and/or chemical resistance, epoxy resin based coated flooring will be used as the finishing material, while in other places, terrazzo block, plastic tile, color cement, etc. will be used as appropriate.

4.3.3 Structural Design and Utility Design

This project aims at improving and reinforcing a number of NIOMR's functions, and just the buildings alone that are necessary will be divided as shown in the table below.

Table 4.6 Scale of the Facilities

Name of Building	Site	Floor Area (m^2)		
		Indoor Part	Outdoor Part	Total
Fishing Technology Laboratory	A	1,140.00	64.00	1,204.00
Class Rooms	B	324.48	11.61	336.09
Maintenance Shop for Vessel	C	112.00	104.00	216.00
Grand Total		1,576.48	179.61	1,756.09

As a consequence, utility work will become necessary for each of the buildings. Also, utility work such as electricity, water supply, drainage etc., will be necessary for the cannery equipment and equipment for processing fish residue. Hence, the structural design and utility design which are closely relevant to architectural construction will be discussed below.

(1) Structural design

As the construction sites are close to the sea, materials less susceptible to brine damage will be particularly selected for the principal structural members. The structural system will take into consideration the sureness of local work, durability, and ease of maintenance. For principal frames such as columns, beams and floor slabs, reinforced concrete structure which is the most popular structure in Nigeria will be adopted, and for walls, concrete block construction or brick masonry, the forms of which will be made as simple as possible.

Nigeria is distant from any active seismic area such as the seismic belt in the center of the Atlantic Ocean and no significant earthquake has ever been recorded in the past century. As for wind pressure, the maximum wind velocity is about 60 miles/hour according to the observation records of about the last 10 years at Ikeja which is close to the proposed construction site. Accordingly, the load for structural design mainly consists of the dead load and imposed load as the constant load, to which the effects of wind is added as the horizontal load. The area around Victoria Islands which is the project site, is located at the point of contact between the Lagos Lagoon and the Gulf of Guinea. As it is deemed to comprise a homogeneous ground formed over a long period by sedimentation of sand and estimated to have the allowable ground bearing strength of 5 to 8 t/m^2, the two to three story high buildings planned will be designed on the basis of spread footing.

As each of the country's architectural structure standards are based on the British Standards (BS), the same standards will be followed in this project. The structure of each building under this project will be briefly described below.

The fishing technology laboratory : All columns, beams and slabs shall be of solid reinforced concrete structure. Since every ordinary laboratory, the flume tank room and fishing gear workshop are respectively different in span, height and in other respects, they will be treated as different buildings in terms of structure.

Classrooms : All columns, beams and slabs will be of reinforced concrete structure.

Maintenance shop for vessel : Columns and beams will be of reinforced concrete structure, while the roof will be of wooden structure.

As the loads acting on the buildings, the following will be considered.

1) Dead load : Actual load of members comprising the elements of a building such as the structural members, finishing materials, etc. will be calculated.

2) Live load : Ordinary rooms such as office rooms, classrooms shall basically conform to BS.CP3, Chapter V. If there is any special load, figures will be calculated according to the actual situation. Imposed loads for principal rooms shall be as follows:

Office room : 4.0 KN/m^2
Classroom : 3.0 KN/m^2

As special loads, flume tank, hoist, crane will be taken into consideration.

3) Wind pressure : The basic wind speed will be assumed to be approximately 70 miles/hour (30m/sec).

4) Seismic force : Will not be considered.

For concrete as a structural material, ordinary Portland cement will be used. A concrete plant will be installed on the site where measurement and mixing will be performed. As sea sand collected in the vicinity of Badagri in Nigeria is highly likely to be used, the use of rust preventives will be planned. Reinforcing steel bars used will mainly be imported from Japan.

(2) Utility design

1) Air conditioning and ventilation installation

a) Air conditioning

In the fishing technology laboratory and the classrooms, cooling equipment will be installed in rooms that require air-conditioning. The air conditioning systems will be planned as follows based on the overall judgement that they will allow a reduction in the cost of maintenance and operation, and be easy to operate daily.

① Package type cooler (direct blowing) : Flume tank room

② Window type cooler : Model net fabricating room, classroom for extension service, data room, fishing gear materials, testing room, fishing gear laboratory, fishing methods laboratory, office room, darkroom, fishing gear designing room, lecturer's room (in the classroom building).

b) Ventilation

The following three types of ventilation equipment are planned in consideration of the purpose of each room.

① Propeller fan mounted to the ceiling

ⓐ The fishing technology laboratory

Model net fabricating room, classroom for extension service, data room, fishing methods laboratory, fishing gear workshop, fishing gear materials testing room, fishing gear laboratory, office room, fishing gear designing room.

ⓑ Classroom

Classroom, lecturer's room, mock-up bridge, chart room.

② Ducted fan, or ventilating fan mounted on the wall

ⓐ The fishing technology laboratory

Flow velocity control room, darkroom, kitchen.

ⓑ Maintenance shop for vessel

Tool room

③ Localized ventilation

ⓐ Experimental cannery equipment

ⓑ Equipment for processing fish residue

2) Water supply and drainage installation

a) Water supply

Water supply facilities consist of ordinary fresh water supply facilities, and sea water supply facilities to fish tanks, etc. The water distribution system of each is as follows.

① The fishing technology laboratory

ⓐ Freshwater supply system

The existing deep well will be utilized by replacing its deep well pump with a new one to lift the water into the existing sedimentation tank. After passing through a filter, the water will go through the reservoir tank on the ground and be lifted into the elevated water tank by the lifting pump and supplied by gravity feed. Water will be disinfected by chlorination before being lifted into the elevated water tank.

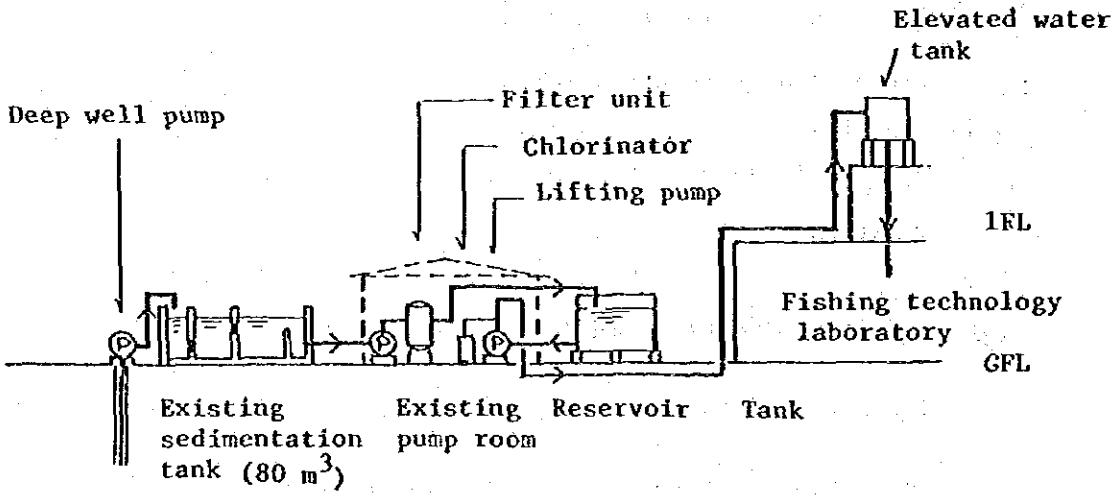


Fig. 4.4 Freshwater Supply Diagram

ⓑ Sea water supply system

Sea water supply system will be installed in order to supply sea water to the water tanks in the fishing method laboratory. Sea water carried from the sea by water tank lorries will be transferred to the underground sea water reservoir tank, then lifted into the elevated sea water tank by the lifting pump and supplied by gravity feed.

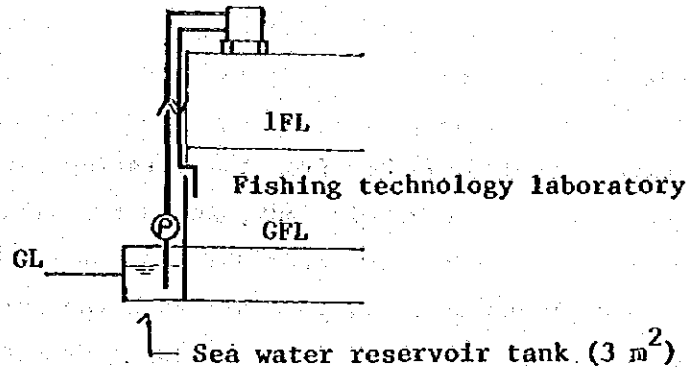


Fig. 4.5 See Water Supply System Diagram

② The classrooms

ⓐ Water supply system

A water pipe will be branched from the existing water inlet pipe and connected to the elevated water tank. And then water will be supplied to lavatories and a wash basin by gravity feed.

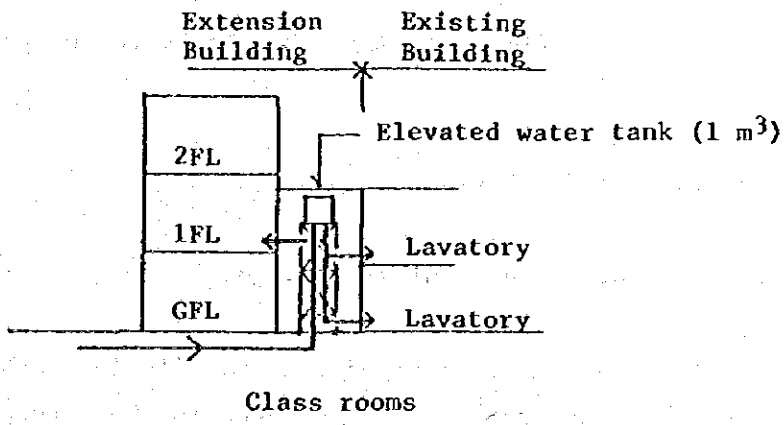


Fig. 4.6 Water Supply System Diagram

③ Experimental cannery, equipment for processing fish residue, and maintenance shop for vessel

ⓐ Water supply system

A water pipe will be branched from the existing water inlet pipe and connected to the reservoir tank, and water will be pumped up into the elevated water tank, from which water will be supplied to the necessary places by gravity feed. Existing water supply pipes on the ground floor of the existing building of the Processing Section of the Fisheries Industry Division, in which the canned product manufacturing equipment will be installed, will be improved in part.

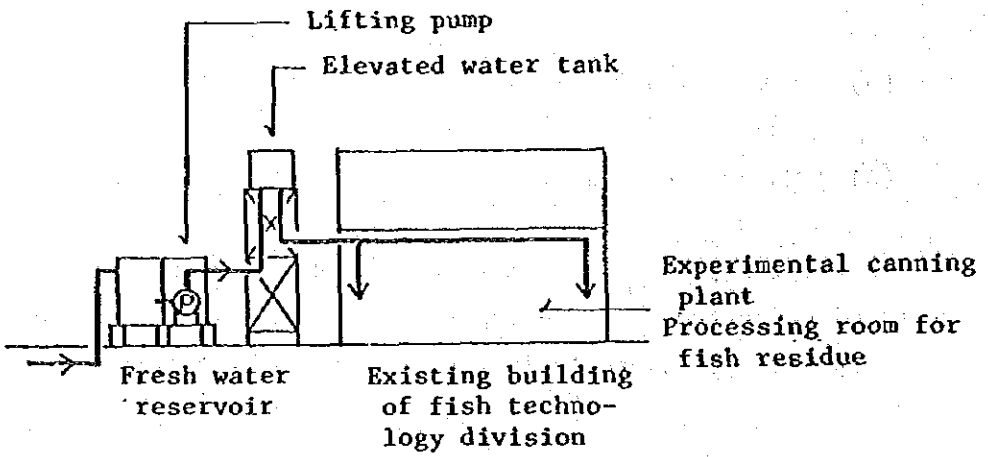


Fig. 4.7 Water Supply System Diagram

b) Drainage installation

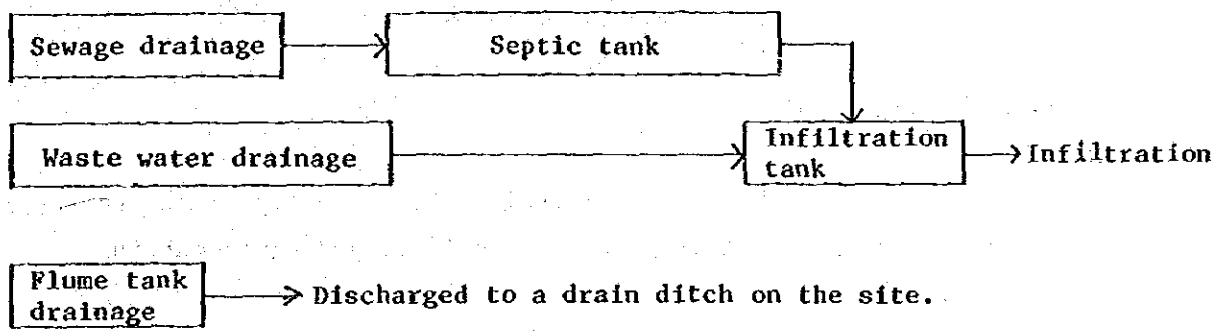
① Treatment of sanitary sewage

Sanitary sewage discharged from the fishing technology laboratory and the classrooms will be treated in their respective treatment tanks of the septic tank system and allowed seep into the ground through the infiltration tank. Accompanying the dismantling of the existing treatment tank of the classrooms, existing drain pipes will be improved or repaired.

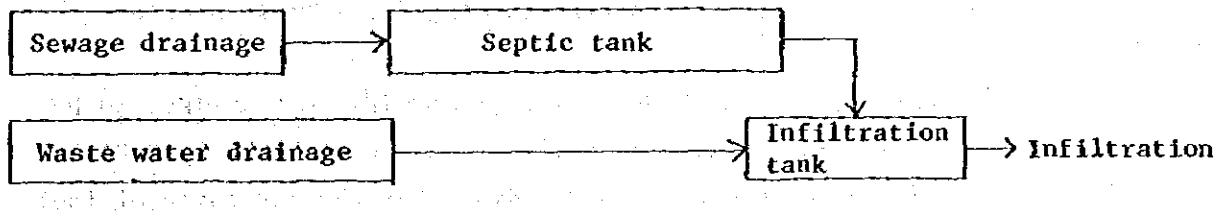
② Treatment of waste water

Waste water discharged from the fishing technology laboratory and the classrooms will be directly led into the infiltration tank of their respective building and seeped into the ground. And waste water discharged from the flume tank inside the fishing technology laboratory will be discharged through a separate system into the side gutter of the existing road within the site. Effluent from the experimental cannery and equipment for processing fish residue will be treated in the grease trap installed outside the building and then discharged into the sea.

ⓐ Fishing Technology Laboratory



ⓑ Classrooms



ⓒ Experimental Canning Plant

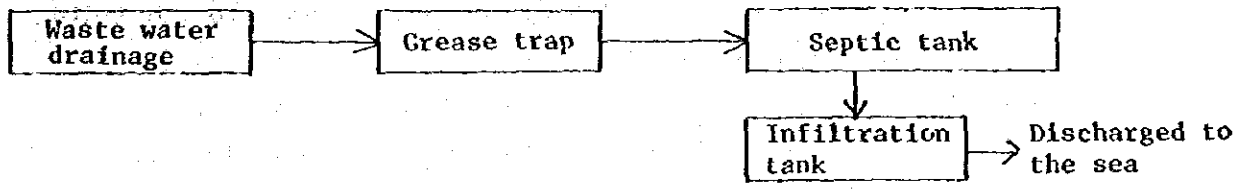


Fig. 4.8 Drainage System Diagram

c) Hot water supplying facility

An electric hot water heater with storage tank will be installed in the pantry of the fishing technology laboratory.

d) Sanitary fixtures

Necessary sanitary fixtures will be installed in the lavatories, wash rooms and the like in each building.

e) Steam supply

A steam boiler will be installed inside the existing building of the Processing Section of the Fisheries Industry Division to supply steam to the experimental cannery.

f) Fuel oil supply

Outdoor oil tanks will be installed at necessary places to supply fuel oil to the power generator, boiler, and equipment for processing fish residue.

3) Electrical installation

a) Power receiving and transforming facilities

① At present, a three phase, three wire system 11KV, 50 Hz power is supplied to the substantion of NIOMR by NEPA. The installed capacity is 200 KVA. For the extension of facilities included in this project, the existing substation, and the main power board will be modified. The power will be distributed to the fishing technology laboratory building by underground cable.

② The Federal Fisheries School and the building which accommodates the Processing Section of the Fisheries Industry Division are receiving three-phase, four wire system, 400V, 50 Hz electric power from the underground cable. Because some spare capacity is available, the existing power board will be modified so that power can be distributed from it to locations which will newly require power as new extensions under this project.

b) Generator

Because power failure occurs every day during the peak hours in the proposed project area, a 310 KVA generator is connected to the existing facilities. In view of this, a generator will be installed for each facility reinforced by this project to secure the necessary power supply during blackouts.

c) Power mains

Power will be supplied from substation and the generator equipment to each facility via the aerial cable, except the fishing technology laboratory building to which power will be distributed via the underground cable. Existing electric poles in the places where power is distributed via the aerial cable will be utilized wherever possible.

d) Lighting and convenience outlet

Lighting fixtures and plug sockets in each building will be supplied with power from the distribution board installed in each building, and evey branched circuit will be protected with a circuit breaker. Gound fault interrupters will be used on circuits to the power outlets of rooms such as the fishing methods laboratry where the floors may possibly become wet with water. For wiring, the methods generally used in Nigeria will be employed. Lighting fixtures used in principal rooms shall be

fluorescent lamps. The standard intensity of illumination in each room shall be as follows.

ⓐ	Study rooms, classrooms and laboratories	400 lux
ⓑ	Office rooms and conference rooms	300 lux
ⓒ	Fabricating rooms and working rooms	200 lux
ⓓ	Corridors, lavatories, etc.	100 lux

e) Telephone and interphone installation

Since NIOMR does not now have any spare capacity in telephone circuits and installation of new telephones is difficult, no telephone conduit will be laid. Even if telephones should be installed in the future, they can be readily accommodated in view of the structure of each building. For internal communications, a duplex transmission type interphone system will be installed in each principal room in the laboratory building and the lecturer's room in the classroom building, and be connected with the interphones in existing facilities.

f) Antennas

Antennas for receiving television and radio broadcasts will be provided, and outlets will be set up in necessary places.

g) Lightening arrester

A lightening arrester will be set up on top of the elevated water tank, installed on the Fishing Technology Laboratory.

h) Automatic voltage regulator (AVR)

As some of the equipment in the laboratories will be greatly affected by fluctuations in voltage, AVR will be provided for such equipment. Also, in order to secure their functions even at time of power failure, a small power failure free power source will be installed.

i) Alarm bell

An alarm bell system will be installed in the laboratory building. Bells and push buttons will be installed at necessary places in the corridors.

Table 4.7 Building Component Design

(1) Fishing Technology Laboratory (2) Class Rooms (3) Maintenance Shop for Vessel

Work Item	Examined Aspect	Material, Specification & Construction Method				Cause of Adoption
		A	B	C	D	
Roof		Synthetic Rubber Water-proofing concrete-backing	Corrugated Asbests slate	Zinc-galvanizing Iron-slate		C will be not adopted considering salt-resistance becaise the site is close to sea-shore. A will be adopted in laboratory building and class room building, considering heat insulation.
	Water-proofing	o	o	o		
	Salt-resistance	o	o	x		
	Heat-resistance	Δ	o	x		
	Weather-resistance	o	o	x		
	Heat-insulation	Δ	x	x		
	Workability	Δ	o	o		
	Local-Material	x	o	o		
	Cost	(a)	(c)	(b)		
	Adoption	(1) (2)	(3)			
External walls		Exposed Concrete Paint-finished	Bricks, mortar backing, Paint-finished	Concrete-Block morter-Backing Paint-finished	Hollow-Concrete Block, Paint-finished	C, which is most common and economical type in Nigeria, will be adopted in the main. A will be adopted in transverse wall where reinforced concrete is indispensable from the structural reason. B will be adopted in the walls that required to be thin. D will be adopted in the walls that require ventilation and do not require air-tightness.
	Water-proofing	o	o	o	Δ	
	Salt-resistance	o	o	o	o	
	Heat-resistance	o	o	o	o	
	Durability	o	o	o	o	
	Heat--insulation	Δ	o	o	x	
	Local-Material	o	o	o	o	
	Cost	(a)	(b)	(c)	(d)	
	Adoption	(1) (2)	(1) (2)	(1) (2) (3)	(1) (2) (3)	
Windows		Aluminium Sash (made in Japan)	Aluminum Sash (made in Nigeria)	Wooden Sash	Steel Sash	D will be not adopted. For reason of the site is close to seashore. C also will not be adopted by reason of harmattan in dry season. A will be adopted in view of cost.
	Water-proofing	o	Δ	x	x	
	Salt-resistance	o	o	Δ	Δ	
	Heat-resistance	o	Δ	o	x	
	Durability	o	o	o	o	
	Heat--insulation	o	o	Δ	Δ	
	Local-Material	x	o	o	o	
	Cost	(b)	(a)	(d)	(c)	
	Adoption	(1) (2) (3)				

Note: (a) Expensive (b) A little expenensive (c) A little cheap (d) Cheap

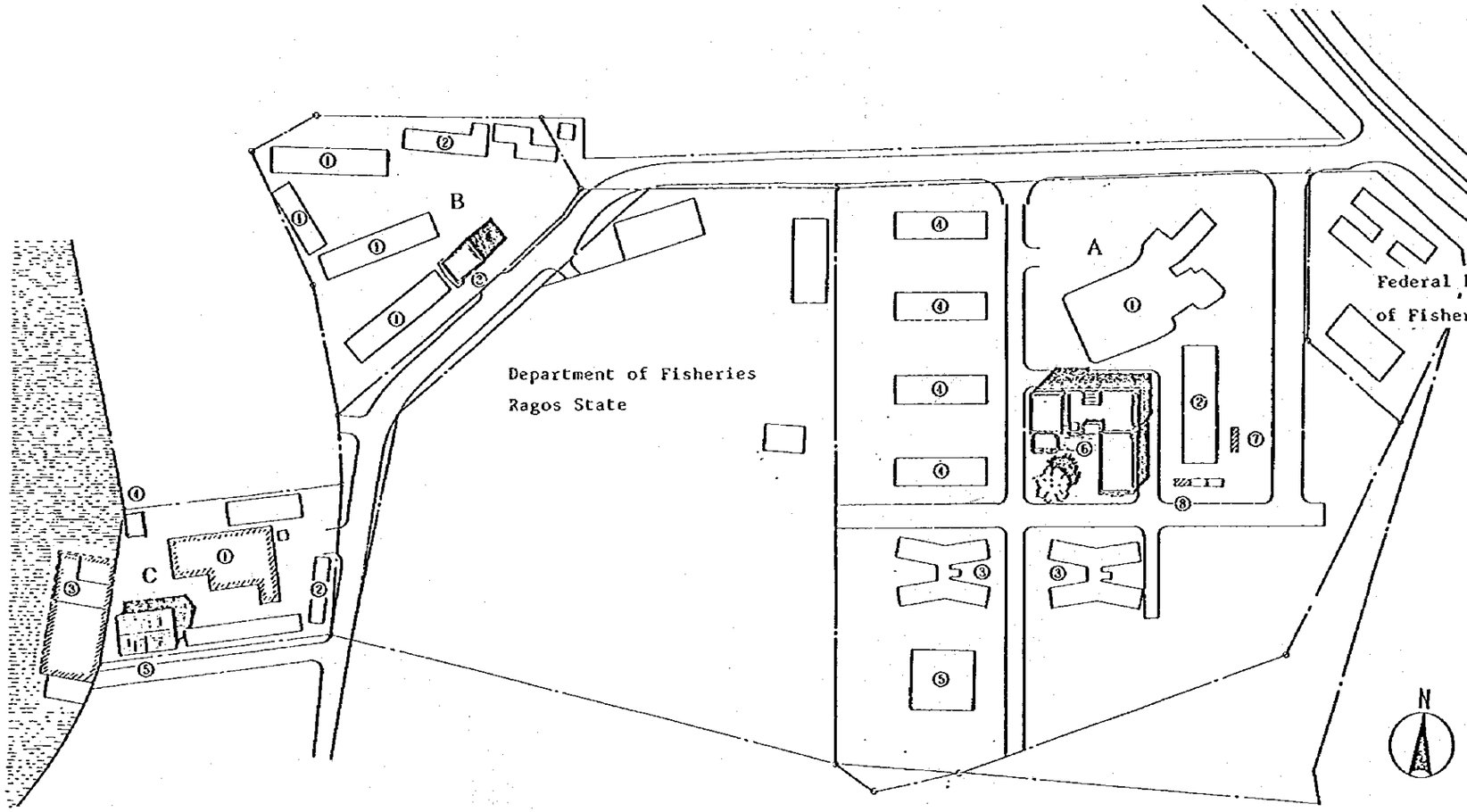
(1) Fishing Technology Laboratory (2) Class Rooms (3) Maintenance Shop for Vessel

Work Item	Examined Aspect	Material, Specification & Construction Method				Cause of Adoption
		A	B	C	D	
Ceiling		Exposed Concrete, Paint-finished	Rock Wool stand-Absorbing board	Asbestos board, Paint-finished	Gypsum board, Paint-finished	A will be used in the Fishing Method Laboratory room, because abundant water shall be used there and it'll be required cleanliness. B will be used in extension room that requires sound absorption. C will be used in maintenance shop for used that requires humidity resistance.
	Appearance	o	o	o	o	
	Moisture-resistance	o	x	o	Δ	
	Durability	o	o	o	Δ	
	Sound-absorption	x	o	x	Δ	
	Cleanliness	o	x	o	Δ	
	Local-Material	o	x	x	x	
	Cost	(d)	(a)	(b)	(c)	
	Adoption	(1)	(1) (2)	(1) (2)	(1)	
Partitioning wall		Exposed Concrete, Paint-finished	Bricks, Mortar Backing, Paint-finished	Wooden frame-Work board backing, Paint-finished	Concrete Block Mortar backing, Paint-finished	D which is the most common and economical type in Nigeria, will be adopted in walls that required thin thickness wall. C will be adopted in individual office considering flexibility in the future.
	Appearance	Δ	o	o	o	
	Water-proofing	o	o	Δ	o	
	Durability	o	o	Δ	o	
	Impact-resistance	o	o	x	o	
	Sound-insulation	o	o	Δ	o	
	Cleanliness	o	o	Δ	o	
	Local-material	o	o	x	o	
	Cost	(a)	(b)	(c)	(d)	
	Adoption		(1) (2)	(1)	(1) (2) (3)	
Floors		Terrazzo Block	Synthetic Resin Coated Floor (EPOXY TYPE)	Mortar hardener finishing	Plastic tile	B wil be used in flume tank room in view of cleanliness and resistance against chemicals. A will be used in entrance lobby, corridors and staircase. D will be used in Laboratory room and class room and C will be used in corridors of class room building and maintenance shop for vessel.
	Appearance	o	o	Δ	o	
	Water-proofing	o	o	o	Δ	
	Abrasion-resistance	o	o	Δ	Δ	
	Impact-resistance	Δ	o	o	o	
	Chemicals-resistance	x	o	Δ	x	
	Cleanliness	Δ	o	x	Δ	
	Local-Material	x	x	x	x	
	Cost	(b)	(a)	(d)	(c)	
	Adoption	(1)	(1)	(2) (3)	(1) (2)	

Note: (a) Expensive (b) A little expenensive (c) A little cheap (d) Cheap

4.4 Basic Design Drawings

1.	Site and Plot Plan		1/2,000
2.	Ground Floor Plan for Fishing Technology Laboratory		1/200
3.	1st Floor Plan	Ditto	1/200
4.	Roof Plan	Ditto	1/200
5.	Elevations -1	Ditto	1/200
6.	Elevations -2	Ditto	1/200
7.	Sections	Ditto	1/200
8.	Classrooms		1/200
9.	Maintenance Shop for Vessel		1/200
10.	Experimental Cannery and Fish Residue Processing Equipment		1/200
11.	Electric Supply System		1/1,400
12.	Fresh Water and Sea Water Supply System		1/1,400
13.	Drainage System		1/1,400
14.	Improvement of Jetty		1/400



New Building

Improvement of Building

Site A
Existing Buildings
① Administration Administration Division
Fishing Resource Div.
Fish Economics & Statistic Div.
Oceanography Div.
Library
② Technical Service Division
Vessel Operation Section
③ Federal Fisheries School Dormitory
④ Flat
⑤ Dining Hall
New Buildings
⑥ Fishing Technology Laboratory
⑦ Deep well & Filter Tank Room
⑧ Sedimentation Tank

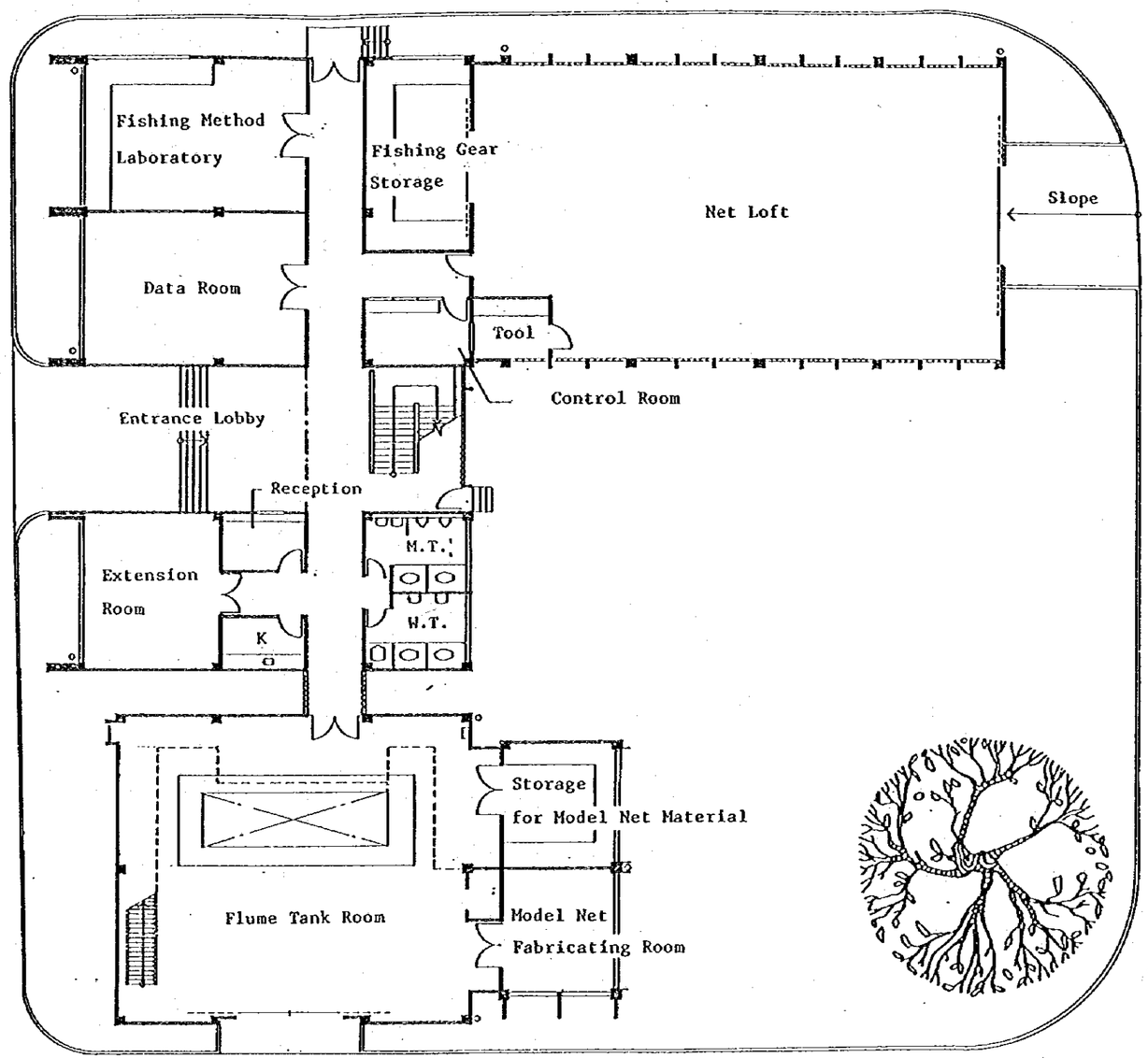
Site B
Existing Buildings
① Classrooms & Offices
② Guest House
New Buildings
③ Mock Bridge & Classrooms

Site C
Existing Buildings
① Fish processing Factory & Office
Fishing Industry Div.
② Office Extension Research Liason Div.
③ Jetty
④ Fish meal Plant
New Building
⑤ Maintenance Shop for Vessel

1/2000

1

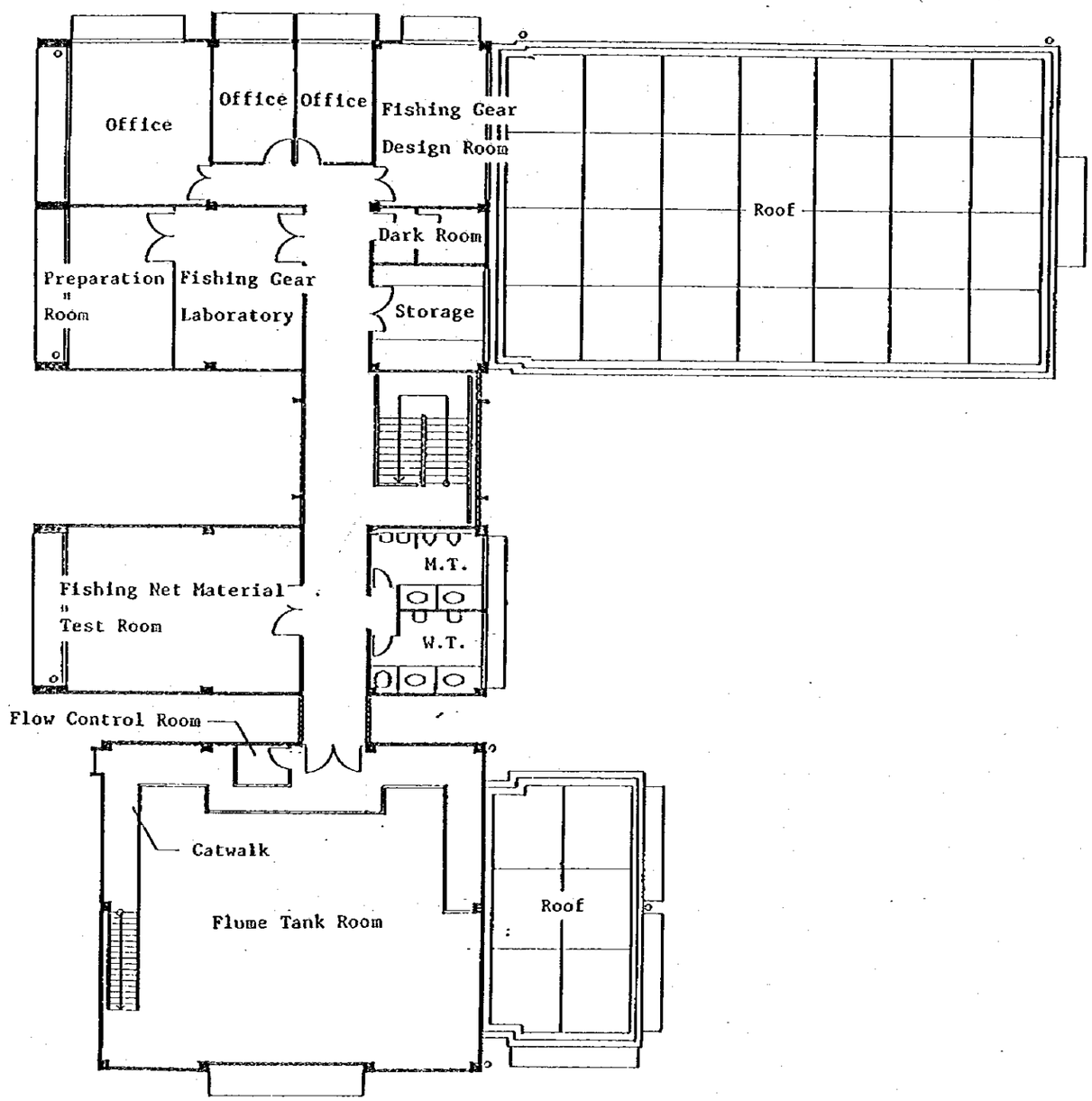
SITE & PLOT PLAN

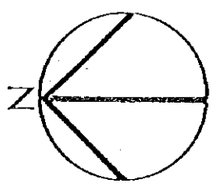


GROUND FLOOR PLAN
FISHING TECHNOLOGY LABORATORY

2

1/200

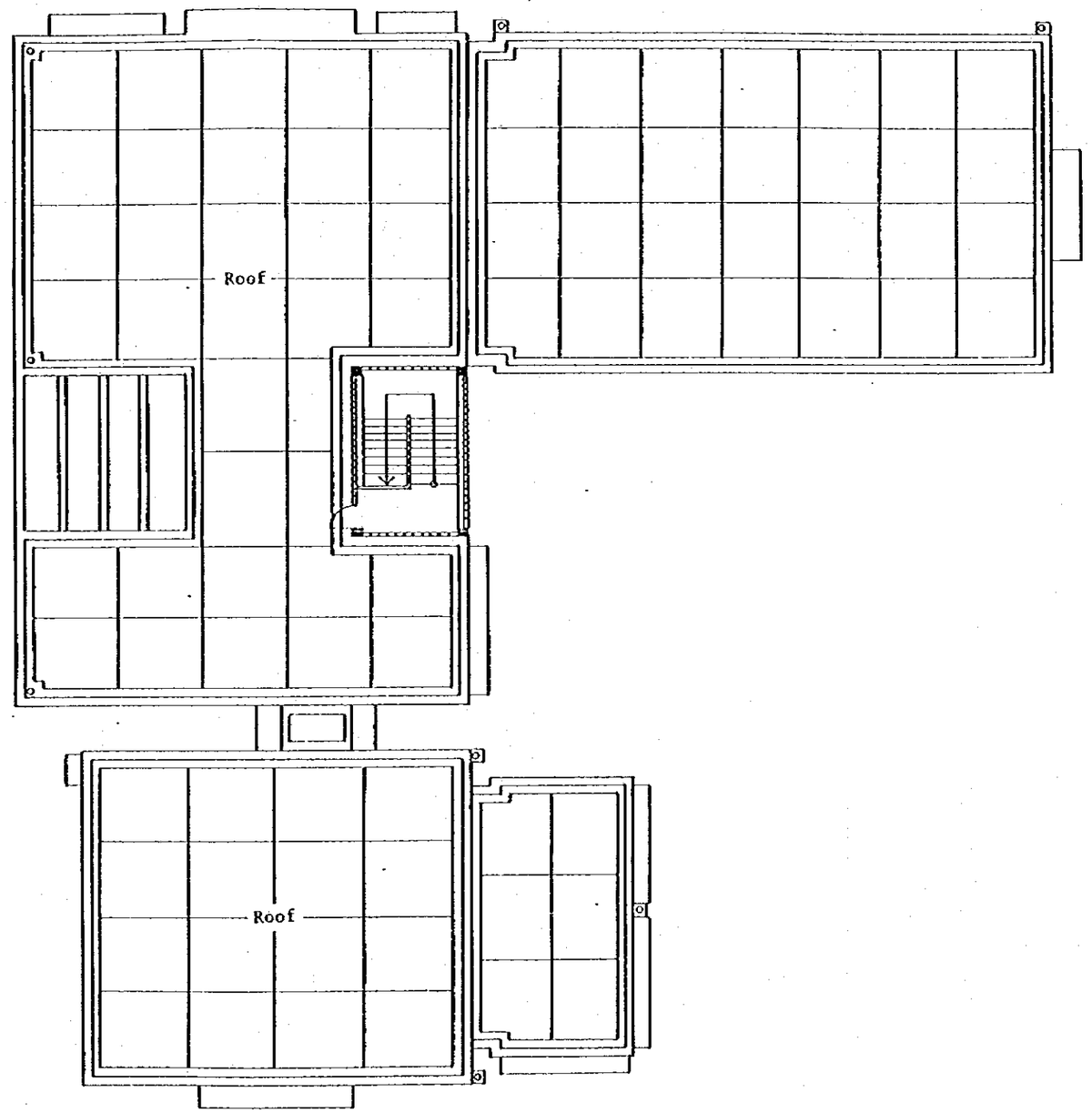




0 1 5 10 M

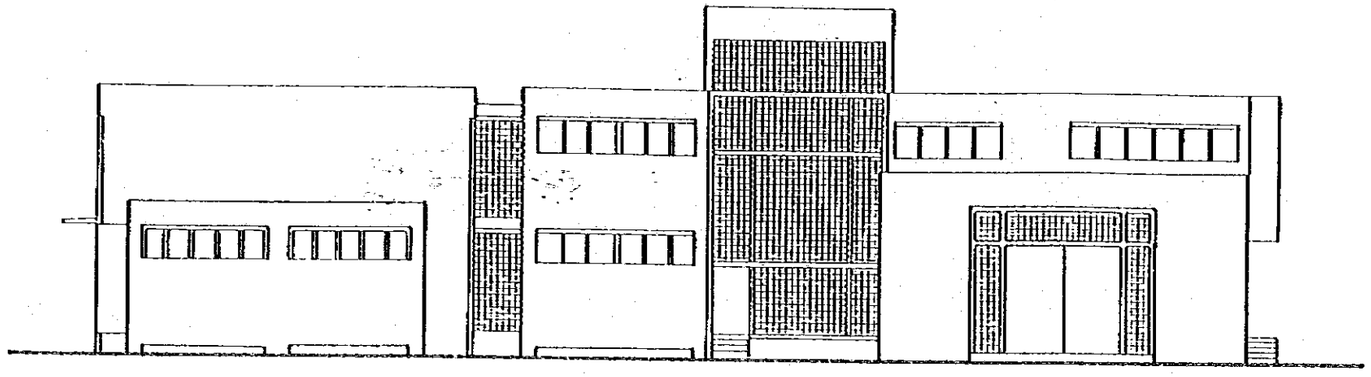
1ST FLOOR PLAN 3

FISHING TECHNOLOGY LABORATORY 1/200

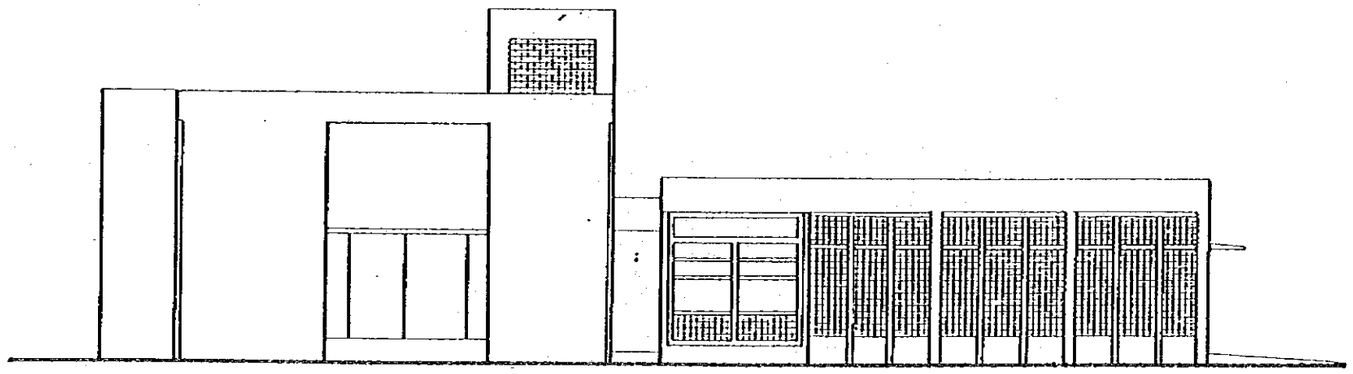


4

ROOF PLAN
FISHING TECHNOLOGY LABORATORY 1/200



WEST ELEVATION



NORTH ELEVATION

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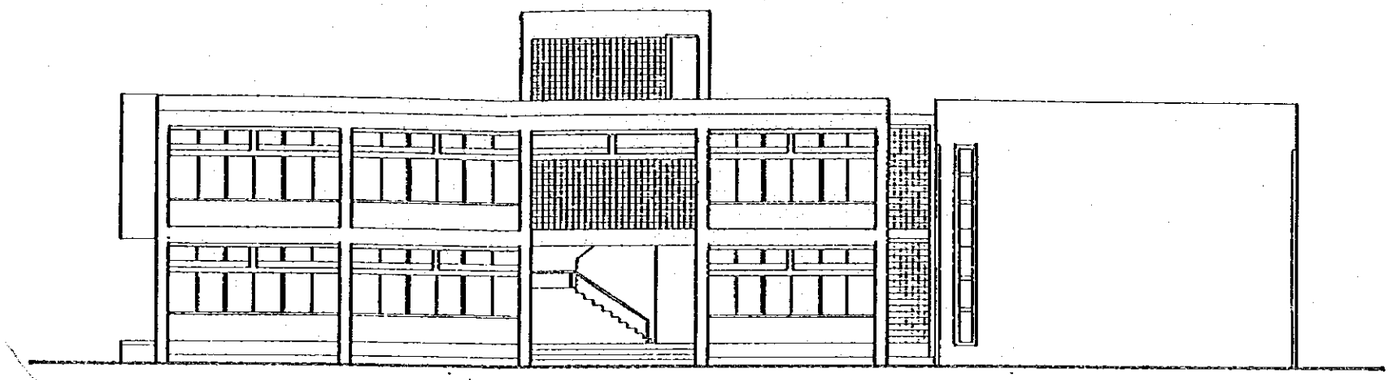
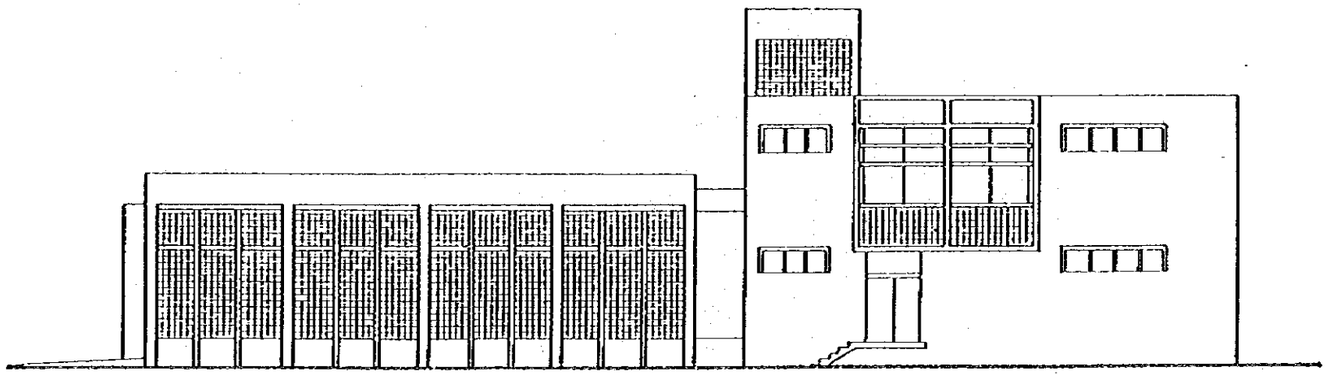
5

ELEVATION - 1

FISHING TECHNOLOGY LABORATORY 1/200



SOUTH ELEVATION



EAST ELEVATION

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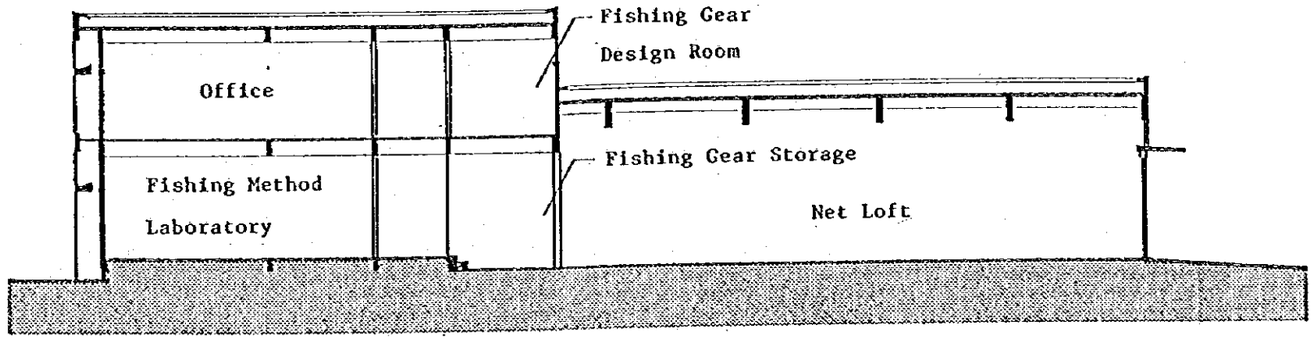
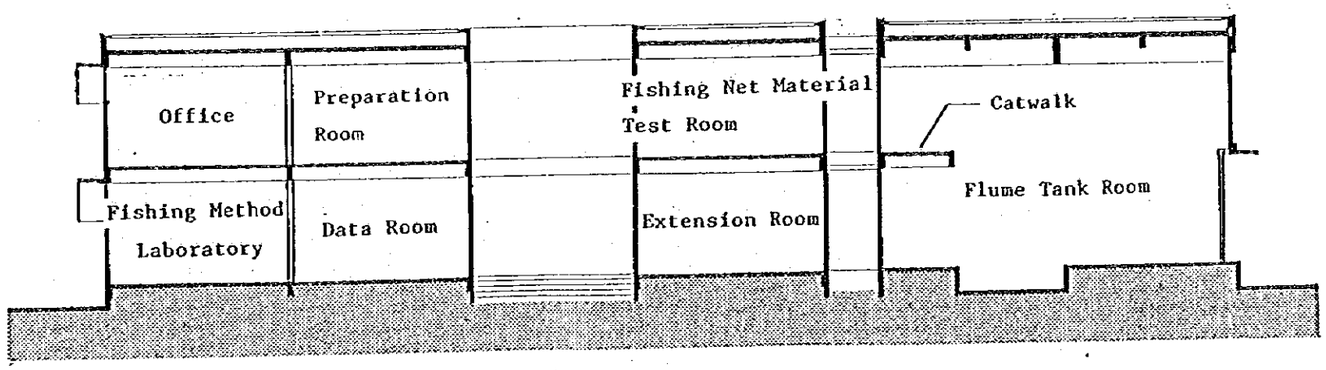
ELEVATION - 2

FISHING TECHNOLOGY LABORATORY 1/200

6



SECTION



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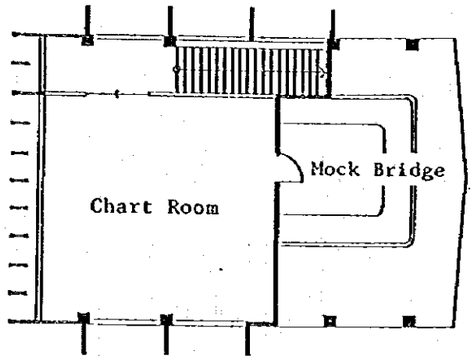
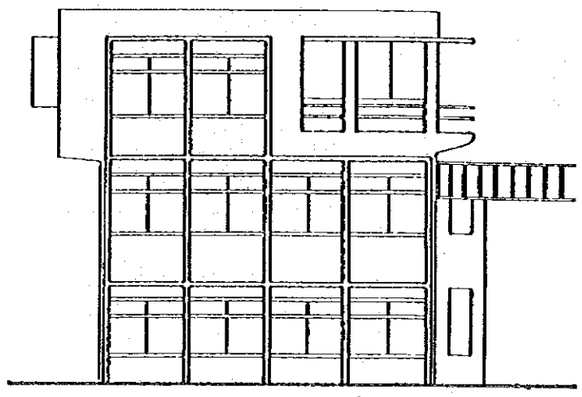
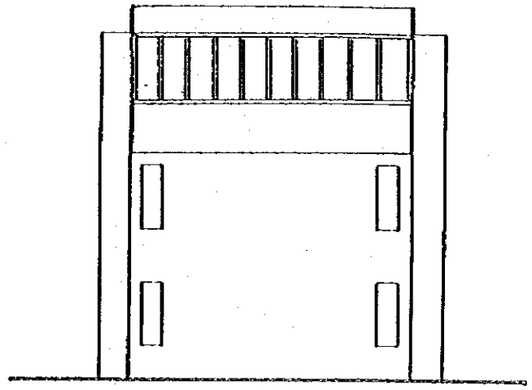
SECTION
FISHING TECHNOLOGY LABORATORY 1/200



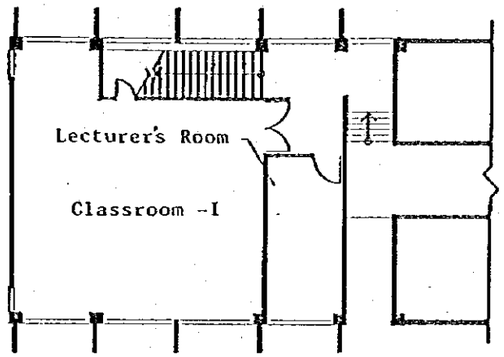
2ND FLOOR PLAN



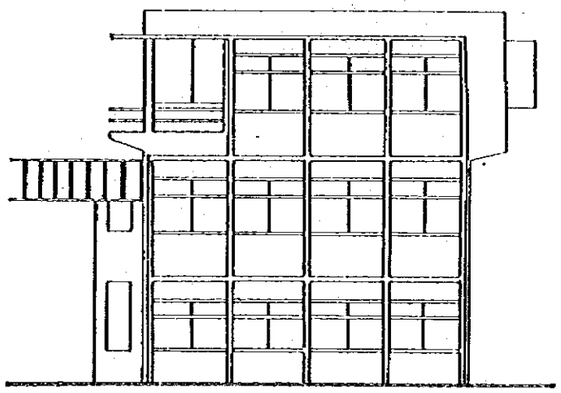
NORTH ELEVATION



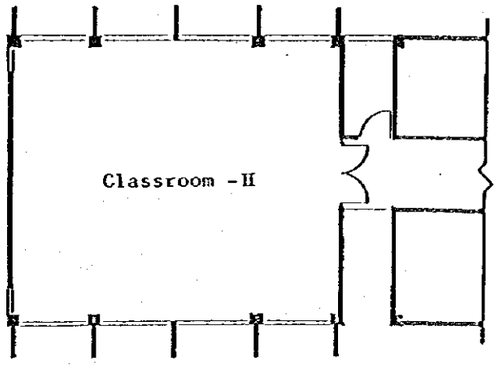
EAST ELEVATION



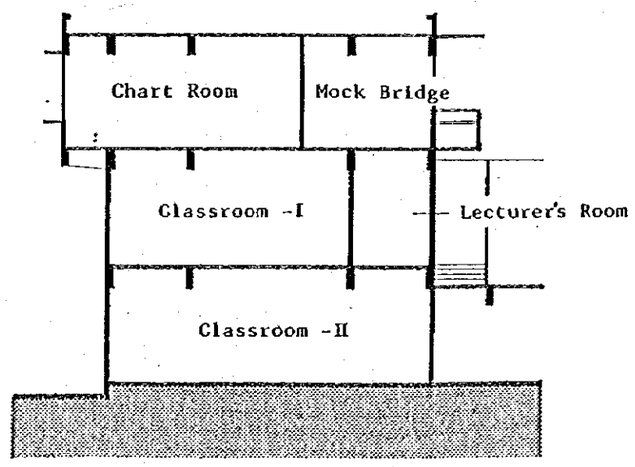
1ST FLOOR PLAN



SOUTH ELEVATION



GROUND FLOOR PLAN



SECTION

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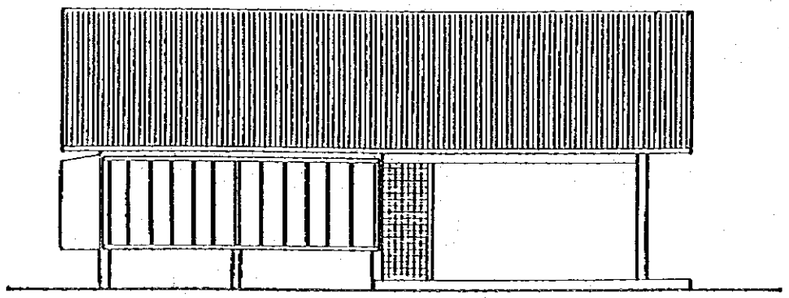
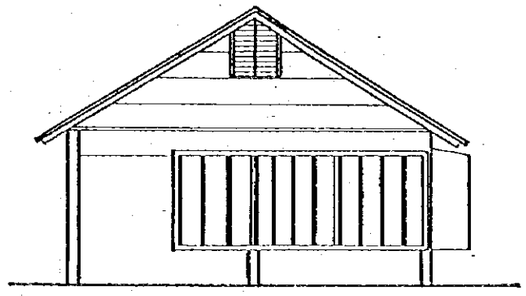
8

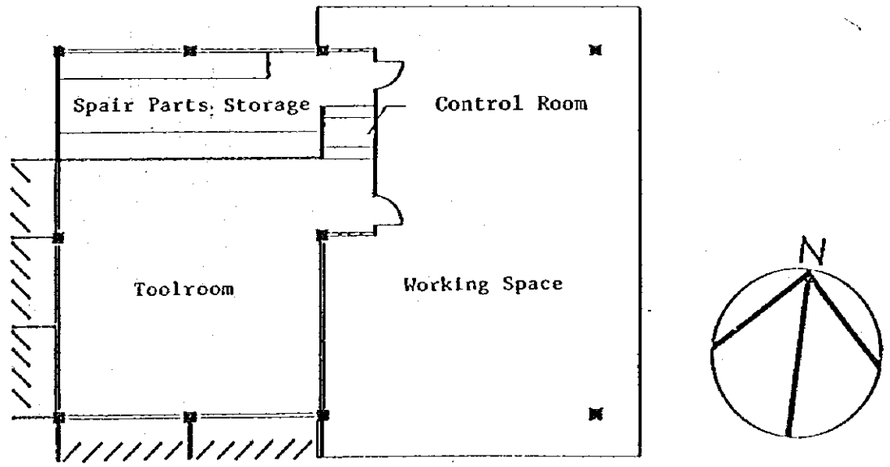
CLASS ROOMS 1/200



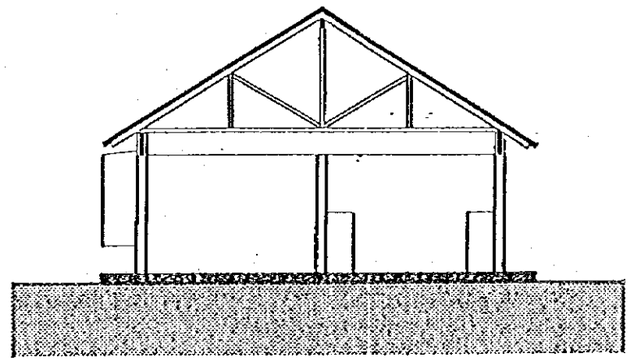
SOUTH ELEVATION



WEST ELEVATION



PLAN



SECTION

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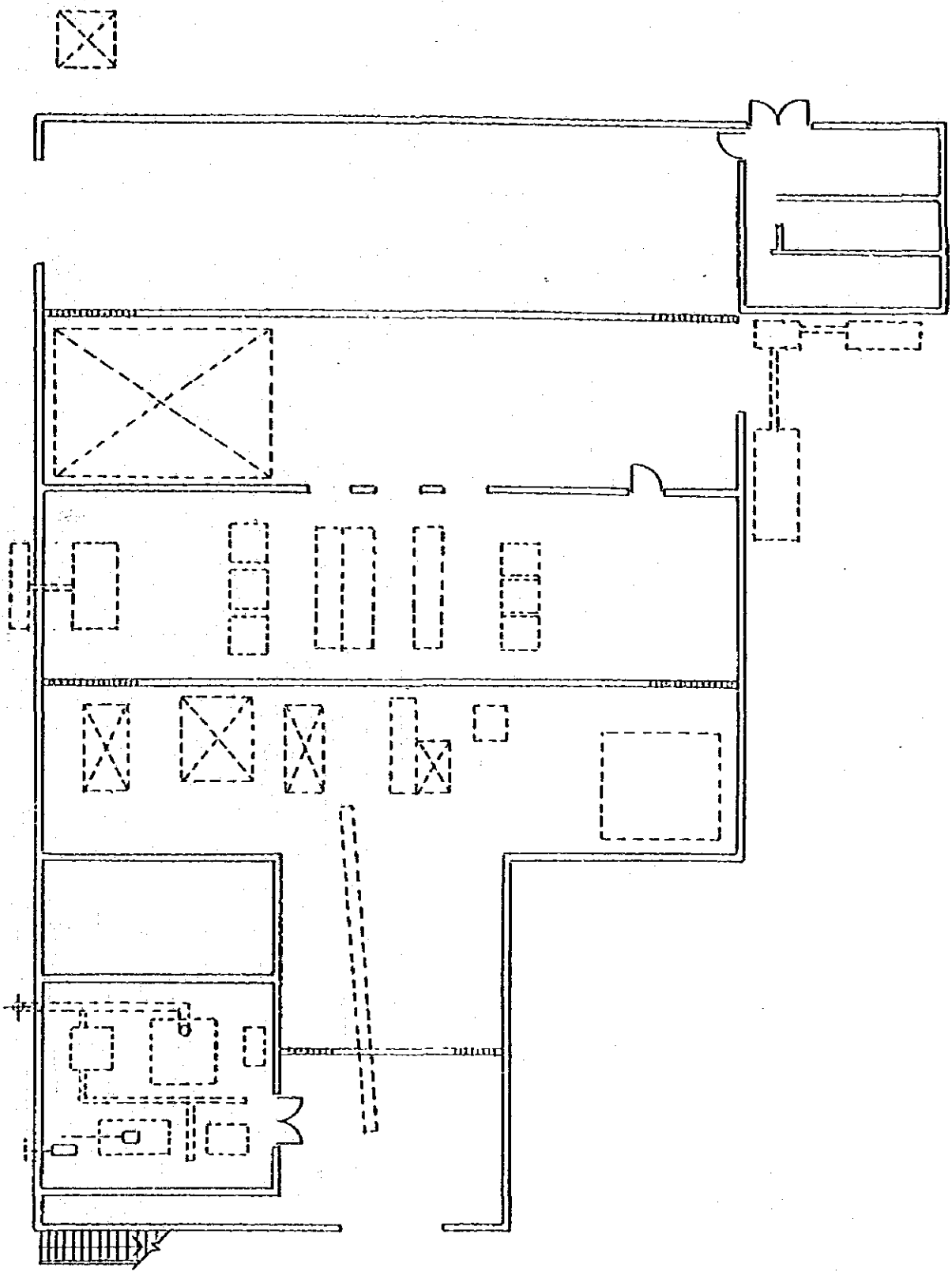
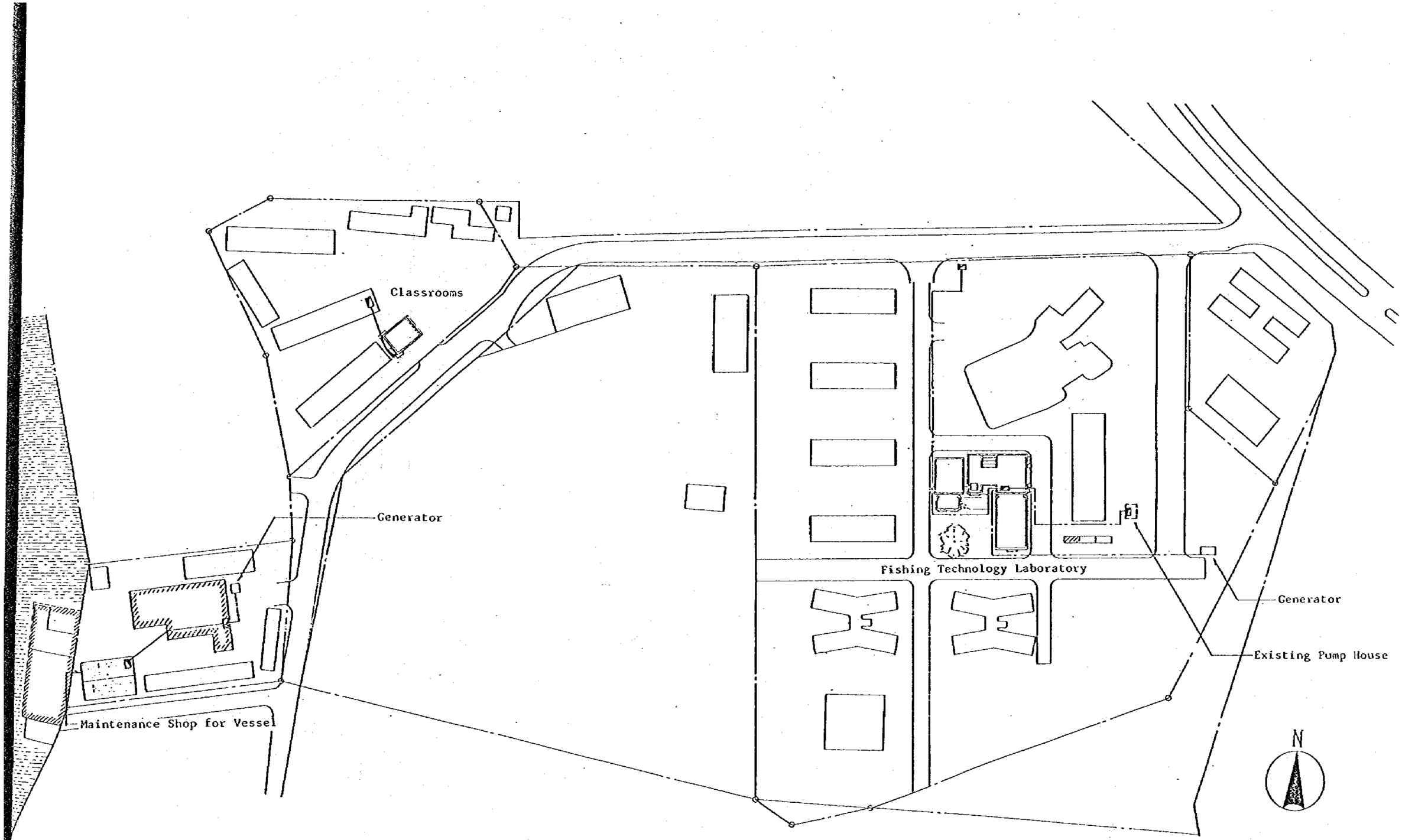
9

MAINTENANCE SHOP FOR VESSEL 1/200



10

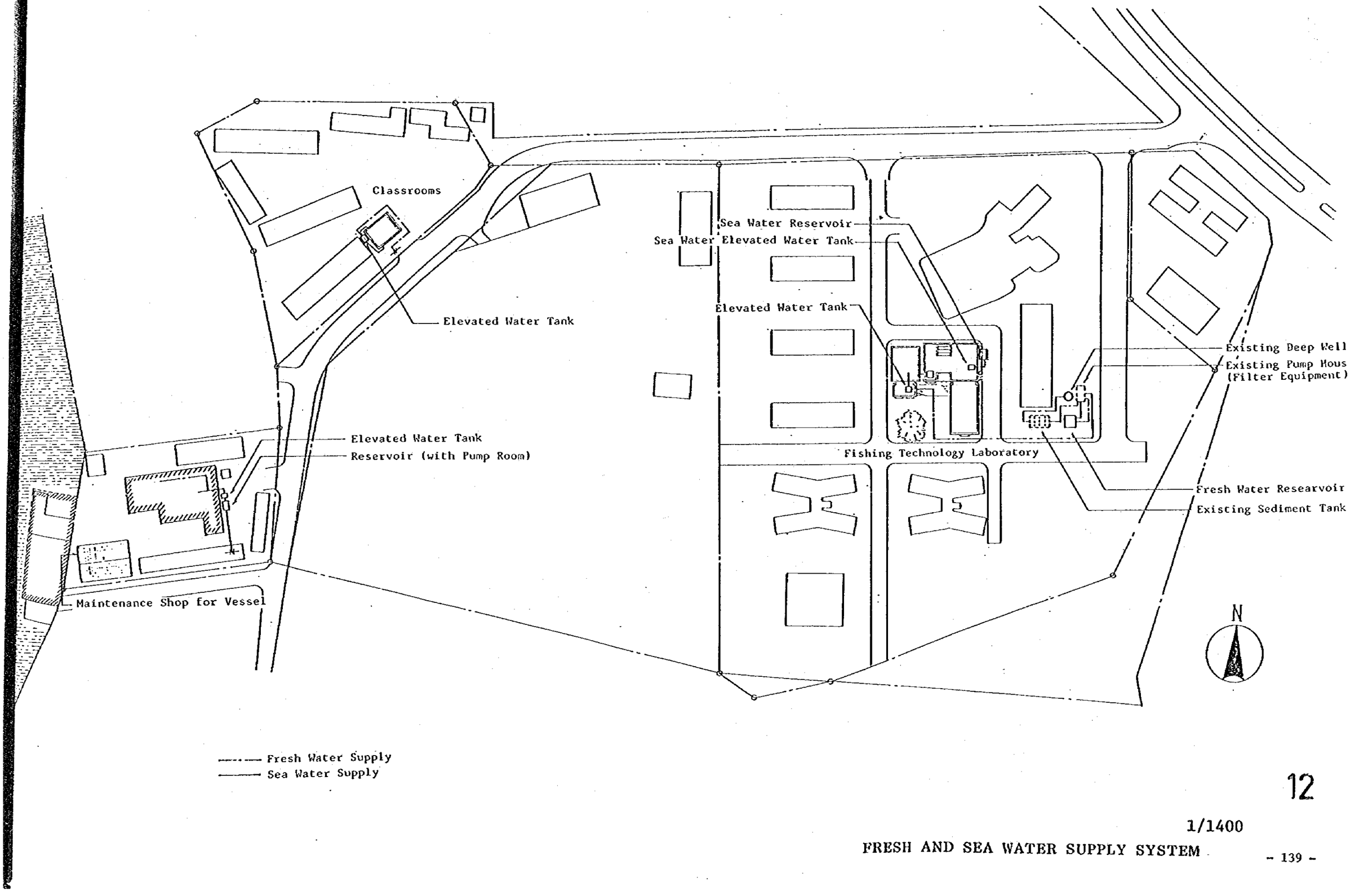
EXPERIMENTAL CANNERY &
FISH RESIDUE PROCESSING EQUIPMENT 1/200



11

ELECTRIC SUPPLY SYSTEM

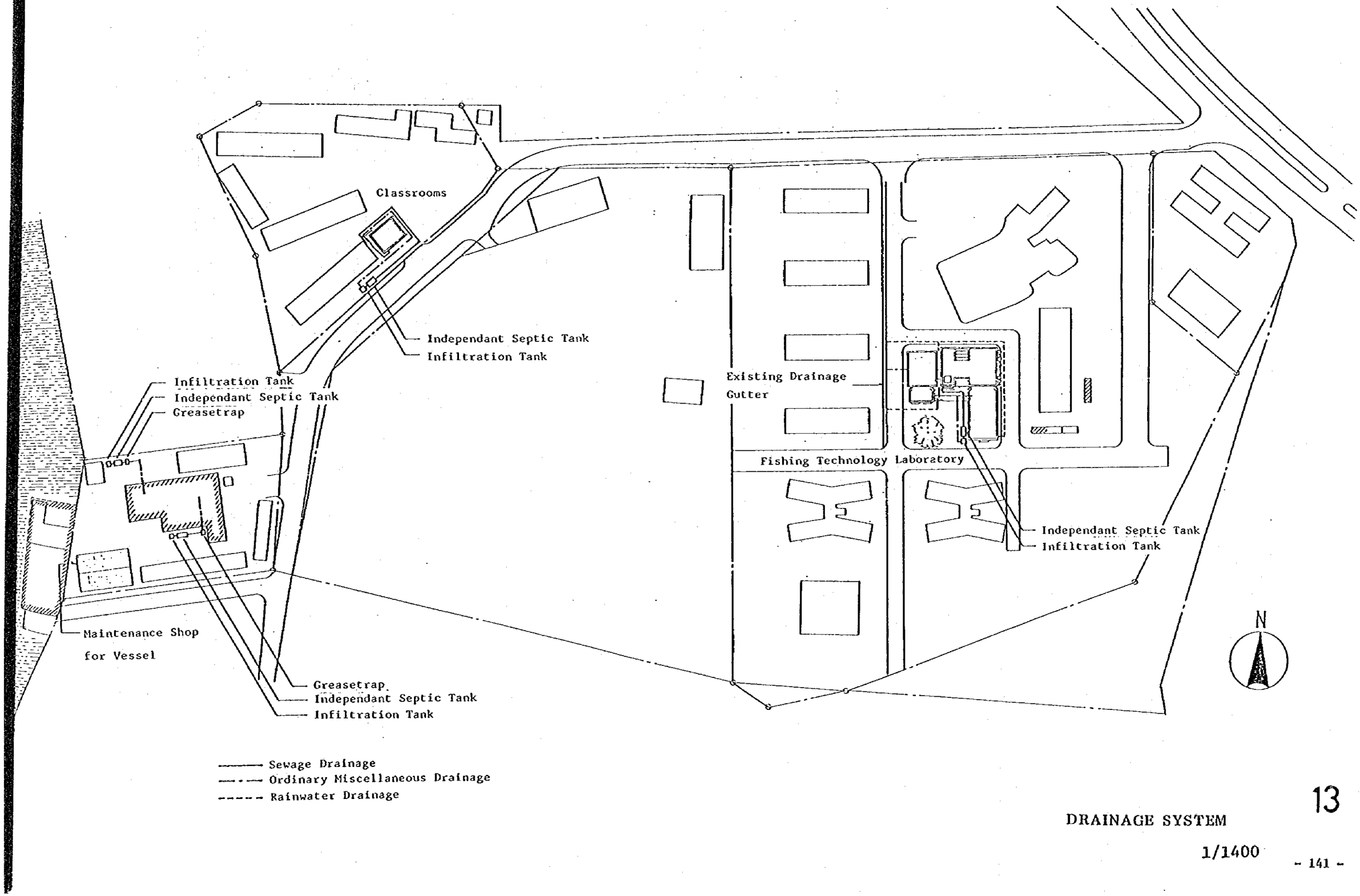
1/1400



12

1/1400

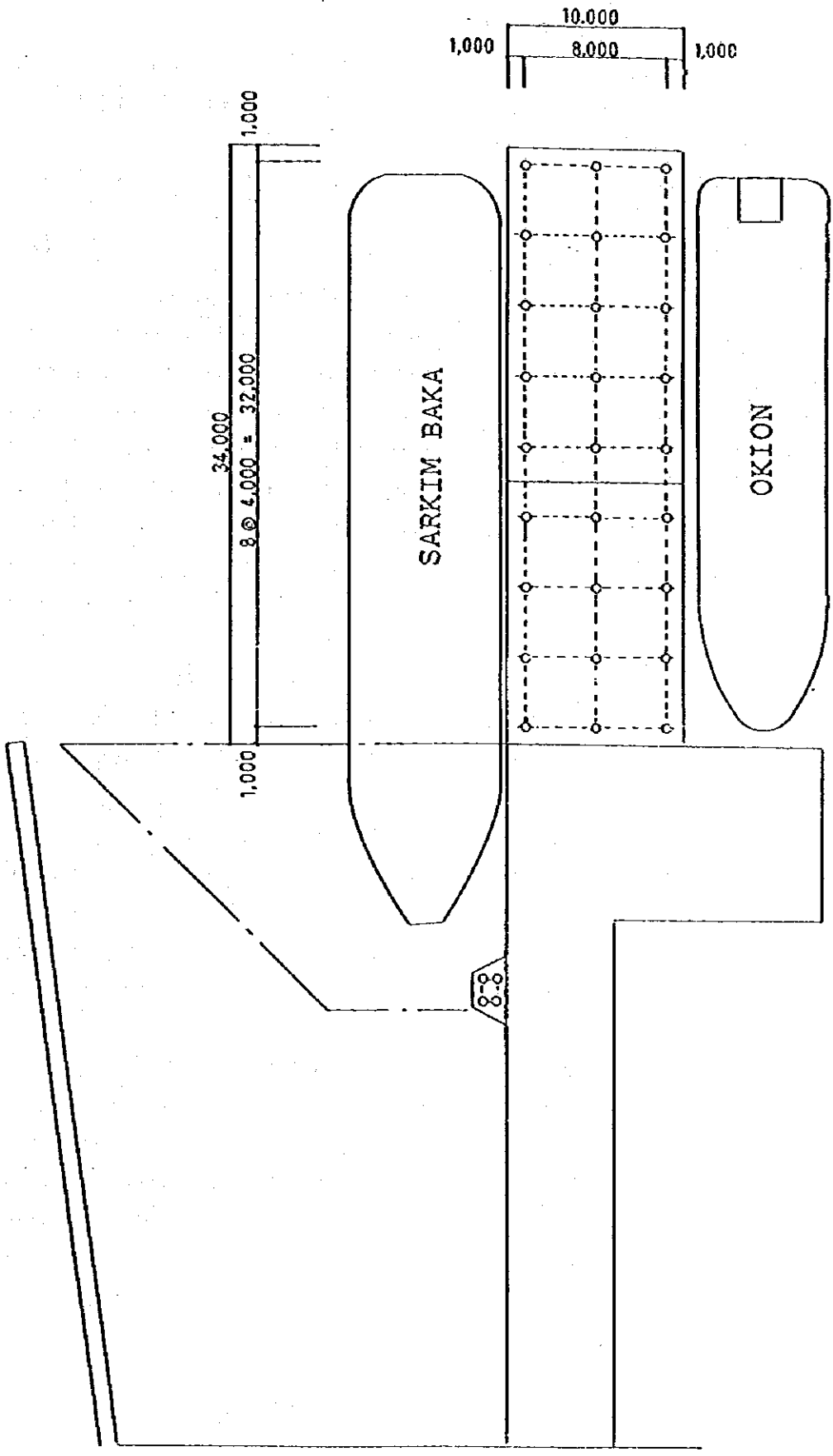
FRESH AND SEA WATER SUPPLY SYSTEM



13

DRAINAGE SYSTEM

1/1400



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IMPROVEMENT OF JETTY 1/400

4.5 Implementation Schedule

4.5.1 Situation of the Construction Industry and Work Execution Schedule

The technical level of the construction workers in Nigeria is not so high in general and furthermore there is shortage of skilled workers. Whenever particularly good quality of construction work is desired in Nigeria, the foremen and/or a group of skilled workers who have had the experience of training in the industries of Europe or the U.S.A. are normally employed in order to make up for the above mentioned manpower and technical deficiencies and to have them supervise the skill and the work of the local workers to secure the required level of work.

In this project also the supervisor should be assigned and it is considered necessary to send a technician from Japan as the supervisor depending on the field of the works.

The construction materials in Nigeria are mostly imported because local materials are available only in limited types and usable materials are scarce. Therefore, it is particularly important to compute accurately the period required from the order to the delivery to the site in every procurement of such materials.

The construction work execution schedule of this project is made taking into account the work capability of the local workers, the required time for the procurement of the imported materials and the weather conditions at the site. The implementation schedule will be prepared accordingly.

4.5.2 Scope of the Construction Work

The scope of the work to be undertaken by the government of Nigeria and the government of Japan are listed below.

Table 4.8 Scope of the Construction Work

		Nigeria	Japan
Infrastracture	Site Clearing and Leveling	Ground leveling, felling and unrooting of vegetation should be finished before the start of the work, in accordance with the Construction of the road accessing the existing facilities, replacement of the existing Generator and septic tank.	Road; parking lots, street lamps and drying places in the blocks of the buildings to be provided by Japan.
	Water Supply	Laying work of water supply main pipe up to the water reserve tank to be constructed by Japan.	Installation of water reservoir tank, pumping equiment and elevated water tank, water supply facilities to each project facilities.
	Drainage		Drainage facilities of all buildings to be provided to by Japan.
	Electric Power Supply	Lead up to the power receiving and transforming facilities, cost of the required formalities; and supply of power to the facilities borne by Nigeria. Formalities with the Nigeria authorities regarding power receiving and substation and sharing of leading cost.	Power receiving and subsequent transmission systems up to each facility.

Table 4.7 Scope of the Construction Work

	Nigeria	Japan
Building		Fishing Technology Laboratory Classrooms Maintenance Shop for Vessel
Jetty		Improvement of the existing jetty
Equipment		Installation of equiment and demonstration
Furniture and Figgints	Furniture	Equipment directly necessary for research and equipment such as laboratory tables, chair, bookshelf, locker, etc.
Transportation of Construction Material and Equipment	Customs clearance on the ocean of the landing, tax exemption measures obtaining Import License and incured costs.	Packing, insurance, shipping, Ocean transportation, landing in the port of Lagos and land transportation of the equipment to the site supplied by Japan.
Others	To be advising commission of A/P and payment of commission for the banking services based upon the B/A. To accord Japanese consultant and contractor such facilities as may be necessary for their entry into Nigeria and stay there in for the performance of their work.	

4.5.3 Supervision Scheme

(1) Supervision Scheme

After the conclusion of the construction contract, the project manager and the resident supervisor should go to the construction site in order to give the contractor instructions pertaining to the construction and conduct consultations and agreements for the work schedule together with the necessary arrangements for the various procedures.

After the commencement of the construction work, the resident supervisor should be stationed at the project site permanently to supervise the work progress. Moreover, the supervisor should present periodic reports on the state of the work to the Embassy of Japan in Nigeria and related agencies of the government of Nigeria, and should take the initiative to coordinate the views of the parties concerned with this project, including the contractors, and facilitate communications and understanding among them.

The project manager and the engineers in charge of the structure, utilities and equipment and jetty should go to the project site during the various stages of the work in order to carry out on-the-spot supervision.

The resident supervisor should be stationed at the work site until the completion of the delivery procedure of the completed facilities and equipment.

The actual work of supervision will be executed by paying utmost attention to the natural conditions, customs and systems in Nigeria, taking into account the technical level of the local workers. The construction supervision is aimed at achieving smooth progress and successful results in the construction and to complete it within the prescribed period of time.

The implementation schedule should be made after the detailed examination of each work step taking into account the construction techniques and capacity of the local industries as well as the required period for the construction materials procured in Japan to be delivered to the site. Based on the results of the above examination the schedule will be adjusted and finally approved.

The items of supervisory works in connection with this project are listed below.

1) Advice and Guidance for Construction Contract

To examine the qualification of the bidders, to prepare the bidding procedure and carry it out , to evaluate the detailed statements of the bidders, to select the contractor, to attend at the signing of the construction contract.

2) Inspection and Approval of Construction Drawings and related Documents

To inspect and approve the construction drawings, samples of materials and equipment etc. submitted by the contractors

3) Instructions Regarding and Inspection of the Construction Work

To examine the construction plan and work schedule and give instructions regarding them, to identify and give instructions regarding the progress of the work, to conduct inspections required during the construction work.

4) Approval of Payment

To inspect and verify the amount of the work completed that is required for payments to be made during and after the completion of the work and to issue the approval for payment

5) Construction Progress Report

To present periodic reports on the progress of the work to the owner and the government of Japan agencies concerned in order to facilitate the smooth execution of the work shared by both Japan and Nigeria

6) Delivery of Facilities and Equipments

To attend at the formalities to deliver the facilities and equipment in conformity with the contract after verifying the satisfactory completion of the work according to the contracted conditions and to complete the supervisory work with the issuance of the certificate of acceptance of the owner.

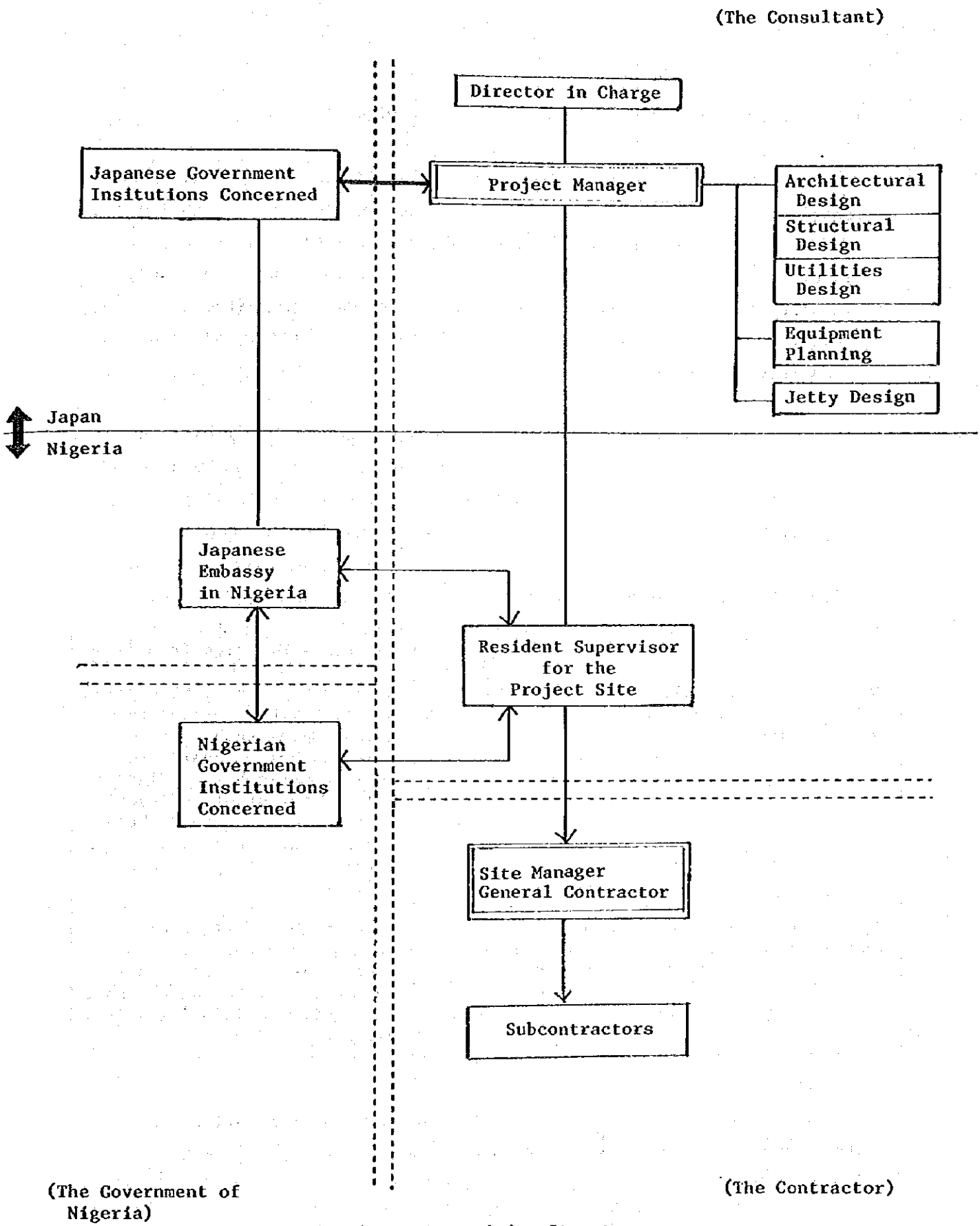

Fig. 4.23 Supervising Structure

4.5.4 Procurement Plan for Materials and Equipment

Among the construction materials available in Nigeria, those locally manufactured are not so abundant and are limited to such items as sand, gravel, reinforcing bar, cement, concrete blocks, bricks, slate, wood, plywood and tiles etc., in the construction sector, and PVC pipes, hume pipes, wiring materials for low-tension systems, sanitary fixtures in connection with utility installation. All other items rely on imports.

The main construction materials required in this project are recommended to be procured by the following procurement plan because there are some problems in the quality and supply of the locally manufactured products.

Table 4.9 Procurement Plan for Construction Materials and Equipment

	Materials Procured in Nigeria	Materials Procured from Japan
For Building Construction	Gravel, Sand, Rubble, Clay brick, Concrete block	Reinforcing steel, Structural steel, Plywood for concrete forms, Metal sash and door, Cement asbestos board, Rock wool acoustic board, Plastic tile, Water proofing layer, Iron board, Grating Manhole cover, Heat insulating material paint, porcelain tile, glass.
For Machine Installation	PVC conduit, Switch, Convenience outlet partly to illuminate equiment	Wire, Lighting fixtures, Panal, Generator, PVC, pipe, Valve, ERP Reservoir tank and elevated water tank, Pump, Air-conditioning units, Air blower, etc.

None of the materials and equipment for the various examinations and study in this project are manufactured in Nigeria and procurement from Japan is scheduled.

4.6 Implementation Schedule

The detailed design and the construction supervision of this project will be executed by the consultants from Japan.

Under the consultants, Japanese firms will carry out the required tasks such as the procurement of the materials and equipment, construction of the facilities, manufacture of the materials and equipment, procurement, transportation and installment.

The implementation of this project will be executed under the supervision and control of the governments of Nigeria and Japan.

After the signing of the official exchange note for the grant-in-aid between the government of Japan and Nigeria, the consultants will conclude the consulting services contract with the Nigerian Institute for Oceanography and Marine Research (NIOMR, the executive agency of the project) Federal Republic of Nigeria and undertake the work of the detailed designing.

In this project there is an additional study for the designing of the pier which requires three months for the design. Therefore, the designing will be undertaken in consultation with the government of Nigeria.

After the completion of the detailed design, the contractor will be determined by a bidding process executed under the Japanese Grant Aid scheme. The successful bidder will receive the evaluation of the details of the quotation and conclude the construction contract after the adequacy of the quotation is verified. This bidding procedure will require about 1.5 months.

After the contract is concluded between the government of Nigeria and the awarded contractor, the procurement of the construction materials and manufacture of the materials and equipment will start.

At the inception of the work, the contractor should prepare detailed drawings and obtain approval from the consultants for the drawings. The procured materials and equipment are to be transported to Nigeria and utilized for the construction. The materials and equipment procured in Japan and transported to Nigeria as well a the services should be tax exempted in Nigeria because they are to be utilized for the project under the grant aid program but it is assumed difficult to expect such exceptional arrangements for this matter in view of the recent severe import restriction policy in Nigeria.

In this project the executive agency will obtain from the government of Nigeria the import permission in the most expedient manner and import the materials and equipment as well as the services required for this project without delay.

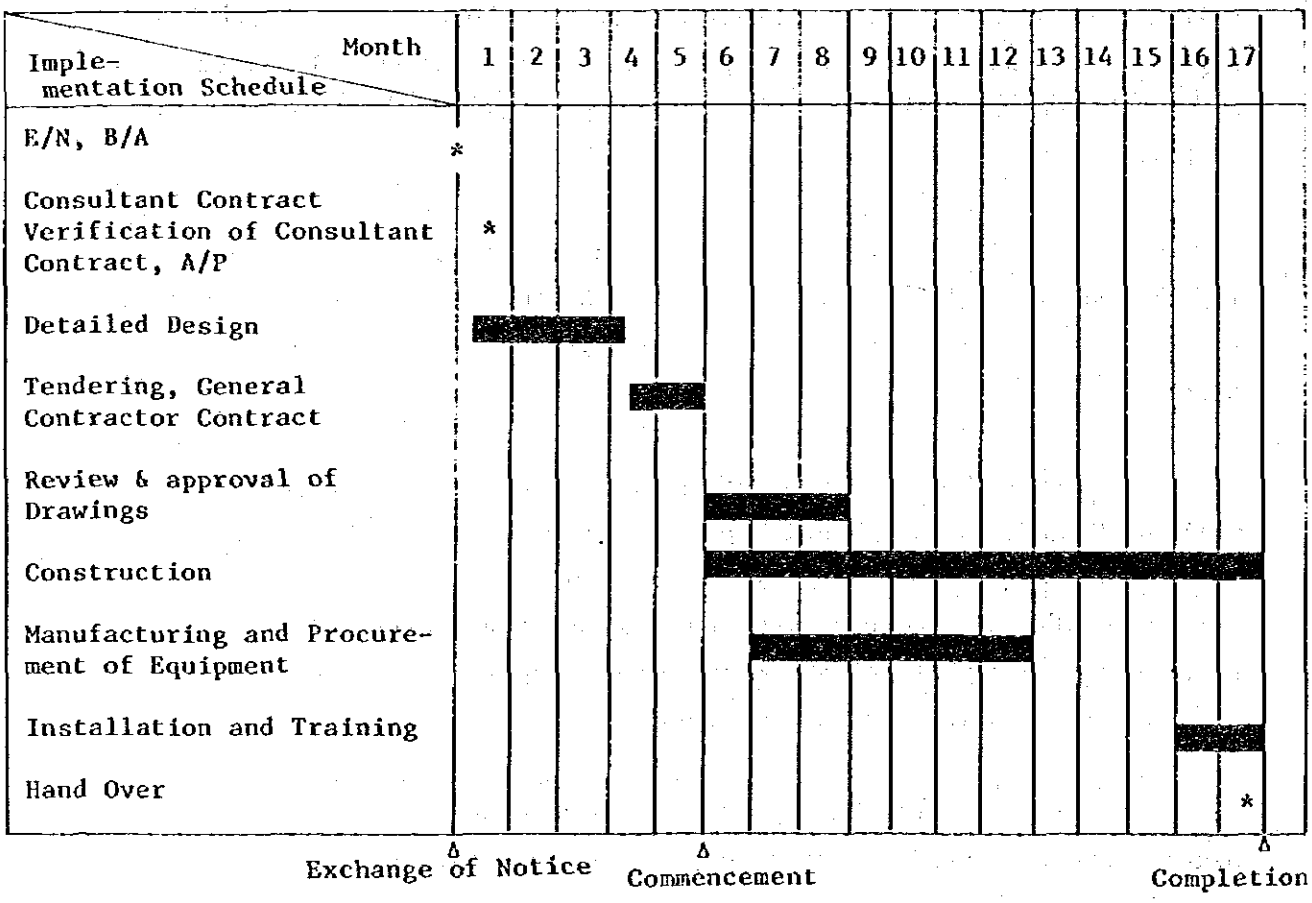

Fig 4.24 Implementation Schedule

It will require about 12 months from the commencement of the construction to final commissioning of the facilities and the materials and equipment to the government of Nigeria through a process that includes manufacture of materials and equipments procurements, installments and test operation. Accordingly, it is estimated to require about 17 months to complete the implementation schedule of this project after the signing of the official exchange note.

4.7 Operation and Maintenance Cost

Basically excessive operation and maintenance costs are not required in this project. The largest part of the budgeted costs of NIOMR is the personnel costs. In this project the recruiting of new staff is basically not required for the reinforcement of the activities of NIOMR because the above mentioned reinforcement can be accomplished by internal personnel reshuffle. The anticipated next largest costs next to the personnel costs are the costs electricity. Most of these electricity costs are incurred for the operation of the lighting and air-conditioning and the costs are assumed to increase slightly in this project.

The largest equipment among the examination equipment in this project is the flume tank. The operation costs are estimated on the assumption that the water is exchanged once a month and operated for 10 day in a month (4 hours operation per day) as below.

① Electric power required for the exchange of water (30 tons)

0.5 x 2.2 kw x one time/month x 0.06 nila/kwh = 0.066 Naira

② Electric power consumption of flume tank 15 kwh, load 0.8, operation ratio 0.8

4h x 15 kwh x 0.8 x 10 times month x 0.06 nila/kwh
= 12 Naira

③ Electric power consumption of lighting and other meters

4h x 5kwh x 10 times/month x 0.06 nila/kwh = 12 Naira

Total 35.106 Naira/month

Accordingly the yearly direct operation cost of the flume tank is 421.272 Naira/year. The slight increase in the costs is assumed due to the smooth operation of the above mentioned equipment.

On the other hand, NIOMR is legally permitted to transfer the income obtained through its activities to the research budget of the year and income of 347,405 Naira was transferred to the research budget in 1985. In this project canned foods and feed can be produced by the smooth operation of the experimental canning plant and the fish residue processing equipment and can be sold to obtain income to supplement the reduced budget for research activities.

The operational costs of the experimental canning plant and garbage treatment plant have been estimated based on the following assumptions.

a) Personnel costs: Estimation is made of the costs increased by this project and the personnel costs of the skilled and semi-skilled workers are not included in the estimation because existing personnel are not increased in the personnel reshuffle of NIOMR. It is assumed to pay 10 Naira per day for the unskilled workers.

b) Power costs: Electric power is used for the general lighting, blower for the boiler, seamer, ventilation fan. The official power charge of 0.06 Naira/kwh is applied.

c) Fuel: Fuel is used for the boiler and supplied to the cooker and the retort. The type of oil is equivalent to A type heavy oil. The fuel price is assumed to be 0.29 Naira/L.

d) Cans for the canned goods: Cans of 70 mm dia. x 50 mmH are presently fluctuating in the range 0.1 - 0.18 Naira/can but in this estimation it is assumed to be 0.15 Naira per can.

e) Refrigerator: Rated power 10 kw, load 0.8, operation ratio 0.8 are assumed to calculate average power consumption of 10 kw x 0.8 x 0.8 = 6.4kw

Equipment Work	Required Amount per cycle				Operational cycles/month	Unit Price (₦)	Monthly Cost
	Electricity	Fuel	Manpower	Q'ty			
Boiler	0.75 kw				1h x 6/cycles	0.06	0.27
(cooker)		30 L			1h x 6/cycles	0.29	52.20
Boiler	0.75 kw				1h x 6/cycles	0.06	0.27
Retort		30 L			1h x 6/cycles	0.29	52.20
Seamer	7.0 kw				0.7h x 6/cycles	0.06	1.76
Refrigerator	6.4 kw				24h x 30/cycles	0.06	276.48
Lighting	2.24 kw				8h x 21/cycles	0.06	22.58
Ventilator	1.5 kw				8h x 21/cycles	0.06	5.12
Non-skilled			7 persons		12 cycles	10	840.00
engineer			3 persons		21 cycles	10	630.00
Can				8,000 pcs.	1 cycle	0.15	1,200.00
Maintenance costs & Consumables*					1/12		735.00
Total Operational Cost							3,825.88

* Costs for maintenance and consumables are calculated at 5%/annum of equipment cost.

Fig. 4.25 Operation Cost of Experimental Canning Plant

The above operational costs can be sufficiently recovered by the sale of the prototype products resulting from the normal operation of the plant.

The maintenance costs required during the 1988 fiscal year mount of the following sums.

Approximate Estimate of Maintenance and Operation Expenses

1)	Personnel	₦17,640
2)	Fuel and Electricity	
	a) Electric power	₦11,486
	b) Fuel oil (Generator, Boiler, Boats and Vehicles)	₦14,400
	c) Gas (Welder)	₦ 2,678
	Sub-total	₦28,564
3)	Consumables	₦32,755
4)	Maintenance (Construction cost x 0.2%)	₦ 8,097
5)	Others	₦ 900
	Grand total	₦87,956

4.8 Approximate Estimate of Cost of Works to be undertaken by the Government of Nigeria

1)	Ground leveling	₦ 1,560
2)	Replacement of the existing Generator and Septic tank	₦ 9,350
3)	Improvement of the roads in the premises of NIOMR	₦ 1,700
4)	Leading electric power into the site	₦ 6,000
5)	Connecting water supply pipe main to the new reservoir	₦ 900
	Total	₦19,510

CHAPTER 5

PROJECT EVALUATION

CHAPTER 5 PROJECT EVALUATION

The Nigerian economy which had depended too heavily on oil has begun to suffer greatly from the decrease in oil revenues accompanying the fall in prices. The Government of the Federal Republic of Nigeria is therefore making every effort to rehabilitate its economy by becoming self-sufficient in food, a policy which it has established as its major goal ever since its Third National Development Plan. It is making slow progress, however. It is developing its fisheries industry on a priority basis in line with its policy of attaining self-sufficiency in food, but Nigeria's fisheries industry which consists mostly of small scale fishermen, even in terms of the number of people engaged in it, is bound to be slow in its pace of development without effective training and rendering of necessary technology. The Nigerian Institute of Oceanography and Marine Research (NIOMR) which is an executing agency of this project is an integrated research institution in the field of fisheries whose objectives lie in research and technological development in the field of fisheries. This project, therefore, purports to improve the activities of NIOMR in the following two fields, (1) development of technology and (2) training and extension. The project also aims to improve infrastructure facilities to ensure success in NIOMR's activities. In other words, the objectives of this project are to take up pioneering development of untapped fisheries resources as its central theme and to pursue research and development in order to quickly expand fisheries production on the one hand, while at the same time promoting training and extension efforts based on a long range perspective of upgrading the Nigerian fisheries industry, and effectively extending the technology developed to small scale fishermen. These two main targets however are not two separate things; they are one in that they mutually interact as they move toward the common goal of developing the fisheries industry of Nigeria. This project also aims to invigorate the Nigerian Institute of Oceanography and Marine Research (whose research activities are greatly restricted by the economic stagnation of Nigeria) by granting the necessary equipment to establish its research infrastructure in order that it may contribute to promoting the fisheries industry of Nigeria.

In concrete terms, the following effects are anticipated through the smooth operation of this project.

1) Through the research and development of fishing gear, NIOMR will be the pioneer in the development of untapped domestic fisheries resources. It will engage in skipjack fisheries development, deep sea trawling-type fisheries development and aquaculture development which shall pave the way for the development and spread of commercial fishing.

2) The research facilities housed in the fishing technology laboratory are not intended only for research and development but also for training and the spreading of fishing gear and fishing methods to benefit those who are involved in fisheries in various places, fishermen, overseas trainees, employees of fishing net manufacturers and other fishery-related enterprises. The beneficial effects of this technology extension on fishermen engaged in small scale fisheries in particular is anticipated to be great.

3) The cooperation in enlarging the classroom building with the addition of a mock-up bridge, a chart room and classrooms will greatly support NIOMR's efforts to educate and train candidates for key positions in fisheries-related areas in a more effective way.

4) This project, as a follow-up on the previous grant aid cooperation project for skipjack fisheries development, will enable more effective search for live bait resources which are indispensable for skipjack fisheries development and thereby contribute to further accelerating its development.

5) Cooperation with the Africa Regional Aquaculture Center of NIOMR will greatly promote its research, training and development activities in the field of aquaculture. As said Center is also a training institute for candidates for key positions in the area of aquaculture from 26 countries of the African region, the benefits of cooperation in this field will not only be limited to Nigeria but will be extended throughout the neighboring countries.

6) Cooperation in the area of fish processing will enable Nigeria, for whom canned products are extremely important, to produce them using fish caught in Nigerian waters. The popularization of these trial products will not only contribute to more effective aquaproducts distribution in Nigeria but will also have the effect of eliminating the present outflow of foreign currency which is due to the use of imported fish for manufacturing canned products.

7) Cooperation in the area of maintenance and upkeep of vessels and equipment will remarkably improve NIOMR's engineering function, by which the satisfactory implementation of an efficient maintenance program for the two research and training vessels granted by Japan in the past and various equipment included in this project can be anticipated.

8) Cooperation in the modification and improvement of the jetty will enable the research and training vessels in the possession of NIOMR to receive equipment repair, loading, unloading and other services alongside the jetty. This will enable NIOMR to achieve a satisfactory maintenance and upkeep program and a smooth operating schedule, which in turn will greatly contribute to NIOMR's research activities including the development of untapped fisheries resources and training activities. The improvement to the jetty will also contribute to preventing damage to the vessels arising from the present unstable mooring condition.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

This facilities improvement project for the Nigerian Institute of Oceanography and Marine Research is anticipated to reinforce the functions of said Institute and to create the effects and benefits indicated in the Project Evaluation. This project is closely relevant to the increased production of food and promotion of education which are the two most important development strategies outlined in the National Development Plan of Nigeria, and it may be concluded that it is a most significant as well as opportune cooperation project for a country whose economy is in serious condition. Nigeria, which is endowed with oil resources, is one of the leading countries in West Africa, and its influence over its neighboring countries is quite great as exemplified by the international training institute of NIOMR's Africa Regional Aquaculture Center. It is therefore believed that the benefits of this project will not be contained within Nigeria alone but that they will extend to the surrounding countries.

For smooth implementation of this project, the following matters are especially recommended.

1) In implementing this project, the executing agency (the Nigerian Institute for Oceanography and Marine Research) is requested to make adequate preparations in advance by acquiring a full understanding of the mechanisms of Japan's grant aid cooperation program program and by maintaining close contact with each of the concerned ministries and agencies so that smooth arrangements can be made for the issuance of contract documents, banking arrangements (B/A), authorizations to pay (A/P) and other necessary instruments.

2) All facilities, equipment and supplies included in this project will be placed under the custody of specific divisions and sections for the sake of administration. However, in view of NIOMR's present shortage of equipment, it is hoped that joint research projects transcending the boundaries of divisions and sections will be actively promoted for effective utilization of facilities and for achieving greater results in research and development.

3) In consideration of NIOMR's budgetary situation, this project was designed on a scale that permits it to be implemented without an increase in manpower. It is hoped that in the event a shortage of manpower should arise NIOMR will flexibly cope with the situation by reshuffling its present staff and not resort to hiring new people with the exception of part timers. With respect to NIOMR's organizational structure, it is hoped that the Fishing Technology Section will be upgraded to the Fishing Technology Division and that the Fishing Gear Section and Fishing Method Section will be under the new division by the time this project is ready to be launched.

4) It is hoped that the present Vessel Operation Section will be upgraded into the Vessel Operation Division and that it will establish a close cooperative relationship with the Technical Service Division whose activities are to be stepped up by the implementation of this project.

5) It is requested that adequate time for preparations and arrangements be reserved for the work necessary for the implementation of this project and that such work will progress smoothly according to the work schedule for this project.

APPENDIX

APPENDIX

Appendix I. Minutes of Discussions (Basic Design Study)

JAPANESE GRANT AID PROGRAMME FOR FISHERIES: CONCLUSIONS OF DISCUSSION OF BASIC DESIGN STUDY ON THE IMPROVEMENT OF FACILITIES OF NIGERIAN INSTITUTE FOR OCEANOGRAPHY AND MARINE RESEARCH IN THE FEDERAL REPUBLIC OF NIGERIA

1. In response to the request made by the Government of the Federal Republic of Nigeria for grant aid assistance for the improvement of facilities of Nigerian Institute for Oceanography and Marine Research, (hereinafter referred to as the "project"); The Government of Japan has fielded to Nigeria through the Japan International Co-operation Agency (JICA) a team headed by Mr. Takeo Koyama to conduct a basic design study for the realization of the project from 6th April to 2nd May, 1986.

2. The team has carried out a field survey, held a series of discussions and exchanged views with the Nigerian authorities concerned with the project.

3. As a result of the survey and discussions, both parties have agreed to recommend to their respective governments and to authorities concerned to examine the result of the survey attached herewith toward the realization of the project.

O B J E C T I V E

The objective of the project is to assist the development of research and man-power training functions of the fisheries sector in Nigeria through the strengthening of research functions of NIOMR.

Functions to be strengthened under the project:

1) Strengthening of fishing gear technology, fishing method technology and man-power development programme of NIOMR
2) Development for fish processing technology with respect to tuna and pelagic species.
3) to follow up and complement the past Japanese grant aid to NIOMR.

Donor Agency

The Government of Japan.

Nigerian Executing Agencies

On the Nigerian side, the Federal Ministry of Science and Technology will be responsible for the administration of the project and the Nigerian Institute for Oceanography and Marine Research (NIOMR) will be the executing agency of the project.

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Components of the project

The project is consisted of two categories: One is the strengthening of the function of NIOMR and the other aims to follow up, the effectiveness of the past grant aid projects which are currently being successfully utilized. Details of functions to be strengthened were itemized under the objectives. Both parties agreed that this project will complement the previous grant aid; altogether, fostering NIOMR's integrated improvement to fisheries development in Nigeria.

The area to be covered by the project are as follows:

1) Construction of Fishing Technology Laboratory which consists of the following facilities:
   - Flume tank room
   - Net loft
   - Fishing gear laboratory
   - Lab. for fishing method
   - Library
   - Offices
   - Necessary equipment

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2) Construction of mock bridge which consists of the following:
   - mock bridge
   - classrooms
3) Jetty to moor existing research and training vessels.
4) Equipment for cannery and machinery for cold room.
5) Mechanical workshop for the maintenance of the activities of NIOMR.
6) Fishmeal plant

Obligations of the Nigeria Government

In order to ensure the smooth implementation of the project, the government of Nigeria will make necessary arrangements as follows:

a) to provide data and information needed for design and implementation of the project.
b) to exempt from custom duties and undertake prompt customs clearance of all goods to be imported for the implementation of the project where the crates or goods are labelled "Japanese Government Technical Aid to NIOMR; Ministry of Science and Technology"

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c) to exempt the Japanese nationals concerned in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in Nigeria.

d) to provide the Japanese nationals concerned legal permission for carrying out the project.

e) to bear all expenses connected with the provision of the site, clearing and levelling of the site and the supply of the site with necessary utilities i.e. electricity, water and telephone line etc. in addition to the provision of a pavement and garden after the construction. And to make complete budgeting and personnel preparation for operation of the project.

Study team

The Japanese survey team will convey the result of the survey and discussions held in Nigeria to the Government of Japan and to take necessary steps

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to realize the project within the budgetary limits of Japanese grant aid.

Both parties confirmed that the system of the Japanese grant aid was fully understood by the Nigerian authorities concerned through the explanation given by the Japanese survey team.

J. G. TOBOR
DIRECTOR
NIOMR

DATED: 17. April 1986

TAKEO KOYAMA
TEAM LEADER
JAPANESE SURVEY TEAM
小山武夫

DATED: 1986. Apr 17.

Appendix II. Minutes of Discussions (Draft Report Explanation)

MINUTES OF DISCUSSIONS ON THE IMPROVEMENT OF FACILITIES OF NIGERIAN INSTITUTE FOR OCEANOGRAPHY AND MARINE RESEARCH IN THE FEDERAL REPUBLIC OF NIGERIA

IN RESPONSE TO THE REQUEST OF THE GOVERNMENT OF THE FEDERAL REPUBLIC OF NIGERIA FOR GRANT ASSISTANCE FOR THE IMPROVEMENT OF FACILITIES OF NIGERIAN INSTITUTE FOR OCEANOGRAPHY AND MARINE RESEARCH (HEREINAFTER REFERRED AS "THE PROJECT"), THE GOVERNMENT OF JAPAN DECIDED TO CONDUCT A BASIC DESIGN STUDY ON THE PROJECT AND ENTRUSTED THE STUDY TO THE JAPAN INTERNATIONAL COOPERATION AGENCY (JICA). JICA SENT TO NIGERIA THE TEAM HEADED BY MR. TAKEO KOYAMA, DIRECTOR, NATIONAL RESEARCH INSTITUTE OF FISHERIES ENGINEERING, FISHERIES AGENCY FROM 6TH APRIL TO 2 MAY, 1986. AS A RESULT OF THE STUDY, JICA PREPARED A DRAFT REPORT AND DISPATCHED A MISSION TO EXPLAIN AND DISCUSS IT FROM 14 JULY TO 26TH JULY, 1986.

BOTH PARTIES HAD A SERIES OF DISCUSSION ON THE REPORT AND AGREED TO RECOMMEND TO THEIR RESPECTIVE GOVERNMENTS THAT THE MAJOR POINTS OF UNDERSTANDING REACHED BETWEEN THEM, ATTACHED HEREWITH, SHOULD BE EXAMINED TOWARDS THE REALIZATION OF THE PROJECT.

23 JULY, 1986

小山武夫

MR. TAKEO KOYAMA
LEADER
JAPANESE STUDY TEAM

J.G. Tobor

MR. J.G. TOBOR
DIRECTOR
NIGERIAN INSTITUTE FOR OCEANOGRAPHY AND MARINE RESEARCH

23/7/86

ATTACHMENT:

1. *THE NIGERIAN SIDE PRINCIPALLY AGREED TO THE BASIC DESIGN PROPOSED IN THE DRAFT FINAL REPORT.*

2. *THE FINAL REPORTS (10 COPIES IN ENGLISH) ON THE PROJECT WILL BE SUBMITTED TO THE FEDERAL REPUBLIC OF NIGERIA BY THE BEGINNING OF OCTOBER, 1986.*

3. *THE NIGERIAN SIDE UNDERSTOOD THE SYSTEM OF JAPAN'S GRANT AID PROGRAMME AND CONFIRMED THE MEASURES TO BE TAKEN BY NIGERIAN SIDE TOWARDS THE REALIZATION OF THE PROJECT.*

23 July 1986.

Appendix III. Member of the Study Team

III-1. Basic Design Study Team

Leader	Takeo Koyama	Director, Fishing Gear and Methods Division National Research Institute of Fisheries Engineering, Fisheries Agency.
Coordinator	Takenori Yamazaki	Assistant Director, First Africa Division Middle Eastern and African Affairs Bureau Ministry of Foreign Affairs
Architectural Planning	Kazuo Ito	Raymond Architectural Design Office, Inc.
Structural Planning	Hideo Enomoto	Raymond Architectural Design Office, Inc.
Utility Planning	Yuji Okutsu	Raymond Architectural Design Office, Inc.
Fishing Gear Planning	Yasuhisa Kato	Raymond Architectural Design Office, Inc.
Equipment Planning	Kenji Okamura	Raymond Architectural Design Office, Inc.

III-2. Draft Report Explanation Team

Leader	Takeo Koyama	mentioned above
Coordinator	Takenori Yamazaki	(Ditto)
Architectural Planning	Kazuo Ito	(Ditto)
FISHING GEAR PLANNING	Yasuhisa Kato	(Ditto)

Appendix. IV Study Schedule

IV-1. Basic Design Study

Date	Time	Place	Activity
1. Apr. 6 (Sun)			Tokyo ... (AF 269) ... Paris
2. Apr. 7 (Mon)			Paris ... (UT 881) ... Lagos
3. Apr. 8 (Tue)	A.M.	Embassy of Japan Federal Ministry of Science & Technology, National Development Finance and Foreign Affairs	Courtesy call and explanation of the Survey schedule
	P.M.	Federal Fisheries School	Observation of Fish Processing Factory and Jetty.
4. Apr. 9 (Wed)	A.M.	Embassy of Japan	Discussion on the Survey schedule.
	A.M. P.M.	NIOMR	Explanation of the objection of the team, schedule, system of Japan's Grand Aid. Confirmation of the contents of request and executing Agency.
5. Apr.10 (Thu)	A.M.	NIOMR	Confirmation and discussion of the request Field Survey of the Project site and research of the infrastructure.
	P.M.		Investigation of Fish Processing Factory and Jetty.
6. Apr.11 (Fri)	A.M.	NIOMR	Discussion on the Project Confirmation of the contents of the laboratory and equipment and Fish Processing Factory and Jetty. Field survey of the site for laboratory and soil investigation.
7. Apr.12 (Sat)	A.M.		Research for the price of common goods at the Market in Lagos.
8. Apr.13 (Sun)			Observation of the small fisheries. (KETA VILLAGE, IBESHE SEABEACH)

Date	Time	Place	Activity
9. Apr.14 (Mon)	A.M.	NIOMR	Discussion for the Laboratory and Jetty.
	P.M.	Federal Fisheries School	Confirmation of the contents of the request and executing Agency. Field survey of the site Prepare the draft minutes.
10. Apr.15 (Tue)	A.M. P.M.	NIOMR	Discussion for the Laboratory, equipment, Federal Fisheries school, and draft minutes.
11. Apr.16 (Wed)	A.M.	NIOMR	Internal Ministry Meeting of the Japanese Grant Aid System. Discussion and preparation for draft minutes.
12. Apr.17 (Thu)	A.M.	NIOMR	Signing of the minutes
	P.M.	Embassy of Japan	Reporting to the Embassy of Japan Collection of data and information.
13. Apr.18 (Fri)	A.M.	Federal Fisheries school	Collection of data.
	P.M.		Attendance to the graduation ceremony. Collection of data and information for construction and equipment.
14. Apr.19 (Sat)	A.M.	Lagos Univ.	Collection of data. Observation of the Building Construction in Lagos.
15. Apr.20 (Sun)	A.M.		Lagos ... (WT 100) ... Port Hearcourt African Regional Aquaculture Center. Observation of the Reservoir and Hatchery.
16. Apr.21 (Mon)	A.M.		Observation and discussion with Fishing Terminal of Federal Courtesy. Port Hearcourt ... (WT 103) ... Lagos
17. Apr.22 (Tue)	A.M.		Observation of the construction site and collection of data and information related to the Utility.

Date	Time	Place	Activity
18. Apr.23 (Wed)	A.M.		Collection of data of construction materials.
19. Apr.24 (Thu)	A.M.		Collection of data of the electrical equipment. Investigation of the construction standard.
	P.M.		Compiling contents of discussion and data.
20. Apr.25 (Fri)	A.M.	NIOMR	Supplementary survey for existing facilities.
	P.M.	Federal Fisheries School	Supplementary survey for existing facilities. Compiling contents of discussion and data.
21. Apr.26 (Sat)	A.M.	NIOMR	Supplementary survey for Fish Processing Factory and Jetty.
	P.M.		Collection of data and information and observation of the building in Lagos.
22. Apr.27 (Sun)	A.M. P.M.		Investigation of the general goods.
23. Apr.28 (Mon)	A.M.		Prepare the report of the survey and Itinerary.
	P.M.	Embassy of Japan	Courtesy call to the Embassy of Japan. Report to the Embassy of Japan. Final discussion with NIOMR.
24. Apr.29 (Tue)	A.M.	Federal Fisheries School	Final Discussion
	P.M.		Preparation for the Trip.
25. Apr.30 (Wed)			Lagos ... UT 744 ... Paris
26. May 1 (Thu)	P.M.		Paris ... AF ... 274
27. May 2 (Fri)	P.M.		..... Tokyo

IV-2. Draft Report Explanation

Date	Time	Place	Activity
1. Jul.14 (Mon)			Tokyo ... (JL 401) ... London
2. Jul.15 (Tue)			London ... (BR 361) ... London
3. Jul.16 (Wed)			London ... (BR 361) ... Lagos
4. Jul.17 (Thu)	A.M.	Federal Ministry of Science & Technology	Courtesy call and presenting the draft final report.
		Federal Ministry of Finance (External Finance Division)	Courtesy call.
	P.M.	NIOMR	Courtesy call, presenting the draft final report and deliberation on the schedule.
5. Jul.18 (Fri)	A.M.	Embassy of Japan	Courtesy call, explanation of the draft final report and deliberation on the schedule.
		Federal Ministry of Science & Technology	Courtesy call to Minister of Federal Ministry of Science & Technology
	P.M.	NIOMR	Explanation of the draft final report.
6. Jul.19 (Sat)	A.M.	NIOMR	Explanation of the basic design.
	P.M.		Collection of data.
7. Jul.20 (Sun)	A.M. P.M.	Ibadan	Observation of International Institute of Tropical Agriculture (IITA).
8. Jul.21 (Mon)	A.M. P.M.	NIOMR	Supplemental explanation on the basic design.
9. Jul.22 (Tue)	A.M.	NIOMR	Internal Ministry Meeting. Explanation of the Japanese Grant Aid System. Deliberation on Draft Minutes.
	P.M.		Observation of the construction Site.

Date	Time	Place	Activity
10. Jul.23 (Wed)	A.M. P.M.	NIOMR Embassy of Japan	Signing of the Minutes. Reporting on the result of the survey.
11. Jul.24 (Thu)			Lagos .. (BR 372) .. London ... ... (BR 896) .. Paris
12. Jul.25 (Fri)			Paris ... (AF 276) ...
13. Jul.26 (Sat)			... Tokyo

APPENDIX V. Cooperative Officials in the Study

V-1. Nigerian Officials Concerned

(1) Federal Ministry of National Planning

(Development Aid Division)

Mr. A. Akinboboye	Deputy Secretary
Mrs. R. O. Sonaiya	Principal Assistant Secretary
Mr. C. Adogoke	Assistant Secretary
Mr. A. Alao	Principal Assistant Secretary

(2) Federal Ministry of Finance

(External Finance Division)

Mr. Mpu Obaro	Director
Mrs. Iremiren	Principal Secretary
Mr. I. O. Ukobo	

(3) Ministry of External Affairs

(International Economic Co-operation Department)

Mr. Oyetayo	Deputy Director (Bilateral)
Mr. Adebola O. Labiraw	

(4) Federal Ministry of Science and Technology

Prof. E. U. Emovon	Minister
Ms. Olukoya	Permanent Secretary

(Agricultural Science Division)

Dr. Adetunji	Director
Ms. K. Tychus Lawson	Legal Adviser
Mrs. M. I. Udo-Aka	Chief Scientific Officer
Dr. M. O. U. Ikpeama	Assistant Chief Scientific Officer

(5) Federal Ministry of Justice

Mr. E. F. Fatoye	Senior State Councel

(6) Nigerian Institute for Oceanography and Marine Research (NIOMR)

Mr. J. G. Tobor	Director
Mr. A. A. Olaniawo	Pincipal of Federal Fisheries School, Lagos
Dr. T. O. Ajayi	Chief Research Officer (Fisheries Resource)
Mr. S. A. Amune	Administrative Secretary
Mr. R. E. K. Udolisa	Chief Reserach Officer
Mr. B. B. Solarin	Senior Research Officer

Mr. O. Oladosu	Principal Engineer
Dr. A. Chidi Ibe	Principal Engineer
Mr. M. Ademola. Afinowi	Centre Manager/Chief Res. Officer (African Regional Aquaculture Center)

(7) Federal Coastral Fishery Terminal (Borikiri-Port-Harcourt)

Mr. Sisei. S. Joshua	Project Manager
Mr. Martin. M. Mmeo	Project Engineer

(8) Keta Village, Ibeshe Sea Beach

Chief. Kokutse. Agla (Chairman)

V-2. Japanese Officials Concerned in Nigeria

(1) Embassy of Japan

Mr. Wataru Miyakawa	Ambassador extraordinary and plenipotentiary (At Basic Design Study)
Mr. Mitsuro Donowaki	Ambassador extraordinary and plenipotentiary (At Draft Report Explanation)
Mr. Satoshi Molimoto	Councilor
Mr. Akira Kawahara	Secretary
Mr. Shyoji Yoshimoto	Secretary
Mr. Takeaki Iwatsuki	Secretary
Mr. Hidenori Yamakawa	Member of Embassy staff

(2)

Mr. Kametaro Washizu	Expert
Mr. Kazuma Tanaka	Expert
Mr. Tomio Sugiyama	Expert