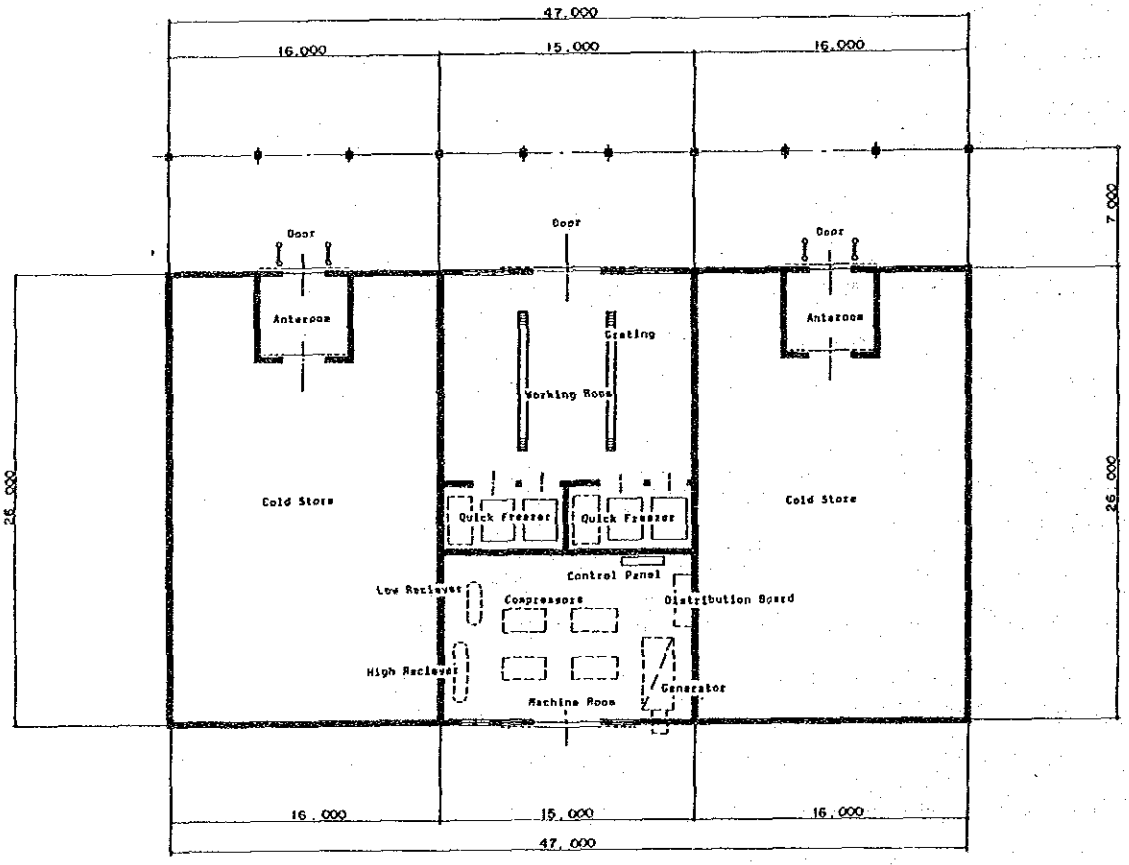
i) as frozen-on-board fish to be stored directly in the refrigerator after landing; and

ii) as frozen-on-land fish to be brought first to the freezer and then stored after freezing

In this plan, the quick-freeze room has been placed in the center of the facility, with a refrigerated room located on either side to minimize mixing on entry. The machinery room has been placed to the rear of the freezer room so as to achieve maximum piping efficiency.

The section plan has been prepared on the above basis, taking into account the functions of the various rooms and flow of products. On this basis, the total required floor area has been set at 1,222 m^2 as shown in the following plan.



COLD STORAGE FLOOR PLAN

2) Fish Landing Wharf

(a) Vessels to be Served

Vessels to be served by this facility and the expected operations are as follows:

i) Fish landings by skipjack pole-and-line vessels

ii) Landings by purse-seine carrier vessels (attached to the group purse-seine fleet)

iii) Loading of reefer vessels

Table 4.8 *Description and Number of Target Vessels*

Type of Vessel	Gross Tonnage	Length	Draft	Number
Skipjack Pole-and-Line	60-100 tons	25-35 m	2.0 m	22
Purse-seine Carriers	288	47.3	3.5	2
Reefer Carriers	3,000-4,000	110-135	5.5	-

(b) Wharf Length

Wharf length has been determined on the basis of the requirements of target vessels.

i) Skipjack Pole-and-Line Vessels

Skipjack pole-and-line vessels based at Noro are at sea for 3-4 days and so the number of vessels returning to port each day will be:

22 vessels / (3-4 days) = 6-8 vessels/day

Since the skipjack pole-and-line fleet is projected to land 2,495 tons of yellowfin per year, the daily landings can be set at 7.5-8.3 tons, based on 300-330 days of operations per year. On this basis, the average landings per vessel may be estimated at 0.93-1.38 tons.

Landings of yellowfin by the pole and line boats, based on the catch mixture rate of this species to date, can be expected to run about 10% of total landings and be landed together with skipjack. This is the same situation as has prevailed in the past and so there will be a basic need to properly handle these landings at the existing facilities. However, with the start of year-round operations, we can expect increased landings and a corresponding increase in the number of fishing vessels backed up to discharge catches. While we can anticipate that the new dock may be used by these boats, it should be sufficient to provide for two such vessels at the most.

Accordingly, the length of the wharf, including a safety margin of 10%, becomes:

(25-35m) x 2 x 1.10 = 55-77 m

ii) Purse-seine Carriers

There are two identical carrier vessels attached to the group purse-seine fleet. The required wharf length, figuring a vessel length of 47.3 m plus a 10% safety margin, becomes:

47.3 x 1.10 = 52.03m

Thus, the total wharf length for each purse-seine carrier vessel will be 52m.

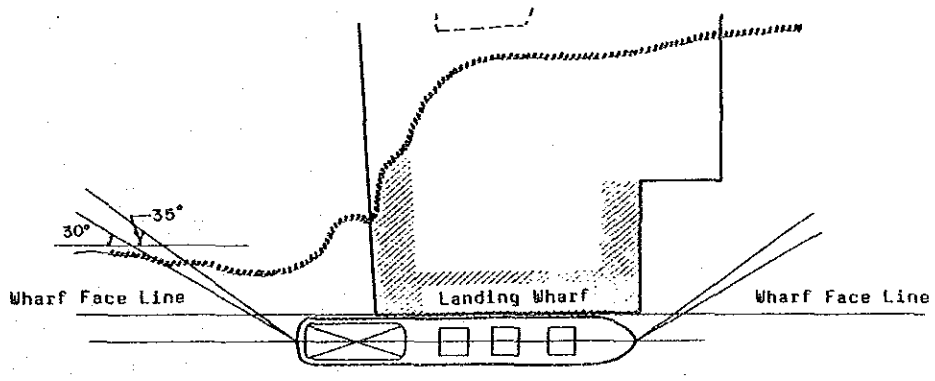
iii) Reefer Vessels

At present, reefer carriers in the 2700-3000 ton class call at Noro, but to lower freight rates, consideration is being given to the use of up to 4,000 ton vessels. Again, allowing a 10% margin to vessel length, the required wharf length for this type of vessel becomes:

(110 - 135m) x 1.10 = 121-148.5m

In deciding wharf length, consideration should be given to total length requirements in the event that all of the above vessels berth simultaneously. However, in the case of concurrent arrivals by reefer vessels and skipjack pole-and-line boats, it will be possible for the skipjack vessels to unload at existing wharves by accepting a short waiting time; and if purse-seine carrier and reefer vessels dock at the same time, the carrier boat can berthed alongside of the reefer vessel for direct transshipment. There is, thus, no need to consider the problem of simultaneous arrivals.

Accordingly, the maximum required length will be that of the reefer vessel of 148.5m, but this size of vessel need only be accommodated about once a month. The next largest requirement is the skipjack pole and line vessel of 77m, but usage frequency will be low. In this Plan, therefore, by installing a mooring dolphin along the face line of the wharf, it will be sufficient to provide a wharf length equivalent to the actual requirements-- viz., the distance between the hatches of the reefer vessel plus a small safety margin.



In the case of a 3000 ton reefer vessel, the average distance between hatches of both ends is about 50 m. Adding a 15 m allowance at each end plus another 20 m for a repair dock (which is planned for the future), we arrive at a total length requirement for the wharf of 100 m. Construction of a mooring dolphin will be necessary on the southern boundary of the power station and, in this case, unobstructed access should be secured to this dolphin whenever necessary.

(c) Plan Depth

The maximum draft at full load among the vessels using the wharf will be the 5.5m for the reefer vessel. The Plan depth will be determined by adding a safety margin to the maximum draft. According to the "Technical Standards and Comments on the Port Facilities" published by the Japan Port Association, the safety margin should be established within the range of 0.5~1.5m. As the Plan sea area is relatively calm and the target vessel type for this wharf is reefer vessels, a Plan depth of 6.5m would be appropriate, taking 1.0m as a safety margin.

(d) Crown Height

Based on the "Technical Standards and Comments on the Port Facilities", as previously given, in the case of a wharf depth of 4.5 m or more and a tidal variation of 3.0m or less, the usual practice is to add 1.0 ~ 2.0m to HWL. Since HWL in the Plan area is 0.75m, the crown height becomes 1.74 ~ 2.74 m. Under this Plan, the facility will also be used by fishing vessels of about 100 tons, while the crown height of the existing wharf for fishing vessels is +1.7m. Accordingly, we have set the Plan crown height at +1.7m, which is almost at the minimum standard value.

3) Fishing Vessel Repair Wharf; Wharf for Small Fishing Boats

In anticipation of the possible future need for a repair facility for fishing vessels, we have made a provision in the Plan for using the area beside the Plan landing wharf as the site for a repair wharf for fishing vessels.

The vessels to be serviced at this facility, excluding the very large purse seiners, would be in the order of 60-280 tons, with a vessel length of 25~47m. The wharf length is therefore set at 50 m and an apron width of about 20 m would be required for storage of repair materials.

The draft at full load of a 280 ton purse-seine carrier vessel is 3.5m. However the draft will be reduced to around 2.5 m at light condition, and the vessel can be serviced by this facility should a -3.0m Plan depth be provided. The crown height would be the same as for the landing wharf, at +1.7m.

We are also providing, under this Plan, for a wharf for small fishing boats which could be used by local canoes equipped with outboard motors. As these small boats are 8-10m long, with a draft of about 0.5 m, the wharf length has been set at 20 m and the Plan depth at -1.5m. Obviously, the lower the crown height, the more convenient it will be for small boats to use the wharf. However, considering that the tidal variation is close to 1m, we have set the crown height for this wharf at +1.2m, or 0.5m below that for the repair wharf.

4) Administration Building

This facility is to provide management services for the cold storage facilities. Its staff will include a manager, 3 clerical workers, 5 mechanics/drivers, and 4 ordinary workers, for a total of 13 persons in all. In addition, there will be about 10 temporary workers during loading periods.

Based on the nature of the facility's functions, the required rooms will include: an office, employee rest room, night-duty room, workshop, forklift garage, and a toilet and shower room.

(a) Office

As the office responsible for overall warehouse operations, including the landing wharf and small ice plant, the staff is expected to include a manager, technical supervisor, and 3 clerical workers, for a total of 5 persons. Fixtures and furniture will include desks, chairs, file cabinets, chairs for the reception area, and other accessories. Allowing for the placement of these items and the provision of sufficient space

between them, the required floor area for the office will be about $64m^2$.

(b) Employees' room

This room will be used by employees for changing of clothes and breaks. A total of 14 persons will use this room-- four regular workers and 10 temporary. Furnishings will include tables, chairs, and lockers for use during breaks. Allowing for placement and proper spacing, the required floor area will be $30.4m^2$.

(c) Night-duty room

This facility will provide sleeping quarters for the night staff and will be designed to accommodate two persons. Furnishings will include beds and lockers. Allowing for placement and proper spacing, the required floor area comes to $32m^2$.

(d) Workshop

Operations to be performed in this facility will include the repair of parts for the refrigeration machinery, inspection and repair of forklifts, and repairs on pallets and other accessories.

Since the bulk of repairs on the freezer can be performed on the site, the main freezer-related operations will be inspection and repair of small components; thus, no special area is needed for this work. The workshop should be large enough to permit repair work on one forklift. Other fixtures will include a work table for parts repair and a storage area for parts and tools. Repair equipment to be housed in this area will include a compressor, bench drill, and bench grinder.

Allowing for the work table, repair equipment, work space, and access, the required floor area will be 48m^2.

(e) Forklift garage

This garage will house four 2-ton forklifts and a battery charger. Allowing for spacing and access, the required floor area becomes 32m^2.

(f) Other rooms

...The toilet and shower will be used only by the male staff.

...The parts storage area will be for the storage of miscellaneous items needed for facility operations and will not be limited to particular items.

These rooms have been included in the plan for the administration building. The area of the toilet and shower room will be 16m^2.

(g) Plan for the administration building

This facility will incorporate the manager's office, night-duty room, rest area and other welfare facilities, garage, workshop, and a room for machinery repairs. Based on an arrangement plan prepared on the basis of the indicated functions, the total floor area of the administration building has been set at 224m^2.

3) Small Ice-making Plant

a) Required Facilities

Based of the anticipated activity, the required facilities will include ice-making equipment, an ice storage bin, a parts warehouse, and an office.

i) Ice-making equipment

Ice shapes may be divided into three categories: flake, plate, and block.

Flake and plate ice are small in size, which minimize to bruise fish. These types are, therefore, most commonly used for relatively high-value fish. They are not, however, suitable for storage over long periods.

In the present Plan, given the high outside temperatures, the wide area of ice distribution, and the long cruising times of user vessels, we have selected block ice, which is convenient to store. The weight of block ice is 25 kg and so capable of being handled manually. Rainwater will be used for ice production and city water will only be used at times when there is no water in the rainwater catchment tank. No particular chlorination device will be required. The ice production cycle of the plant will be 12 hours.

b) Ice storage bin

This storage bin is intended to coordinate ice production and shipments. There is no established way of calculating the size of such a facility; determination is made on a case-by-case basis. In this instance, we have allowed a down-time of four days in ice production for maintenance checks, breakdowns, and holidays and have set the storage volume at two tons, equivalent to four days' production.

For this sort of small ice plant, it has been decided to use a prefabricated warehouse, which is low in cost and offers good insulation properties.

The area required to store two tons of ice has been calculated at 4.35m^2, based on an effective warehouse area ratio of 50%, a

0.92 bulk specific gravity, and an average stacking height of 1.0m. Thus:

$$2(t) \times 50\% / 0.92 / 1.0(m) = 4.35m^2$$

Accordingly, we will use standard prefabricated panels of 1.8m (W) x 2.7 m (L) x 2.2 m (H), with a thickness of 100 mm. In view of the high outside temperatures and the need to store the ice for a certain period, we shall install a freezer to maintain temperatures in storage bin at 0°C.

iii) Room size

a) Storage area for parts

This area will be used to store ice-making cans, maintenance supplies, refrigerant, and other miscellaneous items. Considering the need for a general storage area and for a continuing reserve of 10 ice cans and the storage of 25 kg refrigerant bags, the floor area has been set at $16m^2$.

b) Administration room

This space is for use by management personnel and will double as the management office for the adjacent workshop facility. Thus, the required floor space has been calculated so as to provide office space for two workshop instructors and the manager of the ice plant.

The space will include desks, chairs, file cabinets, and chairs for trainers. Allowing for proper spacing, the required floor space comes to $17.5m^2$.

c) Lavatory

The lavatory facilities will be housed in a separate building, since they will also be used by staff from the neighboring outboard engine workshop. Based on anticipated usage by ten persons, we have planned a minimum size facility, with one water closet, one urinal, and a wash basin.

iv) Plan

The subject facility will require space for ice making, ice storage, administration, and ice handling. At the ice-making and storage areas, after removal following ice making, melting, and removal from the ice can, the ice is then stored in a storage bin. The lay-out plan includes the ice-making equipment, storage bin, melting tank, dumper, chute, and other required items. The plan also facilitates movement from the administration to the operations area and the handling of materials entering or leaving the storage area.

Based on the above considerations, the required floor area for the small ice-making facility has been set at $128m^2$.

6) Workshop

This facility will comprise a training room for outboard motor repairs, and a storage area for parts and accessories.

(a) Training room for outboard motor repairs--
The required area has been determined on the basis of the volume of operations and the required equipment. The number of motors to be repaired at any given time has been set at about four, while the number of trainees is set at 5-8 persons taught by two trainers.

Among the items of equipment, special space will be required for the hydraulic press, test tank, wash stand, parts shelf, compressor, work stand, and engine rack. Based on the area for

the repair of equipment and outboard motors and access space for inward and outward movements and the various pieces of equipment, a lay-out plan has been prepared, calling for a floor space of $60m^2$.

(b) Storage and other areas--

The articles to be stored in this space include parts for outboard motors, tools, and miscellaneous items. Since these articles are quite varied, the number of items and storage periods will be irregular.

An appropriate lay-out plan for the workshop facilities has been prepared on the basis of which the required floor area for the above items comes to about $18m^2$.

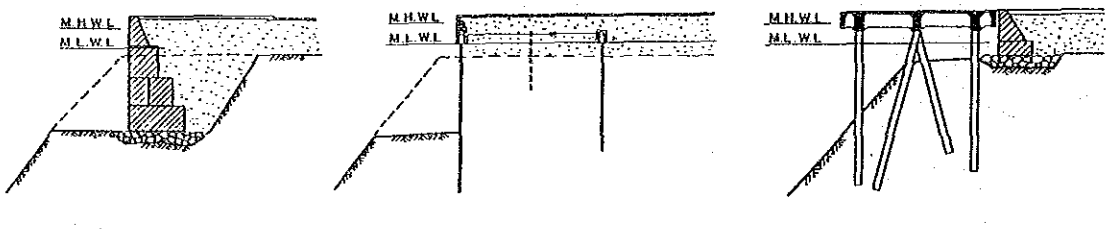
Based on the above considerations, we have prepared an overall lay-out plan for the workshop facility, which calls for a total floor area of $78m^2$. The floor plan is shown in Section 4.7.

(2) Determination of Structure

1) Wharf Facilities

The natural conditions at the Plan site are most favorable, and so neither wind nor waves will have a significant effect on wharf structure. Tidal variation is small (a maximum of 0.96m), while tidal current is 20cm/sec or less. No effects of drift sand, silting or scouring are anticipated. The site is on a coral reef, and there are sudden increases in water depth at a distance of about 100m from shore. The soil is generally a composite of coral sand and coral gravel, so that an average N value of greater than 10 can be expected.
Under the above conditions, there are generally accepted three structural types for a wharf; (a) gravity type, (b) sheet pile type, and (c) pile type.

Considering the sea bottom topography at the Plan site, approximate section plans for the three structural types are as shown below.



(a) Gravity Type (b) Sheet Pile Type (c) Pile Type

Here we shall determine the most suitable structural methods on the basis of an overall analysis of the three possibilities, taking into account the natural conditions, the usage conditions, and the construction conditions in relation to the specific characteristics of each method.

(a) Gravity Type

Generally speaking, this type is best suited to hard sandy gravel ground, but as the depth increases, the wall block weight also

increases, rendering this method uneconomical. The base ground at the Plan site is relatively hard sand, with a mixture of hard coral gravel. If a rubble mound is constructed after excavation, then it becomes possible to install concrete blocks. However, the amount of excavation required for installation is the largest among the three types.

With regard to construction materials, a large amount of concrete material and rubble stones for the mound would be required, and since these materials are unavailable in the Noro area, there would be need for a major procurement plan involving both collection and transport.

This method is best suited to wharves with a relatively shallow depth. But, in the case of deep water, as in the present Plan, the required blocks become quite large and, considering the working radius, would call for the use of cranes of at least 100 ton capacity or other large machinery, such as floating cranes. The rear area can be used as a block construction yard after completion of the landfill.

Technically speaking, this method would involve considerable underwater operations and so can be classified as being of medium difficulty. On the basis of the tidal current observations, there is no likelihood of any siltation due to construction of the facilities.

(b) Sheet Pile

Based on the results of the borehole tests, the Plan site was found to be compatible with sheet pile construction. While excavation would be necessary in front of the sheet piles, the amount of soil to be removed would be only about half that required with the gravity type.

The main construction materials required are concrete and sheet piles. The amount of concrete is the smallest among the three structural types. All the sheet piles would have to be imported, but since direct unloading is possible at Noro port, no problems would be encountered in connection with material procurement, including inland transport.

This type of method permits easy driving of piles from the shore, while the principal item of equipment would be a 40-ton crane.

Technically speaking, since the number of construction stages is limited, this method is the simplest of the three types. However, if the sheet pile method is used, rust-inhibiting treatment will be essential.

(c) Pilings

As in the case of sheet piles, the foundation would permit driving of steel piles. With this method, since the wharf face line can be set at the point of required depth, no excavation is required. This type is suited to deep water areas and so was used for the deep-water wharf in the adjoining commercial port.

Under the present Plan, however, as opposed to the deep-water wharf, there is a requirement for landfill of the rear area. As a result, a retaining wall would be necessary with either the gravity type or sheet pile structure. Thus, this method involves two construction methods, and the construction costs would be relatively high.

The main construction materials are concrete, steel piles, and re-bars. The piles and re-bars can be sourced from abroad and so present no problems. There is also a need, specific to this type of structure, for temporary construction materials for beams and platform concrete.

With regard to the construction equipment, it would be necessary to procure a large pile driving vessel and shore cranes. The former can be sourced from Japan and other countries.

From a technical standpoint, a relatively high degree of skill would be required in the pile driving on the sea, floor concrete, and retaining wall.

A report card can be made for the three structural methods, based on the above evaluation categories.

Evaluation Category	Gravity Type	Sheet Pile Type	Pilings
a) Natural conditions ... Dealing with the foundation	△	△	△
b) Usage conditions			
(1) Safety on vessel impact	○	△	×
(2) Ease of loading	○	○	○
c) Construction conditions			
(1) Main materials from overseas	△	△	×
(2) Main equipment from overseas	△	○	×
(3) Temporary construction	△	○	△
(4) Ease of construction	△	○	×

○: suitable (few)

△: care is required (average)

×: unsuitable (many)

None of the above three types poses any problem in terms of topography, soil conditions, tidal currents, silting, or other natural conditions.

With respect to usage conditions, in terms of relative safety against vessel ramming, the relative order of preference would be: gravity, sheet pile and pilings.

From the standpoint of construction conditions--i.e., procurement of equipment and relative ease or difficulty of construction--, the sheet pile method would be best, followed by gravity and piling in that order.

In terms of material costs, since concrete materials are relatively expensive in the Noro area, the gravity type would entail the highest costs, followed by piling and sheet pile, in that order. In terms of construction cost, the piling and gravity types would be relatively expensive, owing to the need for pile driving or crane boats; thus, the sheet pile method would be more advantageous.

On the basis of total construction costs (including materials), it is evident that the sheet pile method is the most economical.

As to the construction period, all three types can be completed within the required schedule.

Based on the above considerations, it has been concluded that the sheet pile method would be most appropriate as the structural method for the Plan wharf.

The wharf construction alongside the landing wharf would be as follows:

For the southern side, sheet pile construction has been specified, as in the case of the main wharf, taking into account that this area will be used for the mooring and berthing of small vessels and also the future plan for a repair wharf for fishing vessels. On the north side, we have specified sheet piles for protection purposes for about 20m from the face line of the main wharf, but beyond that point, we have specified riprap on the shore side.

2) Shore Facilities

The structural method has been determined on the basis of facility use, scope, procurement of labor and materials, and ease of maintenance. The shore facilities comprise: cold storage, ice-making plant, and workshop

along with supporting administration facilities and may be divided broadly into factory and warehouse groups. The floor area of the cold storage will exceed 1,200m^2 and will require high eaves and a wide 16m span.

The ice plant and workshop are to be small facilities. However, in order to accommodate ice-making equipment and permit practical training in repair work, both facilities will require high eaves and wide openings. For plant and warehouse facilities requiring high eaves and broad spans, the most widely used structural method is steel framing, since this type permits relatively wide openings in comparison with other techniques, construction is fast and efficient, and construction costs are comparatively low.

The Plan facilities both call for wide openings and are to be located in a reclaimed area. In addition, it is desirable that the building be light in weight and that construction time be short, although skilled workers in the area are in short supply. The use of prefabricated steel framing of a particular quality would be most desirable from the standpoint of construction management. We have, accordingly, decided that steel framing would be most suitable for this facility.

Similar shore facilities are located in the vicinity of the Plan area, including the power plant, a copra warehouse at the commercial port, STL cold storage, and an administrative office. The structural method used in all these facilities is steel framing, and so this method has also been found appropriate on the basis of a comparison with these existing facilities.

With regard to the foundation structure, since the existing soil in the area is coral reef, considerable bearing capacity can be expected. Since the filling material will be a mixture of gravel and sand, and in view of the high underground water table, we may expect adequate shrinkage and compacting of the reclaimed ground, and since the building is to be a relatively light structure, an independent foundation with direct support will be used.

(3) Finishing Materials

1) Roof

The main types of roofing observed in similar facilities in the vicinity are gable and shed, while the most frequently used roofing material is corrugated steel sheet. In both the recently completed power plant and the STL cannery, which is presently under construction, vinyl-coated steel sheets are used. In this Plan, steel sheet roofing has been specified, owing to their wide use in the area and ease of construction and maintenance. However, since steel sheet roofs are poor in heat and sound-insulation properties and are subject to rusting, we have considered, where necessary, the use of insulation and sound-proofing materials as well as ventilation. We have specified the use of steel sheet whose surface has been treated with a vinyl or fluorine rust inhibitor.

2) Exterior Walls

Since a portion of the walls in the cold storage will also be used as exterior walls, the same kind of steel plate material will be used (i.e., steel sheet treated with a vinyl coating).

In the remainder of the facility, concrete blocks will be used as exterior wall material because of their superior properties; they are economical and durable, can be produced locally, and are relatively easy to build and maintain. The finish will be mortar with spray paint.

3) Interior Finishes

For functional reasons, none of the Plan facilities require special finishes. As floor finishes, concrete sub-flooring and cement mortar finishes have been specified for their good

workability and durability. In the toilets and shower rooms, however, tile will be used for sanitary reasons.

The standard wall finish will be a mortar and paint finish on block surfaces. In the toilet and shower, the same tile finish will be used as for the floor.

The ceiling finish in the office, night-duty room, rest room and toilet will be a plywood and paint finish. In the interest of proper ventilation, no ceilings will be provided in the other rooms. The above finishes have been chosen because all are in general use, so that replacement materials can readily be obtained, and for ease of maintenance after completion of the building.

(4) Layout Plan for the Shore Facilities

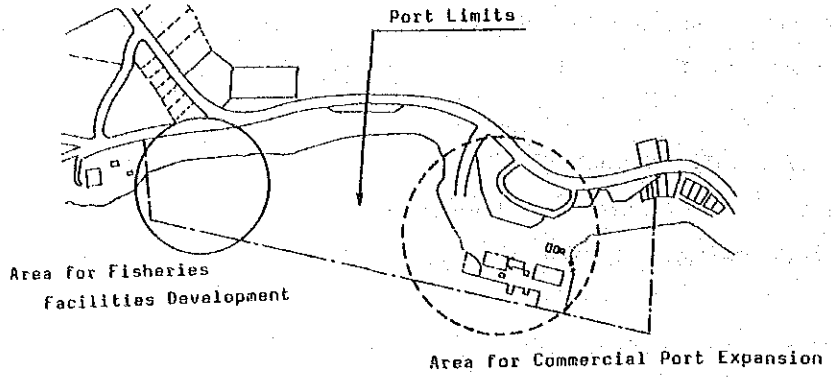
The refrigeration facilities, outboard engine workshop, small ice plant, and fuel and water supply facilities have been positioned as shore facilities in the area directly behind the landing wharf.

1) Wharf Location and Face Line

The site and face line of the wharf have been determined on the basis of the Noro Township Development Plan and natural environment in the surrounding area.

(a) Compatibility with the Township Development Plan

As the Plan site for these facilities, we had originally considered using waters about 200m north of the deep water wharf at the commercial port which has just been completed. However, since this area has been reserved for future expansion of the port, as shown in the following chart, we have decided to build the fishery-related facilities in the area opposite the commercial port within the port limits.



We had also considered building the wharf for the shore facilities in front of the SIEA power station adjoining the north side of the existing Plan area. However, a research laboratory is planned by the Fisheries Department of Ministry of Natural Resources to the south of the power plant, and this is conditioned on the future construction of an access road to the rear of the site and on providing direct access to the waters in front of the planned laboratory. In the opinion of the Solomon Islands authorities, it would be difficult to change this site; in addition, the site would extend beyond the port area. Consequently it has been decided to locate the wharf, cold storage, administration building, workshop for outboard engines, and the small ice-making plant all within the port area on the south side, thereby avoiding the planned site of the research laboratory.

And, should a slipway be required in the future, it could utilize the waters south of the Plan area. We have, therefore, laid out the facilities in such a way that the area to the south of the Plan wharf can be used as a repair dock.

(b) Natural Conditions

Winds, waves, tidal flow and other meteorological conditions have a major influence on vessel operation and mooring, while sea bottom topography, drift sand and silting can affect

wharf structure and construction. We have, therefore, given full considerations to these natural conditions in preparing a layout plan for the wharf facility.

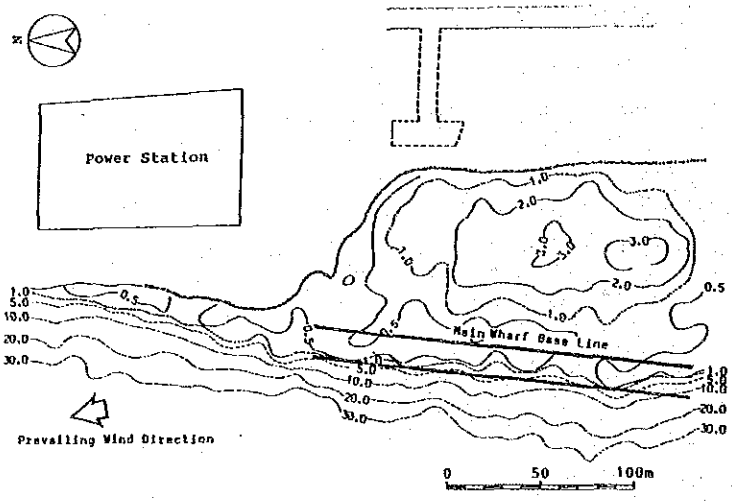
i) The layout has been prepared in such a way that the direction of the prevailing winds will not be at a right angle to the face line of the wharf.

The winds at the Plan site are, for the most part, southwesterly, and so it is preferable that the face line of the wharf be drawn in an north-south direction and that vessels berth on the western side.

The existing wharves, such as the deep-water wharf in the commercial port and the STL loading wharf, were all positioned on the basis of the same considerations.

ii) The Plan depth has been set at 6.5m at the main wharf.

Since the 6-7m isodepth line in front of the Plan site runs in a north-south direction, almost the same as the face line for the existing deep-water wharf, we have set the direction of the face line of the Plan wharf as well along the 6-7m depth line. With regard to the wharf location, inasmuch as the sea bottom in front of the Plan site has a steep gradient of almost 45^{o}, if the required resistance to the passive soil pressure is taken into account, the location of the wharf should be moved some 12m to the shore side of the 6-7m depth line. This would shorten the design length of the sheet piles. By moving the wharf shoreward, even considering the requirement for dredging the front area of the wharf, construction costs would be reduced. And, considering that the dredged soil can be used as fill material for the rear area and that shore-based work for driving sheet piles would thereby become feasible, the front face of the wharf has been moved to a location 12m to the shore side of the present 6-7m depth line.



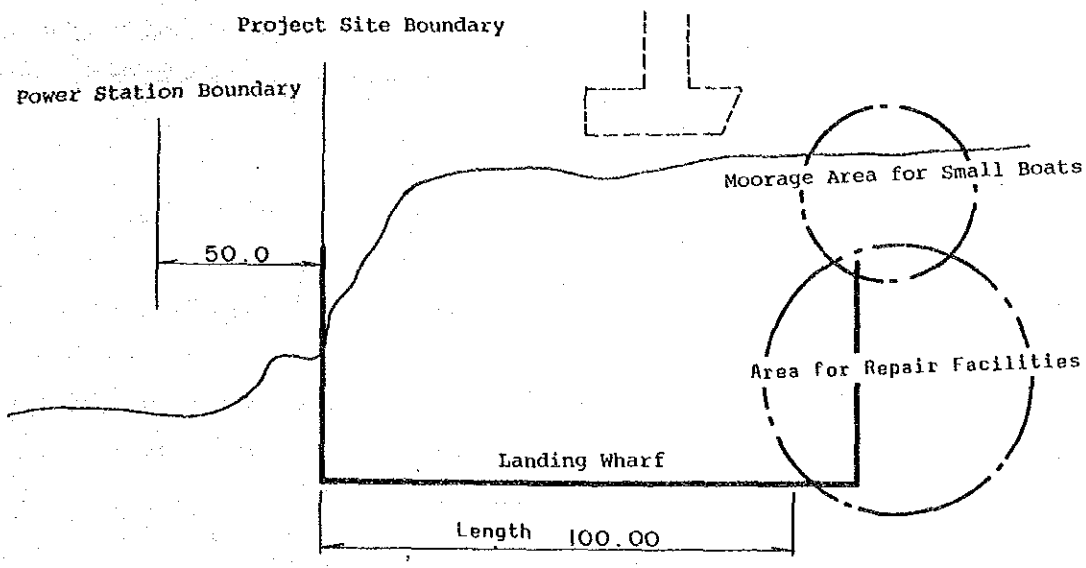
Wharf Face Line and Water Depth

iii) Tidal Flow, Drift Sand, and Sedimentation

Based on the results of the survey conducted in the area of the planned construction, it can be anticipated that the tidal currents are very weak throughout the year-- not greater than 0.2m/sec at a depth of 2.5m.

No large rivers flow into the bay, nor is there evidence of any turbulent coastal currents. And, in the absence of any shifting of bottom soil owing to breaking waves, there was no silting phenomenon. We, therefore, concluded that, following the completion of the subject facilities, there was no likelihood of siltation from drifting action. The layout of the Plan wharf was prepared based on the above considerations.

With respect to the use of the area south of the Plan site, we have positioned this area as the site of a future fishing boat repair facility, and the shallow waters near shore as a berthing area for small boats and canoes of the residents. While the relative effect of offshore winds is slight, the site topography is quite suitable for building a slipway.



2) Layout Plan for the Shore Facilities

(a) Cold Storage

The target facility is the cold storage (1,222m^2) and the administration building (224m^2).

Allowing space for the loading and unloading of catches, the cold storage will be located roughly in the center of the site, while the administration building will be positioned on the south side, adjacent to the ship repair facility.

(b) Small Ice Plant and Workshop

Considering the fact that the main wharf on the south side will be used for small fishing vessels, the small ice plant and workshop have been positioned at the southeastern corner of the Plan site.

(c) Fuel and Water Supply Facilities

Fuel and water supply facilities for the user vessels have been located next to the administration building to facilitate vessel coordination.

(d) Ship Repair Facility

Should a vessel repair facility become necessary at some time in the future, the facility would include a workshop, slipway, and repair wharf. The future workshop will require about 300m^2, sufficient for machining operations, storage of supplies and parts, and management services.

The slipway will have a gradient of 1/10th in the water, 1/16 on shore, and 1/13 inbetween. Figuring the water depth at the end of the ramp at -3.0m and the land end at +1.6m, the length of the slipway itself would come to 60m. And, allowing for a winch and extra rope length, the total length would be about 90m. The width would be about 10m, based on an average vessel width of 4.5m and 3m extra working space on both sides.

The layout plan for the shore facilities is shown in Section 4.7.

4.2.3 Community Center

(1) Facility Size

The components of the Community Center are as shown in items 1)-3) following, along with the administration and boarding functions supporting these activities.

1) Training facilities
2) Meeting rooms, library, and plaza to promote cultural activities in the area
3) A clinic facility for primary care

4) Incidental facilities

5) Dormitory for trainees

In calculating the size of the Plan facility, we made use, as available, of governing standards or materials along with the findings from comparative studies of similar buildings in the area, when a sufficient sample of such buildings existed. When governing standards were not available, we calculated size on the basis of the indicated functions of the various rooms as well as the space required for furniture and human activity.

1) Training Facilities

Among the various training programs offered by the Center, the ones with the highest probable frequency are the training programs at the local level run independently by agencies of the Central Government. These programs, as shown in Appendix V-13, comprise no fewer than 12 courses. The importance of manpower development is stressed in the National Development Plan, and despite the inadequate training budgets and facilities, the various agencies are deeply involved in manpower training. In this respect, there is great significance to establishing appropriate training facilities in Noro, which is intended to become the core city of Western Province.

In addition to programs offered by agencies and departments of the Central Government, there are also various regional programs targeted at young people. These are sponsored by public organizations, such as the United Nations, Commonwealth Youth Programme (CYP), World Assembly Youth (WAY), and a number of non-governmental organizations (NGO), which provide assistance in the form of funding and instructors. During 1988, ten or more workshops were held in the various provinces, while one national-level workshop was held at Honiara and three regional workshops were conducted in the northern part of Malaita.

In order to obtain a better understanding of the types and scope of the specific programs offered, we selected, as an example, the programs conducted at the Administrative Training Center of the Ministry of Public Service, which is responsible for the general training of government workers. The number of training programs to be offered at this Center during 1989 is expected to total 46 courses, covering a wide range of subjects, such as administrative training, personnel administration, accounting administration, computers, service procedures and document control. The bulk of these are aimed at improving the efficiency of government services. (A general list of these programs is given in Appendix V-14.)

Course enrollment runs generally from 15-20 persons, with the smallest class numbering ten trainees (for the computer courses). The number of instructors varies with the content and length of the program but normally involves 3-4 persons. As to course length, the curriculum has two courses of 4 weeks, one of 3 weeks, one of 2.5 weeks, 17 of 2 weeks, 18 of 1 week, and seven of 2 days, with 1-2 week courses most common. Based on the above, it may be concluded that the standard training program for the Central Government involves 15-20 trainees and 3-4 instructors and is of 1-2 weeks' duration.

Accordingly, the training rooms at the Center have been designed to accommodate about 15 persons. Since course and training materials cover a wide range of subjects, we have provided 1 multipurpose training room with a floor area of 84.5m^2, with an additional storage area of about 20m^2 for equipment and supplies.

2) Cultural Facilities

The combination library/meeting room should be capable of accommodating conferences of 10-15 persons as well as library racks. For larger meetings, the pilotis area of approximately 150m^2 --below the high floor--can be utilized, as this area can accommodate meetings and events of 30-40 persons. Allowing space for a storage

area for supplies and a toilet, the total space requirement becomes about 40^2m.

3) Clinic

The space requirements for the clinic must be sufficient to permit the conduct of examinations, treatment, and laboratory work. Allowing for equipment placement and proper working space, the section plan calls for a floor space of $29m^2$.

The purpose of the pediatric clinic is to dispense advice and education to mothers and children as a means of diffusing knowledge of child hygiene and health care throughout the area. There is, therefore, no particular need to establish a specialized pediatric clinic; it will be sufficient to provide a space in which nurses can talk with and advise patients, and it was concluded that $29m^2$ would be ample for this purpose.

The rest area for nurses should accommodate three persons (1 registered nurse and two nurse aids) and should also be capable of treating emergency patients.

In addition to the above areas, a toilet and washstand will also be provided.

4) Adjunct Facilities

(a) Management office; rest area for instructors:

The management office will control overall operations of the subject Center. A total permanent staff of three persons is anticipated, including a manager, clerk/receptionist, and maintenance man. In addition, the set-up should be capable of accommodating temporary help, as required.

The instructors' rest area, containing a table and four chairs, will be positioned in a corner of the office. Based on the dimensions and layout of the necessary furniture, the total space requirement has been set at 60m^2.

(b) Night-duty room

One resident employee will be required to maintain and operate this facility. The maintenance man provided for under (a) above can double as this resident employee, and so the night-duty quarters should be sufficient to accommodate a single individual.

Allowing for a bedroom, dining-kitchen area, toilet, and shower, the space requirement for this area has been set at 36m^2.

(c) Toilet; washstands

Combining the requirements for men and women, the total area would be 33m^2.

(d) Entrance hall, stairs, corridors

This space will provide access to the main facilities and has been calculated at 113m^2 in all.

5) Trainee Dormitory

Most of the training programs are geared to both men and women and so the breakdown of the student body by sex will not be uniform. Since the average class size for the courses given by the Central Government is 15-20 persons, it should be adequate to provide, as boarding facilities for trainees, four twin rooms and two rooms for four-person occupancy. Allowing for beds and other basic

furnishings, the twin rooms have been set at $27m^2$ each and the four-person rooms at $33m^2$, for a total requirement of $174m^2$. In addition, a total of $42m^2$ will be needed for toilets and showers.

Four private rooms for instructors have been provided with a combined area of $108m^2$, including showers and toilets. Common areas will include a dining room of $60m^2$ and a kitchen of $20m^2$. In addition, we have provided an area of $27m^2$ for a combined night-duty and superintendent's room as well as $18m^2$ for storage.

The required floor space by sub-divided rooms for the above facilities is shown in Table 4.9.

Table 4.9 Facility Scale

(Community Center)

Type of Facility/Room	Floor Area (m^2)	Comments
1) Training facility	(104.0)	
Training room	84.5	
Attached storage room	19.5	
2) Cultural activities	(107.0)	
Meeting room/library	68.0	
Storage area in the plaza; lavatory	39.0	using the pilotis area
3) Clinical facility	(91.0)	
Consultation/examination room	29.0	
Child welfare room	20.0	
Anteroom for nurses	14.0	
Toilet	28.0	
4) Incidental facilities	(212.0)	
Management office/instructor's room	30.0	

Night-duty room	36.0	
Toilet	33.0	
Hall and corridor	113.0	
TOTAL	514.0	

(Trainee Dormitory)

1) Dormitory for trainees	(216.0)	
Bedrooms (6)	174.0	Double room x 4, four-person room x 2, total 16 persons
Toilet & shower	42.0	
2) Boarding facilities for instructors	(108.0)	4 single rooms
3) Common/management facilities	(269.0)	
Cafeteria/Lounge	59.4	
Kitchen	20.0	
Management office/Night-duty room	27.0	
Store room	18.0	
Hall and corridors	144.6	
TOTAL	593.0	

(2) Layout Plan

Following is an outline of the basic layout plan for each facility.

1) Community Center

The site for this facility is a corner plot bounded by roads on the east, south, and west. The area from the east to the west road has a slope of about 6.0m from the highest to the lowest

point. Attention was paid to the following points in this design plan.

(a) Through creative use of the altitude differential, three different functions have been accommodated at the Community Center while seeking to reduce site preparation costs.

(b) Since the climate in the area is very hot and humid, ventilation is a prime consideration. Based on the meteorological study, the wind flow in the Noro area is mainly from the southeast. Accordingly, the building is to be built on the long east-west axis and left open on the north and south sides.

2) Trainee Dormitory

The site for this facility is recessed about 30m from the main highway, with an access road to this main road provided at the north corner. The gradient from northwest to southeast is about 5.5m. The following points were carefully considered in formulating the layout plan.

(a) To minimize the length of the access road, the entrance to the building has been set near the north corner, with a common area adjoining this entrance. The plan calls for the living areas to have high floors and to extend toward the southeast, in the direction of the downward slope.

(b) As in the case of the Community Center, this building will be built along the long axis from northwest to southeast, so as to maximize north-south ventilation.

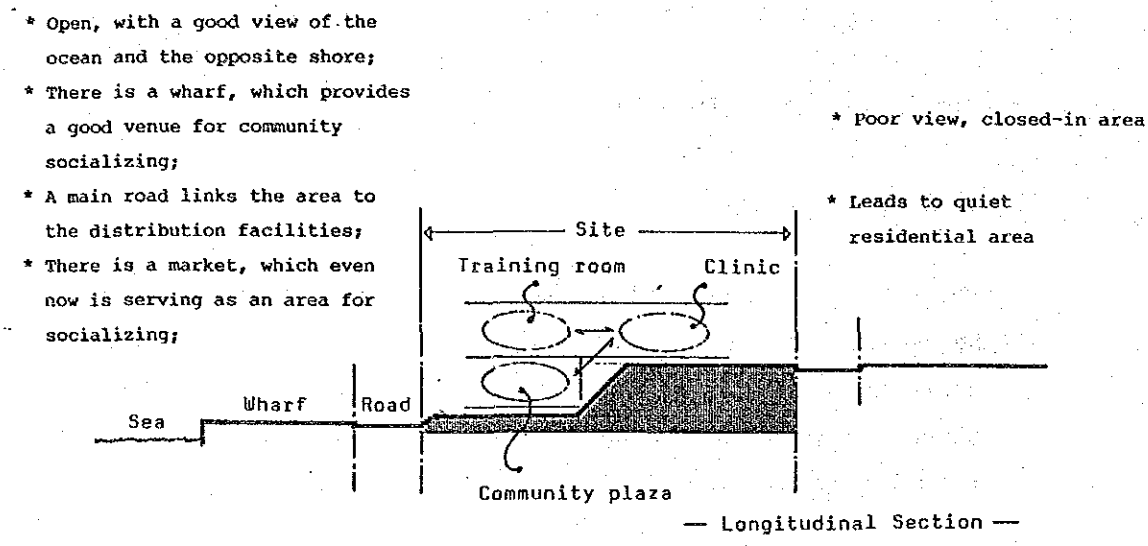
(3) Building Plan

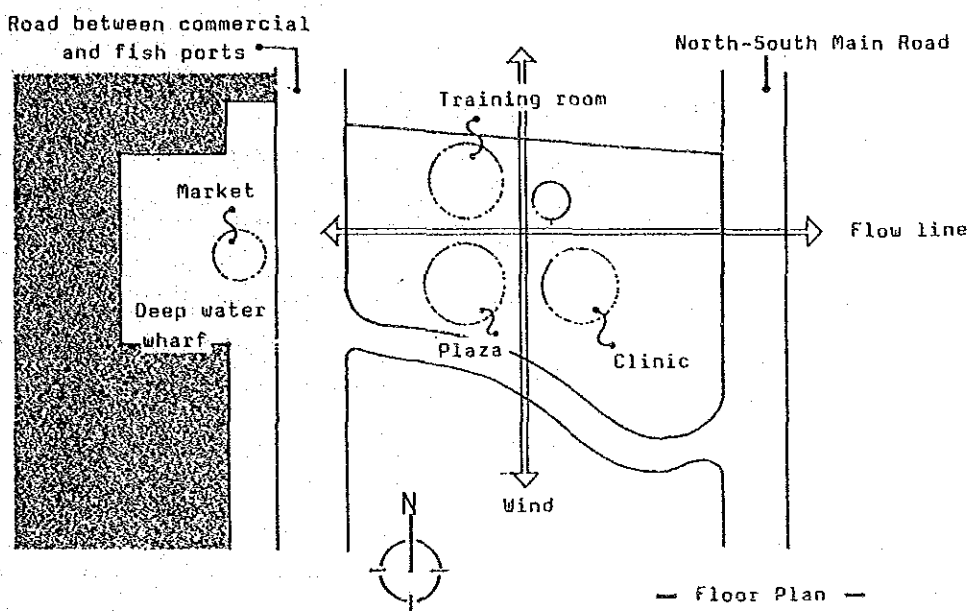
1) Section Plan

(a) Community Center

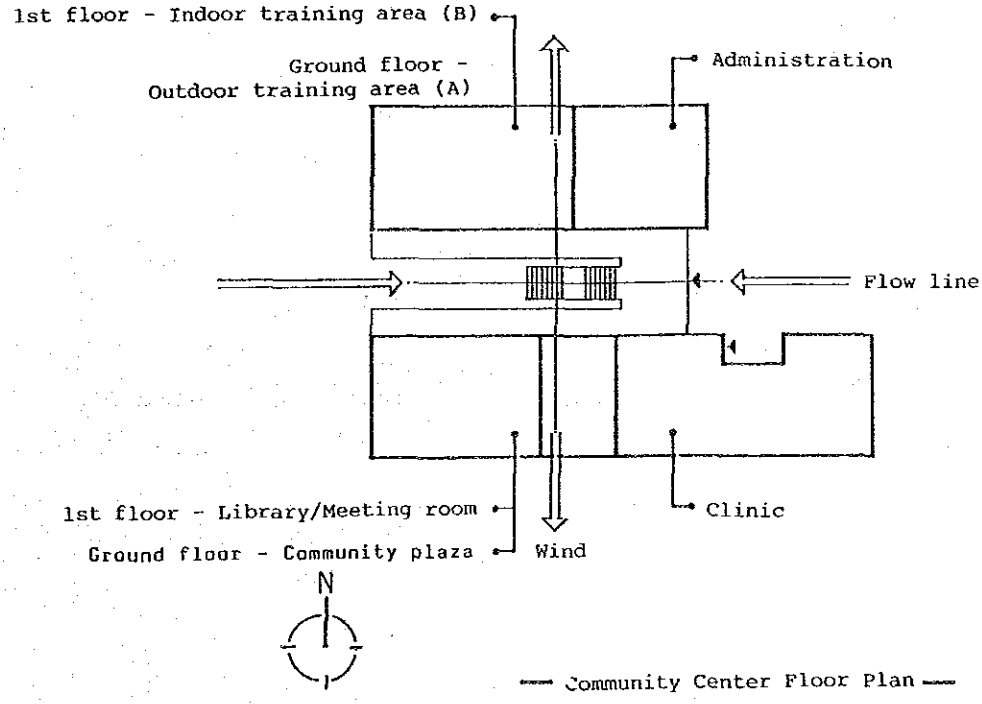
As noted above, this facility is to be comprised of: (1) a training facility, (2) a clinic, and (3) meeting rooms and cultural amenities.

Since there is a decided slope from east to west, as shown in the following section plan, there will be marked differences in the views to the rear of the facility.





In preparing our zoning plan, consideration was given to the logistics and configuration of the site area. The plaza will be located in the low section of the site, facing the wharf. The clinic will be separated from the noise of the waterfront plaza, facing the road on the eastern side. The zoning plan is expressed in the following chart.



(b) Dormitory

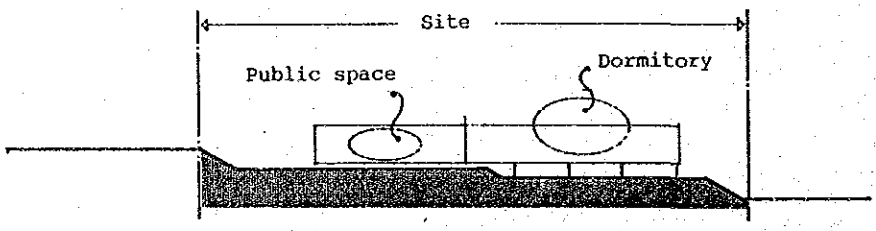
This facility is composed of: (1) the dormitory for trainees (2) accommodations for instructors and (3) common areas.

There will be four double rooms and two four-person rooms for the trainees, with a separate lavatory and shower room. This will be the trainee dormitory wing.

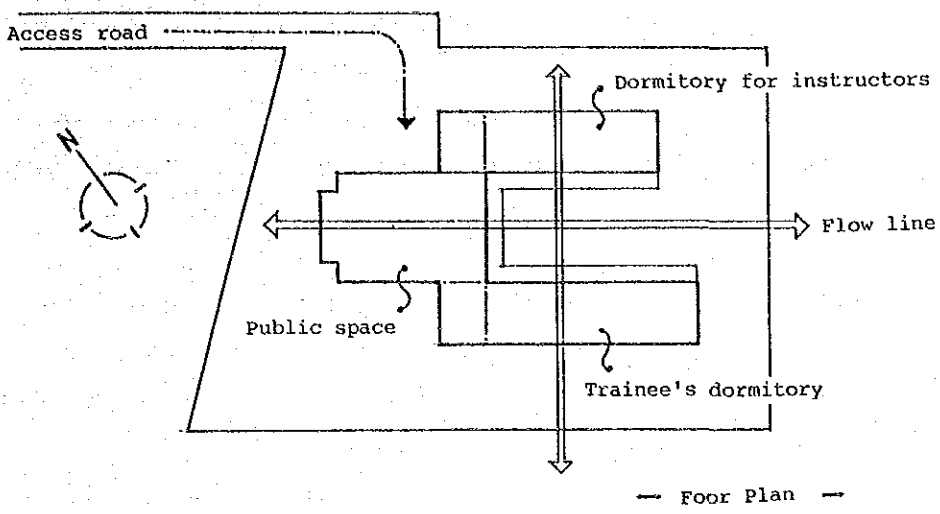
There will be four rooms for the instructors-- all single rooms with private toilet and shower. This will be the instructor wing.

Joining these opposite wings will be a common area, containing the entrance, cafeteria, and lounge.

With regard to zoning, as shown in the following charts, the common area will be located at the high end of the site, with the sleeping quarters along the downward slope. The bedrooms will be given high floors to improve livability and insure good north-south ventilation.



Longitudinal Section



(4) Number of Stories; Height (Section Plan)

1) Community Center

Ceiling heights in the Solomon Islands are considerably higher than in Japan. High ceilings are, from the standpoint of combating the excessive temperatures, an accepted method of building construction along with ventilating windows. Thus, one sees very few ordinary flat ceilings; the bulk are a raised cathedral type following the contours of the roof.

In more specific terms, the ordinary ceiling height for a small room is 2.8~3.0 m; the height of middle size room often ranges from 3.5m to 6~7 m. In the subject facility, based on these survey values, the floor height of the pilotis section has been set at 4.0 m. On the first floor, in order to be able to change the side ventilation quickly to vertical in the activity portions, high cathedral type roofs will be built. Thus, the training room will have an eave height of 3.5 m, with the roof rising in a hipped shape.

Based on the above, even in the small room in the clinic, we will be able to secure a ceiling height of some 3.0 m.

2) Dormitory

In the dormitory as well, the basic elements are the same as for the Community Center and so the floor and ceiling heights have been set as follows:

Bedrooms--	eave height :	3.2 m
	ceiling height:	3.0
Common area--	eave height :	3.6
	ceiling height:	sloping ceilings

(5) Part Plan

In considering the part plan, we dealt with the following natural and social conditions:

...Climate-- high temperature; high humidity

...Rainfall is concentrated in limited periods of time

...Although there are virtually no building materials available in Noro, items available in Honiara can be worked into the plan.

The part plan was based on careful consideration of the above points. In this section, if there is no mention to the contrary, the conditions will be the same as for the Community Center and dormitory.

1) Roofing

Flat roofs were rarely in evidence during the field survey; the preponderance were hipped roof or gable, but this is probably a natural result of the climate in the area. The two most popular styles are the leaf roof seen in private homes and steel sheet roofing.

In this Plan, we have specified sloping roofs, as they are best suited to the area's climate, and have paid special attention to roof backing materials and ventilation.

2) Exterior Walls

The basic structure of both facilities is to be reinforced concrete and so exposed concrete will be used as the primary finishing materials, owing to its relatively precise workmanship during construction. In certain areas, dressed concrete block will also be used.

3) Outside Openings

As entrance doors, wooden doors as well as steel doors shall be used.

For windows, we will use the jalousie type in principle, which is very prevalent in the area. However, aluminum doors and windows will also be used for the necessary sections.

In the design of the openings, particular attention has been paid to making the eaves deep and to ensuring adequate water return so as to avoid direct sunlight and prevent the rain from blowing in from the sides. We have also calculated an appropriate value for sun height.

4) Floors

Considering the high humidity, high raised floors will generally be used in the living and office quarters, with sub-flooring ventilation to be secured.

As to finish, mortar trowel finish has basically been specified, but ceramic tile will also be used in the pilotis section, porch, and entrance hall in the Community Center and in the entrance hall and cafeteria in the dormitory.

5) Interior Finishes

For the interiors, the following materials will be used, as appropriate, and insulation will also be provided:

Ceilings : Strip ceiling
Sound-absorbent board; plywood with paint finish

Interiors: mortar trowel, paint finish, exposed concrete, plywood with paint finish

(6) Structural Plan

In this section, unless there is an indication to the contrary, the structural method will be the same as in the Community Center and dormitory. The applicable standards and seismic force for the structural design will be discussed in Section 4.6. Here, we shall only deal with structural design.

In contrast to the other production facilities, the subject facilities are to be used by many and unspecified persons.

We have taken into account the fact that, as the core city of Western Province, a certain elan is required in public buildings. This facility, by the very nature of its activities, must be durable and long-lasting.

From this perspective, the following methods have been specified:

(1) The structural components will be RC.

(2) In consideration of the distinct characteristics of the various rooms, the rigid frame structure will be used.

(3) With regard to the roof structure, based on examples of local construction and the shape of the planned roof, we will, as a

basic rule, use wooden frame structure. In particular, New Zealand laminated timber is being considered for the upper roof in the Community Center.

(4) For the foundations, since the Plan buildings are one- and two-story respectively, and since, based on the survey findings, the site foundation has relatively high N value at shallow depth, we have specified direct support, independent foundations.

4.2.4 Electrical and Mechanical Plan

(1) Power Facilities

Power supply in the Plan area is via overhead, high-voltage (11,300 V) transmission lines over a trunk road from the power station. This supply is stepped down from the transmission line via a branch pole transformer and brought into the junction boxes at each facility and then distributed to the required equipment. The trunk lines to the various facilities in this Plan are generally buried; within the building, power is distributed through PVC pipes.

In this electrical plan, we shall avoid facilities that are complex to handle or maintain, concentrating on simple effective equipment, while the materials and products used will, to the greatest extent possible, be of standard specifications. To keep maintenance simple, we have selected materials that are in general use in the area and readily available.

The power facilities may be divided into lighting and outlet facilities and power facilities.

1) Lighting facilities

From a maintenance standpoint, the bulbs used will, to the maximum possible extent, be of a type that is available locally. Fluorescent and incandescent bulbs are both widely used in the area. The building facilities will primarily use fluorescent light, supplemented by incandescent light when required. Outdoor lighting for the oil storage tank and wharf facilities will use mercury lamps.

After careful consideration of local conditions, we have set the following lighting specifications:

Room	
Office, training room	300 LX
Corridors, storage areas	200
Sleeping quarters	200
Toilets	100
Within premises, wharf facilities, work apron	20
Within premises	10

Lighting fixtures directly exposed to outside elements will be of salt-resistant construction.

Sockets will be geared to office equipment and hand tools in the work areas.

Load voltage will be 240V, 50Hz.

2) Power Facilities

The target equipment in the shore facilities will include the compressor for the cold storage and quick freezer, small ice-making plant, and other equipment in the workshops.

In the oil storage tank, the power receiving facilities will be the fire extinguishing equipment and, in the Community Center and dormitory, hydrant equipment.

Load voltage will be 415V, 50Hz.

(2) Water Supply and Drainage Facilities

1) Water Supply

Water will be brought into the Plan area through branched pipes from the 6" main pipe laid along the trunk road. The facilities to be supplied include the Community Center, dormitory, and shore facilities. However, since much rainfall is expected, rainwater tanks have been installed in most of the facilities in the Plan area to reduce operating costs. Accordingly, we have specified water catchment tanks of appropriate capacities in the various Plan facilities.

As for the oil storage tank, since consumption will be limited while the facility is quite far from the main water supply pipe, no city water connection will be made.

A water supply outlet will be provided at the landing wharf for use by vessels.

At the Community Center and dormitory, fire extinguishing equipment will be installed pursuant to local regulations.

2) Drainage

Sewage pipes are laid along the main road running to the shore facilities. Thus, soil and waste water draining from the facilities will all be merged and directly discharged into the sewage pipes.

However, the waste water from the workshop, which will contain oil, will first be cleansed of oil in a trap device and then evaporated and permeated.

Since the sewage facilities are not yet completed in the vicinity of the oil storage tank, Community Center, and dormitory, septic tanks will be installed at these facilities for treatment of their soil water.

4.3 Small Harbor Workboat

(1) Required Functions

This workboat is to be a small vessel performing a variety of functions within the port of Noro.

Since there is no need for high speeds within the harbor, normal output of the main engine has been calculated on the basis of a normal speed of about 7 knots. On the other hand, in view of the required tugging capabilities, the engine will have to be large enough to be capable of towing fishing vessels using Noro as their home base as well as barges. Setting the displacement of target vessels, excluding the large purse-seine vessels, at about 400 tons, since the required thrust for towing at 3 knots will be about 1.0 ton, the output of the engine has been set at a level combining this tugging requirement with the rated cruising capacity.

The normal output of the main engine required to obtain a 7 knot speed, as derived from the BHP performance curve, is about 50 ps; setting this at 75% of the maximum continuous rating (MCR),

$$MCR = 50 \text{ ps} / 0.75 = 67 \text{ ps}$$

As to the required output when tugging, the required towing power of 1.0 ton plus the cruising power will come to about 100 ps; accordingly, the MCR becomes:

$$MCR = 100 \text{ ps} / 0.75 = 133 \text{ ps}$$

The output has, on this basis, been set at 130 ps.

Turning next to the capacity of the fuel tank, while this will, of course, depend on the type of operation involved, assuming that the boat normally operates 5 hours per day, the fuel consumption will be, when tugging:

100 ps x 200g/hr = 20,000g/hr = 20.0kg/hr

20 kg x 5 hrs. = 100 kg

In capacity terms, at a 0.85 specific gravity,

100 kg / 0.85 = 117 lit/day

Based on the vessel's layout and structure, a tank of about 1.3 m^3 can be provided; thus, barring any special operations, it should be sufficient to refuel on a cycle of about once a week.

(2) Principal Particulars

The main specifications for this vessel are as follows:

	(all figures approximate)
Length	11.20m
Length between perpendicular	10.0m
Width (mold)	3.50m
Depth (mold)	1.30m
Design draft	1.00m
Output of main engine	MCR 130 ps x 2,000 rpm x 1 engine
Cruising speed	7 knots
Fuel tank	1.3m^3
Bunks	2
Applicable regulations	Japanese Government Safety Regulations for Small Vessels

4.4 Equipment

(1) Training Equipment

1) Outboard Engine Workshop

At this facility, residents using mainly outboard motors will be given instruction in the regular care and maintenance of these motors. One of the key objectives of this workshop is to encourage residents to bring in defective engines and learn at first hand the techniques of repairing them under the guidance of the instructor. In addition, equipment must also be provided to permit, to some extent, emergency repairs of other outboards as well as vehicles, forklifts, and marine engines.

The essential equipment will include drivers, wrenches, pliers, and other hand tools.

Course enrollment will be limited to 10 persons. Thus, a total of 10 tool kits will be required. Commonly used spare parts for outboard motors will also be provided in anticipation of the need for parts replacement in connection with repairs.

The equipment requirements for this facility will be as follows:

Hand tools (driver, wrench and plier sets)	10 sets
Cutaway model of outboard motor	1 unit
Hydraulic press	1
Wash stand	1
Compressor	1
Test tank	1
Parts shelf	2
Work stand	1
Work counter	1
Tool shelf	1

2) Fishery Training Materials

The primary objective of this program is to improve the hand-line gear presently used by small-scale fishermen, and so samples of vertical line gear and line-making equipment will be provided. In addition, model gill nets as well as materials for making and replacing this kind of net will also be provided to permit training in gill net fishing methods

Since the materials for gear-making are considered expendable with each course, if 3 courses are offered per year to 10 trainees each, the annual requirement will be 30 sets of materials-- or 90 sets over a 3-year period. Thus, including spares, 100 sets will be needed.

Samples of vertical line gear	10 sets
Materials for making vertical line	100 sets
Model gill nets	10 sets
Gill net materials	100 sets
Net needle	100 pcs
Replacement thread	70 spools

(2) Basic Clinic Equipment

The requirement is for a facility that will provide primary care along with child welfare services. The clinic facility will, for the time being, be centrally positioned in the areas health care system. It is felt, however, that it would not be appropriate to provide equipment requiring specialized medical or maintenance technicians or a continued supply of expendables. Since this facility is scheduled to be managed by a registered nurse and two nurse aids, the plan includes only equipment that can be handled by these personnel.

4.5 Facility Summary

The overall facility plan, as formulated above, may be summarized as follows:

1. Oil Storage Facilities

Tank	3,000 kl x 2 units
Administration building	1-story, concrete block construction; floor area-- 60 m^2
Oil pipes	Oil intake pipe, ϕ200, approx. 2.5km, buried Distribution pipe, ϕ150, ϕ100, partly buried
Terminal facilities	Oil intake terminal (Commercial Port) Dispensing station (new dock)
Fire fighting equipment	Foam-type

2. Shore Facilities

(1) Wharf:

1) Landing wharf:

Length	100m
Depth	-6.5m
Plan crown height	+1.7m

2) Repair wharf:

Length	50m
Depth	-3.0m
Plan crown height	+1.7m
Work apron width	20m

3) Wharf for small vessels:

Length	20m
Depth	-1.5m
Plan crown height	+1.2m
Work apron width	7 - 8m

(2) Shore Facilities:

1) Cold storage: Steel-frame, 1-story, floor area 1,220m^2
Storage capacity: 250 tons x 2 rooms = 500 tons, -25°c
Quick freezing equipment: 3 tons x 2 rooms = 6 tons, -35°c
Pallets: 2.25(l) x 1.25(w) x 1.2(h)m, 525 units
Forklifts: 2-ton electric type, 3 units
6-ton diesel type, 2 units
Weighing equipment: 2-ton bench scale, 1 unit

2) Administration building: Steel frame, 1-story, floor area 224m^2

3) Small ice plant: Steel frame, 1-story, floor area 128m^2
ice making capacity: 500kg/12hrs, block ice

4) Workshop: Steel frame, 1-story, floor area 78m^2

3. Community Center

(1) Community Center: RC construction, 2-story, floor area 514m^2

(2) Dormitory: RC construction, 1-story, floor area 593m^2

4. Related Facilities

(1) Electrical facilities

Lighting fixtures, lighting and power circuit facilities

(2) Water supply and sewage

Water supply and sewage facilities, rainwater tanks

5. Small Workboat

11.2(l.o.a) x 3.5(b) x 1.3(d)m, 12gt (approx.), 130ps

6. Equipment

(1) Training equipment:

Workshop equipment for outboard motor repair

Fishing gear for training in fishing operations

(2) Basic clinical equipment

4.6 Facility Design Conditions

1. Applicable Standards

Structural and building codes are presently under development in the Solomon Islands. Although Australian standards are generally followed, these are not compulsory. The subject Plan has been based, in principle, on Japanese standards. However, with respect to seismic force, it has been decided to follow New Zealand standards.

2. Wharf Facilities

	Landing Wharf	Repair Wharf	Small Boat Wharf
Length	100m	50m	20m
Plan depth	-6.5m	-3.0m	-1.5m
Crown height	+1.7m	+1.7m	+1,2m

3. Target Vessels

Specifications	Reefer Carriers	Fishing Vessel	Boats & canoes
Gross tonnage	3,000	100	-
Overall length (m)	110	35	8-10
Vessel width (m)	15	6	2
Draft at full load	5.5	2.0	0.5

4. Tide Levels

HWL	+0.95m	High Water Level
MWL	+0.52m	Mean Water Level
CDL	0.00m	Chart Datum Level
LWL	-0.01m	Low Water Level

(5) Seismic Load

Earthquakes have been computed via the following formula, in conformity with NZS4203:

$V = Cd. Wt$

where: V= Total horizontal forces at time of earthquake

Cd= Seismic design force with coefficient as in the following

$Cd = C.I.S.M.R$

C= based on the type of foundation, as determined for the area, and the periodicity of the structure. The Solomon Islands are designated as Zone A (in NZS Fig. 3, p. 45), and this has been set as C=0.5

I= the importance factor coefficient of the building

I= 1.3

(Class 2 in NZS Table 4)

S= has been set at 0.8 in the direction of the coefficient XY, determined on the basis of building structure (Item 3 in NZS Table 5)

M= has been set at M=1, which is the RC structural coefficient, based on the type of building structure (Item 3, Table 6, NZS)

R= the risk coefficient, based on building use. This has been set at R=0

Based on the above, the seismic design coefficient, Cd becomes:

$$Cd = 0.15 \times 1.3 \times 0.8 \times 1.0 \times 1.0$$
$$= 0.156$$

6. Wind Load Factor

The design wind loads shall be determined by the following formula (Japan Building Code, Construction Ordinance):

$$P = g.\ c.\ A$$

where: g(velocity pressure) $= 60\sqrt{h}$ ($h<16m$)

h= building height

c= wind pressure factor

A= pressure receiving area

P= design wind load

7. Bearing Load

This has been established as follows, giving due consideration to the use, type, and actual condition of the facility.

Roofs	25kg (per m^2)
Classrooms	300 kg
Offices	300 kg
Night-duty room	300 kg
Corridors; balconies	180 kg
Wharf apron	1,000 kg

8. Soil Conditions

(1) Foundation

Average N value	N=10
Internal friction angle	ϕ=30°
Weight in the water	r sub= 1.0t/m^3
Moist weight	rt= 1.8t/m^3

(2) Backfill sand

Internal friction angle	ϕ=30°
Weight in the water	r sub= 1.0t/m^3
Moist weight	rt= 1.8t/m^3

9. Materials

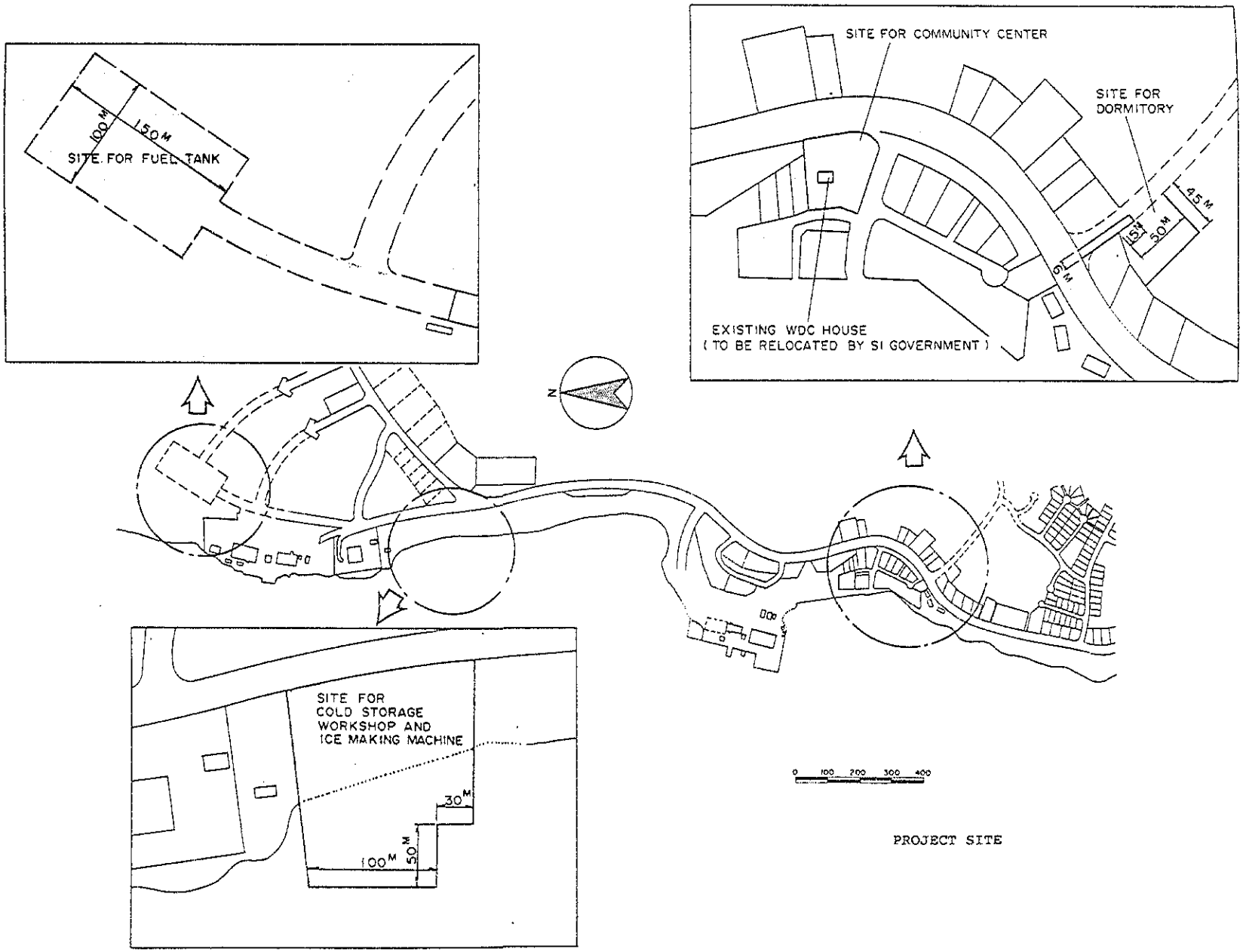
(1) Concrete

Ordinary concrete	Basic design strength	Fc=210Kg/cm^2
Plain concrete	" " "	Fc=180Kg/cm^2

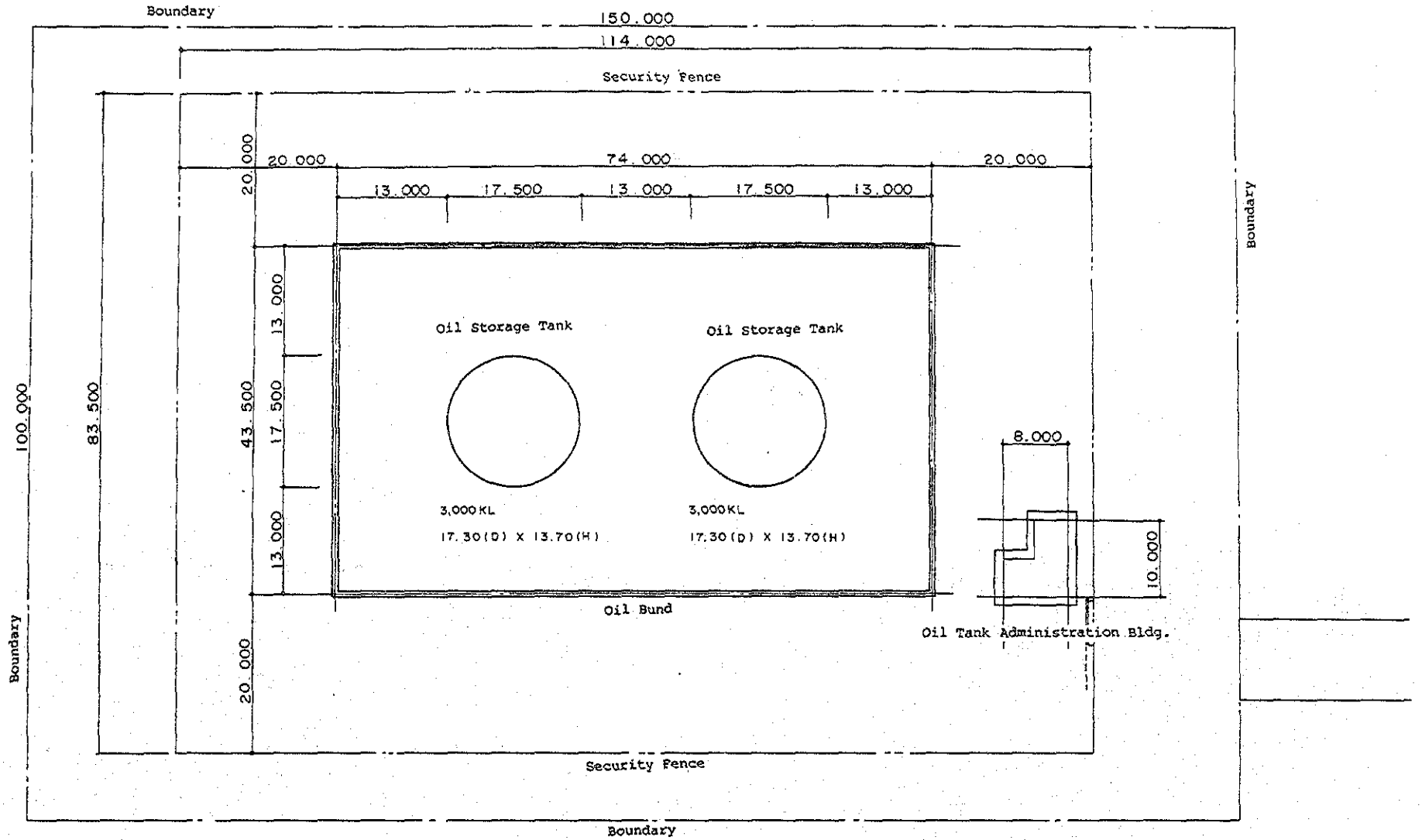
(2) Steel materials

Type of Material	Specifications		Code	Type
Structural steel	For general construction	JIS G 3101	SS41	Formed steel
Steel sheet pile	Steel sheet pile	JIS A 5528	SY30	U shape
Iron bar	For RC use	JIS G 3312	SD30	Deformed bar

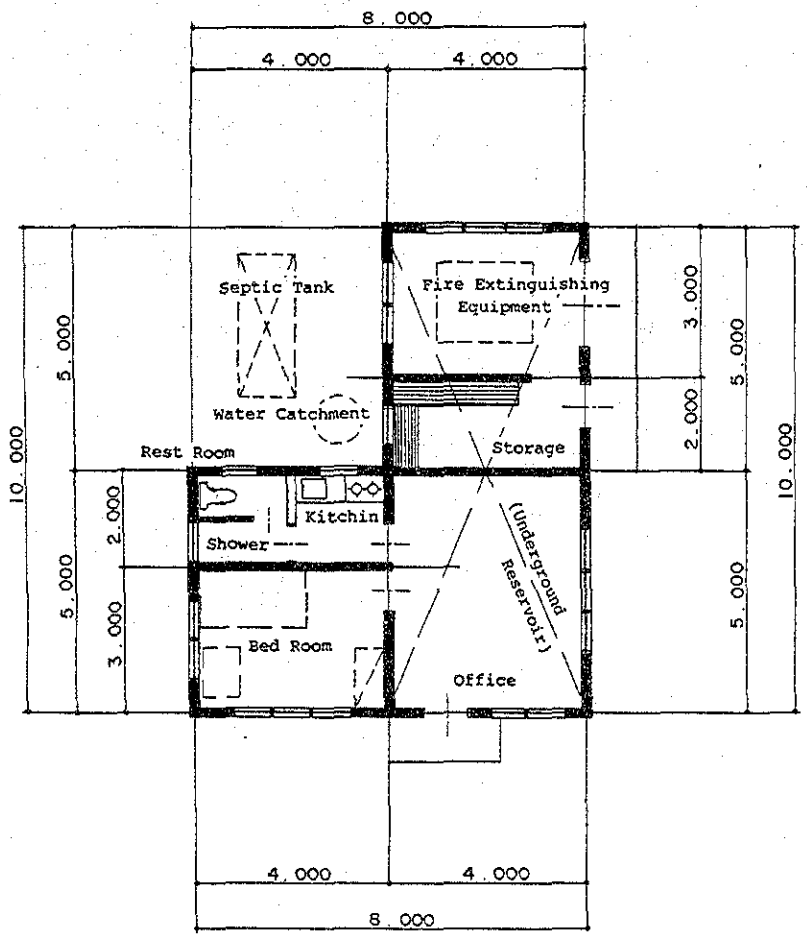
4.7 Basic Design Drawings



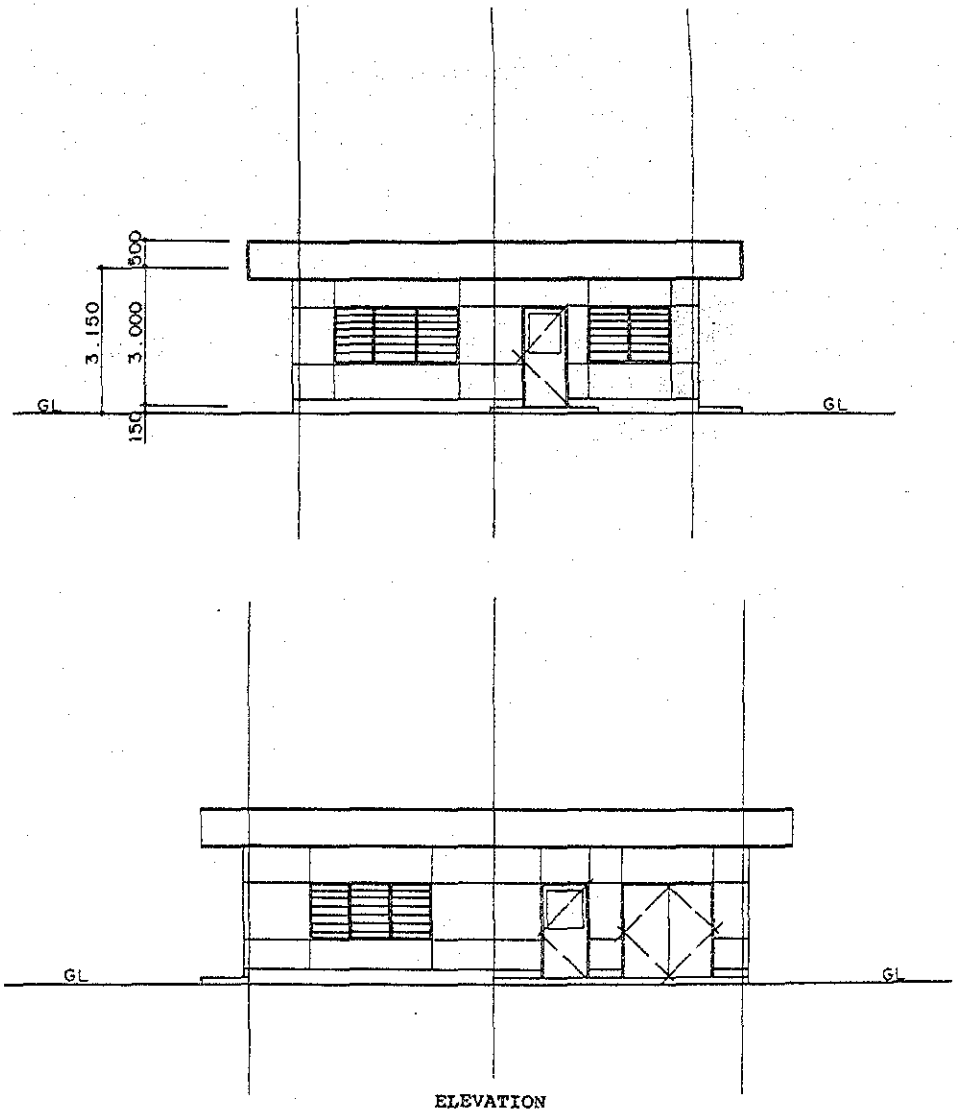
PROJECT SITE



OIL TANK SITE PLAN

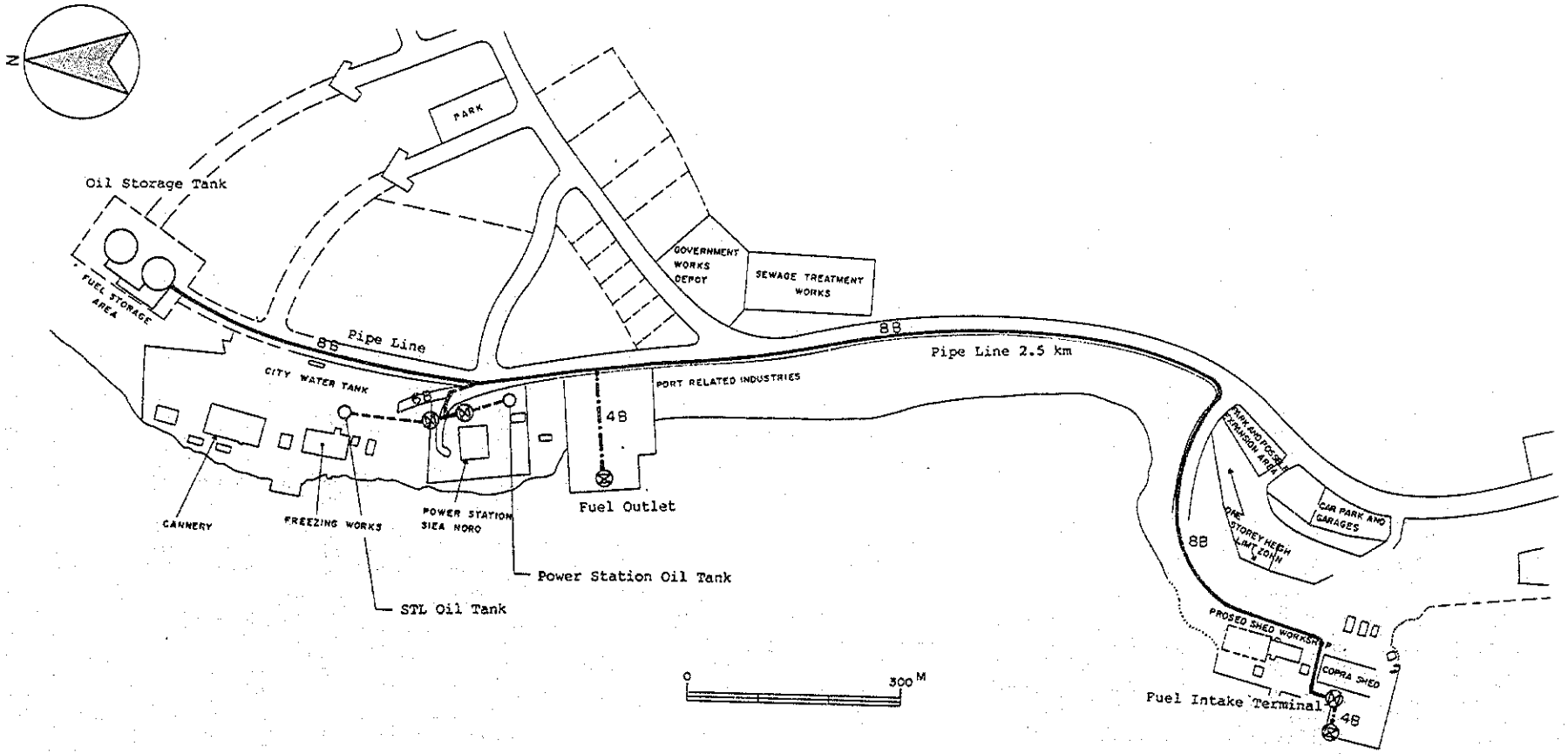


FLOOR PLAN

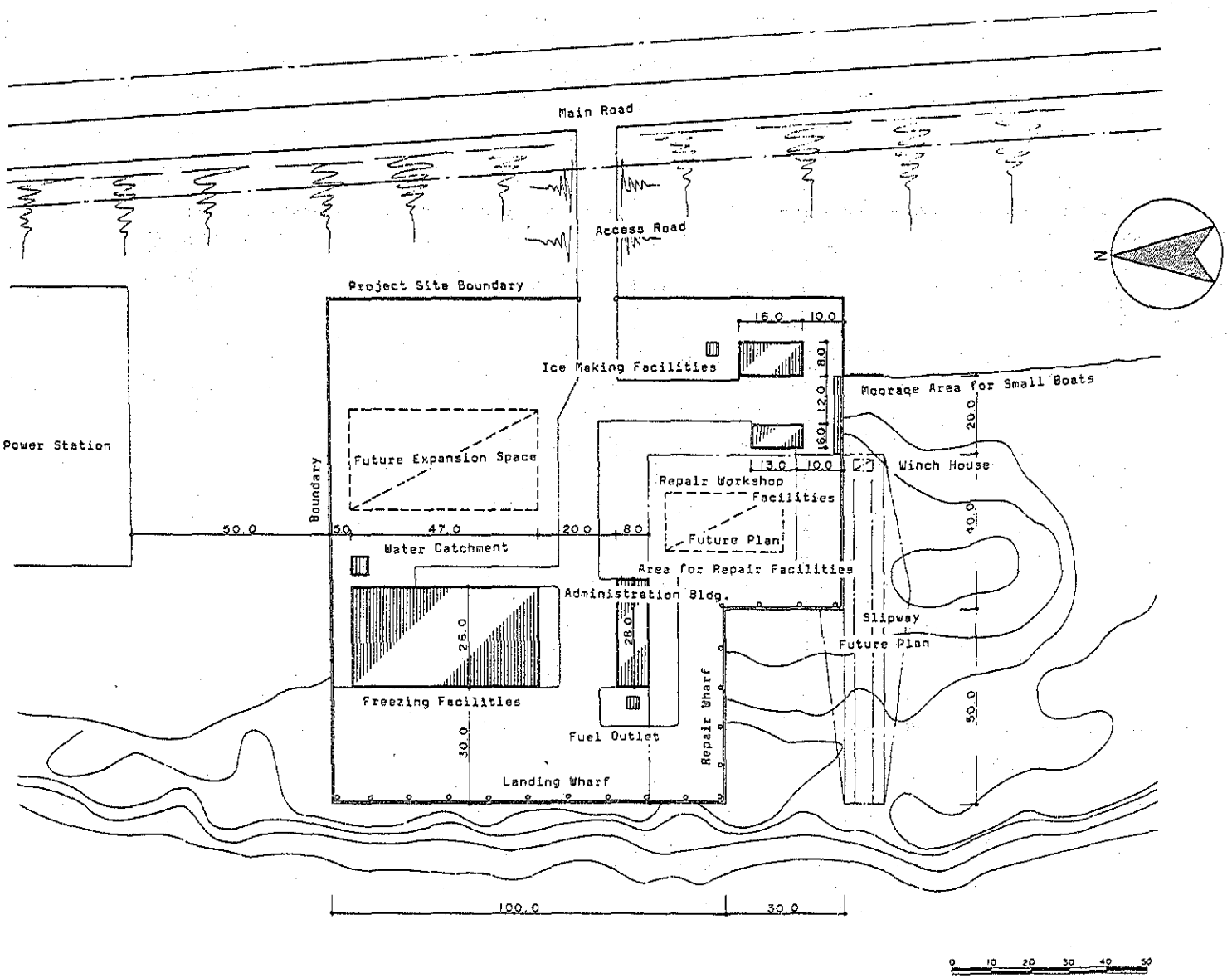


ELEVATION

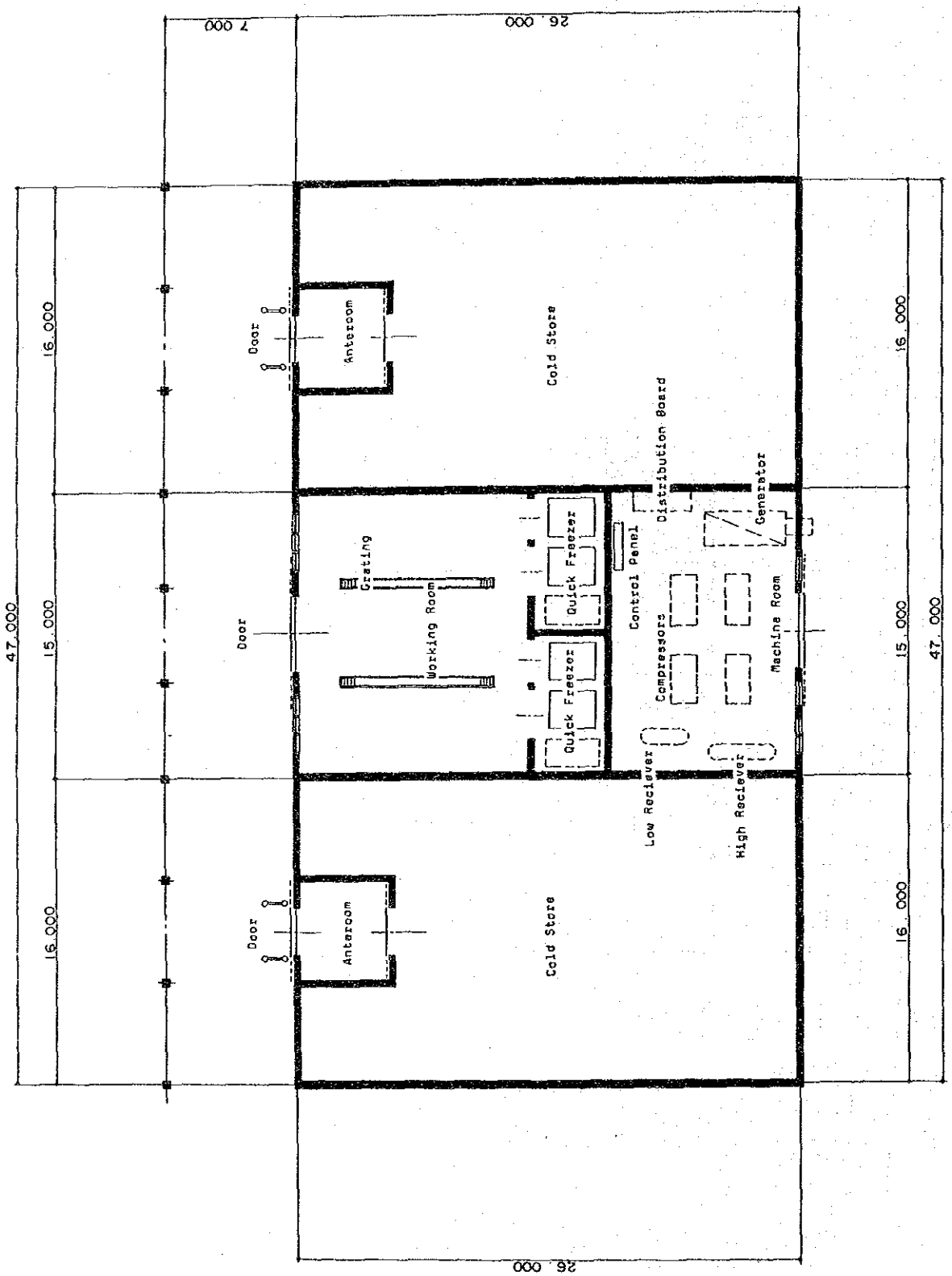
OIL TANK ADMINISTRATION BLDG.



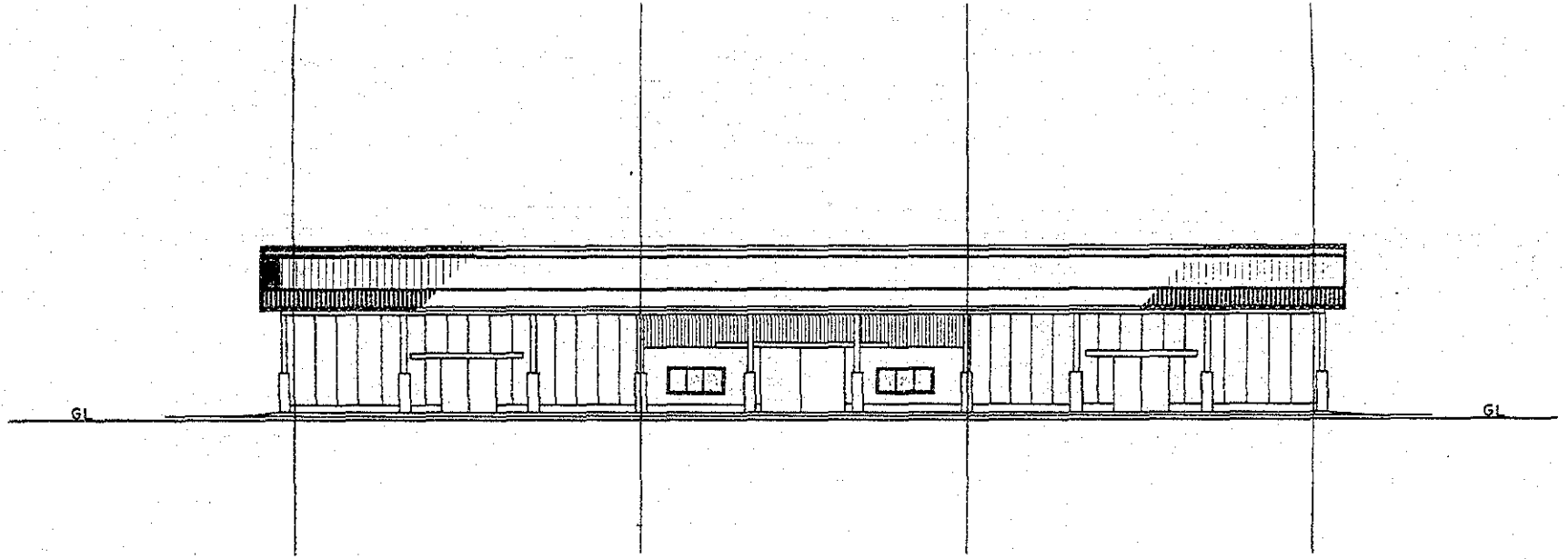
PIPE LINE ROUTE

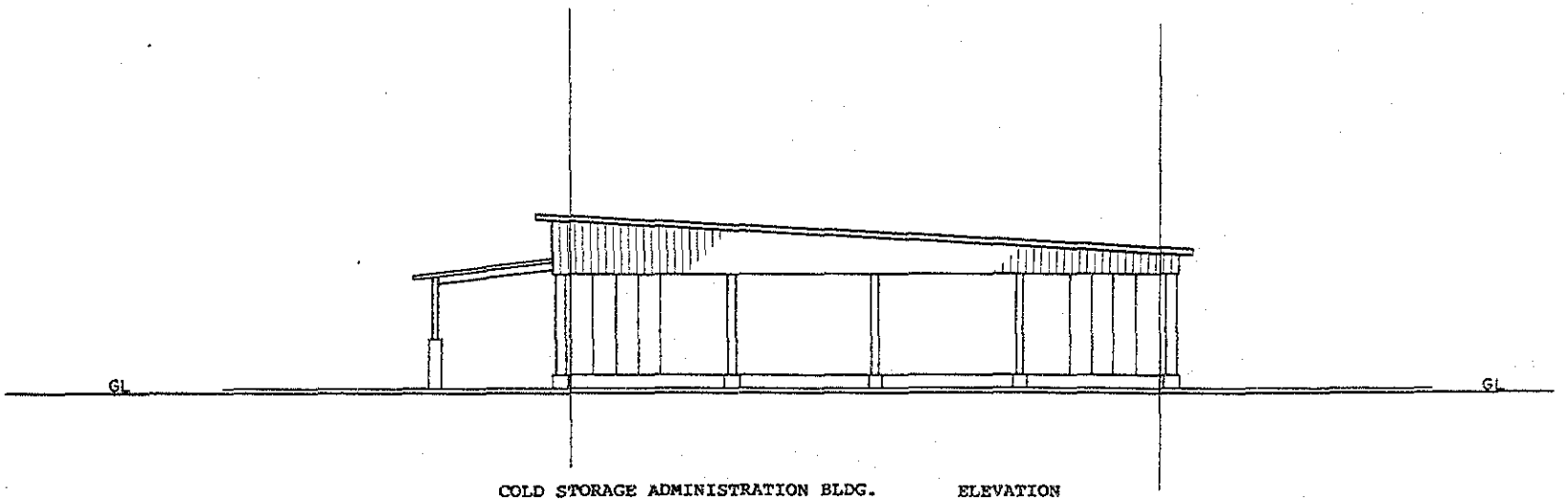


SHORE FACILITIES SITE PLAN

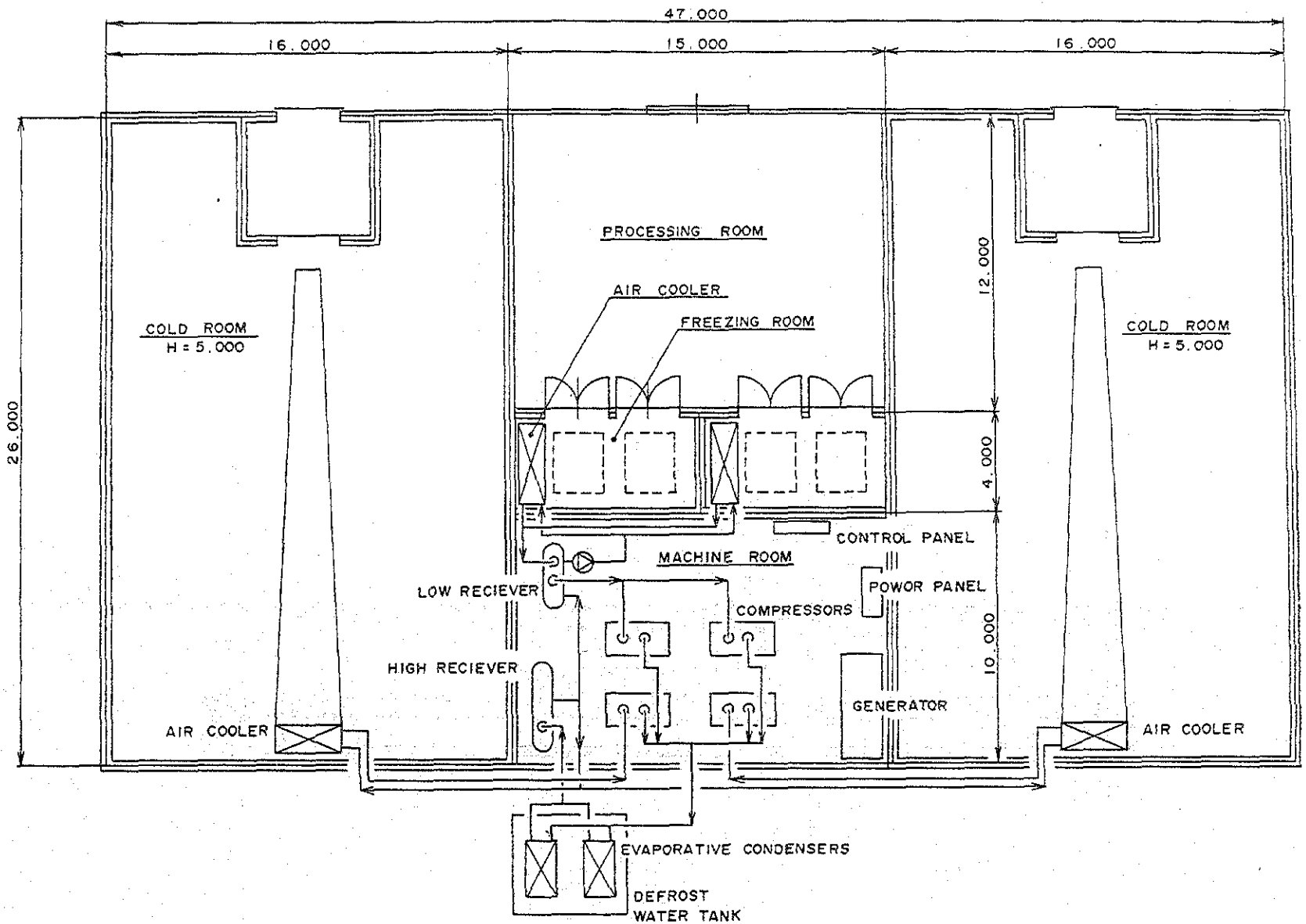


COLD STORAGE FLOOR PLAN

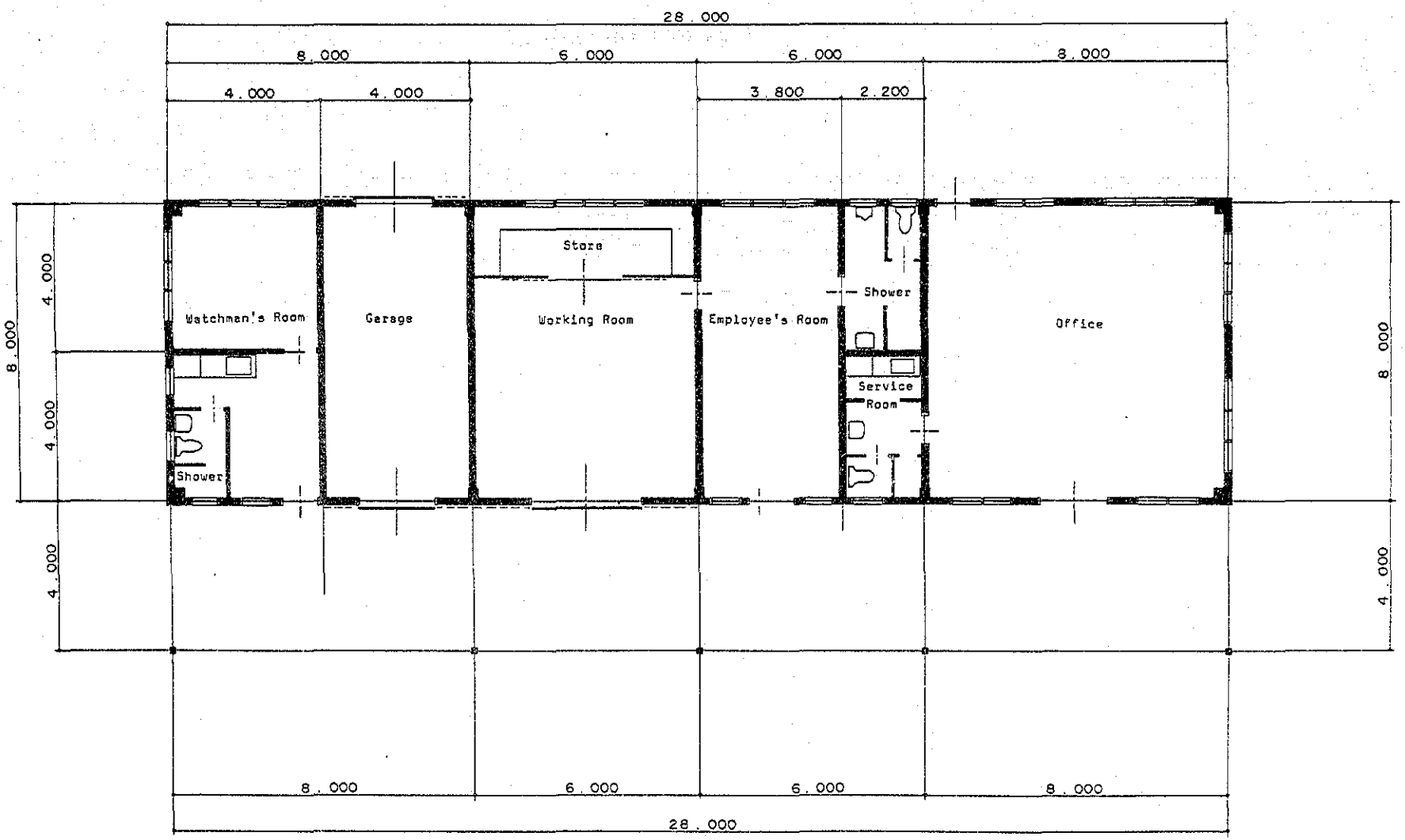




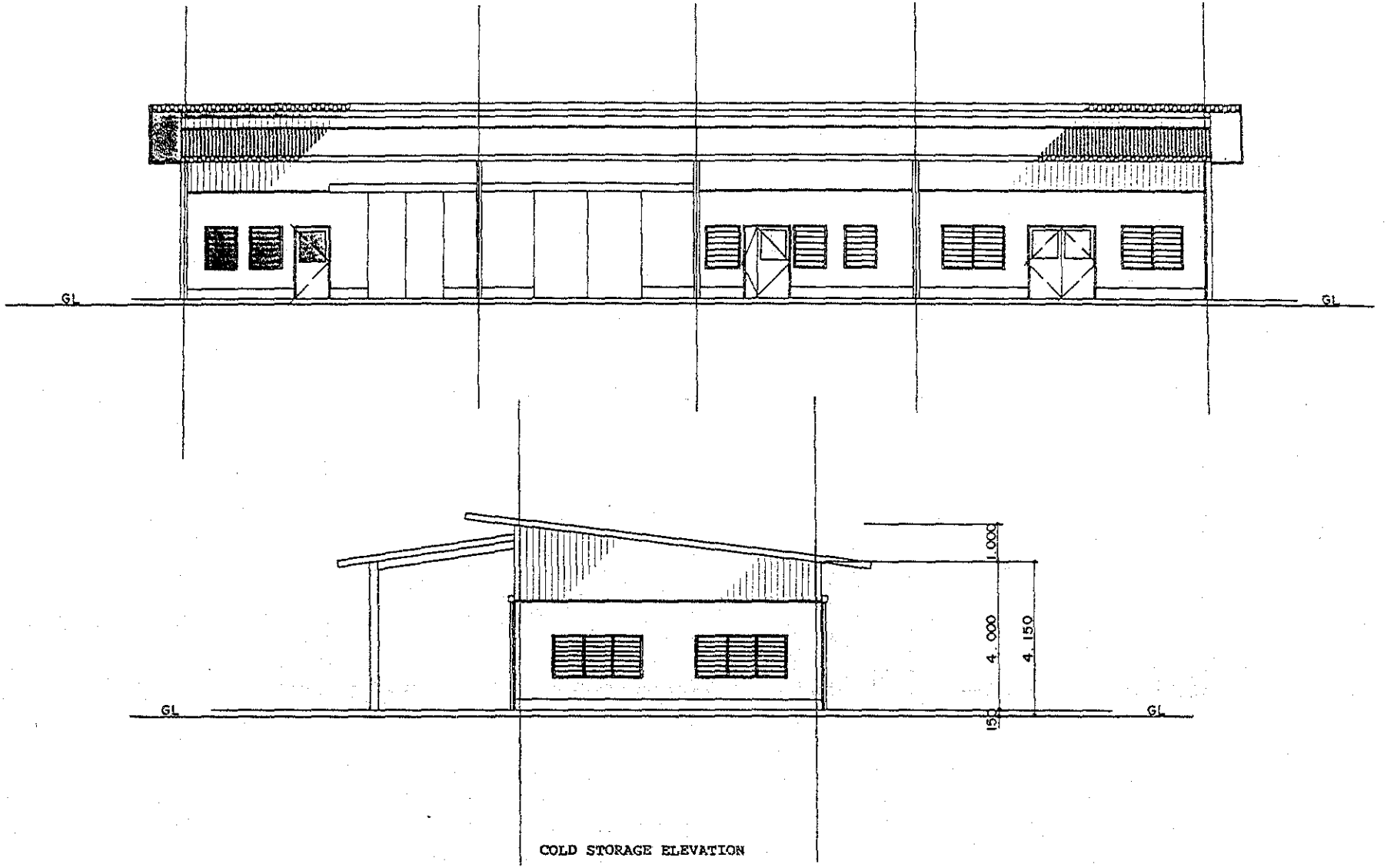
COLD STORAGE ADMINISTRATION BLDG. ELEVATION



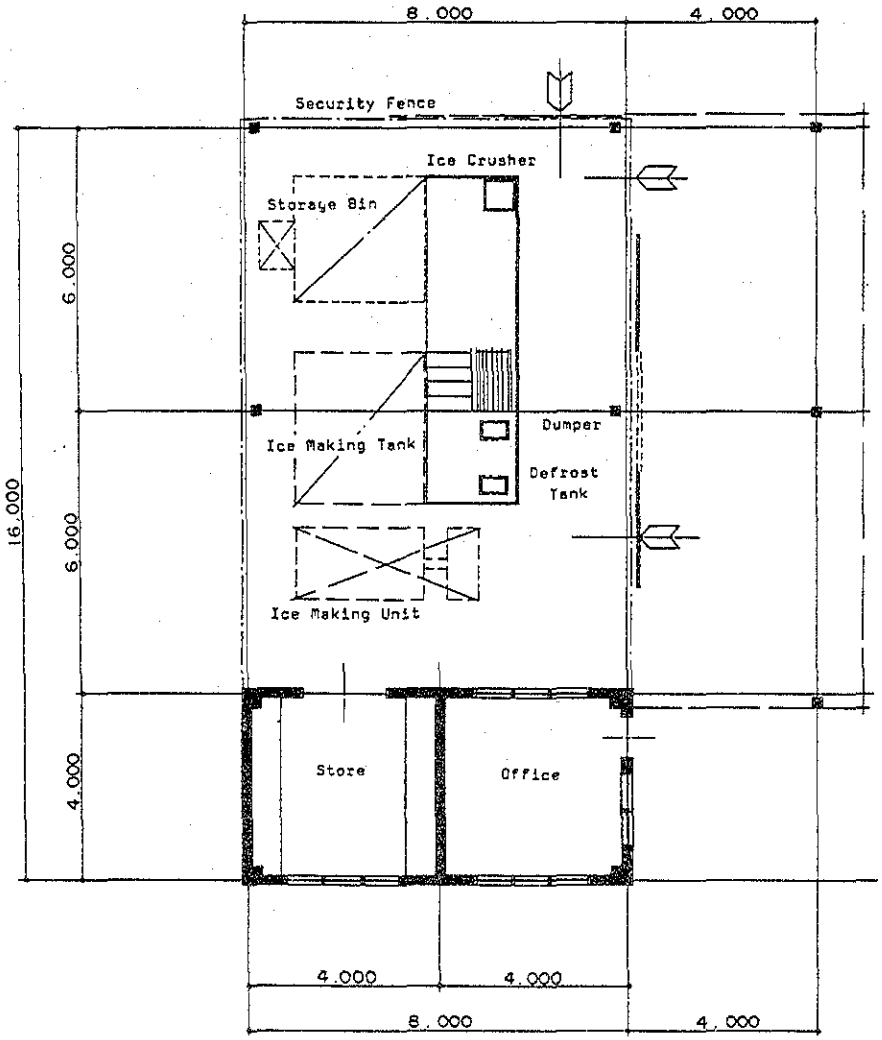
COLD STORAGE MACHINERY ARRANGEMENT



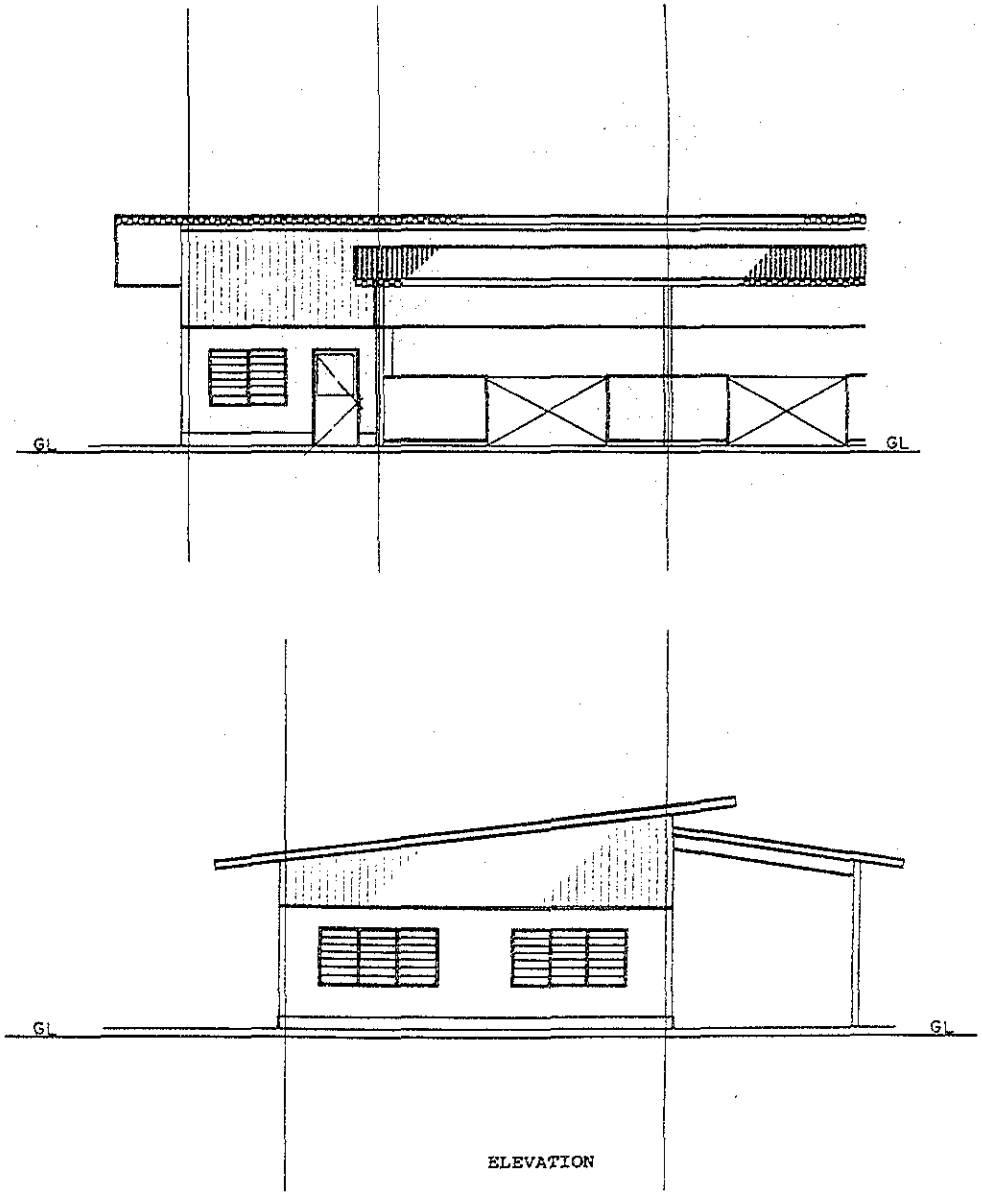
COLD STORAGE ADMINISTRATION BLDG. FLOOR PLAN



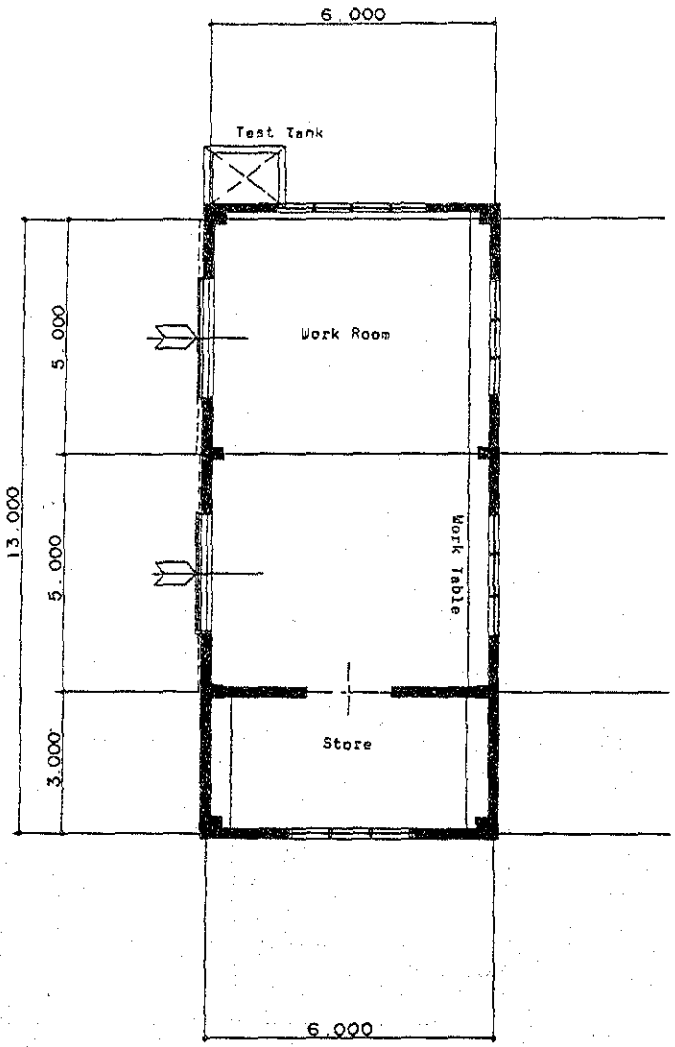
COLD STORAGE ELEVATION



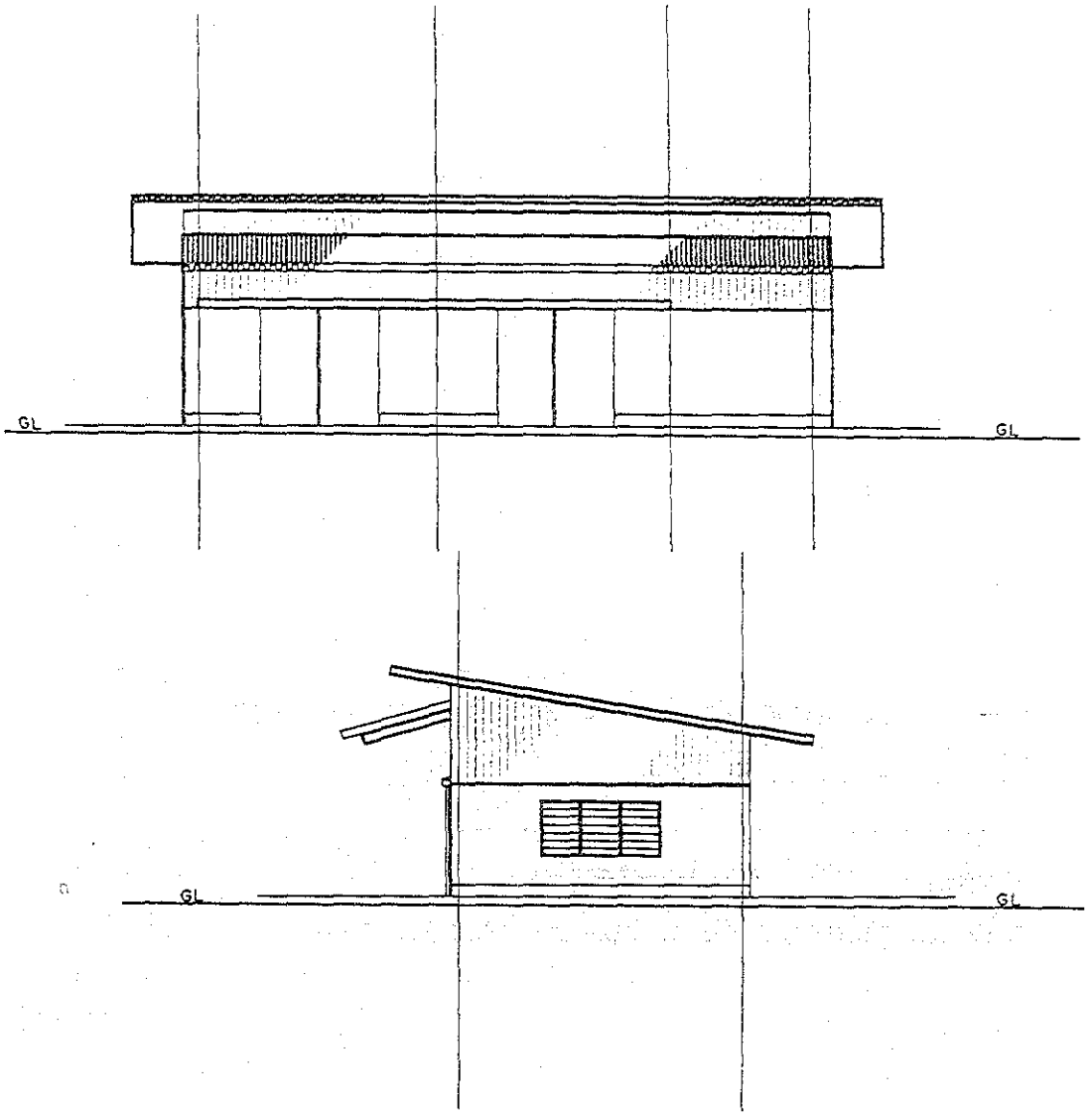
ICE MAKING FACILITY FLOOR PLAN



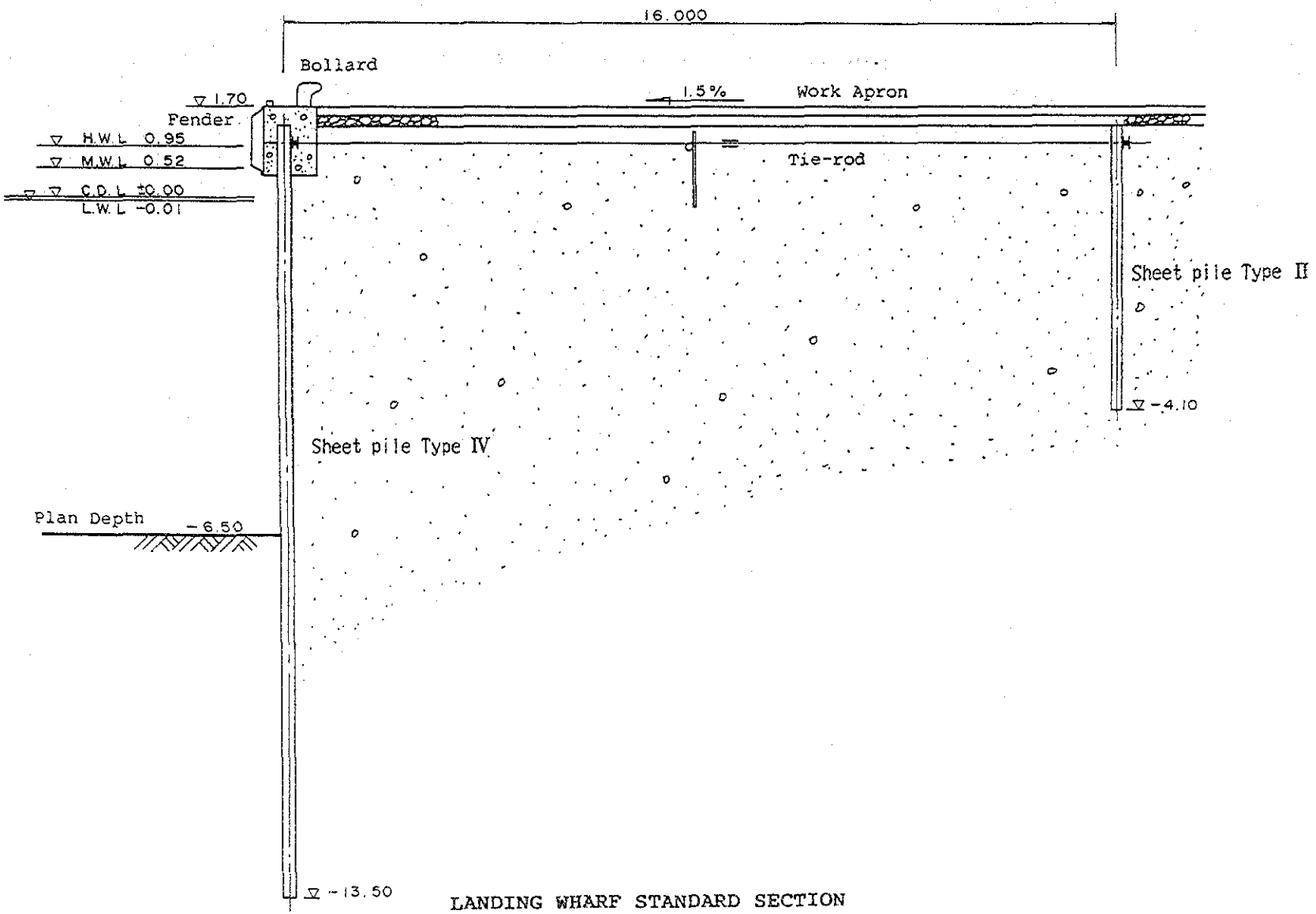
ELEVATION



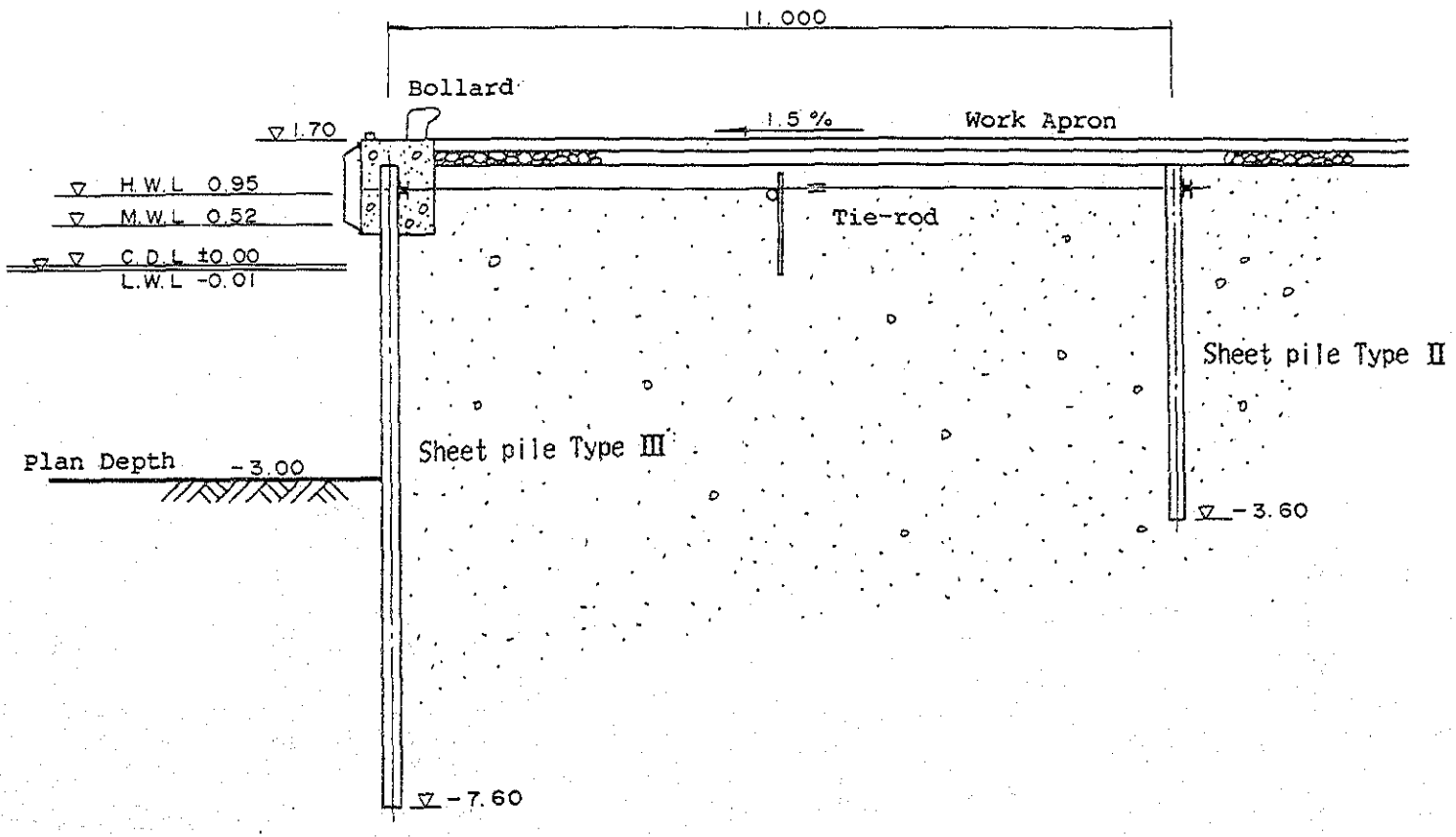
WORKSHOP FLOOR PLAN



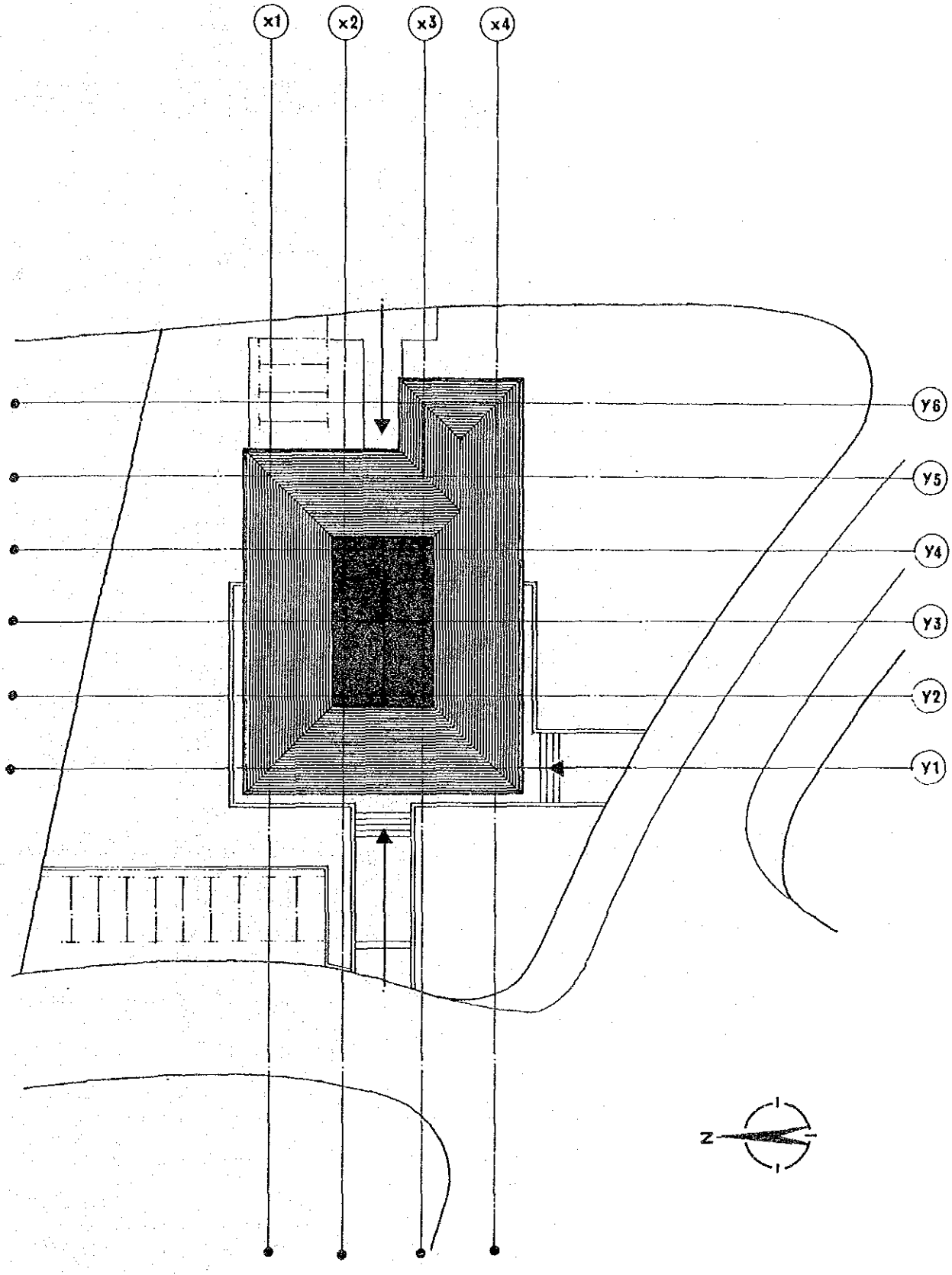
ELEVATION



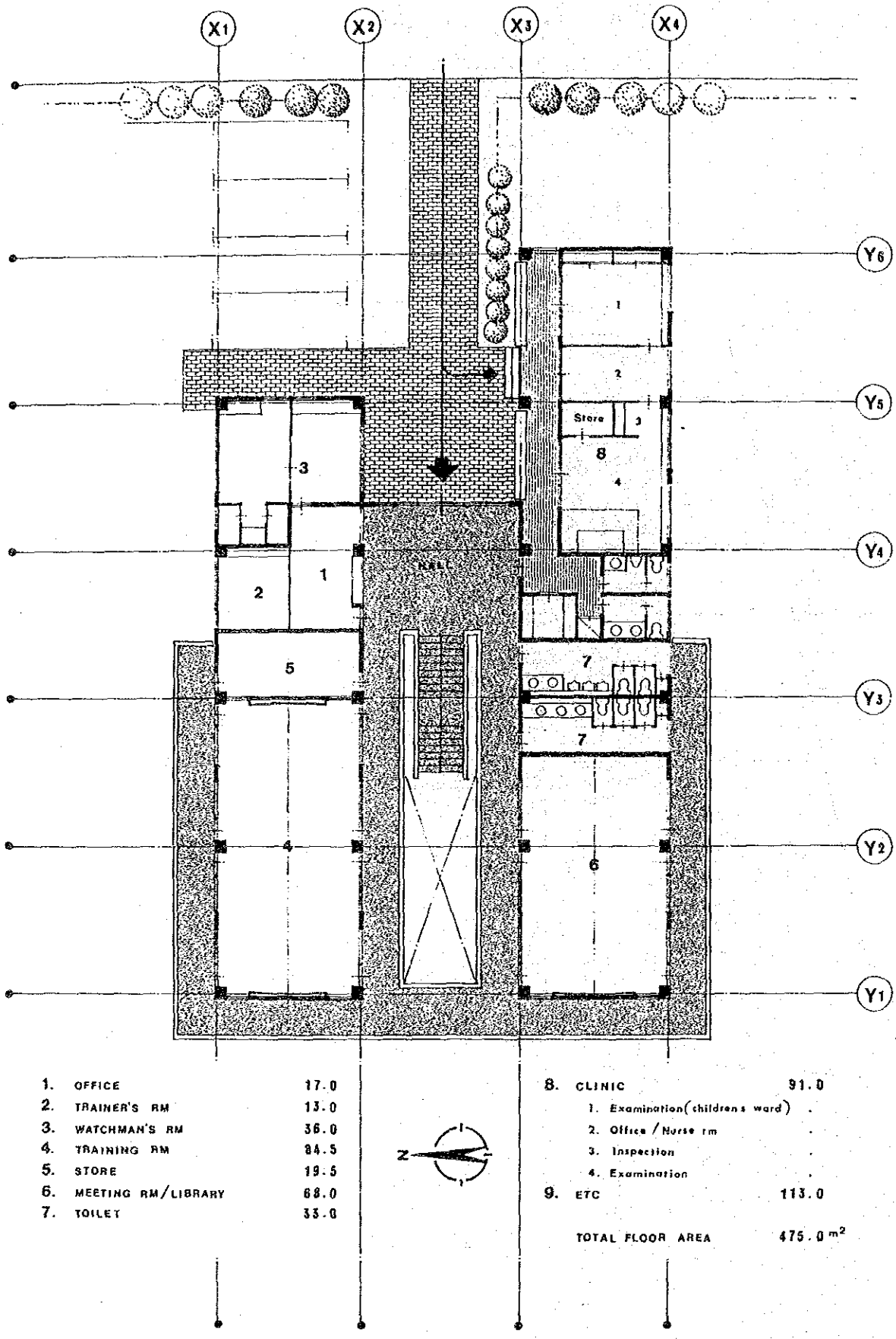
LANDING WHARF STANDARD SECTION



REPAIR WHARF STANDARD SECTION



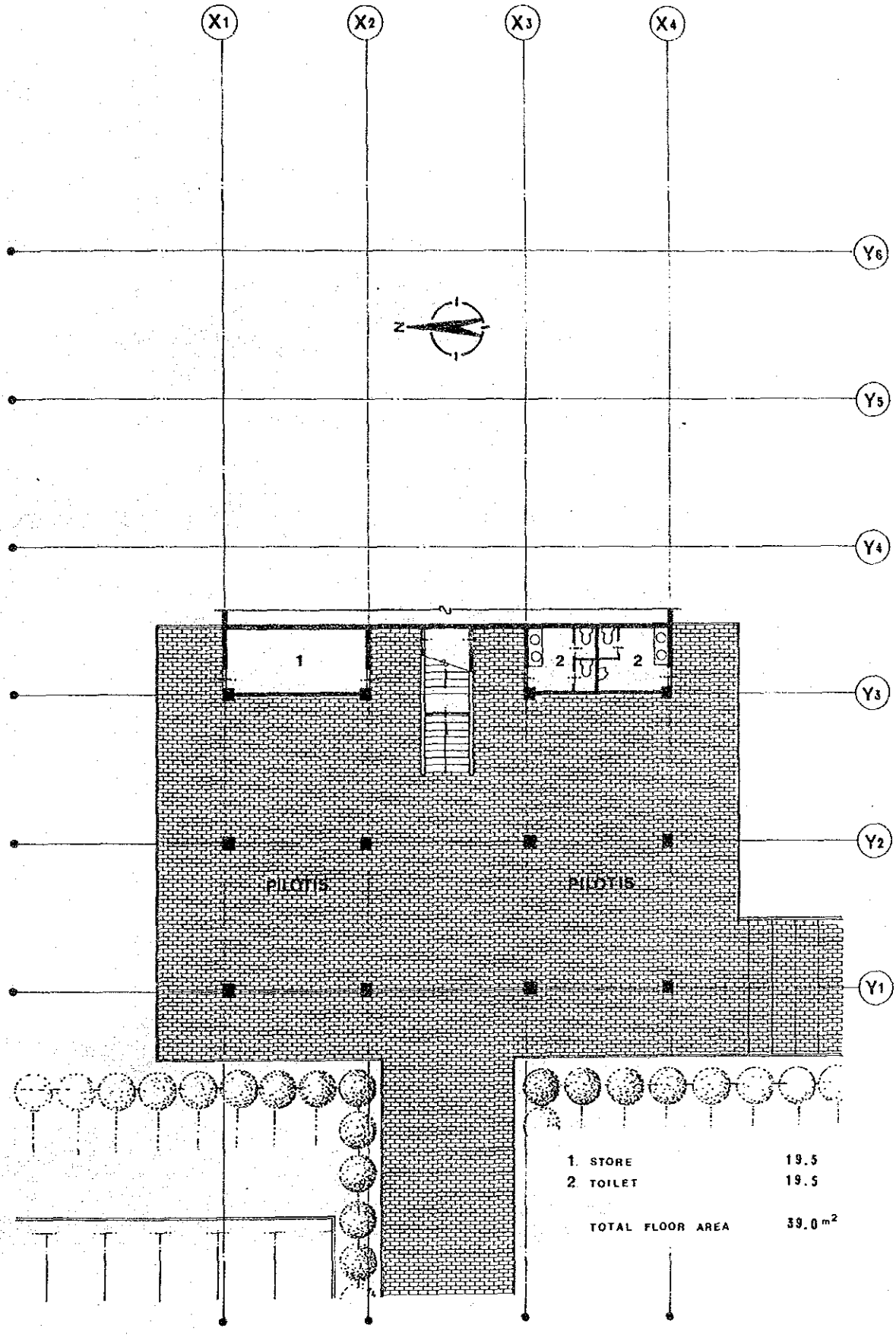
COMMUNITY CENTER LOCATION PLAN



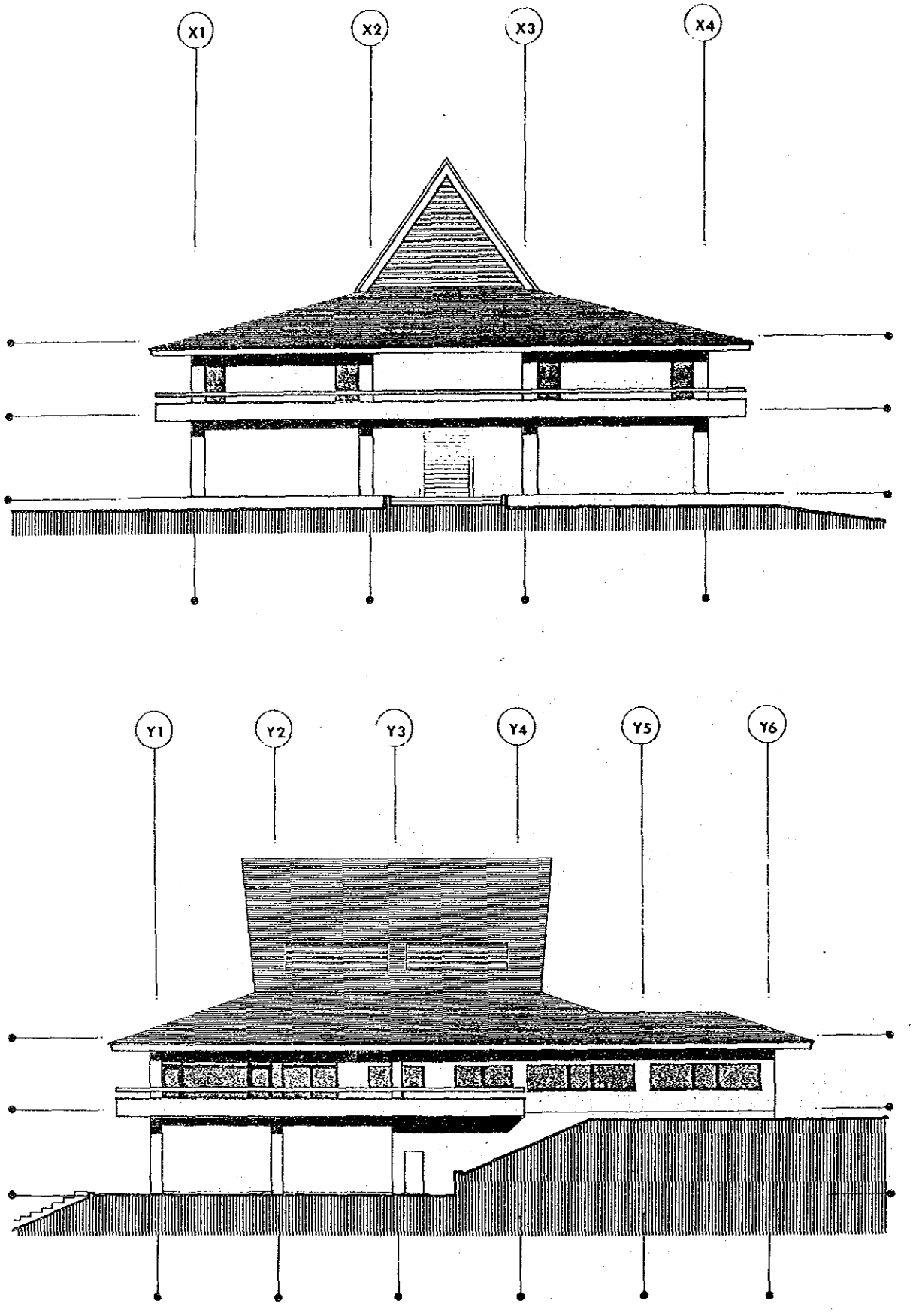
1.	OFFICE	17.0
2.	TRAINER'S RM	13.0
3.	WATCHMAN'S RM	36.0
4.	TRAINING RM	84.5
5.	STORE	19.5
6.	MEETING RM/LIBRARY	68.0
7.	TOILET	33.0

8.	CLINIC	91.0
	1. Examination(childrens ward)	.
	2. Office / Nurse rm	.
	3. Inspection	.
	4. Examination	.
9.	ETC	113.0
	TOTAL FLOOR AREA	475.0 m²

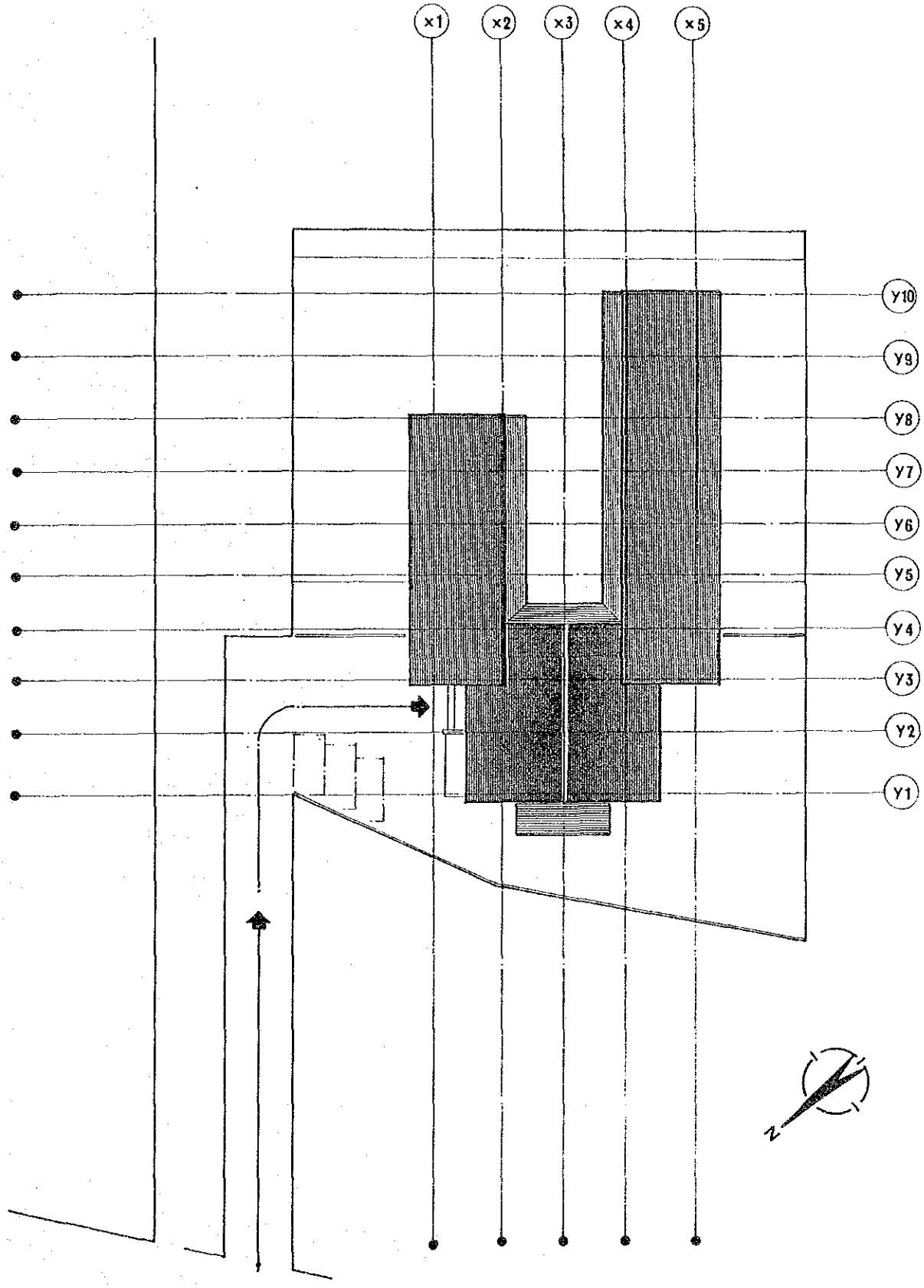
COMMUNITY CENTER GROUND FLOOR PLAN



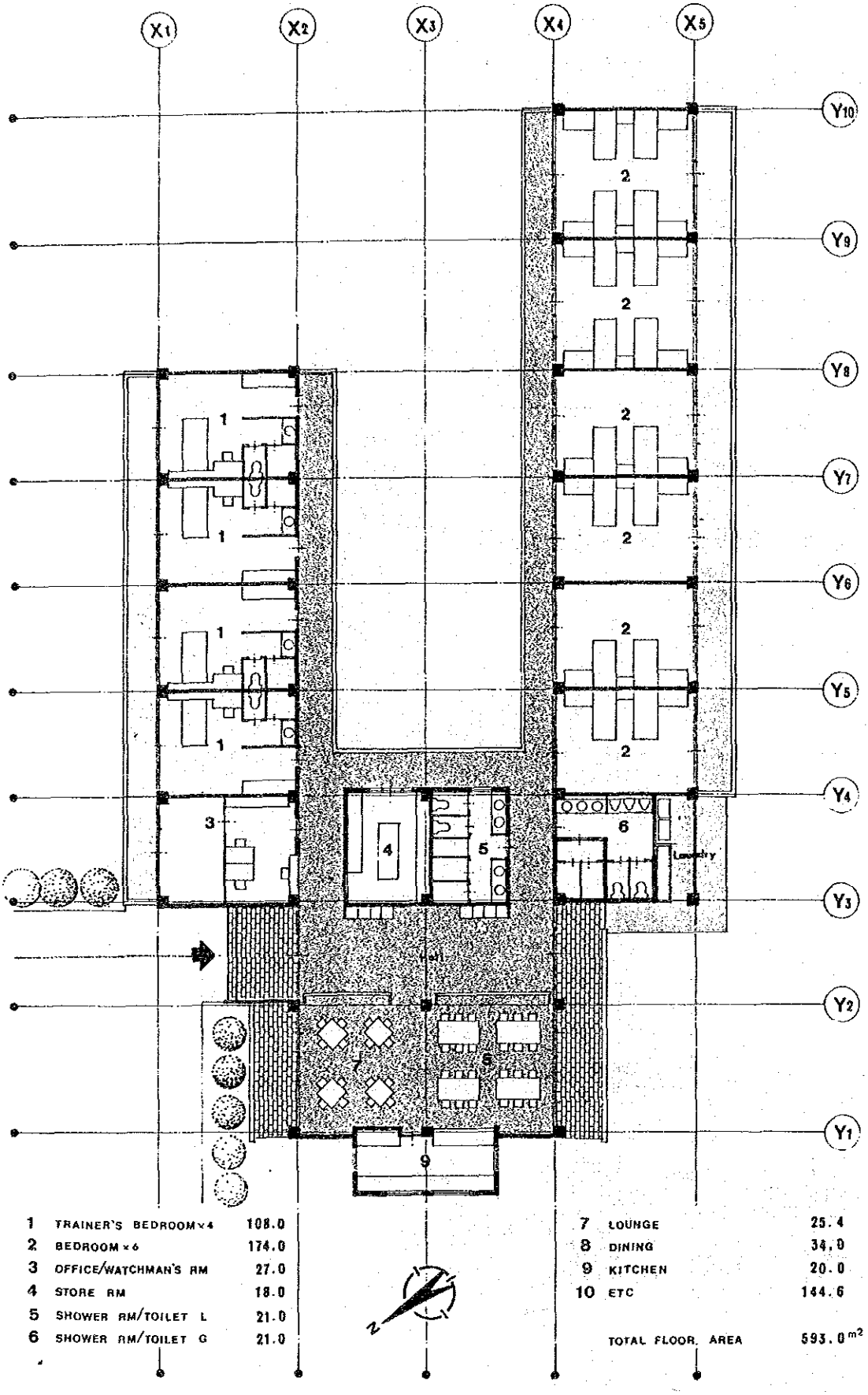
COMMUNITY CENTER PILOTIS FLOOR PLAN



COMMUNITY CENTER ELEVATION



DORMITORY LOCATION PLAN 0 5 10 15 m

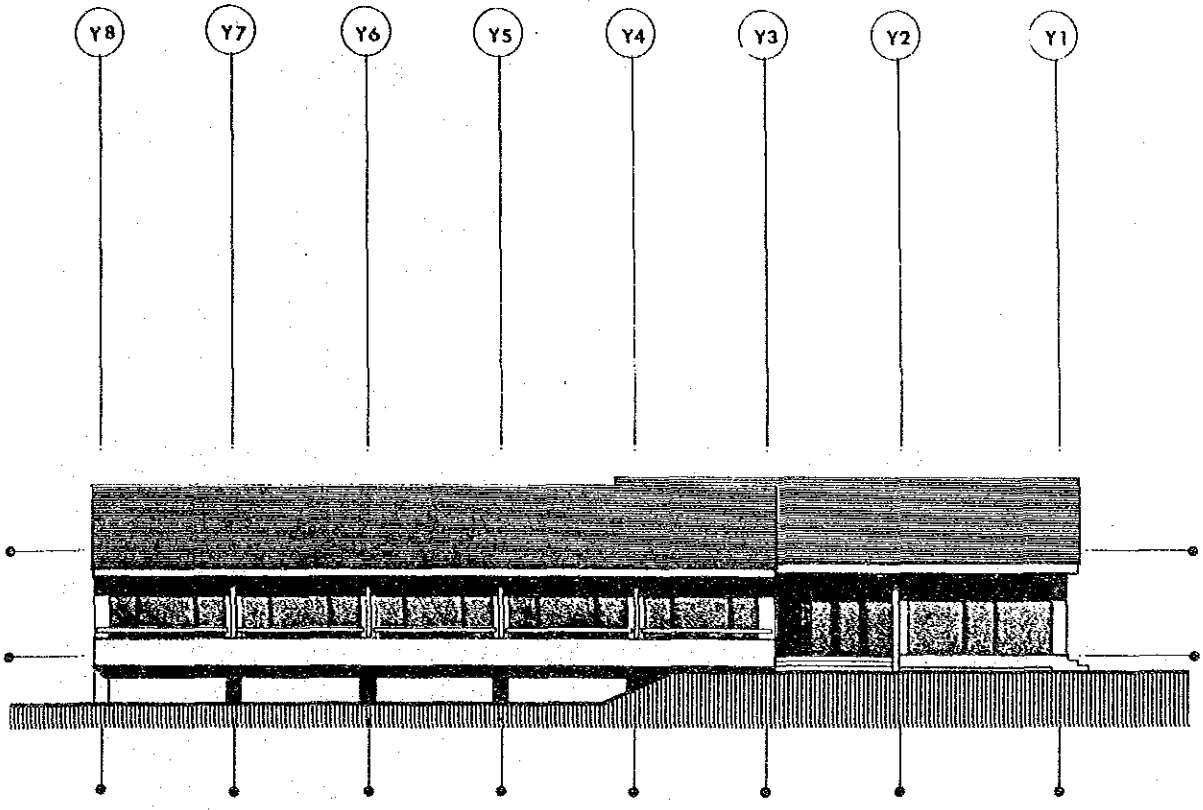


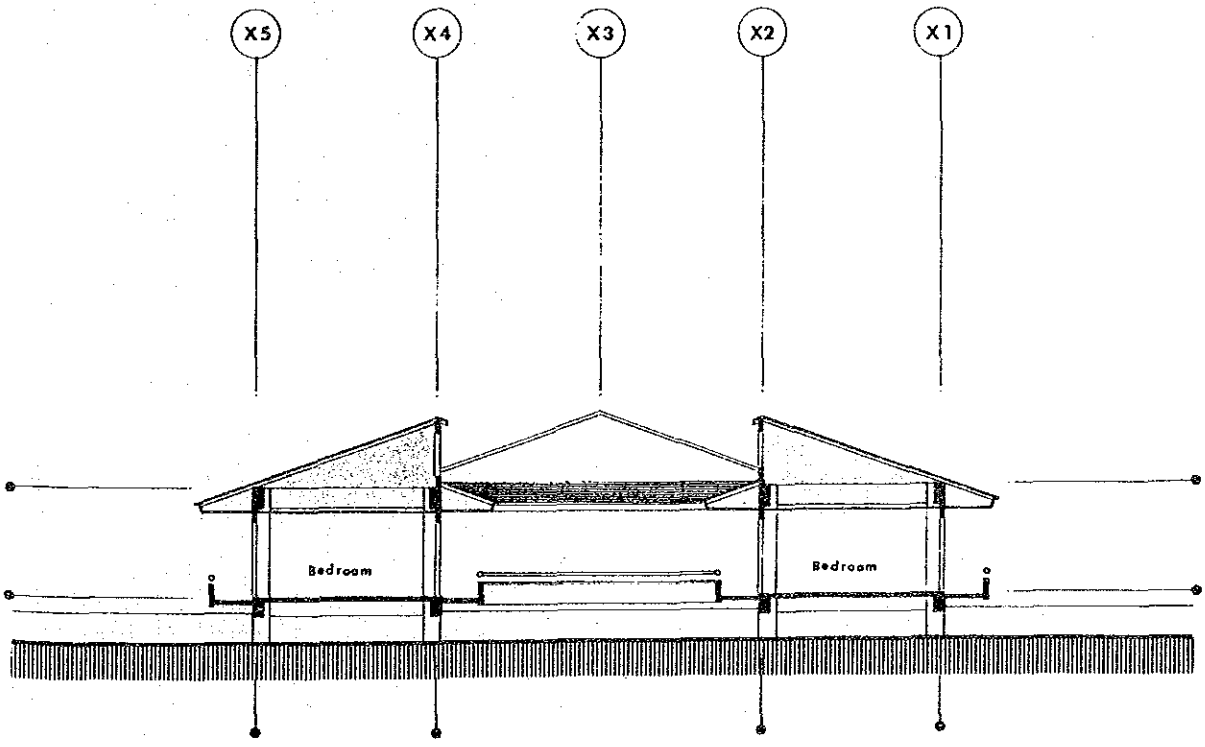
1	TRAINER'S BEDROOM×4	108.0
2	BEDROOM×6	174.0
3	OFFICE/WATCHMAN'S RM	27.0
4	STORE RM	18.0
5	SHOWER RM/TOILET L	21.0
6	SHOWER RM/TOILET G	21.0
7	LOUNGE	25.4
8	DINING	34.0
9	KITCHEN	20.0
10	ETC	144.6
	TOTAL FLOOR AREA	593.0 m²

DORMITORY

GROUND FLOOR PLAN

0 5 10 m





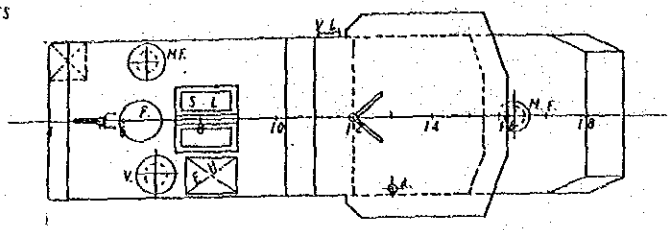
DORMITORY ELEVATION & SECTION

0 1 2 3 4 5 10m

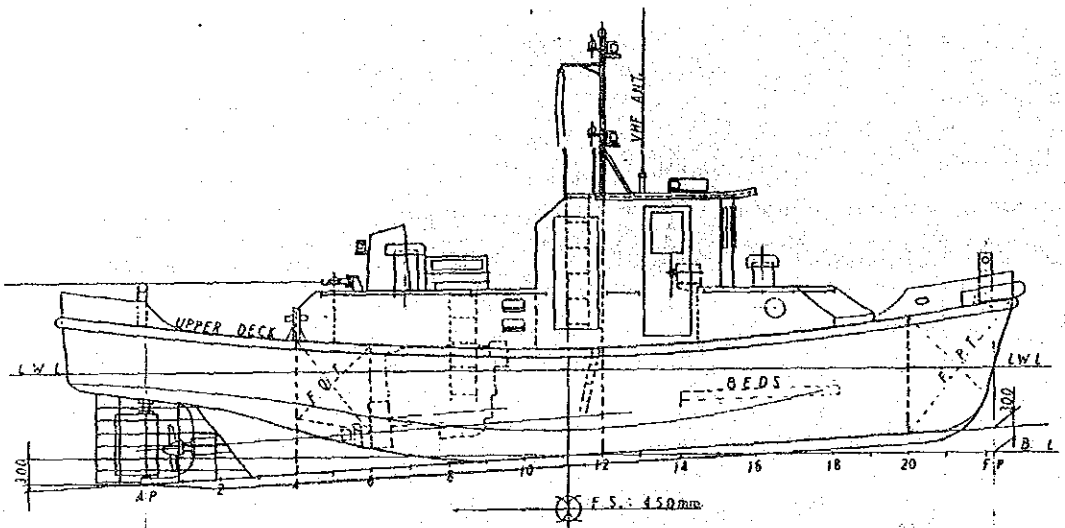
PRINCIPAL PARTICULARS

LENGTH O.A.	:	11.2 M.
" P.P.	:	10.0 M.
BREADTH, MLD.	:	3.5 M.
DEPTH, "	:	1.3 M.
DRAFT, DESIGNED	:	1.0 M.
MAIN ENGINE		
MAX. CONT. OUTPUT	:	130 PS
SERVICE SPEED	:	7.0KTS
COMPLEMENT	:	3

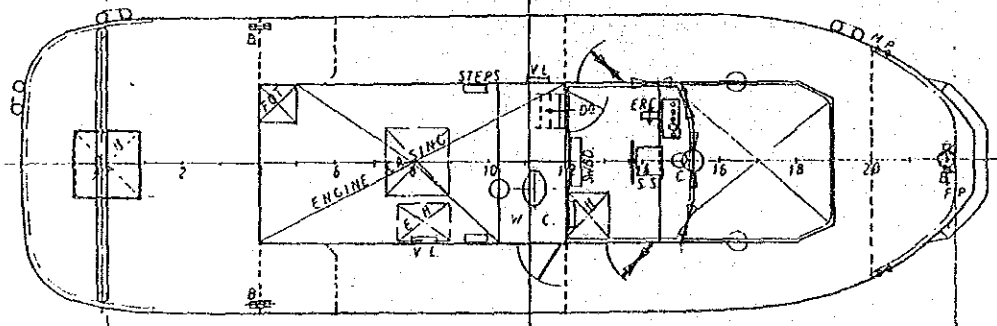
SMALL WORKBOAT GENERAL ARRANGEMENT



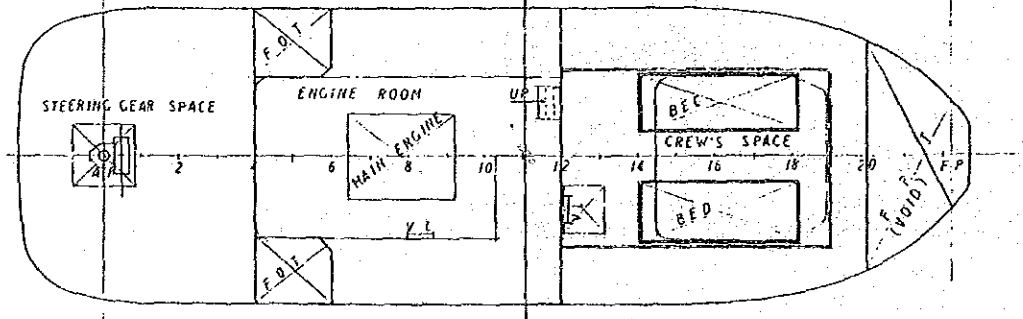
DECK HOUSE TOP



F.S.: 450mm



UPPER DECK



HOLD

SCALE : 1/40

0 1m 2m

CHAPTER 5 IMPLEMENTATION PLAN

5.1 Implementation Structure

The governmental body that is to be in charge of the Project prior to implementation will be the Noro Fisheries Infrastructure Development Project Coordinating Committee, which has been organized specifically for this Project. The Chairman of this Committee is the Permanent Secretary of the Ministry of Economic Planning, with other members drawn from the Ministry of Natural Resources, the Ministry of Transport, Works and Utilities, the Ministry of Finance, the Western Province Government, and the Solomon Islands Ports Authority.

At the implementation stage, responsibility for the various facilities will be in the hands of the operating agency for the particular facility. Thus, the implementing organization for the oil storage tank will be the Ministry of Natural Resources; for the shore facilities, including the cold storage, the Ministry of Natural Resources and the Solomon Islands Ports Authority; for the Community Center, the Western Province Government; and, for the workboat, the Solomon Islands Ports Authority.

At the construction stage, the Ministry of Transport, Works and Utilities will be in charge of civil engineering, construction, related approvals, permits and inspections, and other technical matters.

Upon completion of the facilities, operations and management will be handled by the same organizations as are involved with implementation.

5.2 Areas of Responsibility:

(1) If the subject Plan is carried out under Japanese grant-aid, the Government of Japan will be responsible for the following aspects:

1. Construction of the oil storage facility.

2. Construction of the shore facilities.

3. Construction of the Community Center.

4. Construction of the small harbor workboat.

5. Procurement of related equipment.

6. Ocean and inland transport for the equipment and materials required for the construction program.

7. Consulting services in the area of implementation planning, tenders, and construction supervision.

(2) The Solomon Islands Government will be responsible for the following aspects:

1. Securing the construction site, removal of obstacles on shore and in the water, relocation of an existing house, and any necessary site preparation.

2. Payment of all duties, fees, and expenses on imported equipment and materials.

3. Procedures in connection with tax and other exemptions for Japanese nationals providing equipment or services for the Project in the Solomon Islands.

4. Obtaining and issuing permits and authorizations, as required for implementation.

5. Appropriating budgets for effective maintenance and operation of the facilities to be built under the grant-aid as well for required equipment, furniture, and fixtures.

5.3 Implementation Plan

5.3.1 Basic Guidelines

The construction plan will be based on the following guidelines, taking into consideration the natural and social conditions in the surrounding area and the present state of the construction and other local industries.

(1) The Plan facilities cover a broad spectrum of technical areas: the landing wharf, including reclamation of the rear area, is in the realm of civil engineering; the oil tank and cold storage warehouse are plant facilities; the Community Center, dormitory, and administration building are construction; and the small harbor boat is in the area of shipbuilding.

Noro has been positioned as the future core city of Western Province and is in the midst of an extensive infrastructure development program involving roads, port facilities, and power plant. However, the city is far removed from the capital, Honiara, and the labor supply is quite limited. It must be recognized, therefore, that the supply of manpower and materials is not yet sufficiently developed to permit a large-scale project to be carried out within a limited period of time. While we plan to utilize local labor and materials to the maximum degree possible in the construction program, this will have to be done on the basis of a carefully prepared procurement plan.

(2) Careful consideration has been given to the topographic, oceanographic, and meteorological conditions at the Plan site. The structures will be carefully adapted to the local climate and will harmonize with the surrounding environment. In the shore construction program, in particular, care will be taken to minimize its impact on the natural environment.

(3) Considering the scope of the proposed plan, the ability of the area to accommodate the construction program, facility priorities, and the overall construction period, it has been deemed appropriate to carry out the Project in two stages. The first phase will comprise the oil storage facility and small workboat, with the second phase to include the remaining facilities.

5.3.2 Construction and Supervision Plan

(1) Project Flow

The Project is to be divided into two phases. The initial phase will commence following the Exchange of Notes between the Solomon Islands Government and the Government of Japan and the subsequent signing of a consultancy agreement between the Ministry of Natural Resources and the Japanese consulting organization. The consultants will prepare a detailed design as well as the tender documents for the construction work.

After the necessary approvals and procedures have been completed by the Solomon Islands Government, tenders will be solicited from Japanese construction companies, and a contract will be made with the lowest tenderer. After receiving approval from the Government of Japan, the construction will get underway.

The consultants will supervise construction until the turnover of the facilities and will dispatch supervisory personnel to monitor project progress and insure construction quality. The contractor, in turn, will dispatch general supervisory as well as senior engineers and technicians in the areas of civil engineering and construction who will reside in the Solomon Islands for the required periods of time.

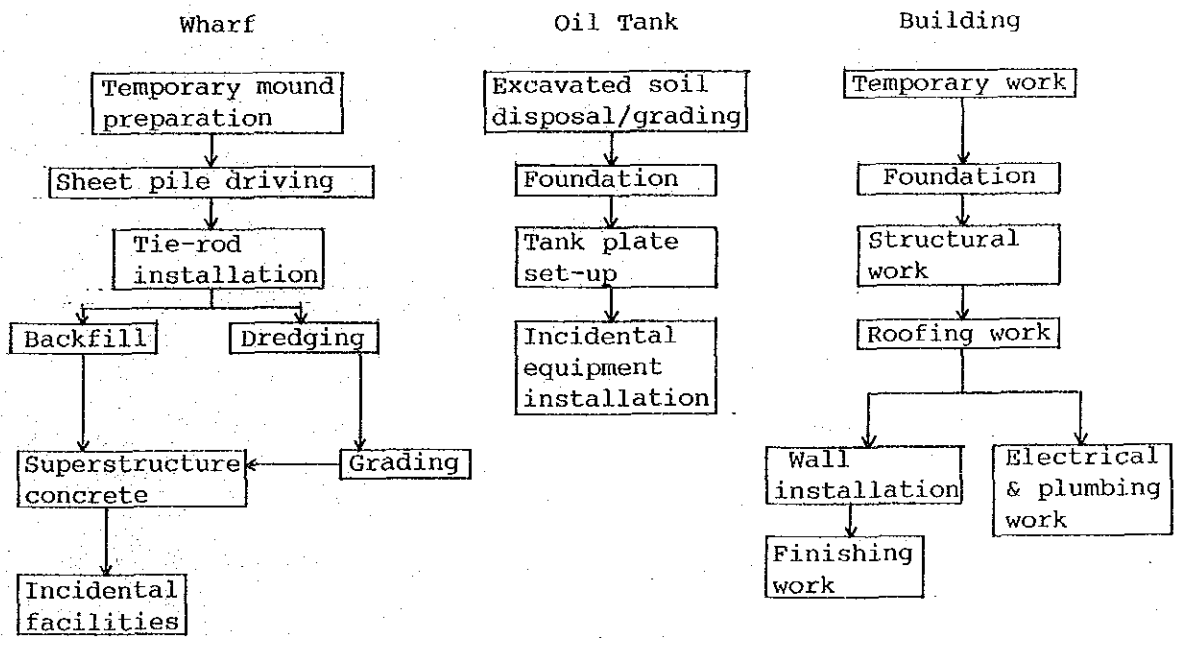
The second phase of the Project, following the Exchange of Notes between the two governments, will follow almost the same procedures as the first phase.

(2) Work Plan

The work program for the landing wharf, the main facility under the Plan, will start from the construction of a temporary causeway for large construction machinery by bulldozing soil from the shore. Then, sheet pile driving will proceed by a crawler crane, followed by installation of tie-rods, backfilling and concrete work for the superstructure. The installation of the incidental equipment will conclude the construction work for the landing wharf. Dredging in front of the sheet piles will start after tie-rod installation. The soil volume to be dredged has been calculated at approximately 15,000m^3 and the excavated soil will be used for filling the rear area. In order to avoid the work being influenced by unfavorable sea conditions, except for the dredging, the marine works have been minimized by planning the construction work to be done on the shore.

The shore facilities including the cold storage, administration building, workshop and ice making plant will be constructed on the reclaimed area to the rear of the wharf. The required volume of soil for filling can be covered by the soil excavated from the oil storage tank site and dredging in front of the wharf.

Following is the general construction work flow for the wharf, oil storage tanks and other buildings.



5.3.3 Procurement Plan for the Construction Equipment

Those items which can be procured in the Solomon Islands on a convenient and economical basis will be procured locally, with all other products to be sourced in Japan. The procurement plan for the main construction materials is shown below.

(1) Items to be procured locally

At the present time, the construction materials being produced in the Solomon Islands are such primary products as sand, gravel, rubble, riprap, fill soil, and timber, with concrete blocks the only secondary product.

Products available on the market include: cement, iron bars, veneers, galvanized iron sheets, and materials for water supply and sewer. Cement and iron bars are mostly imported from Taiwan and Korea, with the other items coming mainly from Australia and New Zealand.

As to other materials, in view of the small inventories and limited variety, with certain exceptions, it will be difficult, in our view, to procure them on the local market.

The following items will be procured locally:

Main Items	Area of Usage
Filling material	Wharf
Sand	Civil engineering, shore facilities
Gravel	"
Rubble stone	"
Cement	"
Iron bars	"
Concrete blocks	Shore facilities
Timber, plywood	"

Jalousies (window frames) "

Paint "

However, the bulk of the above materials will have to be procured in Honiara; the only items available in the Noro area are sand, gravel, rubble stone and riprap.

The required volume of filling material is estimated at about 35,000m^3. Some 22,500m^3 will be generated from the excavation work of the oil storage tank and another 15,000m^3 are expected from the dredging in front of the wharf. Thus, we have concluded that the necessary soil for filling can be covered within the construction work for this Project.

2) Materials to be procured in Japan

With respect to the principal items to be sourced in Japan, the following points have been taken into consideration.

The quantity of steel structure (steel plate and piping for the oil tanks, structural steel for buildings) will total about 700 tons, while sheet piles will amount to about 710 tons. Since these materials will be brought to the Plan site after prefabrication or primary processing, if they were to be purchased from some other third country, it would not be economical, considering the costs of supervision and transport. We have decided, therefore, to source these items in Japan.

In the case of the materials for the electrical and water supply/sewer facilities, since the Solomon Islands are a small market, there are obvious limits to the variety and depth of supplies, and so here too it would be best to procure them from Japan. It will be necessary, however, in the interest of proper maintenance, to select toilet facilities, shower units, and faucets for which future replacement parts can be locally obtained.

Accordingly, the main items to be procured from Japan will be:

Main Items	Area of Usage
Steel materials (for structural steel, sheet pile)	Oil tank, pipes, wharf
Materials for water supply/sewer, pipes	Administration buildings, Community Center
Materials for electrical facilities	"

5.3.4 Procurement of the Main Items of Construction Equipment

The Ministry of Transport, Works and Utilities, which is primarily responsible for the maintenance of public facilities, and one local contracting firm, own and lease construction equipment. The procurement plan for the main items of construction equipment has been prepared as follows, based on a consideration of the types and condition of available equipment, conflicting use commitments elsewhere in the area, and rental charges.

Main Items of Construction Equipment	Area of Procurement
Crawler crane	Japan
Generators	Japan
Compressors	Japan
Welding equipment	Japan
Backhoe	Solomon Islands
Bulldozer	Japan/Solomon Islands
Barge	Solomon Islands
Dump truck	Solomon Islands
Truck crane	Solomon Islands
Hopper	Solomon Islands
Breaker	Japan
Trucks	Solomon Islands

5.3.5 Procurement of Other Materials

The equipment included in this Plan are the small workboat, forklifts, weighing equipment, machine tools, and other industrial products.

It is possible to obtain ferro-cement, FRP, and wooden boats in the Solomon Islands but there are no shipyards that produce the steel workboat required for the Plan. We have decided, therefore, that it would be best to source this boat in Japan.

Since the industrial products are scarcely produced in the Solomon Islands, local procurement would mean essentially a reliance on imported supplies. Thus, from the standpoint of both quality and price, it would be most advantageous to obtain these items from Japan.

5.3.6 Transport Plan

Two shipping companies operate between Japan and the Solomon Islands, with each making one call per month. Thus, a total of two calls a month are made by regularly scheduled vessels. The transit time to Honiara for one company is a half-month; for the other, 1.3 months, owing to a number of stops enroute.

The distance from Honiara to the Plan site at Noro is about 300 km, requiring a full-day's trip by scheduled inter-island vessels.

For this Project, however, considering the substantial cargo involved, it has been decided to dispatch a vessel directly to Noro for discharge at the New Port.

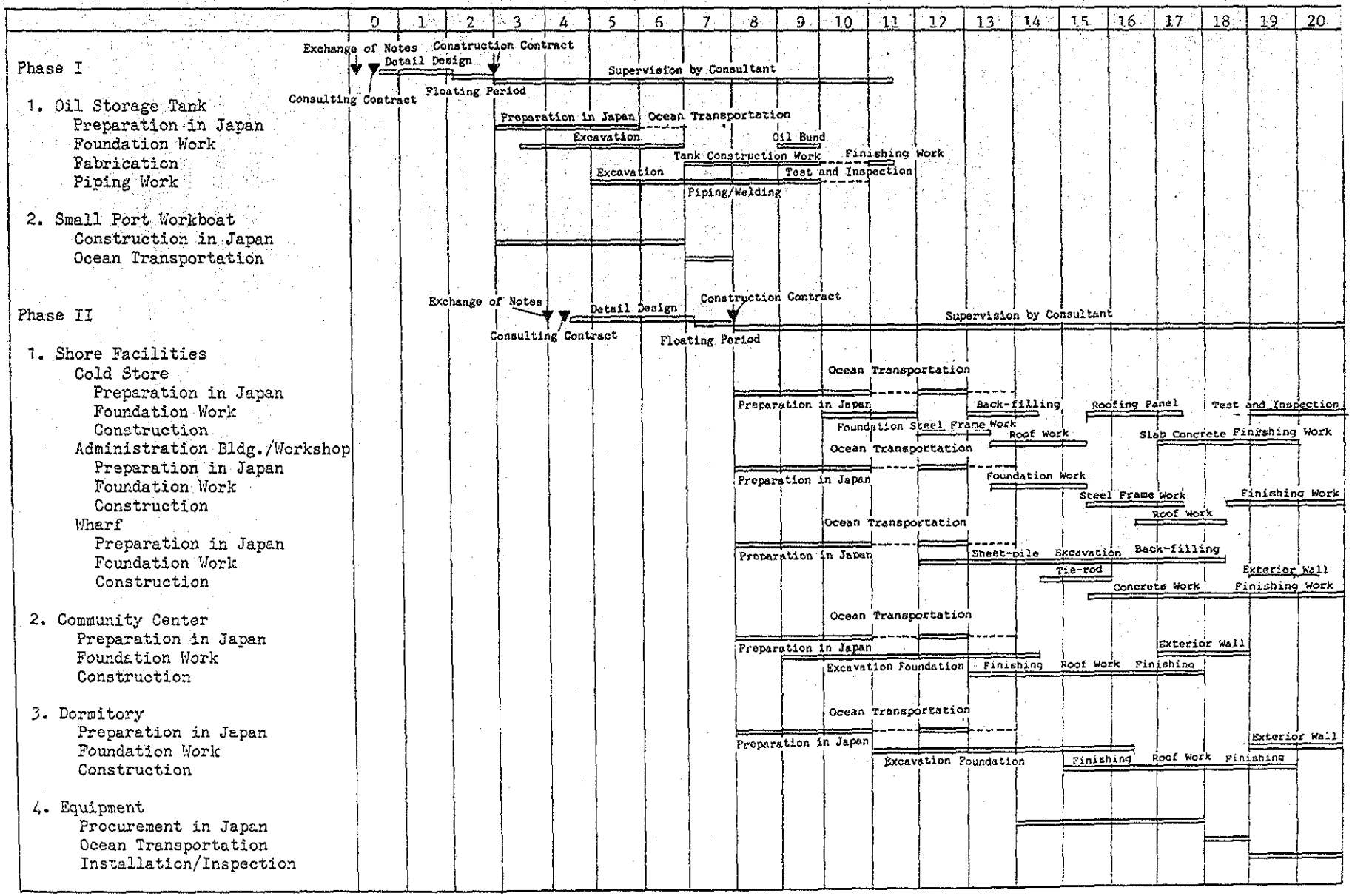
5.4 Implementation Schedule

The implementation schedule for this Plan is divided into Phase 1, covering the period for detail design, tenders, and construction of the oil tanks, pipes, and a workboat, and Phase 2, covering the construction of the shore facilities and Community Center.

In planning this schedule, consideration has been given to the actual time required for the various construction jobs and they have been classified into three groups: work that must be completed first, ahead of the other work; work that can progress simultaneously; and work that can be done independently. After giving due consideration to the temporary construction plan, materials procurement, and construction period and cost, we have worked out an optimum construction period.

The overall project schedule is shown on the following page.

PROJECT FLOW CHART



CHAPTER 6 MANAGEMENT AND OPERATING PLAN

6.1 Management Structure

6.1.1 Facility Operating Structure

The subject Plan incorporates a number of facilities with widely different objectives and characteristics. As a result, the management structure has been classified into the following three patterns:

Purpose and Nature of Facility	Management Method
(1) Basic infrastructure facilities geared to the area	Direct government involvement
(2) Facilities oriented to industrial activity, geared mainly to the fishing industry	Management by a public organization
(3) Facilities geared to the welfare of area residents	Management by local government

The fuel tank facility falls in Group 1; the cold storage, small workboat, and small ice-making plant in Group 2; and the Community Center and trainee dormitory in Group 3. Following is a description of the planned management structure for each of the various facilities.

(1) Fuel Storage Facility

This is a facility in which the Government must participate, from the standpoint both of protecting the national economy and the people's livelihood in times of emergency and that of sound energy policy. The government agency involved in this area is the Ministry of Natural Resources, but based on discussions with the concerned authority of the

Solomon Islands Government, it is planned to establish a government-financed corporation to manage the fuel storage tank under the auspices of the Investment Corporation of Solomon Islands.

The Investment Corporation of Solomon Islands is a special corporation established under Solomon Islands laws in 1977 and is under the jurisdiction of the Ministry of Finance. Its purpose is to function as the Government's investment conduit for key national projects in the areas of air transport, communications, transportation and tourism. To date, the Investment Corporation has invested a total of $36 million in some 14 companies, five of which it owns 100% of the shares; that is to say, they are national corporations.

(2) Shore Facilities (Cold Storage, Small Ice-making Plant, Workshop)

These shore facilities are to be built in the Noro port area to the rear of the landing wharf. This port is under the jurisdiction of the Solomon Islands Ports Authority (SIPA) and is the nation's No. 2 international port after the capital, Honiara.

The cold storage under this Plan will be a public warehouse directed mainly at the storage of frozen yellowfin. Thus, its principal operations will be receiving fish landed by fishing vessels, storing this fish in the warehouse, and loading the fish on reefer vessels for export.

The small ice-making plant is geared to filling demand for ice for the return trips of small boats and canoes bringing copra to Noro from neighboring islands. The plant will, therefore, service small vessels.

The workshop is designed to provide training in the repair of outboard motors, and although attached to the Community Center, in consideration of land transportation convenience for the motors brought in by canoes and possible future expansion, this workshop has been positioned as part of the shore facilities complex.

From the above standpoint, it is quite appropriate that the management of the shore facilities be in the hands of SIPA. This organization is a special corporation under the jurisdiction of the Ministry of Transport, Works and Utilities. With a long history dating back to 1956, SIPA is a mature organization, well developed in terms of both finances and organization, and operates on a sound, self-supporting basis.

In anticipation of the commencement of the operation of the new deep-water wharf at Noro from 1989, six SIPA officials are now stationed in Noro. There is thus little need, from the standpoint of either organization or personnel, to adopt new administrative procedures for the shore facilities.

In our view, assuming proper maintenance of the subject facilities, there is every reason to believe that operating costs can be covered through independent operations. Thus, the shore facilities are not likely to impose a financial burden on the already self-supporting SIPA.

(3) Small Workboat

This will be a small vessel, with a length of about 11m, which will be engaged in a variety of harbor operations at Noro port and will be operated by SIPA. The main cargo at Noro harbor, apart from the frozen skipjack and tuna loaded from the STL wharf (17,000 tons in 1987), is copra, which is loaded via barges. However, with the completion of the deep-water wharf and the opening of the new cannery during 1989, and assuming the construction of the new cold storage under this Plan, there should be a major increase in the volume of cargo handled at the port of Noro.

SIPA presently serves Honiara harbor with three vessels: a 32 foot pilot boat and two launches of 25 ft. and 16 ft. respectively. SIPA plans to offer essentially the same harbor services at Noro as at Honiara, and personnel have already been deployed at Noro for this purpose.

When the new workboat is not engaged in harbor service, it will be permitted by government ordinance to charge $40 per hour for general use. Based on the activity pattern at Honiara, no problems are anticipated in connection with the management structure for this vessel.

(4) Community Center and Dormitory

These facilities are intended to provide welfare, cultural, and educational services for the residents of Noro and the surrounding areas of Western Province, and the Provincial Government will be entrusted with their management.

With regard to the clinic, the Ministry of Health and Medical Services will assign at least one registered nurse and two nurse aids to run the facility. Registered nurses in Solomon Islands are qualified to engage in normal medical examinations and treatment, and have assumed the responsibility of operating clinics. So, it can be said the registered nurses are playing an important role in providing people with a basic level of medical services in Solomon Islands. Noro, as the trading hub of Western Province, is likely to become a social crossroads for people from neighboring villages. Thus, in addition to servicing the crew members of the fishing fleet and the Noro community directly, the clinic will also be able to provide indirect health care to outlying communities. It is felt, therefore, that it is proper that a registered nurse and two nurse aids be based at the Center.

No technical problems are anticipated with regard to the operation of the meeting room, training areas, and dormitory. The meeting room is primarily for use by Noro residents, particularly young people employed by local industries. The training facilities will offer a variety of courses at the provincial level held by the ministries of the Central Government or under the sponsorship of the Youth Congress which are being developed at the national level by the Ministry of Home Affairs and Provincial Government.

These facilities have been designed to operate at minimum cost, but the Western Province Government will be obliged to appropriate a budget for their operation.

A management system should be established that would permit these facilities to recoup a portion of their operating costs with a view toward lightening, to at least some degree, the financial burden on the Provincial Government. For example, consideration might be given to renting out the facilities for general use when they are not needed for regular functions.

6.1.2 Personnel Plan

The expected personnel requirements for the various Plan facilities are as follows:

Job Category	No. of persons	Duties
1) Fuel storage facility		
Manager	1	Overall responsibility; Supervision of inspection checks
Workers	2	Fuel distribution and intake
2) Cold storage facility		
Manager	1	Overall responsibility
Clerical staff	3	Inventory records, accounting, general office work
Mechanics	5	Equipment maintenance, also serve as drivers
Workers	4	Regular staff
	10	Part-time for reefer loading operations
3) Small ice plant		
Manager	1	Overall responsibility
Workers	1	Full-time
	2	Part-time (when making ice)
4) Workshop		
Instructors	2	Part-time

5) Small workboat		
Captain	1	
Crew	2	
6) Community center		
Center director	1	Overall responsibility for Center and Dormitory
Clerical staff	1	Course registrations
Building maintenance man	1	Resides on premises
Instructors	1-4	Part-time
Registered nurse	1	In charge of clinic
Nurse aid	2	Assistance to registered nurse
Physician	1	Part-time
7) Trainee dormitory		
Clerical staff	1	Reception, accounting
Resident manager	1	Living on premises
Kitchen staff	4	Contracted out
Workers	3	Part-time

6.2 Maintenance and Operating Plan

6.2.1 Management Duties

(1) Fuel Storage Tank

The primary maintenance responsibilities will involve the two 3,000 kl fuel tanks and related safety equipment, such as the fire extinguisher; the 2.5 km 8" intake pipe from the deep-water wharf to the tanks; the distribution pipe from the tanks to the pipe connecting the STL and SIEA service tanks; and the administration building.

Since the tanks and pipes will be installed in accordance with API (American Petroleum Institute) standards, there will be a need for regular inspections conforming to these standards.

The administration building will be a concrete block structure. In addition to a program of regular maintenance, it will require repainting every five years. However, since the facility will be a storage area for a large volume of combustible substances, inspections should pay particular attention to safety procedures, such as the security fence, fire extinguishers, and valves.

The main duties of the new company that is to be established by the Investment Corporation of Solomon Islands will be to administer the operations of the fuel storage tank. However, technical experience and safety know-how will be required to maintain the safety of the tanks and pipelines. In Solomon Islands, fuel distribution is handled by two international oil companies. It will be necessary, we feel, to develop a structure for effectively utilizing the capabilities of the private sector in operating this facility.

(2) Cold Storage

A maintenance plan will be required for the four 30kw compressors that are to operate the two 250-ton, -25°C cold store rooms and the two 3 ton/day airblast quick freezers, along with the pumps, fans, and other related equipment; the administration building; and the pallets, forklifts, scales and other peripheral equipment.

The machinery selected for this facility will be highly reliable and supported by an appropriate volume of expendable supplies and parts. In addition, four compressors of equal capacity will be installed to permit a certain level of operations to be maintained when one unit is out of service, through a changeover in refrigerant pipes. Nonetheless, there will be a requirement in the maintenance program for technicians skilled in freezer maintenance. In this connection, it is suggested that consideration be given to making a request for overseas technical cooperation for the requisite period of time.

The structure of the cold storage will be of steel frame construction and will be located in an area subject to damage from sea winds. For this

reason, it is vital that the exposed portions of this structure be repainted at least once every three years.

The maintenance operations for the administration building will involve mainly inspections of electrical facilities, replacement of expendables, and repainting, once every three years, of the exposed portions of the steel frames.

The wharf construction method will utilize steel sheet piles, which will be given cathodic protection treatment to prevent rusting. Also, since a provision has been made in the design for corrosion action over a long period of time, no regular maintenance operations will be required for this purpose.

Cracks are likely to develop in the paved portions of the concrete work apron after a period of time, in which case the cracks should be plugged with mortar or a similar substance. Similarly, with regard to the asphalt pavement, regular maintenance such as that applied to ordinary roads will be required.

With regard to the small ice-making plant, the same maintenance checks will be required as for the equipment in the refrigeration machinery; however, since brine is to be used as the refrigerant, brine density control will be necessary.

In the case of the workshop, there will be a maintenance requirement for the small power tools, and, in addition, since parts will be handled for outboard motors, storage of these parts and warehouse withdrawal controls are also included in the maintenance program.

(3) Small Workboat

This is to be a steel vessel, about 11m in length, and statutory inspections will be required. With regard to dry docking, at present, there are no such facilities in Noro, and so a private slipway in Gizo will be used.

(4) Community Center and Dormitory

These will be ordinary buildings, with no specialized facilities. Normal maintenance, therefore, will be concerned mainly with the replacement of lighting fixtures and the inspection of water supply and drainage facilities. Since the dormitory, in particular, will be used by a large and unspecified number of people, daily inspections and cleaning are a must.

These buildings will be of RC construction, and so there will be no need for structural maintenance. However, in the interior areas with a paint finish, repainting on a 5-year cycle would be desirable.

6.2.2 Maintenance and Operating Cost

Maintenance and operating costs for the Plan facilities may be anticipated as follows:

1) Labor costs
2) Office costs
3) Facility maintenance costs
4) Utility costs

(1) Labor Costs

Labor costs for the various facilities based on the prevailing wage rates in the Solomon Islands may be set as follows:

Senior managers	SI$1,500/month	SI$18,000/year
Managers; senior engineers	1,200	14,400
Mechanics; drivers	500	6,000
Office workers;		
Specialized workers	300	3,600
Ordinary workers	250	3,000

The labor costs for each facility have been computed on the basis of the Personnel Plan in Section 6.1.2.

1) Fuel Storage Facility

Since this is a specialized facility, high-level skills are required. Thus staff will consist of a manager and two mechanics.

SI$14,400 x 1 person + 6,000 x 2 persons = SI$26,400

2) Cold storage facilities

The regular staff will consist of a general manager (1), assistant manager (1), clerical staff (2), mechanics (5), and specialized workers (4). There will also be a requirement for 10 part-time workers working 3 months in total per year.

SI$18,000 x 1 person + 14,400 x 1 person + 3,600 x 2 persons + 6,000 x 5 persons + 3,600 x 4 persons + 3,000 x 10 persons x 3/12 year = SI$91,500

3) Small Ice-making plant

This facility will employ 1 manager, 1 office worker, and 1 specialized worker. In addition, it will use 2 part-time workers 4 months per year.

SI$14,000 x 1 person + 3,600 x 2 persons + 3,000 x 2 persons x 4/12 year = SI$23,600

4) Workshop

Instructors will be recruited from regular employees of related government agencies, so that there will be no labor overhead at this facility.

5) Small workboat

The captain will be at the senior administrator level, the crew at the specialized worker level.

SI$18,000 x 1 person + 3,600 x 2 persons = SI$25,200

6) Community Center

There will be a 3-man staff, including a manager, office worker, and a specialized worker. In the case of the instructors, nurses, (registered nurse and nurse aid), and doctor, the necessary personnel will be provided by government organizations, so no provision need be made for their salaries.
Accordingly,

SI$14,400 x 1 person + 3,600 x 2 persons = SI$21,600

7) Trainee dormitory

This facility will require 1 office worker, 1 specialized worker, and 3 part-time ordinary workers who will work nine months per year.

SI$3,600 x 2 persons + 3,000 x 3 persons x 9/12 year = SI$13,950

(2) Office Expenses

Office expenses will include communication costs, office supplies, and miscellaneous items. We have budgeted these collectively at 5% of labor costs.

We have also provided for travel costs for instructors. Since the training courses at the Community Center are to be organized by the Central Government and the Youth Congress, there should, in principle, be no need to pay instructor honorariums. However, it may

be anticipated that, in the future, when the Center develops its own independent programs, instructors will be separately invited. Assuming that 10 instructors are invited from Honiara per year, the cost of their round-trip air fares would be:

SI$268 x 10 persons = SI$2,680

(3) Maintenance and Operating Costs

We have estimated as follows annual costs for repairs and maintenance on buildings, equipment, and machinery.

1) Fuel storage facility

Painting-- Painting will be required once every three years for the tank and exposed pipes. The cost per painting, based on the use of regular paint for the tank and surrounding pipes and aluminum paint for the exposed portions of the distribution pipes, is estimated at SI$10,900. Thus, the annual cost becomes:

SI$10,900 / 3 years = SI$3,630

Solution for fire extinguisher-- Allowance has been made for one change of solution every 2 years, figuring 1,400 l per change, each change will cost SI$13,800.
Thus--

SI$13,800 / 2 years = SI$6,900

Other-- We have allowed 10% of the original price to cover the cost of replacement valves and materials for intake and distribution terminals. This comes to approximately SI$8,200 per year.

Totaling the above, annual maintenance costs for this facility may be expected to run SI$18,730.

2) Cold storage facilities

Parts for machinery-- We have allowed 3% of the original cost of the compressor, cooler, pump and other equipment to cover replacement parts.
This works out to SI$36,900 per year.

Expendables-- We have estimated SI$13,000 to cover the cost of refrigerant, lubricating oil, lighting fixtures in the buildings, and miscellaneous items.

Painting-- The steel frame portion will have to be painted once every three years at a cost of SI$13,400 per painting, or SI$1,140 per year. Allowance has also been made for SI$1,200 for pavement repairs. The annual cost thus becomes SI$12,340.

Totaling the above, the total maintenance cost for this facility becomes SI$52,240 per year.

3) Small ice making plant

We have allowed 3% of the original cost for replacement parts, or SI$3,200/year. Expendables, such as brine, will come to SI$400/year. Other maintenance costs for the building may be estimated at SI$200, for an overall total of SI$3,800/year.

4) Workshop

3% of the original cost of the workshop equipment has been allowed to cover the cost of a bench drill, grinders and other small electrical tools as well as for replacement parts for outboard motors. Another SI$200 has been estimated for building repairs, resulting in a combined total of SI$3,100/year.

5) Small workboat

Figuring 700 hours of operation per year, the cost of fuel and lubricating oil will come to SI$9,400. In addition, provisions have made for a reserve for repairs of 5% per year of the cost of the hull and fittings, which will amount to SI$14,800. The total comes to SI$24,200/year.

6) Community Center

Consideration has been given to maintenance costs for the building and facilities. These costs will include mainly expendables, such as light bulbs, replacement of broken windows, replenishment of chemicals for the septic tank, and one painting every five years. The resulting total comes to SI$920/year.

7) Trainee Dormitory

In this facility too, we have allowed for repairs to the building and its facilities. The main costs will be the same as for the Community Center. However, since this is a boarding facility, there will be many ceiling fans, beds, and items of kitchen equipment, all with a high use frequency. Allowing for the above, annual maintenance costs have been estimated at SI$1,900.

(4) Utilities

We have estimated the cost of electricity, water and LPG gas for each facility. In the case of electricity and water, Honiara rates have been applied, while LPG has been costed at SI$2.2/kg.

1) Fuel storage facility

The only utility expenses for this facility will be power for the 200W mercury lamps required for night operations and safety along with lighting in the administration building. Since night operations will not be continuous, we have figured an average use

of five mercury lamps. Including the cost of building lighting, the total electricity cost becomes SI$1,370/year.

2) Refrigeration facilities

The capacities of the main items of equipment at this facility are as follows:

Compressors	30 kw x 4 units
Condenser fans	1.5 kw x 4
Pumps	2.2 kw x 4
Fans for refrigerator	1.5 kw x 4
Fans for freezer	2.2 kw x 6
Cooling water pump	1.5 kw x 2
Defrost pump	2.2 kw x 1
Floor heater	2.0 kw x 2

Based on anticipated utilization rates for the refrigerator and freezer, the total power consumption by these facilities comes to:

Refrigerator	372,000 kwh
Freezer	255,000 kwh
TOTAL	627,000 kwh

627,000 kwh x SI$0.37/kwh = SI$232,000

Lighting and power costs for the warehouses, office and premises come to:

6,400 kwh x SI$0.37/kwh = SI$2,370

Among the other power requirements, a particularly large amount will be consumed in connection with the recharging of the electric forklifts. Adding to this the power consumed by equipment in the administration building and workshop, the annual cost of these miscellaneous power requirements may be estimated at:

42,000 kwh x SI$0.37/kwh = SI$15,540

On the above basis, the annual power cost for the refrigerator becomes:

SI$232,000 + 2,370 + 15,540 = SI$249,900

If water consumption is estimated on the basis of a regular complement of 15 persons, the annual consumption comes to 540m^3. The water needed to operate the refrigerator and freezer will be obtained almost entirely from stored rainwater. However, since rainfall is somewhat erratic, we have assumed a 10% reliance on municipal water supplies or 600m^3/year.

Water cost per year comes to:

(540 + 600)m^3 x SI$0.28/$m^3$ = SI$336

Thus, the total power and water costs combined become SI$250,240 per year.

3) Small Ice making plant

The combined power costs for the ice-making plant and ice storage bin have been calculated as follows:

Ice-maker	6,480 kwh
Storage bin	6,840 kwh
TOTAL	13,320 kwh x SI$0.37/kwh = SI$4,928

Water supply requirements are estimated at about 210m^3 per year. Thus, annual water costs become:

210m^3 x SI$0.28/$m^3$ = SI$59

On this basis, the total expense for power and water would amount to SI$4,990 per year.

4) Workshop

The only power-consuming equipment in the workshop are the small power tools and lighting fixtures. Total power cost has been estimated at SI$135/year.

5) Community Center

The main sources of power consumption will be general lighting, ceiling fans, power tools in the training rooms, hot water heaters in the clinic, and the air conditioners. Based on indicated consumption patterns, power cost has been estimated at SI$2,620 per annum.

Water usage, based on an average complement of ten persons, has been set at 360m^3 per year, resulting in a cost of SI$100/year.

Total power and water costs for this facility are estimated at SI$2,720 per annum.

6) Trainee dormitory

Power consumption per year has been established at 4,632kwh, which would mean an annual power bill of SI$1,390.

Water consumption, based on an average of ten regular users, including shower and kitchen requirements, has been calculated at 450m^3 per year, resulting in an annual cost of SI$126.

LPG for kitchen use is forecast at 600 kg per year, on the basis of which the annual gas bill would come to:

600 kg x SI$2.2 = SI$1,320

Accordingly, the total annual utility costs for the dormitory would amount to:

SI$1,390 + 126 + 1,320 = SI$2,840

Summarizing the annual operating cost estimates shown above, we have the following:

	Labor Costs	Office Expenses	Maintenance and Operating Costs	Utility Costs	Total
Fuel Storage Facility	26,400	1,320	18,730	1,370	47,820
Cold Storage Facility	91,500	4,580	52,240	250,240	398,560
Small Ice-making Plant	23,600	1,180	3,800	4,990	33,570
Workshop for Outboard Engine	-	720	3,200	140	4,060
Small Harbor Workboat	25,200	1,260	24,200	-	50,660
Community Center	21,600	3,760	920	2,720	29,000
Trainee Dormitory	13,950	700	1,900	2,840	19,390

CHAPTER 7 PROJECT EVALUATION

7.1 Benefits from Project Implementation

The Solomon Islands Government, in an effort to restructure the nation's economy, has, since 1985, been placing prime emphasis on strengthening the country's economic foundations. In the 1987-89 Programme of Action, natural resource development has been accorded a top priority. The authorities are working to develop the fishing industry of the country, which is endowed with rich skipjack and tuna resources. In 1986, the fishing industry produced 10.9% of GDP and accounted for 45% of total exports; as a key industry for employment creation, it is playing an extremely vital role in national development.

The centers of the Solomon Islands' fishing industry are Tulagi, in Central Province, and Noro, in Western Province. The Western Province Government has been developing Noro as a fishery-oriented city and intends to build it into the central city of the province. To this end, the Central Government, since 1986, has been carrying out the Noro Township Development Plan, within the context of the National Development Plan. The plan involves extensive infrastructure construction, including a deep-water port, water supply and sewer, power, and roads, and this program has nearly been completed.

If the subject Plan is implemented in the Noro area in the wake of this basic infrastructural development, it would make an important contribution to the rapid development of the nation's fishing industry based on skipjack and tuna. The detailed benefits of the Plan are discussed below.

1) Stable Supply of Fuel

Through the construction of the oil storage tank for use by fishing vessels, the power station, ordinary vessels and areas which are not yet served by electric power, a structure will be developed to deliver stable fuel supplies at stable prices.

2) Added value for the Fishing Industry

With the completion of the cold storage facility, it will become possible to selectively store high-value yellowfin, which will lead to improved vessel efficiency and a rise in export prices.

3) Increasing the International Competitiveness of the Fishing Industry:

The cold storage and landing wharf will facilitate the coordination between the stock adjustment of frozen fish and the chartering of large reefer vessels. Based on a decrease in ocean freight costs and a wider choice of export markets, the overall international competitiveness of the country's skipjack and tuna fishing industry will be greatly enhanced.

4) Improved Welfare Services for Workers in the Fishing Industry and Area Residents

The clinic at the Community Center will be a basic welfare facility for fishermen based at Noro and other workers in the fishing industry. And, since there are at present no public medical care facilities in Noro, this clinic will make a major contribution to the welfare of the entire population in this area.

5) The Plan will Promote Regional Development through an Educational and Training Program

Utilizing the facilities at the new Community Center, a varied educational and training program for young people, including courses in the repair of outboard motors, will be offered by the various youth organizations including the Youth Congress. This will invigorate the villages in Western Province, where a large number of people are living.

6) Urbanization of Noro

When this Plan has been implemented on the infrastructural foundation now in place, there will be major industrial development, led by the fishing industry. This will bring an influx of residents, attracted by the increased employment opportunities, as well as the development of related industries, providing a firm base from which Noro can develop as the core city of Western Province.

7.2 Financial Evaluation

The facilities in this Plan which lend themselves to financial evaluation are the oil storage facility and the shore facilities including the cold storage, the small ice-making plant, and the workshop. Let us examine the benefits these facilities will bring in financial terms.

7.2.1 Fuel Storage Facilities

The thinking of the management company for the subject fuel storage facilities planned by the Solomon Islands Government is that the Investment Corporation of Solomon Islands will make an investment in kind in the oil storage tanks, while private oil companies and major users of the tank facilities will also participate to form a public management company for this facility. Since the facility is to handle large amounts of inflammable fuel, it would be best to delegate its operation to private interests with technical experience in the operation and use of such facilities. Thus, in our opinion, it is essential that private fuel companies participate in the new management company.

The fuel storage facility comprises the tanks and distribution pipes. The amortization period for the tanks is 15 years; however, in the case of the pipes, it will be 30 years, owing to the special coating treatment that they will be given and the fact that they are to be buried.

Ignoring costs associated with land investment and profit, we have calculated the financial burden per 1 kl of fuel stored in the Plan tanks

in terms of recovering the construction and operating costs for this facility.

Annual depreciation of the oil storage facility:	SI$ 327,600
Annual operating costs	47,800
Total	375,400

The total volume of fuel to be stored in the tank per year, as noted in Section 4.1.3, is projected at 18,000 kl and thus the charge of the above costs for 1 kl of fuel becomes $20.9. Assuming ex-tanker price of fuel at $500 per kl, the above facility usage charge will add 4.2% to existing prices. On the other hand, with the completion of this facility and the new capability of receiving fuel from large tankers, in comparison with the small present flow (500 kl per vessel), fuel costs are expected to be reduced by some 15%, and so it would be reasonable to recover the depreciation and operating costs from the fuel entering the tanks. Thus, the facility is fully justified from a financial standpoint.

7.2.2 Shore Facilities

The shore facilities will be operated by the Solomon Islands Ports Authority, which is the government organization that manages the country's main port facilities. The Ports Authority receives no financial assistance from the Government, operating on a strictly independent basis. As a result, the introduction of these new facilities should not cause any financial burden to the Ports Authority.

As in the case of the fuel tank, a study has been made on whether the level of prospective storage charges at the new facility will be sufficient to recoup depreciation and operating costs. These costs were estimated as follows:

Annual depreciation of shore facilities	SI$ 615,280

Annual operating costs	446,190
Total	1,051,470

In the case of yellowfin, the warehouse capacity will be 500 tons. Since it can be expected that the average monthly catch of this species will be about 500 tons, the monthly warehouse charges can be calculated as follows, based on a bi-weekly accounting system, which is the standard method used in Japan.

$$\frac{\text{SI \$ 1,051,470}}{\text{(250 + 500) tons x 12 months}} = \text{SI \$116.8/ton}$$

This is the storage charge for a half-month; thus, the monthly rate would be:

SI$116.8 x 2 = SI$ 233.6/ton/month

The level of these charges would correspond to 6.5% of the average price of yellowfin caught by purse-seine vessels in Japan during 1988. Yellowfin prices are roughly double those of skipjack, and, in the absence of this cold storage facility, selective storage is difficult; the value of the resulting damage to the fish would theoretically cover 50% of the price of the yellowfin. In other words, even viewing matters from the standpoint of warehouse users, we feel that there is economic justification in setting storage charges at this level. It is expected that the storage receipts will be sufficient to cover the depreciation and operating charges of the facility, so the net financial burden on the Solomon Islands Ports Authority will be quite modest.

7.3 Appropriateness of Project Implementation

This Project is intended to develop a fisheries infrastructure as the industrial base of Noro, following the development of the social infrastructure in accordance with the Noro Township Development Plan aimed at building Noro into the main city of Western Province.

The fishing industry is positioned in the Solomon Islands economy as a major earner of foreign exchange and the generator of substantial employment. Thus, high hopes are held for the further development of the skipjack and tuna fishing industry, which still has ample room to grow within the Total Allowable Catch (TAC) established for these species. This is seen as the most effective means of envigorating the country's troubled economy.

If the subject facilities are built under this Plan, there will be an increase in skipjack and tuna landings at Noro as well as a growth in value added. As explained in Section 7.1, this will not only bring direct benefits to residents of Noro and the surrounding areas but will also make a direct contribution to the national economy, the benefits of which will be felt over a wide area.

The oil storage tanks, the cold storage facility, and the Community Center included in this Plan will all be managed by different organizations. However, in all cases, the responsible organization is well developed. Also, there is every prospect that in the case of the cold storage facility and the oil storage facility, since fees can be collected from users, the facilities will put no financial burden on the management organizations.

If the Noro area is to develop as the core city of Western Province on both an industrial and cultural level, there is a pressing need to implement the fisheries infrastructure development programs envisaged under this Plan. In addition, the target facilities all have a high degree of public service value. We conclude, therefore, that there would be considerable significance in carrying out the subject Plan under Japanese grant-aid.