6.5 Scope and Scale of the Project

(1) Repair of the main wharf

1) Objective of the work

The purpose of repair of the main wharf is to improve durability and safety of the existing main wharf by provision of anti-corrosion anodes to the piles (H piles) of the pier and by repair of accessories such as fenders and the car-curbings. Urgent repair work is necessary since considerable deterioration are seen progressing.

2) Basic requirements

(a) Repair work for the column piles (H piles) of the main wharf are to be applied to extend its life at least up to 2005.

(b) Repairs of the accessories are to be taken place at points where bad damages are observed.

3) Scope of the repair work

(a) Repair of pilings

The anti-corrosive anodes should be applied to all exposed surfaces of columns piles, being installed along overall 185 m length of the berth. Also repair work using underwater concrete should be provided to the column piles whose concrete sleeves are badly damaged.

(b) Repairs of accessories

a) 8 fenders which are seriously damaged should be replaced.

b) The curbings damaged by collision with hull of ships should be replaced ranging 160 m in total.

c) Mooring post, water supply system

One loosely fixed 50-ton type posts should be reinstalled. One damaged hydrant should be replaced. Some of lights should be moved to newly expanded yard.

(2) Expansion of the Main Wharf

1) Objective of the work

The purpose of the expansion of this pier is to provide space for rationalization of the cargo handling by increasing the width of the existing main wharf at north side of the pier. By this work the apron of the main wharf not only be expanded, but it also be connected to the new cargo handling area to be expanded as described in the following (3), thereby realizing rationalization of cargo handling in conformity with the Master Plan.

2) Basic requirements

The existing main wharf is a detached type pier located 50 m off from land coast. The pier is primarily designed for handling general cargos with a width of 13 m only, and is connected to the yard by two narrow access bridges, each having a width of 10 m. To handle containers, however, width of apron of a pier is required to be more than 25 m. Also, Ro-Ro ships requires same width for connecting their ramp to the pier. Incidentally, when the land reclamation is proceeded in the sea area behind the main wharf according to the plan as described in (3), caution is required not to cause land slide behind the main wharf, by providing a slope mound of approximately 20m width behind the existing pier.

Thus, the width of the pier expansion behind the main wharf is determined to be 18 m, whereby not only width of the apron can be expanded as much as necessary but also the slope mound provided under the expanded pier serves for stabilization of reclaimied land for container yard expansion purpose.

3) Scope of the work

The aforementioned two access bridges of 10 m wide are installed 61.5 m apart. Thus, when the pier expansion take place in between these bridges, the total length of the expended apron becomes 81.5 m, whereby major portion of hold of a container carrier can be covered by the expanded pier. Besides, the cargo handling efficiency of the main wharf will be improved substantially, being accompanied by the benefit of calmness in the harbour to be brought about by the installation of breakwater as described in (6) of this section. The expansion of the pier will be designed in steel pile construction, having a width of 18 m and a length of 61.5 m as shown later in Chapter 7 in detail.

(3) Extension of the container yard

1) Objective of the work

The objective of the work is to expand area of the existing cargo handling yard located about 50 m behind the main wharf by reclaiming sea area in front to improve efficiency of container handling operations, by jointing the expanded area to the rear end of the aforementioned expanded pier.

2) Scope of the work

The land area should be made by reclamation in the sea area behind the aforementioned pier which is to be extended 61.5m in length, as described in (2). The reclaimed area should be extended about 32 m toward sea, and the surface of the land area should be paved for use as container yard.

The new yard area is expected to increase land area by about 3,000 m^2 together with the wharf expansion, thereby improving function of the container yard in relation to transportation and handling of cargo.

The existing cargo handling site in behind the newly reclaimed land is planned to be improved by a project through assistance of the ADB, thus the container handling facilities in Apia Port will be improved substantially when the two projects have been completed.

(4) New ferry wharf and dolphin

1) Objective of the work

The objective of this improvement work is to provide mooring facilities for the international ferries serving Apia Port and the Port of Pago Pago in American Samoa.

2) Basic requirements

The existing mooring quay and mooring post are damaged, and safety of moored ferry cannot be satisfactory. Thus, the main objective of this work is to improve the existing mooring facilities by renewing . The new mooring facilities will be shifted about 30m off south east from the present location in accordance with the Master Plan.

3) Scope of the work

Main dimensions of the new ferry mooring facilities should be determined to accommodate the existing ferry, "Queen Salamasina", and another the new ferry to be furnished in near future.

Dimensions of the ships to be moored:

Tonnage	: 1,000 GT
Overall length	: 45 m
Breadth (maximum)	:12m
Draft	:2.5 m

In order to accept ferries of the above dimensions, some allowances have to be added to each of the above figures. Hence, the specifications of the new mooring facilities are determined as follows:

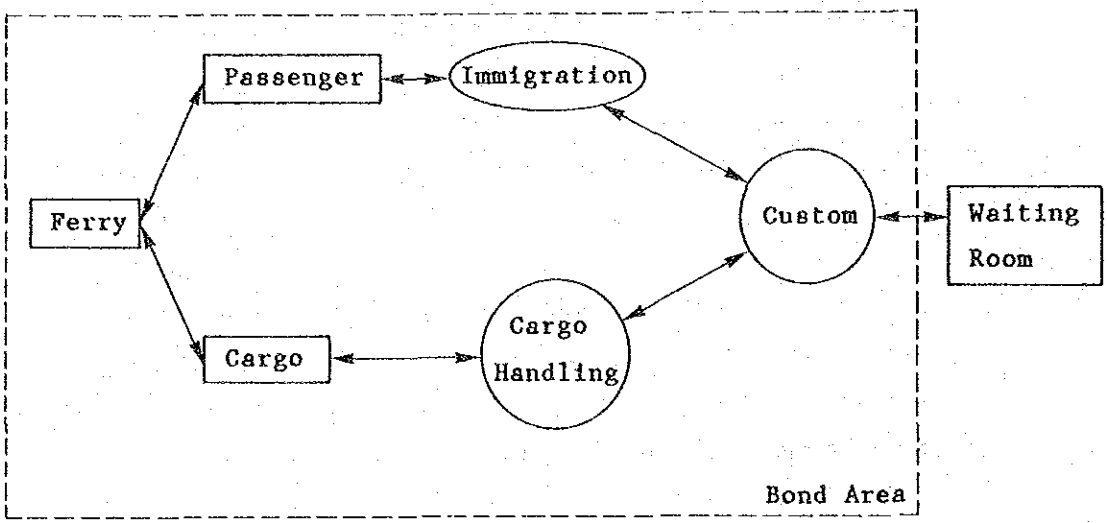
Water depth	: 3.5 m
Length of Dolphin	: 50 m
Impact energy from the ship	: 1.2 T-M (Approach speed to the pier: 0.15 m/sec.)
Tension force of the ship	: 25 T (at the time of a storm)

In consideration of the results of soil mechanics survey, the quay and dolphin are designed in steel structures.
By shifting the location of the quay, revetment and reclamation works are involved in this scope.

(5) Ferry terminal building

1) Objective of the work
The objective of this work is to construct a new ferry terminal building for full functioning of the international ferry services.

2) Functional requirements
The building is to accommodate all facilities for both cargo handling and passenger services as ferry port. Three functions, administration and passenger service and cargo handling have to be operated smoothly, safely and efficiently in this building . Flows of passengers and cargo are requested to be separated as the following diagram.



The terminal building is required to provide spaces for immigration, quarantine control, customs clearance, cargo handling, passenger service and governmental administration, being arranged practically in accordance with flow of functions.

3) Scope of the work

Required floor area for the terminal building is calculated basing on the number of occupants as follows:

(a) Immigration/customs

Passengers 90 p'sonx1.5 m^2 ⟶ 135 m^2

(b) Government office

Head officer 1x30 m^2

Staff 17x6 m^2=102m^2

132m^2 ⟶ 130 m^2

(c) Shipping corporation

Staff 4x15 m^2=60 m^2 ⟶ 60 m^2

(d) Passengers room

Passengers 90x1.2x1.6=173 m^2 ⟶ 175 m^2

Total floor area is 522 m^2 including 22 m^2 for bond cargo storage.

Parking area are 15 lots in bonded area and 40 lots outside bended area.

(6) Breakwater and marker lights

1) Objective of the work

Construction of the breakwater is required for improving safety and efficiency of large vessels operation in their manoeuvring turning, and berthing.

(a) Operating rate of ships during rainy season should be maintained at level of 95%.

(b) Arrangement of the breakwater is in accordance with the layout given in the Master Plan, in consideration of manoeuvring and turning of large sized ships and future installation of a new wharf.

2) Scope of the work

The center line of the breakwater should be arranged in west direction from edge of east reef located at about 200 m north of the northwest end of the main wharf, and the length should be 100 m as shown in Fig. 6.2. By this breakwater installation, total days on which wave height exceeds 50 cm in the basin in front of the main wharf during rainy season from December through February (90 days) can be reduced to less than 6 days as shown in Table 6.2, whereby the operating rate of 95% can be secured for the main wharf. A beacon light shall be installed at west end of the breakwater.

Also marker lights shall be installed on each of the three tanker mooring bouys.

Table 6.2 Calmness in Front of Main Wharf

Kind of wave / Item / Wave height		At present		With the proposed breakwater	
		Appearance days (days)	Ratio of appearance (%)	Appearance days (days)	Ratio of appearance (%)
Wind wave	50cm or more	19	21	5	5
	70cm or more	13	14	1	1
Swells	50cm or more	3	3	0	0
	70cm or more	0	0	0	0
Wind wave + swells	50cm or more	22	24 (76%)	5	5 (95%)
	70cm or more	13	14	1	1

Note 1) Ratio of appearance is the period between December and February.
Note 2) The figures in parentheses are the ratio of workable days.

(7) Tugboat

1) Objective of the work

Provision of new tugboat to replace present old tugboat "Pualele" is urgently required for maintaining safety of incoming and outgoing ships.

The tugboat is designed for assisting large ships in turning, berthing, departing, being provided with capacities and fittings to carry out following works:

(a) Escorting large ships and tankers outside the harbour.

(b) Firefighting, rescueing and traffic services in water area in vicinity of the port.

(c) Pilot services and long-distance cruising for receiving dock service.

2) Basic requirements

The tugboat should be able to serve most of incoming and outgoing large ships whose types and sizes are forecast in section 5.3, that is, the maximun ships of 10,000 to 11,000 GT. Besides, the tugboat should be able to operate even in open sea for rescue service and for a long-distance navigation to receive repair and maintenance services, though it is supposed to be operated mostly in calm water in regular services.

3) Capacity requirements

(a) Main engine power

a) Design requirements :

- Size of ships to serve : 10,000 - 11,000 GT (=15,000 DWT)
- Towing speed : 5 kt (Manouvering operation in the port requires towing speed of 5 kt)
- Wind condition : 10 m/s (Wind direction at angle of 30 degrees with respect to bow)

b) Horsepower calculations

- Total resistance of towed vessel : 9.91 tons.

- Total resistance : 10.4 tons (Resistance of tugboat is assumed to be 0.5 ton, taking some allowance for Froude number of the tugboat.)

- Required towing power of the tugboat : 14.0 tons (efficiency for the tugboat is given at 0.75 10.4/0.75=14.0)

- Conversion rate for towing force from nominal power of main engine depends on type of propeller. For this tugboat, "fixed-pitch-propeller + Kort nozzle" type is assumed in consideration of easy maintenance. For this type of propeller, the conversion rate is 1.3 ton per 100 Horsepower, so that required output of the main engine is 1,080 Horsepower.
(= 14.0 / 1.3 x 100).

- Considering the fact that in conversion, engine power should be given some 30 percent of allowance and also considering that drop of performance due to severe operating conditions at the site, the output of the main engine of the tugboat is set at 1,600 Horsepower.
(=1,080 x 1.5).

(b) Necessary number of tugboats

One tugboat of 1,600 horsepower is counted, since either one 1,600 horsepower tugboat or one of 850 horsepower plus one of 600 horsepower are required for assisting one 10,000 GT ship, referring to the "Tugboat Operation Standard" enacted by the Japan Marine Accident Prevention Association.

(8) Equipment for management and maintenance

1) Objective

The objective of provision of equipment for management and maintenance are to improve port maintenance work, to rationalize accounting work, to enhance port statistics, together with establishment of new port administration system.

2) Basic requirements

(a) Vehicles are required for performance of routine inspections and maintenance works by staff of the Ministry of Transport and the Port Authority, securing mobility of the staff.

(b) A computer system is required in order to rationalize and to make advanced accounting and statistics jobs in the Port Authority as well as, saving manpower requirement.

3) Quantities and specification

(a) In view of the fact that no vehicles are available for maintenance of port facilities and for administration of port operation at present, three kinds of vehicles, 3 units in total (one unit for each kind) are required.

- 3-ton truck (For maintenance work and transportation of heavy material and equipment) 1 unit
- Pick-up truck (For inspection Patrolling and transportation of small equipment) 1 unit
- 4-wheel drive car (For administration of port operation inspection liaison) 1 unit

(b) One set of computer system is required with softwares designed for accounting data processing and port statistics data processing, (Personal computer type).

CHAPTER 7 BASIC DESIGN

CHAPTER 7 BASIC DESIGN

7.1 Design Policies

In this chapter, the results of basic design study on each items as given in the preceding Chapter 6 are presented in regards to the structural, type, sectional drawing and construction method.
In the basic design, the following basic policies are taken into consideration, as well as taking into accounts the request of the Government of Western Samoa, the port activity of Apia, and the site conditions:

1) Construction plan should disturb port operations as little as possible.

2) Designed structures should be simple type and can be constructed rapidly and be easily maintained by the local workers.

3) Cares should be taken to select work plan which will not cause strain or damage on existing structures, especially on the main wharf, during construction.

4) Utilize local materials and manpower and to achieve economical faster construction, considering local condition of technical skill.

5) In design, Japanese codes and standards can be adopted for port facilities, where local codes are seldom available.

7.2 Repair of the Main Wharf

(1) Scope of the work

Maintenance on piles of the pier, repair works of fenders, curbings, bollards and utilities.

(2) Design requirement

Maintenance work for column piles of the existing main wharf should be designed to conform the following conditions.

1) Service life : 15 years, setting target at 2005.
2) Vessel size : 10,000 GT cargo vessel
3) Cargo handling : 20 foot container to be moved by forklift.

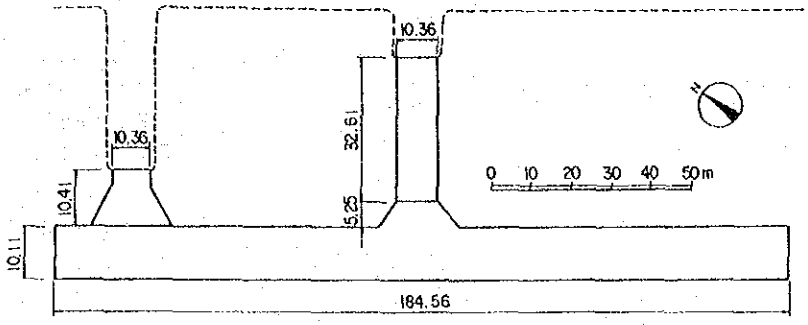
(3) Design requirements

The structure of the main wharf and the damaged condition of fenders and curbings are shown in Figs. 7.1, 2, and 3.
The remaining life of the pier without repair is estimated about 8 years from now on (1987 - 1995) by the investigation of the Master Plan. To extend the life (Appendix - 10), H shaped steel piles should be reinforced by cathodic protection and concrete casing.
Damaged bodies of the fenders and curbing should be renewed.

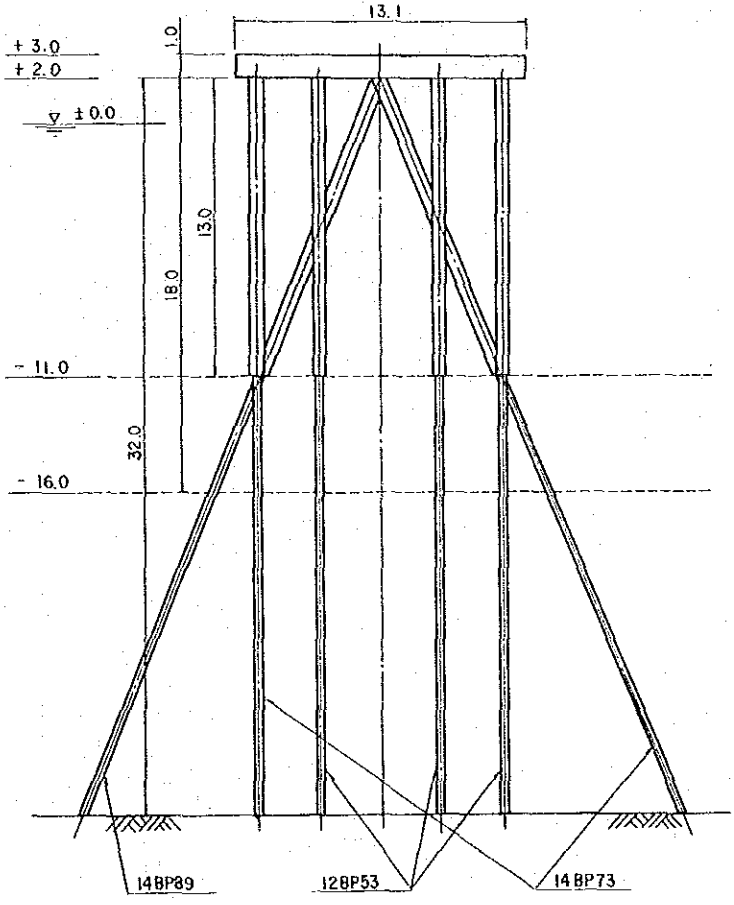
(4) Basic design

As shown in Fig. 7.4, for anti-corrosion protection of H shaped steel piles by sacrificing anodes, aluminum alloy anode (about 150 kgs/pce) shall be installed. All H piles are regarded that at the head of each pile they are inter connected electrically, thus along all length of 185 meters of the wharf H piles have to be installed with total 123 pieces of anodes.
Also badly damaged casing concrete near north end of the main wharf shall be repaired at 20 points at lower portion of column pilings by underwater concreting.
Fender rubbers shall be replaced at 8 places. Curbings should be renewed at portion of 160 m. length.

Plan Layout



Modeled Cross Section



Typical Cross Section of Piles

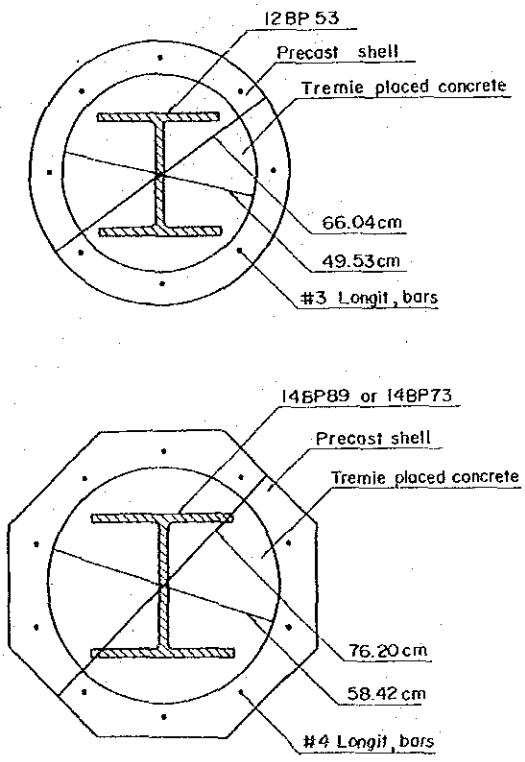


Fig. 7.1 Structural Drawing of Main Wharf (Apia Port)

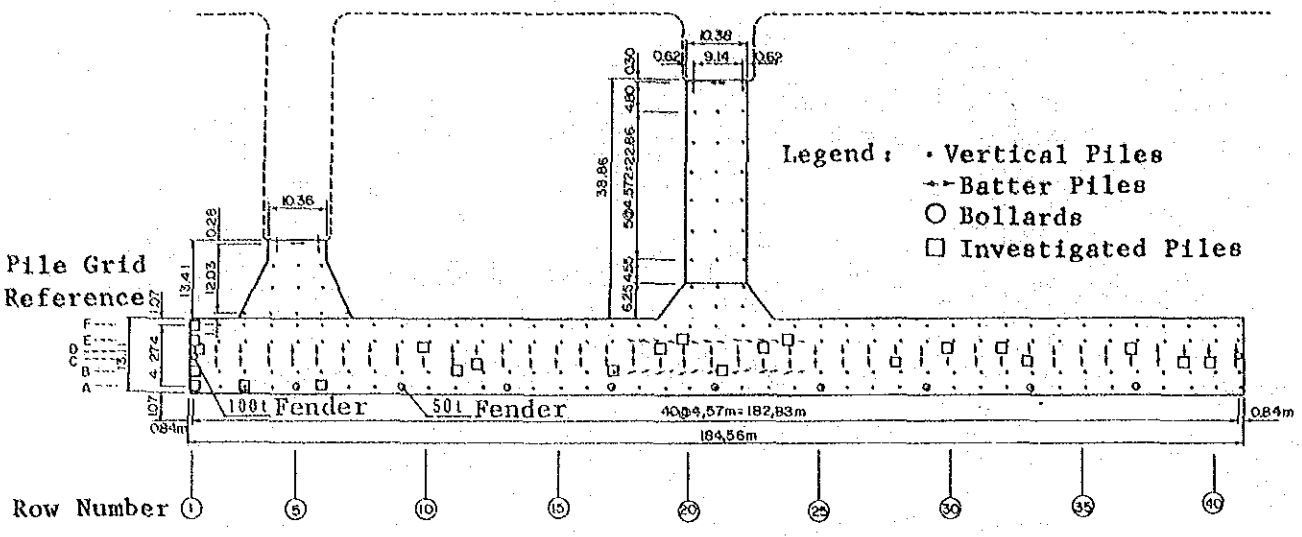


Fig. 7.2 Location of Damaged H-shaped Steel Piles

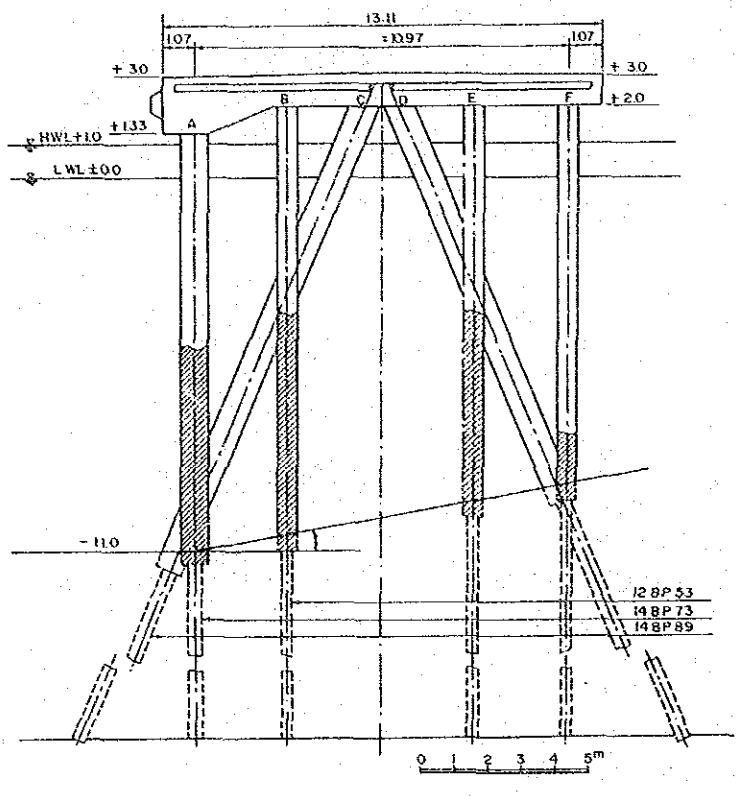


Fig. 7.3 Aspect of Damaged H-shaped Steel Piles (The First Row)

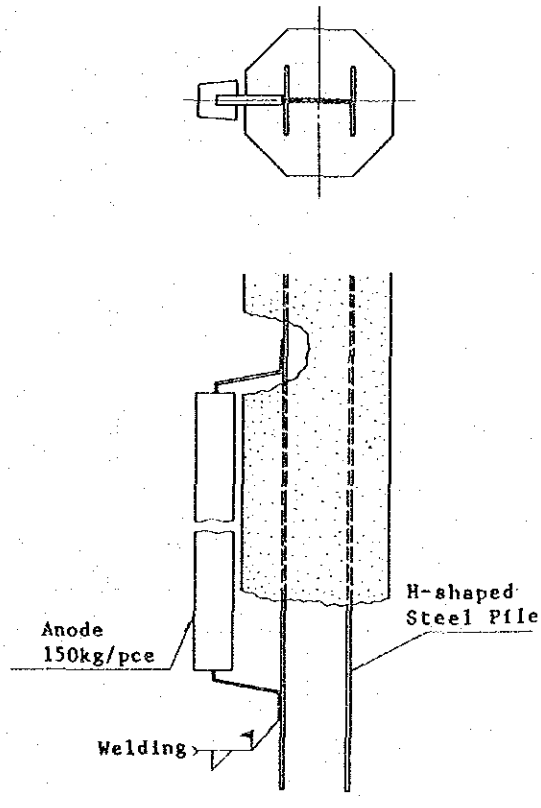


Fig. 7.4 Rust Proof for H-shaped Steel Piles

7.3 Expansion of the Main Wharf

(1) Scope of the work

Construction of a pier of 18 meters in width and 61.5 meters in length in water area behind the main wharf.

(2) Design requirements

The pier expansion in behind the main wharf should be designed as per the following conditions.

Length	: 61.5 (between 2 bridges behind the main wharf)
Width	: 18.0 m (behind the main wharf)
Surcharge	: Ordinary conditions 3.0 t/m^2
	During earthquake 1.5 t/m^2
Seismic coefficient	: Kh = 0.15
Soil condition	: According to the boring survey performed this time, sea bottom layers are as shown in Fig. 5.2 in Chapter 5.
From the bottom of	
the sea to 20 m	: Very loose N = < 5
-20 M to -25 M	: Loose N = < 8
-25 M to -30 M	: Loose N ≒ 10
-30 M to -35 M	: Medium N ≒ 20
Below 35 M	: Base rock layer

(3) Selection of structural types

Soil conditions at the site of pier expansion is rather weaker down to -35 meters depth as shown above. Heavy type structures directly on it involves danger of subsidence or sliding. Considering above, following three fundamental types are proposed and examined;

Type A : Pile bent type pier (Fig 7.5 (1))
Type B : Gravity type supported on piles(Fig 7.5 (2))
Type C : Gravity type (including foundational improvement) (Fig 7.5 (3))

For a working barge to be put in the construction site the existing access bridge have to be cut temporally but this is not permissible for port activity in Apia. Also pile driving on the dock of present pier can reach only 5 meters into the site.

Type A construction, pile driving can be proceeded succeedingly, by driving nearest row of piles at first, then by driving next row of piles on the floor system provided on the ready driven piles. Hence, all piles can be driven without help of work barge avoiding out of access bridge.

In type B construction, since head of the piles are driven down deep into water, pile drivers are not able to proceed on pile head as type A. Because of this, if long piles stand above water surface like in type A, they have to be cut off at seabed to place heavy structure on them. Thus, type A is better because in type A, cut off of the driven piles are not necessary, utilizing them as columns.

In type C, deep excavation of ground in large volume around the foot of the existing pier for replacement with good soil may endanger the stability of the existing pier during excavation. The period of construction will be long because quantity of diver's manual work is large to excavate soil under the pier. Therefore, the main wharf will be occupied long time for construction. It does not conform to the requirement of the said project.

Therefore, the structural type of the expanding pier should be similar to that of the existing pier, eliminating batter piles for simpler construction.

(4) Basic design

As shown in Fig. 7.6 (1),the pier is a structure consisted of piles and floor deck. On top of 6 piles in a row, upper deck structure made of steel concrete and reinforced concrete should be installed. The piles driven into the foundation layer at -35 meters depth will have about 400 tons bearing capacity.

Upper part of the column piles above seabed will be encased in reinforced concrete sleeve for corrosion protection.

The foot of the piles shall be stabilized as shown in the Fig. 7.6 (1), by stacking rubble stones forming a slope surface. The northern rear end of the slope shall be 0 m elevation with flat base for installation of retaining wall for the container yard reclamation.

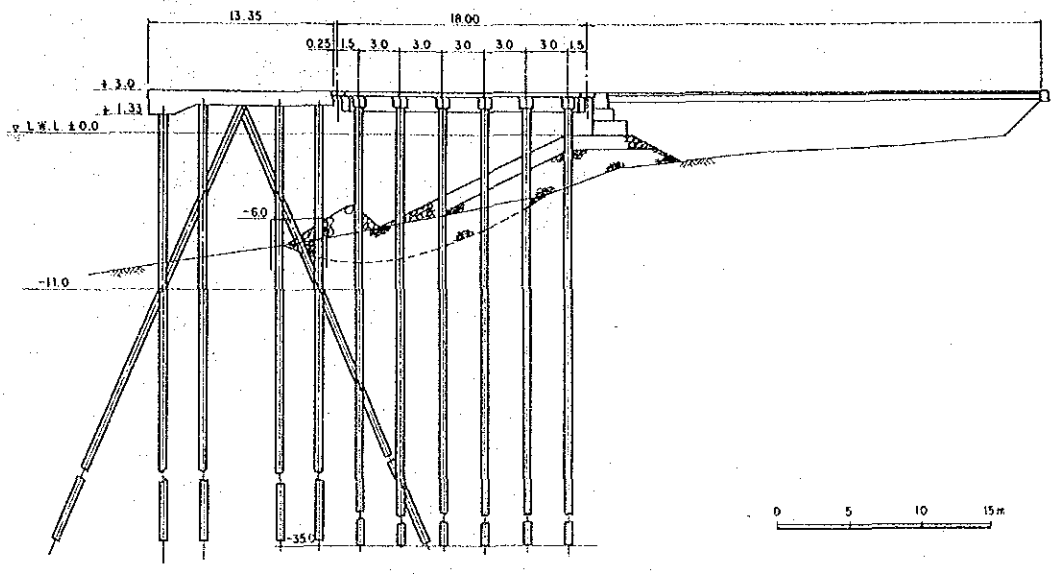


Fig. 7.5 (1) Plan of Pier Type Structure

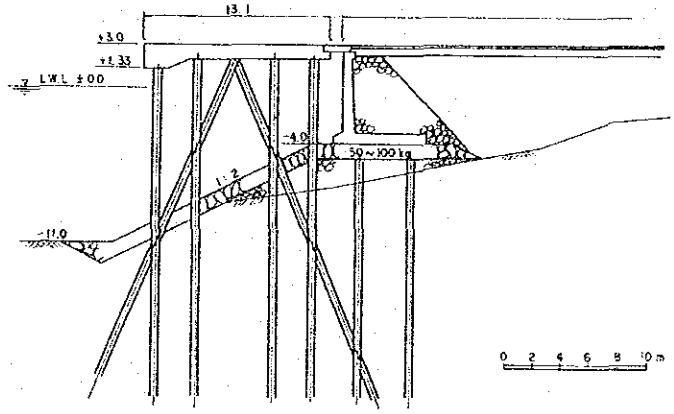


Fig. 7.5 (2) Plan of Gravity Wall on Pile Type Structure

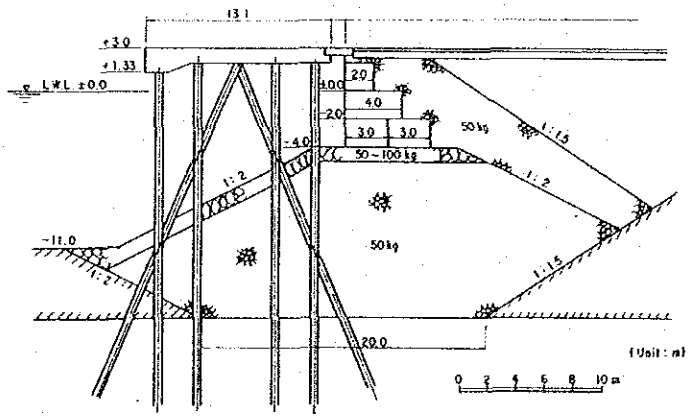


Fig. 7.5 (3) Plan of Foundation Improvement Type Structure

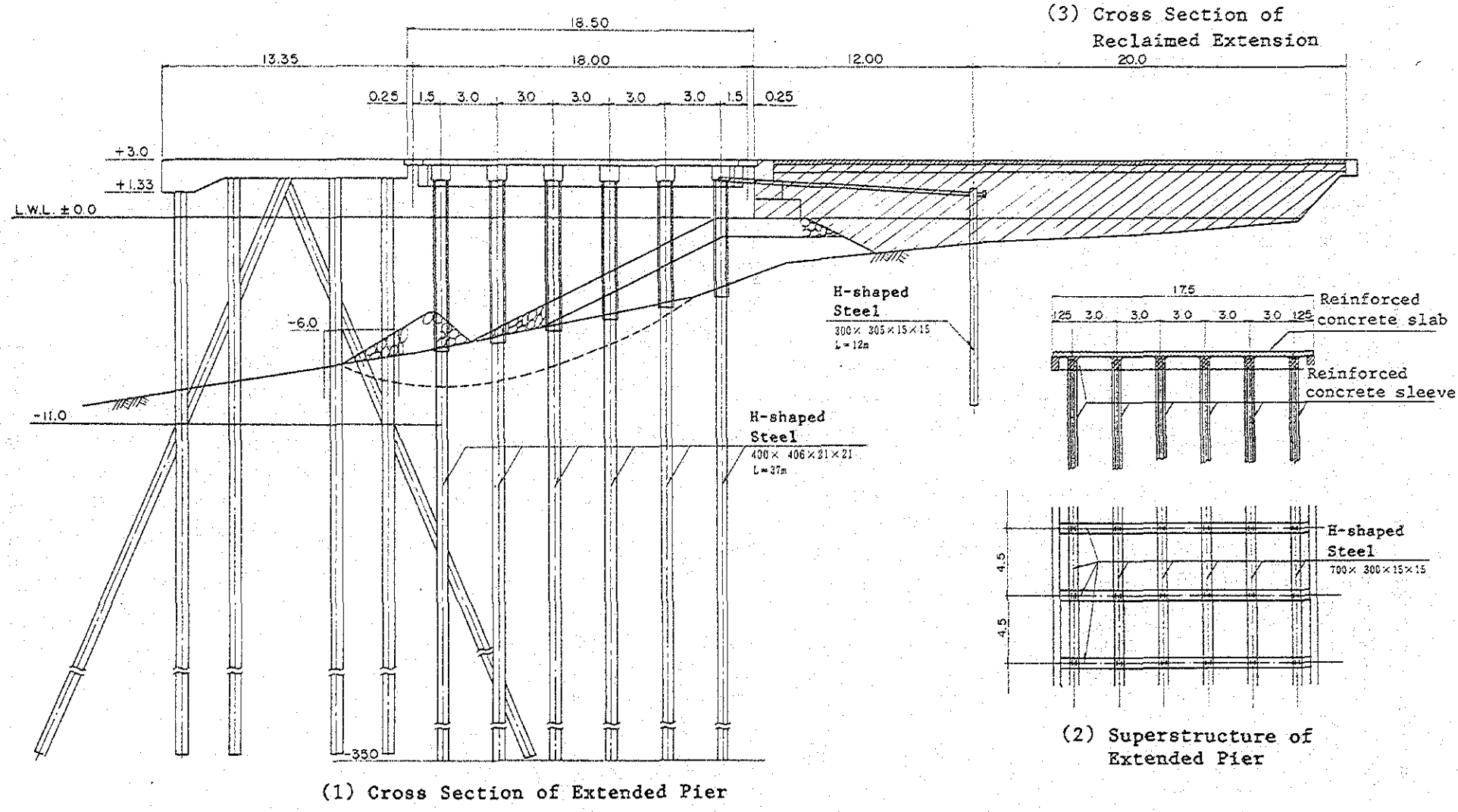


Fig. 7.6 Expansion of Main Wharf and Extension of Container Yard

7.4 Extension of the Container Yard

(1) Scope of the work

Extension of the container yard in front water area of the existing container yard by reclamation.

(2) Design requirement

The reclamation of the container yard is designed in accordance with to the following conditions.

Extended area	: Length, approx. 61.5 m (between the two access bridges) Width, approx. 32 m (between the existing revetment and the expanded Main Wharf)
Surcharge	: Ordinary conditions, 3.0 t/m^2 During earthquake, 1.5 t/m^2 Seismic coefficient, Kh = 0.15
Ground conditions	: According to the boring survey of this phase, the following subsoil strata condition is known as shown in Fig. 5.2 in Chapter 5.

The sea bed elevation deepens from ±0 m to -3 m toward offshore. The bottom layer is consisted of coral reef layer and its thickness is in average 2 to 3 m. Its lower strata are consisted of loose silty sand layer.

The extension land area is to be provided by reclamation and to be finished as part of the container yard, jointing it to rear end of the expanded wharf described above.
Retaining wall shall be placed along the front line of the reclaimed land area.

(3) Basic design

Since this reclaimed land is constructed on the coral reef layer at sea bottom, the stability of the ground depends upon the bearing capacity of this coral reef layer. The surcharge on the coral reef will be around 10 t/m^2 and the bearing capacity of the corral reef is considered to be matching approximately to this load.
At some spots where the coral layer is thinner, settlement of ground may occur due to crashing of coral layer, causing unequal settlement in finished surface. Precaution is necessary for pavement design in this area. Three meter high retaining wall shall be provided as shown in Fig. 7.6 along the line one meter behind the expanded main wharf as per the previous section 7-3, and back fill gravel material shall be placed to reduce earth pressure and wall toe pressure. Further, anchor piles and tie-rods shall be provided to fix the retaining wall and the expanded pier to prevent displacement.

Reclamation of land shall be finished at +2.5 m elevation and a base layer of crusher-run shall be placed in 30 cm thickness on it, with surface pavement for container yard expansion.
Two lines of drains shall be provided in southwestward direction.

7.5 Ferry Wharf and Dolphins

(1) Scope of the works

Construction of wharf and mooring dolphin for ferry boats, including terminal yard reclamation and revetment and front basin dredging.

(2) Design Requirements

The design requirements for ferry mooring facilities are set as follows considering future size of calling vessels.

Dredge depth	: -3.5 m
Length of vessels	: 45 m
Berthing energy	: 1.2 T-M
Mooring force	: 25 T
Soil condition	: According to the boring survey, as shown in Fig. 5.3 in section 5, the foundation layer are composed of the following strata.

From the bottom surface of the sea to -20 m	: Very loose	N ≈ < 5
From -20 m to -25 m	: Loose	N ≈ < 8
From -25 m to -30 m	: Loose	N ≒ 10
From -30 m to -35 m	: Medium	N ≒ 20
-35 m or deeper	: Base rock	

(3) Selection of structural type

As the coral reef strata in the sea bottom have been removed at this spot when the port was dredged earlier, soft and weak strata as described above is exposed at sea bottom, constituting base ground down to around -30 m. Taking this into account, the following two types have been examined.

Type A : Cantilever sheet pile (Fig 7.7 (1))
Type B : Gravity type concrete walls (Fig 7.7 (2))

In case of the former type A, wall can be constructed only by driving large section steel sheet piles into the actual ground keeping stability against backfill pressure.
Whereas, in plan B, riprap mound must be provided by excavating sea beds, to distribute the load of wall in wider area. Consequently, construction takes longer term and subsiding occurs for a long period of time together with progress of concrete works and reclamation.
Since this mooring wharf has to be completed at beginning of the work among all other works of the ferry terminal construction, plan A, whose construction is fast and stable, is considered suitable.
As the mooring dolphin has to support the lateral load of ferry boats, it should have a deep embedment into soft foundation layer and the piling type construction is adopted.

(4) Basic design

1) Ferry mooring wharf
Water depth in front of the quay is -4.5 m in design, considering scouring effect by screw of the Ferry.
The length of the wharf extends to 20 m width and it is designed using box type combination steel sheet piles (Type IVA plus IVA of 18 m long as shown in Fig. 7.7 (1). They shall be driven down to 17 m deep to form a cantilever sheet pile wall, at 30 m south east of the existing ferry wharf.

2) Ferry mooring dolphin
Five mooring dolphins are to be installed along a line perpendicular to the new ferry wharf. Each dolphin has to withstand to lateral load of 25 tons. In each dolphin, four of H-shaped steel piles of 400 mm size shall be combined with concrete superstructure. Fenders and bollard and access bridges are included in design. (Fig 7.9)

3) Revetment and reclamation
The existing ferry wharf basin, north west of the new wharf, shall be closed by the steel sheet pilings and reclaimed as new terminal yard area. (Fig 7.8)
Behind the east end of the new ferry wharf, new land area shall be made by reclamation for new ferry terminal building installation.

4) Dredging for ferry anchorage basin

The water area in front of the new ferry wharf has to be dredged to a depth of -3.5 m.

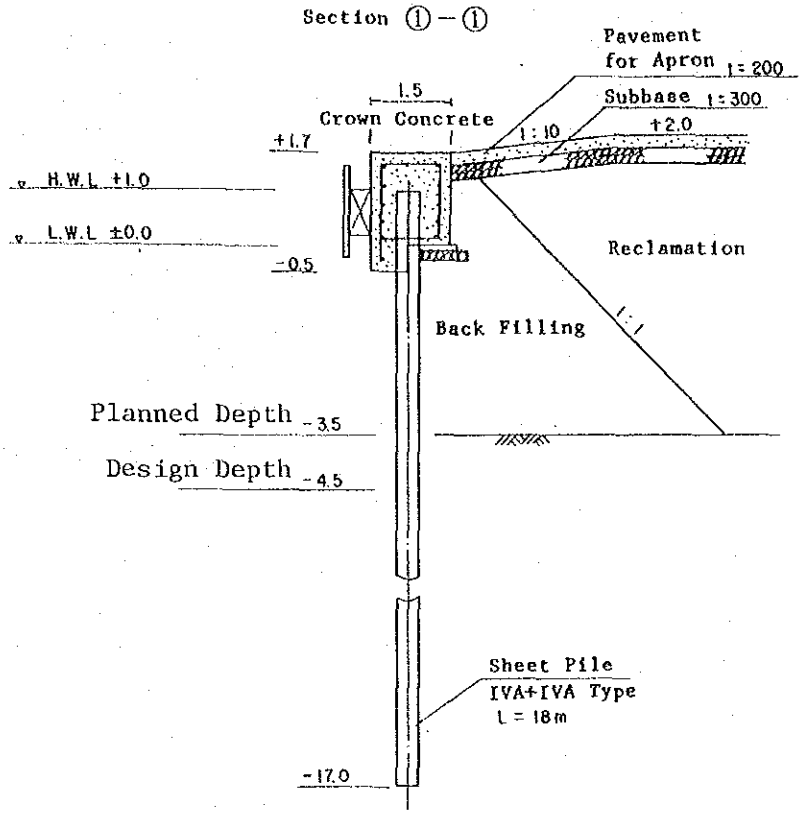


Fig. 7.7 (1) Plan of Cantilever Sheet Pile Type Structure

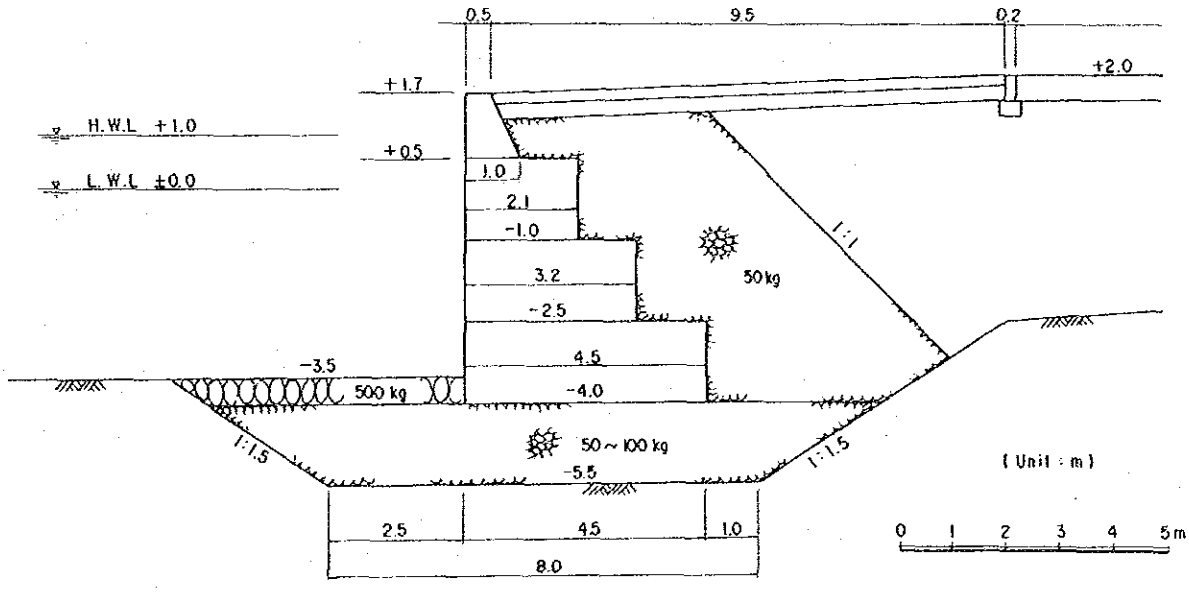


Fig. 7.7 (2) Plan of Gravity Type Structure

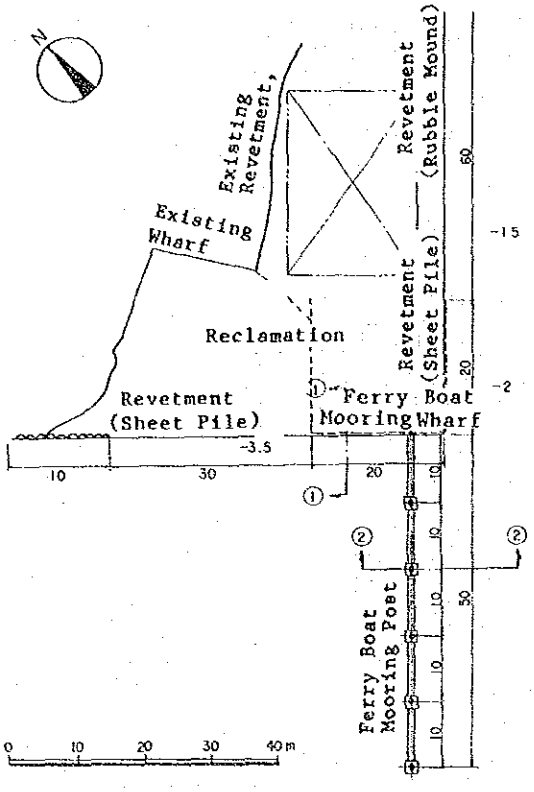


Fig. 7.8 Layout of Ferry Boat Mooring Facilities

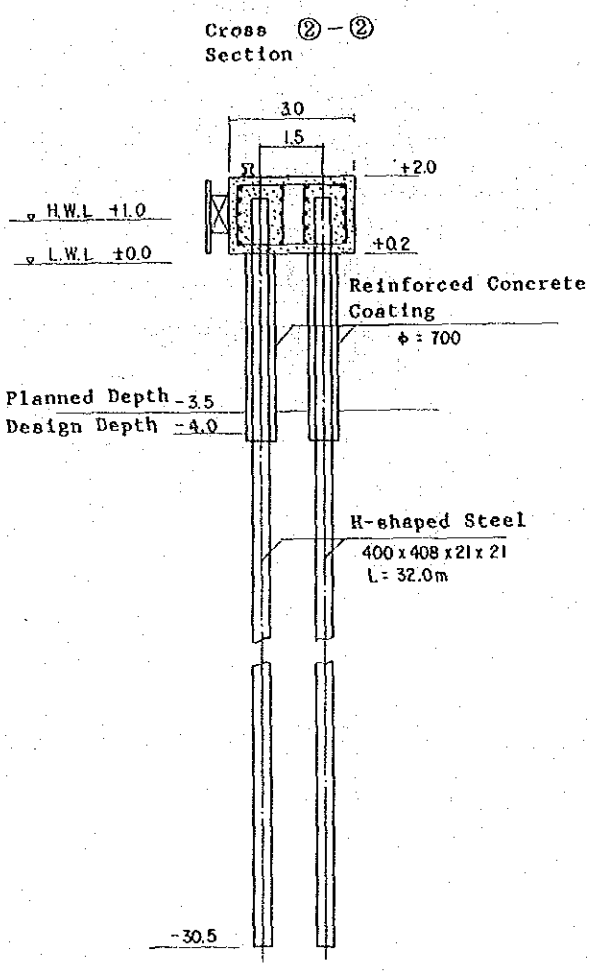


Fig. 7.9 Structure of Ferry Boat Mooring Post

7.6 Ferry Terminal Building

(1) Scope of the work

Construction of new ferry terminal building behind the new ferry mooring wharf. The building shall accommodate spaces for the following purposes.

1) Immigration, custom and quarantine room
This area is for control of passengers and cargo. For efficient operation of passengers, counters for immigration, custom clearance and quarantine inspection.

2) Shipping corporation's room
This area is for operational control of ferry boats, for cargo operation and for booking of tickets by the Shipping Corporation.

3) Passengers' room

(a) Waiting lobby
Area for passengers and other visitors. Ventilation shall be provided. Benches shall be provided.

(b) Bank
Area for foreign currency exchange services shall be provided

(c) Canteen
Snack and soft drink shops for passengers and workers of the terminal building.

(d) Toilets
For passengers and employees.

4) Government office
This area is for administrative office space for custom officers, police officers, quarantine inspectors, port authority, and immigration officers.

5) Storage

Storing space for bonded cargo.

(2) Design Codes and Requirements

1) Design code references

(a) Structural design criteria refers to the codes of New Zealand, the U.S.A. and Japan

(b) Materials to be used

Concrete	FC 180 to 210 kg/cm^2
Reinforcing steel bar	SD 30 (JIS)
	Yield point 3,000 kg/cm^2
Steel	SS 41 (JIS)
	Yield point 2,400 kg/cm^2

(c) Design load

Wind load : Wind velocity 50 m/sec

Seismic load : Seismic zone "C" (New Zealand Code)

V = 0.15 W

2) Water system design requirement

The water service line shall be branched from the existing water main located near the site. The estimated water flow rate is 210 lit/min.

3) Electricity design requirement

The power supply to this building shall be from the existing main line dropping into secondary voltage of 230V single phase. The estimated demand load for this building is approximately 30 KVA.

(3) The Line of Flow in the Terminal

The line of flow inward and outward the ferry terminal building and the site layout are shown in Fig. 7.10,11
The lines of flow for passengers and cargo are consisted of four lines as follows.

(a) Landing passengers
(Disembarking - Immigration/Passport control - Custom clearance - Waiting lobby)

(b) Boarding passengers
(Waiting lobby (Customs clearance) - Immigration/Passport control - Boarding)

(c) Passengers checked cargo

(d) Shipping Cargo, Bonded cargo

(4) Primary specification

1) Architectural floor area (m^2)

Main building	522
Roofed corridors	9
Canopy	306
Total	837

2) Structures and finishings

Foundation	: Reinforced concrete spread footing with pile foundation
Frame work	: Reinforced concrete columns, and wooden truss structure
Roof	: Wooden single finishes with asphalt roofing on wooden sanking
Interior & exterior walls	: Concrete masonry unit walls and prefabricated wooden panels
Ceiling	: Wooden panel
Floor	: Concrete, steel trowel finish and floor tile finish

The floor plan, elevations, and sections are shown in Fig. 7.12,

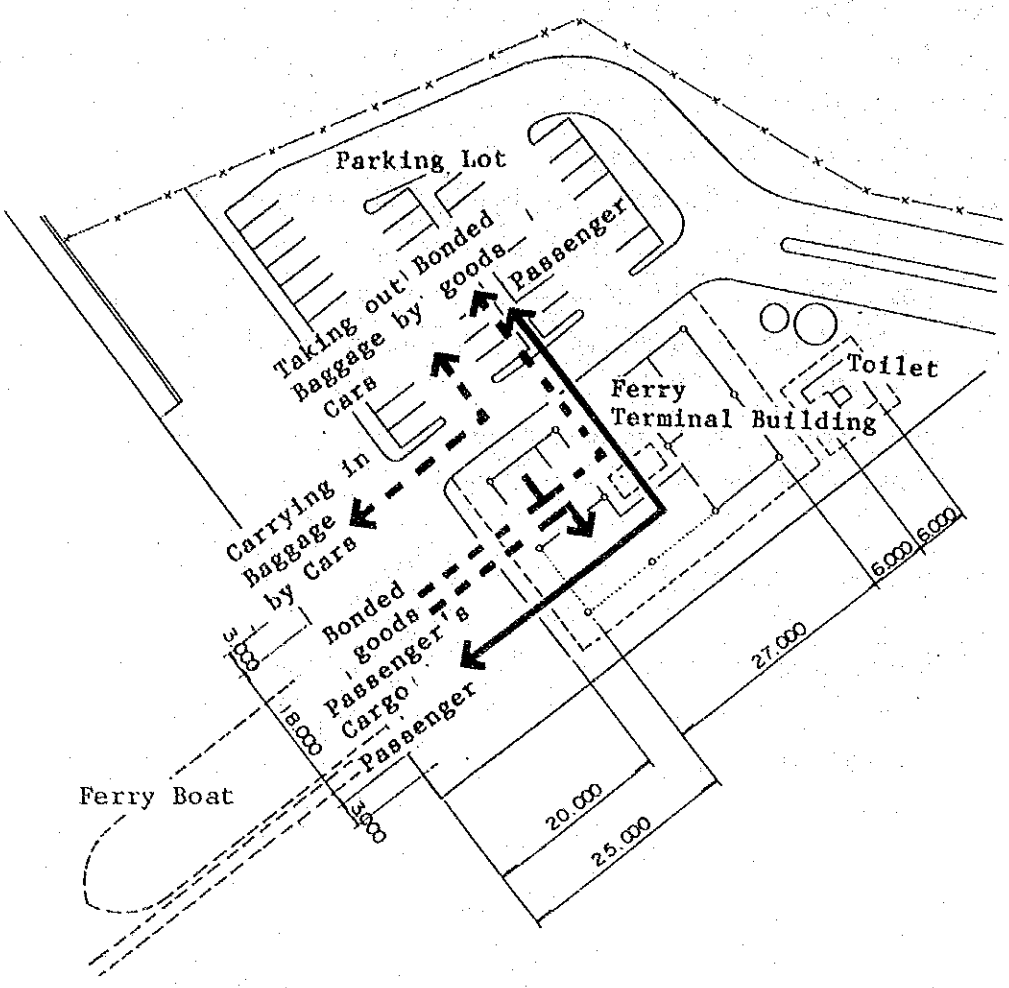


Fig. 7.10 Ferry Terminal Flow Diagram

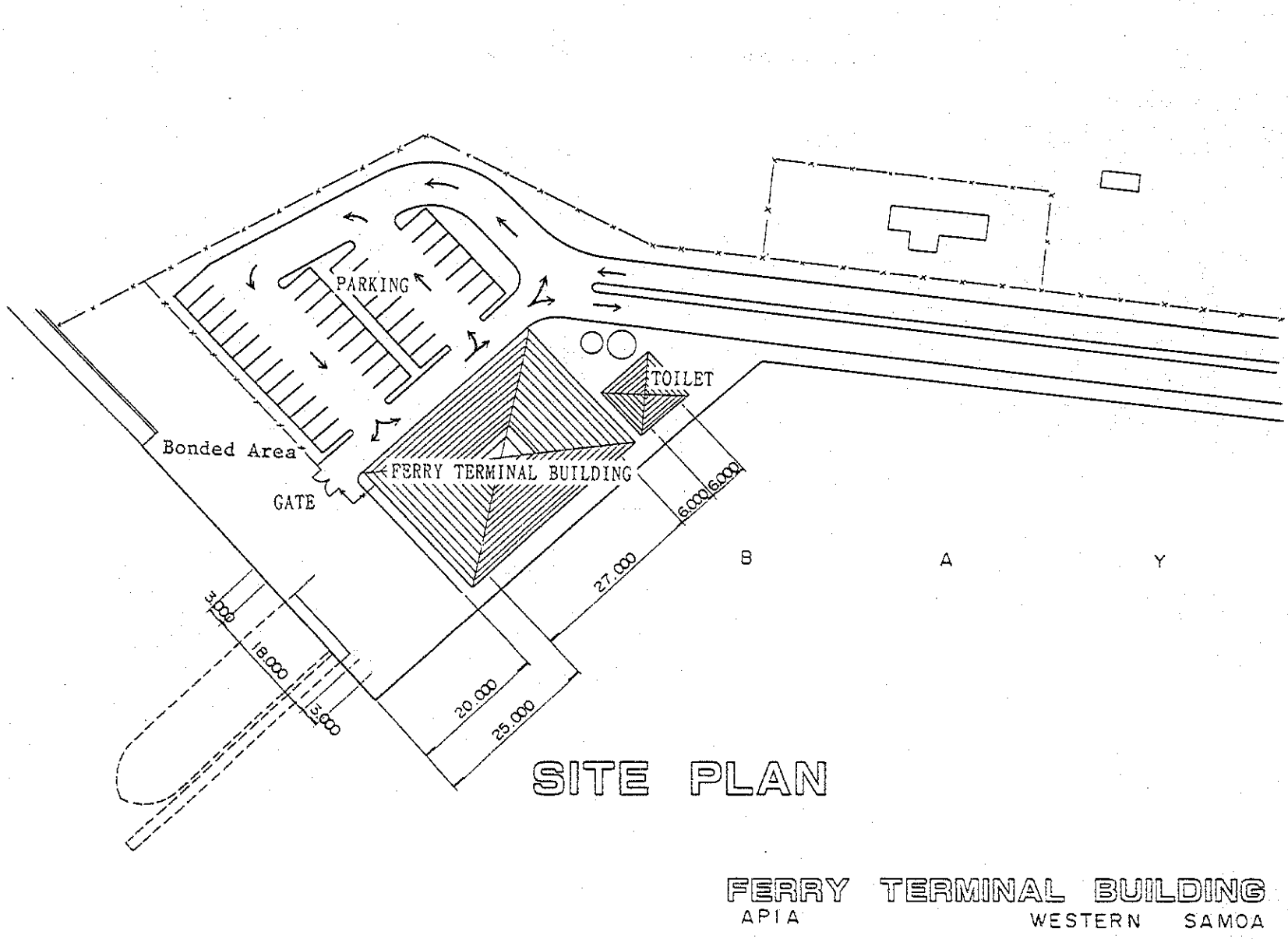
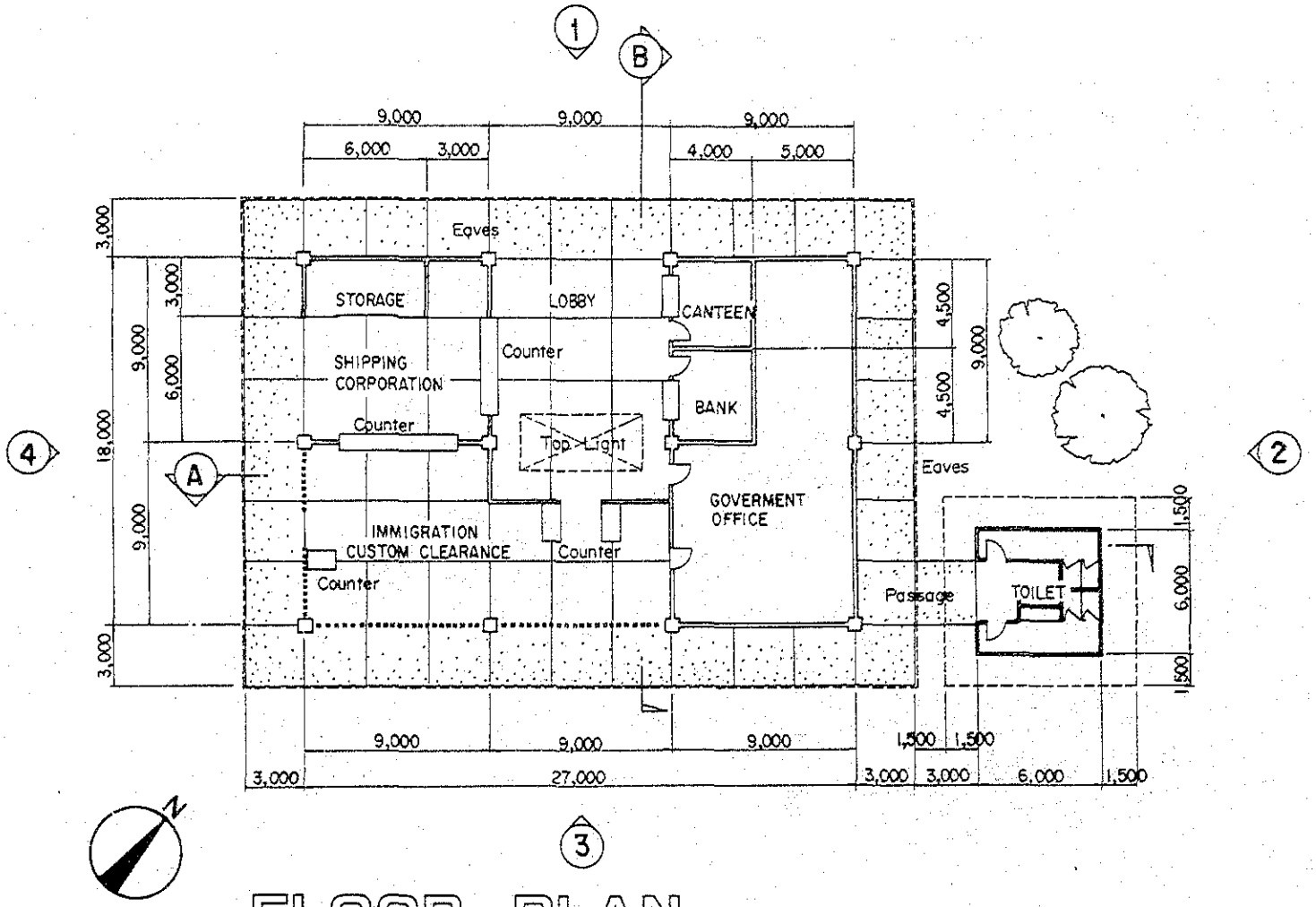


Fig. 7.11 General Layout of Ferry Terminal Facilities

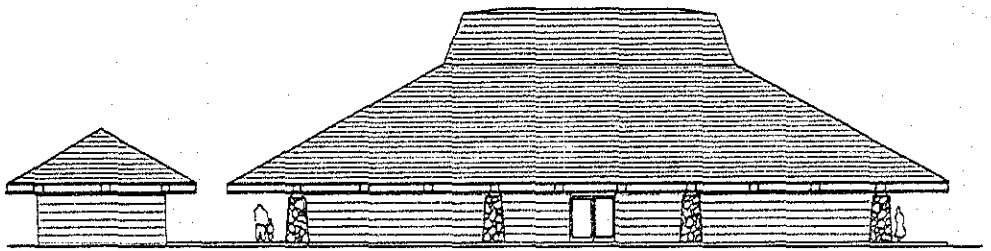


FLOOR PLAN

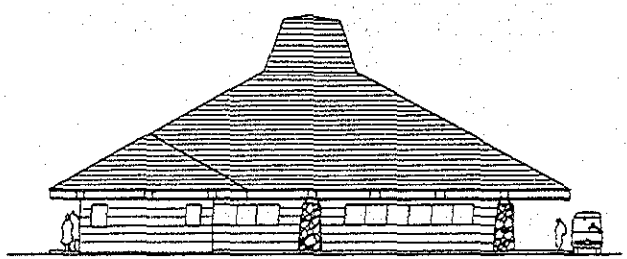
FERRY TERMINAL BUILDING

APIA WESTERN SAMOA

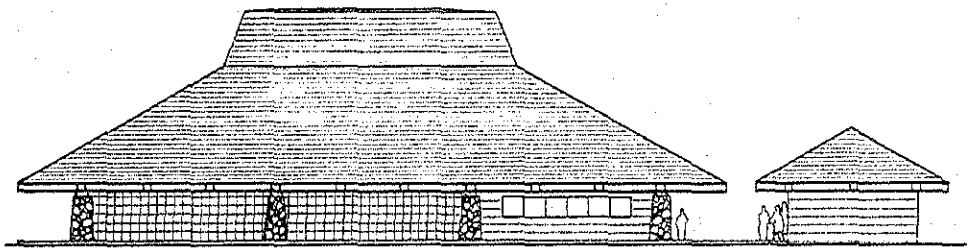
Fig. 7.12 (1) Plan of Ferry Terminal Building



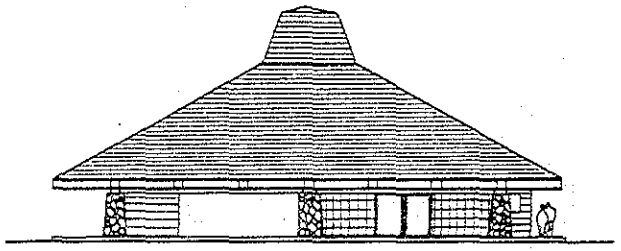
① ELEVATION



② ELEVATION



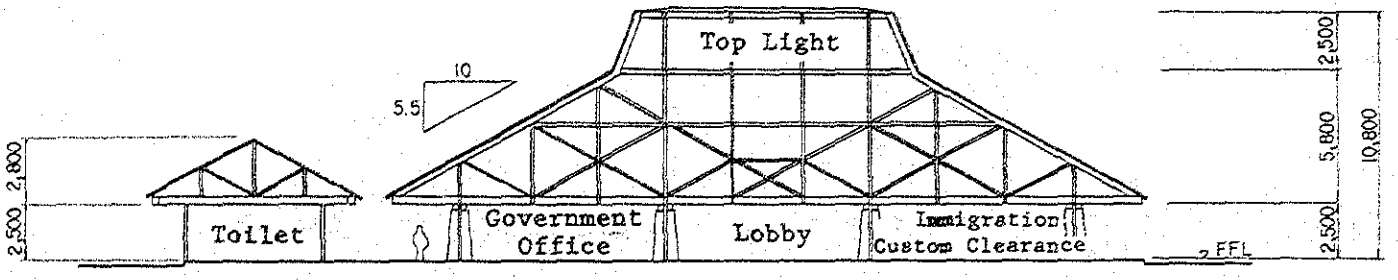
③ ELEVATION



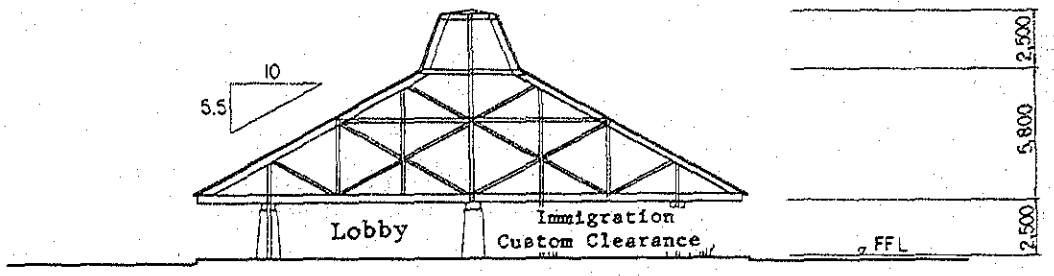
④ ELEVATION

FERRY TERMINAL BUILDING
APIA WESTERN SAMOA

Fig. 7.12 (2) Side View of Terminal Building



A SECTION



B SECTION

FERRY TERMINAL BUILDING
APIA WESTERN SAMOA

Fig. 7.1.2 (3) Cross Section of Terminal Building

7.7 Breakwater and Marker Lights

(1) Scope of the works

Construction of breakwater on east side of harbour entrance channel and installation of light beacon

(2) Design Requirements

1) Tide range : H.W.L +1.0 m, L.W.L ±0.0 m

2) Wave : (Ho) 1/3 = 7.0 m, (To) 1/3 = 10.0 sec.
H 1/3 = 4.2 m, T 1/3 = 10.0 sec.

3) Crown height : +2.8 m (=HWL +1.0 m +0.6 x 3.0 m)

4) Depth of seabed : -13.5 m (-12. 2 to -14.1 m)

5) Soil condition : Silty fine sand

(3) Selection of type

Since small vessels like fishing boats operate at offshore side of the breakwater, it is necessary to minimize reflection of waves from the breakwater. In that consideration, the following two type were proposed and examined.

Type A : Slope faced breakwater with armor concrete block
(Fig. 7.13 (1))
Type B : Composite breakwater with armor concrete block
(Fig. 7.13 (2))

Type A represents a simple structure with superb stability and easy construction work.
Type B, on the contrary, requires more rubble stone for the foundation and require larger lifting equipment to install vertical wall to secure stability against waves.

This breakwater shall be completed in a relatively short period to avoid rainy season. Type A, therefore, is concluded to be best suitable for construction of the breakwater because of its simplicity and faster works.

(4) Basic design

The breakwater shall be armored with 6t-type concrete blocks as shown in Fig. 7-13 (1).

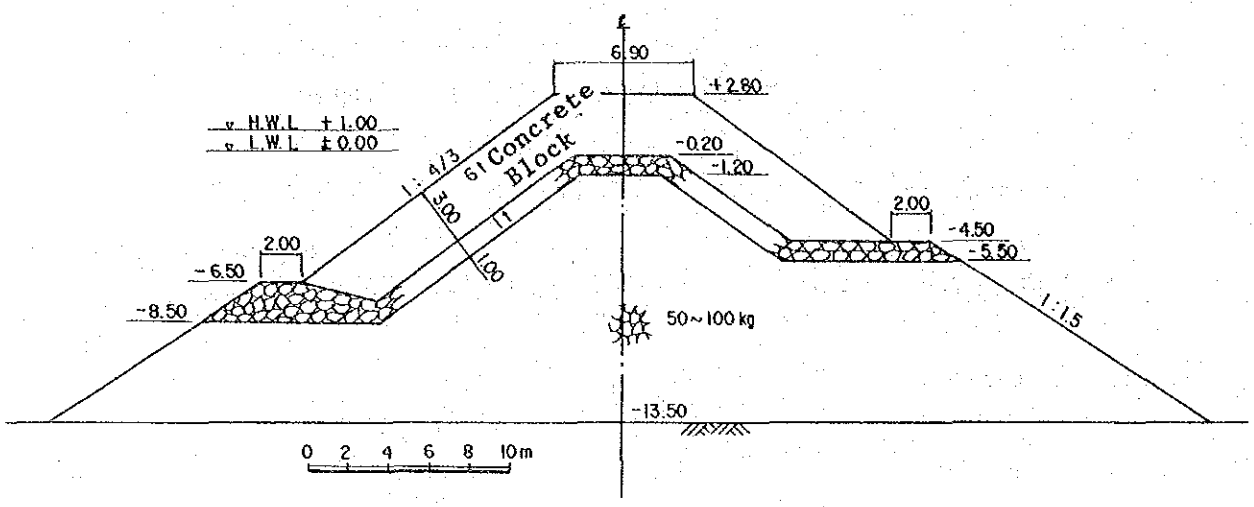


Fig. 7.13 (1) Cross Section of Rubble Sloping Breakwater with Concrete Blocks

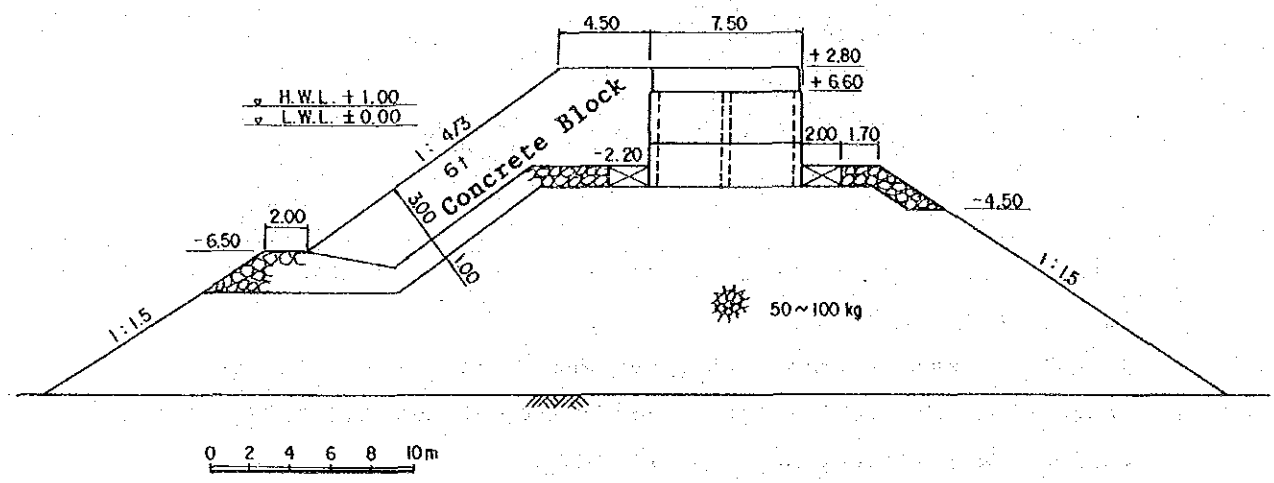


Fig. 7.13 (2) Cross Section of Composite Breakwater with Concrete Blocks

7.8 Tugboat

(1) Scope of the work

Construction of a new tugboat and training of two Western Samoan crews.

(2) Design requirements

The tugboat shall be designed in details according to the following basic requirements. General layout of the tugboat is shown in Fig. 7.14. Principal dimensions are determined basing on common size of tugboats in other ports with 1600 horse power engine out put.

1) Principal dimensions of boat

- Gross tonnage	: Approx. 130 GT
- Length, overall	: Approx. 26 m
- Length, between perpendiculars	: 23.1 m
- Breath	: 6.8 m
- Depth	: 2.8 m
- Draught, designed,	: 2.15 m

2) Speed and pull force

- Crusing speed	: Approx. 12.0 kt
- Maximum range of voyage	: Approx. 1750 sea miles at 12.0 kt
- Pull force	: 20.0 t

3) Tank capacity

- Fuel oil tank	: 45.0 m^3
- Fresh water tank	: 20.0 m^3
- Balast tank	: 10.0 m^3
- Lubrication oil tank	: 4.0 m^3

4) Boarding Capacity

- Crew	: 6 persons
- Passenger	: 2 persons

5) Deck machinery

- Windlass electric	: 2.0 t x 17 m/min.
- Capstan	: 1.0 t x 15 m/min.
- Steering gear	: 3.0 t -M x 1
- Dabbid	: 1 t x 1

6) Equipment

- Fire fighting equipment	: 1 set, sea water type
- Life saving equipment	: 1 set, inflatable life raft (6p)
- Navigation equipment	: Magnetic compass, Radar
- Communication equipment	: VHF radio telephone
- Towing hook	: 25 t SWL

7) Main engine	: 800 Horsepower x 2 (at 900 rpm) Diesel
8) Generator	: AC 225 V x 50 Hz x 3ϕ x 50 KVA x 1
	: AC 225 V x 50 Hz x 3ϕ x 30 KVA x 1
9) Propulsion system	: Fixed-pitch x 4, blade propeller with Kort nozzle x 2, manganese bronze made

(3) Design principle

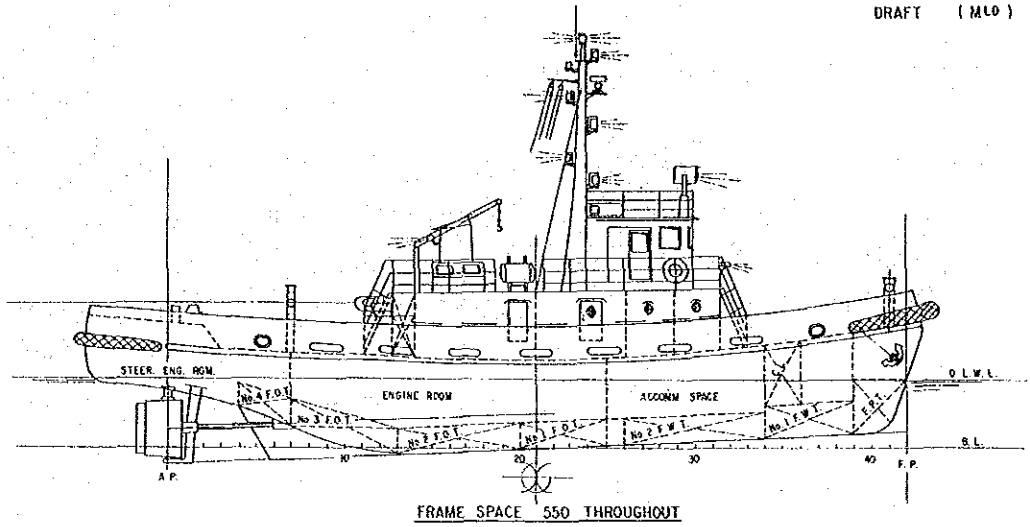
For easy operation and maintenance in Western Samoa, a remote area, thickness of steel plate for hull and deck is specified 1 mm thicker than the standard thickness, and the equipment should be simple for maintenance .

(4) Schedule of the project

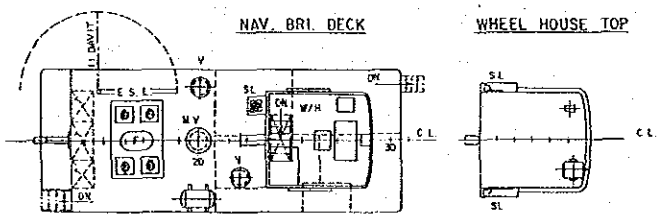
1) Ship building in Japan, inspection in Japan
2) Technical training for Western Samoan crews
3) Navigation to Western Samoa including Samoan trainee
4) Delivery to Government of Western Samoa

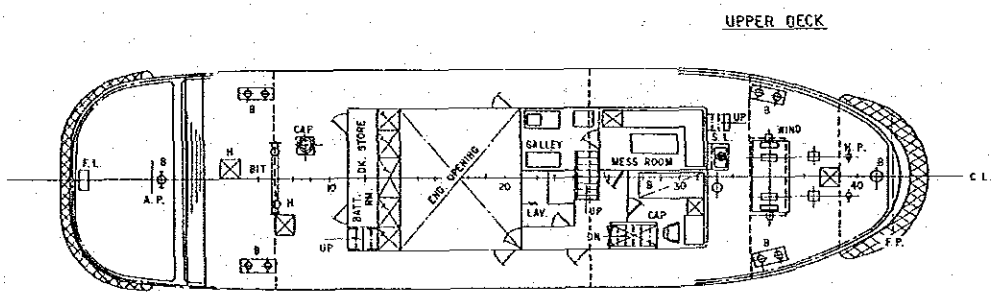
PRINCIPAL PARTICULARS

LENGTH	(O.A.)	26.00m
LENGTH	(P.P.)	23.10m
BREADTH	(MLD)	6.80m
DEPTH	(MLD)	2.80m
DRAFT	(MLD)	2.15m



FRAME SPACE 550 THROUGHOUT





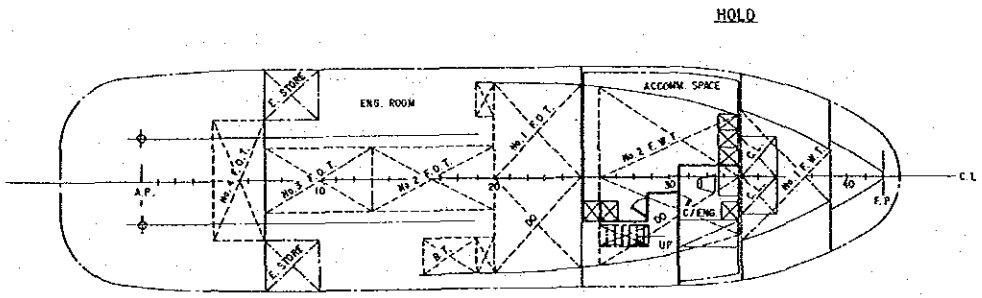


Fig. 7.14 General Arrangement of Tugboat

7.9 Equipment for Management and Maintenance

(1) Computer system

1) Scope of the work

Provision of computer system with following programs.

Accounting data processing : Computation of harbour charges, General accounting jobs

Statistics data Processing : Statistics of cargo volume, Statistics of vessel types, Service indexes like berthing time, cargo handling time, etc.

2) Preliminary Specification

The computer system shall be consisted of a 16-bit personal computer, a display, a hard disk unit, a printer and a plotter. In view of operational conditions in Samoa (high temperature and humidity), the system shall be of sufficient durability.

(2) Vehicles for maintenance

1) Scope of the work

Provision of vehicles for traffic and transportation of staff and equipment and materials for enhancement of operation control and maintenance of ports in Western Samoa. The New Port Authority will inspect and maintain the nationwide port facilities besides such control activities on ship operation and cargo operation.

To enable the Port Authority to perform operation control and maintenance jobs, the following three vehicles are required.

2) Preliminary Specification

(a) Car for port operation controlling activities: 1
4wheel-drive vehicle

(b) Pickup for routine inspection of facilities 1

(c) Truck for maintenance job of port facilities 1

CHAPTER 8 PROJECT IMPLEMENTATION PLAN

CHAPTER 8 PROJECT IMPLEMENTATION PLAN

8.1 Project Implementation Policies

This project will be carried out under the scope of the Japanese Grant Aid System. After approval of the project by the Government of Japan and the Government of Western Samoa, an Exchange of Notes(E/N) will be taken place between both governments and the project plan will be officially put into effect. Next, a Japanese consultant, which shall be appointed by the Government of Western Samoa will start the detailed design work of facilities and equipment. After preparation of tender documents by the consultant, Japanese contractors shall be selected by tender and construction will proceed. A tugboat will be provided by a Japanese shipbuilding company which shall be selected by another tender.

The construction period is expected to be 16.5 months taking into consideration the scope of the project and site conditions. The length of the construction period will be governed by the expansion of the main wharf and construction of the breakwater.

MOT is deemed as the executing organization of the Project in Western Samoa and PWD is assumed to assist MOT during the actual construction work. For the execution of this project, close cooperation and arrangement between Japanese project group and MOT as well as PWD are requested. Consideration is necessary for another project to pave the existing container yard. This will be financed by ADB and carried out under the control of PWD during the period of the grant aid project. Fig.-8.1 shows organization of construction management.

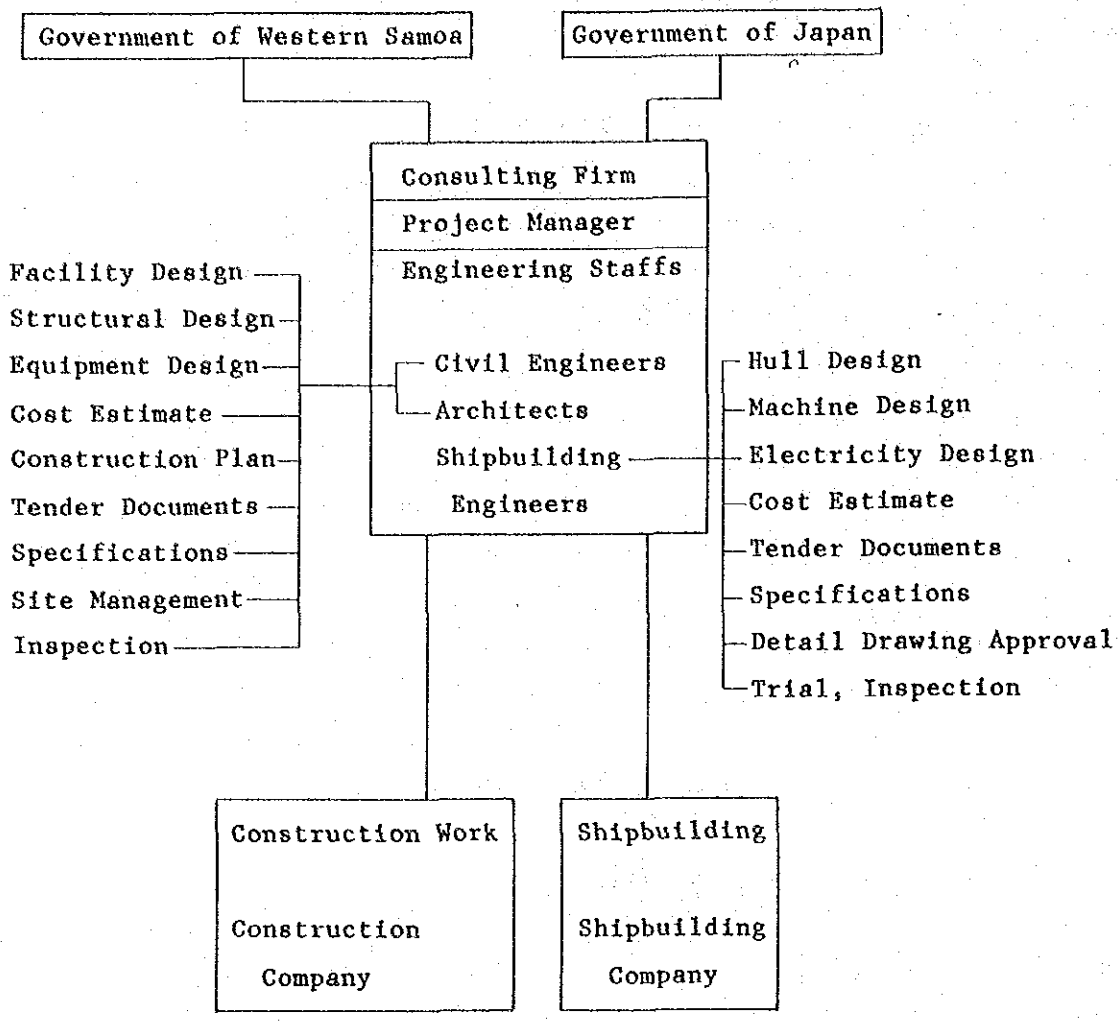


Fig. 8.1 Organization Chart of Implementation Project

8.2 Scope of the Apia Port Grant Aid Project

(1) Scope of the grant aid project

The scope of work of the project by the grant aid for Apia port covers the following items:

1) Repair of the main wharf (piling, fenders and curbings, etc.)
2) Expansion of the main wharf
3) Extension of the container yard
4) Ferry wharf and dolphin
5) Ferry terminal building
6) Breakwater and marker lights
7) Tugboat
8) Equipment for operation and maintenance (vehicles, computers)

(2) Undertakings by the Government of Western Samoa

The following are the items that are to be undertaken by the government of Western Samoa under its responsibility.

1) Demolition of the existing buildings
2) Installation of water main to the ferry terminal building
3) Installation of primary power line to the ferry terminal building
4) Installation of primary telephone lines to the ferry terminal building

8.3 Construction Schedule

Implementation of the Apia Port Project by the grant aid of the Japanese Government will proceed in the following manner.

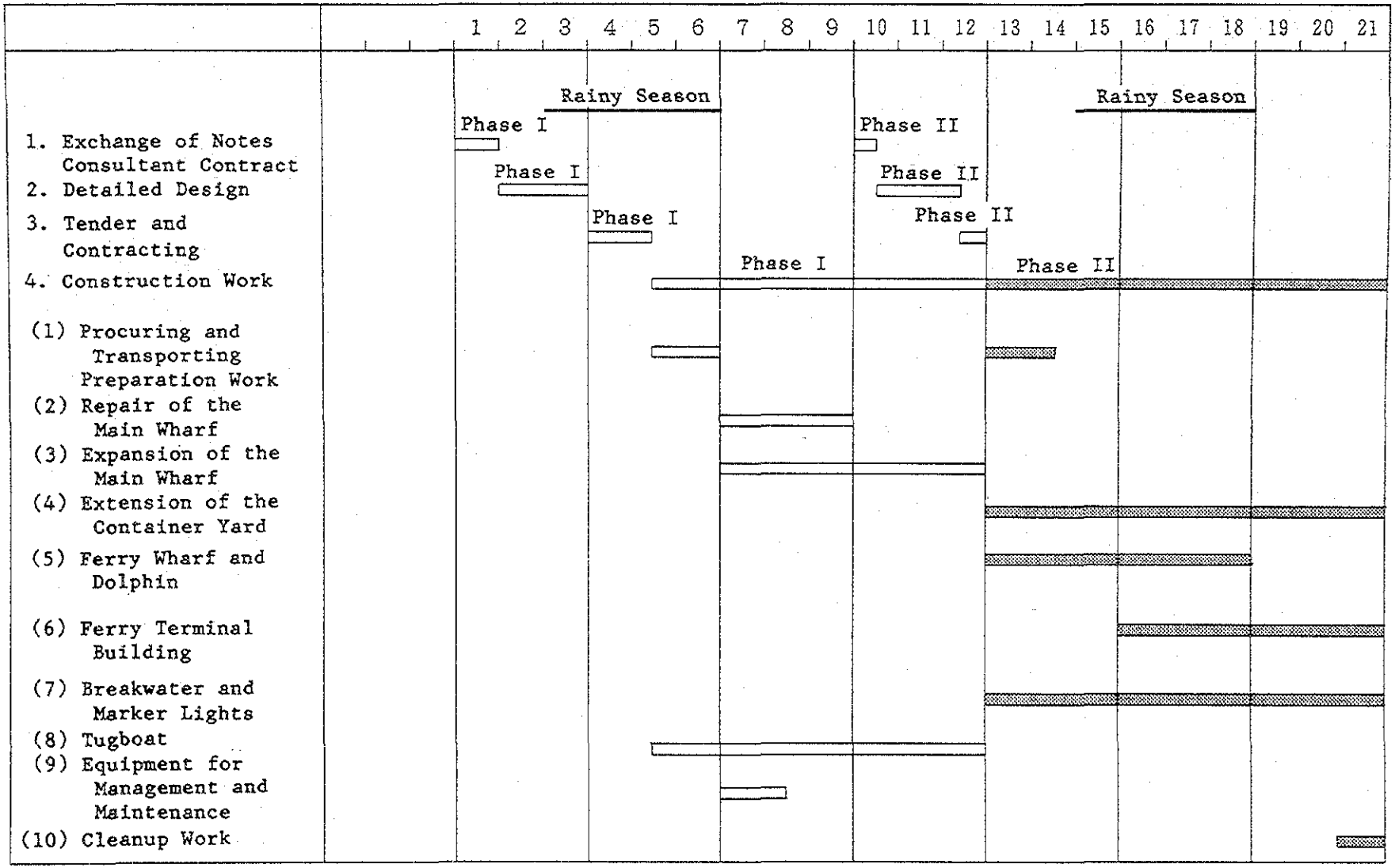
After an exchange of official notes between the Government of Japan and Western Samoa, the latter is requested to conclude a consulting contract with a pertinent Japanese consulting company, as soon as possible. The consulting contract will cover details on design, tender management and supervision of construction. Before awarding the construction contract, the consultant is requested to have finished details on design work and cost estimation and tender management by 4.5 months. Next, the contractor will be requested to complete all of the construction work in 16.5 months. Hence the total project term is expected to be 21 months.

Since the overall project term exceeds 12 months, the project will have to be divided into two phases in accordance with the Japanese governmental budget system. Therefore, before the start of the phase two project, all procedures such as exchange of notes, the consulting contract and the construction contract will have to be repeated between the related parties.

In the first phase of the Project, the most urgently required items such as repair and improvement of the main wharf and construction of the new tugboat are included.
In the second phase of the Project, improvement of the container yard and improvement of the ferry terminal and construction of the breakwater are included.

The outline of progress of the project is shown diagrammatically in Table 8.1.

Table 8.1 Overall Porject Implementation schedule



8.4 Construction Plan

(1) Precautions for planning

For efficient and smooth execution of construction of the Project, a work execution plan for the construction will have to be set up to fit the local conditions at the site. Availability of local materials and skill of local workers will also have to be taken into consideration.

1) Local conditions in Western Samoa for construction

(a) Of the main materials that will be required for the Project, rubble , crusher-run and sand are locally available. However steel, cement and asphalt will have to be imported.

(b) Small construction equipment is locally available, though large items for port construction such as a heavy duty crane and working vessel are not available.

(c) Availability of skilled labor for the port construction is insufficient but unskilled labor is sufficiently available for the Project.

2) Special consideration

(a) In planning a construction schedule, seasonal conditions such as waves and rain should be taken into consideration.

(b) Coordination of the construction schedule with that of ADB project to avoid the entanglement at the site.

(c) Minimization of the number and period of stay of Japanese staff to be dispatched to Western Samoa.

(d) Maximization of the use of local resources and local subcontractors with minimal supply of material from Japan.

(2) Construction plan

Basic procedures for construction of each items of the Project are explained in Chapter 7.

In phase one, expansion of the main wharf will constitute the main field work requiring considerably elaborate technology in both detailed design and field work.
In the phase two plan, construction of the breakwater will be a rather tough job in view of the work schedule and material acquisition. Also it will require the utmost care in field work in the high seas season. In the construction of the Ferry Terminal, control of progress of field work, keeping to the schedule will be of highest importance, since this item includes many jobs to be executed successfully in a scheduled order.

8.5 Supervision by the Consultant

The policy of the Japanese Government for the grant aid project requires that the Project proceed consistently throughout the period from the detail design stage through to the work execution stage under the assistance of the Japanese consultant which shall be chartered by the local government at the time of initiation of detail design works of the Project.

The consultant is requested to supervise the construction work by stationing resident engineers at the site for guidance and instruction in work and testing, inspecting and reporting, as well as a short term dispatching of specialized engineers for each specific technique.

(1) Object of supervisory control

1) Control of the work progress in accordance with the construction schedule, maintaining close contact and reporting to the personnel in both countries responsible.
2) Provision of adequate guidance and advice to the work execution staff so that they can complete construction of the facilities to conform with the design plans.
3) Provision of guidance for adoption of local materials and subcontractors as much as possible.
4) Promotion of technology transfer in construction and engineering to make the most of the grant project.
5) Provision of adequate advice and guidance on maintenance of the delivered facilities to help smooth operations thereof.

(2) Main supervisiory work on construction

1) Assistance on contracting
   Providing assistance on selection of contractors, determining type of contract, preparing draft of contract agreements, reviewing details in work plans and witnessing contract awarding.
2) Checking and approval of work drawings, etc.
   Checking and approving work drawings, as well as approving materials, finishings and equipment proposed or submitted by the contractors.

3) Guidance in construction work

Reviewing work plans, processes, etc., providing guidance for contractors, and reporting on the progress in the work to the owner.

4) Assistance in payment for contractor

Collaborating in checking and processing bills on payments to the contractor for work progressing and for completed work.

5) Witnessing inspections

Inspecting periodically each progressing and completed job and guiding the contractor. The consultant shall, upon confirmation of completion of works and fulfillment of requirements of the contract, witness delivery of the objects of the contract and confirm the owners' acceptance thereof to complete obligations.

The consultant shall also provide reports for the Government of Japan in relation to work progress, payment procedures and delivery of completed facilities.

(3) Management service for building tugboat

The consultant's job to build the tugboat will consist of such services as :

1) Assistance in prequalification of bidding contractors
2) Assistance in bidding
3) Assistance in conclusion of contract between the Government of Western Samoa and successful contractors
4) Witnessing, inspections and testing during building and on completion of tugboat.
   - -Reviewing detailed drawings for approval
   - -Witnessing tests and performance inspection
   - -Witnessing test run in Japan
   - -Witnessing verification test run in advance of delivery to Western Samoa
   - -Witnessing delivery

8.6 Procurement and Logistic Policy

Special attention should be paid to the items below when procuring necessary material/equipment for this project.

(1) Policy to procure material/equipment

For procurement of material and equipment, local availability will have to be examined thoroughly. The procurement policy is to minimize supply from Japan.

1) Supply from Japan

For certain material/equipment like H-beams or steel sheetpiles to be procured from Japan, a procurement schedule will have to be studied carefully since such material require a long period from production to delivery. In ordering fabricated materials, production, processing, packing and shipping will require a much longer time.

Though some small-sized construction machinery is locally available, an equipment procurement plan from Japan should be established considering the local services condition and possibility of long term occupancy.

Since it takes long time for unloading and customs clearance at the local port, close communication with related authorities have to be kept to effect mobilization without delay.

2) Local supply

Stones are major material to be supplied locally. For procurement of stones, careful studies on sources, capacity, quality, and transportation have to be made. On the quality of imported materials such as cement and asphalt, etc., a thorough check on price, quality and quantity are necessary.

3) Cost

Low price has priority in selecting a supply source either locally or from Japan. It should be noted that the supply price from Japan must include fees for packing, transport and insurance but is exempt of tax.

(2) Material and equipment supply

On supply and logistics of material and equipment, some details are given as below.

1) Material

Local : Rubble (50 - 1,000 kg), Crusher-run, Sand, Timber, Cement, Asphalt, Steel Bars, Materials for Building, etc.

Japan : H shaped steel piles, Steel sheet piles, Tie-rods, Fenders, Bollards, Marker lights, Anodes, Scaffolding, etc.

2) Equipment

Local : Trucks, Trailors, Cranes (lifting capacity; below 15 ton), Compressors, Vibrators, etc.

Japan : Crane (lifting capacity; 20 ton and more), Diesel pile hammer, Vibro hammer, Backhoe, Wheel loader, Dump truck, Barge, Tug boat, Diving boat, etc.

Main material and equipment to be supplied from Japan is requested to be transported in two shipments.

1st shipment : Cranes, hammers and H-shaped piles for the expansion work of the main wharf.
A liner vessel can be used for the 1st shipment.

2nd shipment : Equipment and working vessels for the breakwater construction. Steel sheet piles for the ferry wharf.
A barge is preferable for the heavy weight material of the 2nd shipment.

8.7 Approximate Project Cost borne by Western Samoa

Costs to be borne by the Government of Western Samoa are estimated to be approximately 23,400 WS$ as given below.

(1) Demolishing Existing Buildings	7,800 WS$
(2) Installing water supply lines electrical power and telephone line to the Project site	15,600 WS$
Total	23,400 WS$

8.8 Approximate Management and Maintenance Cost

Presently, at the port of Apia, some MOT staff are engaged in administration and operation. When the project has been completed, an additional 5 staff will be required, due to the increase in cargo and the enhancement of maintenance services for the port facilities.

The cost for management and maintenance of the installations by the Project is estimated at 717,000 WS$/year, as given below:

(1) Personal Expenditure	
MOT (1987)	245,000 WS$/year
5 persons x 1200WS$/month/person x 12 months	72,000 WS$/year
(2) Maintenance Costs of Facilities	400,000 WS$/year
Total	717,000 WS$/year

In 1987, the port income sent to the national revenue by the MOT reached 1,260,000 WS$, and in 1991 this is expected to be 1,458,000 WS$. The port income would be a sufficient source of money to sustain the above costs for management and maintenance, if priority is placed on allotting port income for management and maintenance of the port.

CHAPTER 9 PORT MANAGEMENT AND OPERATION

CHAPTER 9 PORT MANAGEMENT AND OPERATION

9.1 Study on Port Management and Operation in Western Samoa

The Study Team conducted a study on port management and operation in Western Samoa, as well as various technical studies, to examine present situation and to identify problems to be improved.

In this chapter, some advisable plans for improvement of management and operations are presented on the basis of the above study.

The characteristic problems in this field are summarized in the following four points.

(1) Main organizations presently conducting activities at Apia Port are listed as follows:

Governmental: MOT, Customs, Immigration, Quarantine, Copra Board, WSSC
Private : Shipping companies, Stevedoring companies

At present in Apia Port, besides MOT, many governmental agencies and private enterprises are conducting their own activities individually with little intercommunication. Establishment of an integrated controlling organization such as a port authority to coordinate the activities of the various public and private sector groups is recommended.

(2) The present port income earned by MOT from port fees and port charges for utilization of port facilities is almost sufficient to sustain all port management and maintenance costs. However, at present, the entire income collected by MOT is transferred to the Ministry of Finance as national revenue, and the budget provided to MOT from the general account is by no means sufficient for appropriate maintenance of port facilities. Therefore, modification of the financing procedure for the port maintenance budget directly from port income is also highly recommended.

(3) The number and skill of technical staff in this port seem to be not yet fully developed for maintenance and development planning of port facilities, and the present equipment for maintenance services is also insufficient. Technical training of maintenance staff together with provision of work vehicles and other necessary equipment would be quite helpful to improve this situation.

(4) Statistics on port activities in this country seem to be not elaborately developed to supply the fundamental information to be used for effective administration and management of ports. Provision of computers and related technical assistance could be an effective solution.

9.2 Proposed Items to be Improved

The items proposed by the Study Team for improvement of management and operation of Apia port are summarized as follows:

(1) Establishment of a Port Authority

1) Relation between the Port Authority and the Central Government
2) Enactment of Laws
3) Efficient Organization
4) Financial Independence of the Port Authority

(2) Port Management

1) Coordination among Port-related Organizations
2) Improvement of the Collection of Port Fees and Charges

(3) Improvement of the Cargo Handling Operations

1) The Main Wharf
2) The Ferry Terminal

In the following sections, some detailed discussions are presented including suggestions and advice for practical solution of the above mentioned problems.

9.3 Characteristics of the Port Authority

(1) Relation between the Port Authority and the Government

1) It is needless to say that ports play an important role in the promotion of economic activities in Western Samoa. Currently in Western Samoa, MOT administers all ports, and has been assigned to serve the public interest, facilitating at more economical, prompt, and safe cargo traffic. In fact, MOT has achieved a significant improvement in Western Samoa's competitiveness in foreign trade. However, due to the recent containerization of marine cargoes, port management needs to be conducted with a business sense similar to that of a private enterprise, and the introduction of new scheme of port management by establishment of a port authority should be considered .

2) However, if the port administration body is converted into a full-fledged private sector entity, because of the monopolistic situation, the authority would tend excessively to earn profits, even stifling the national economy. It is not desirable that the new Port Authority fall into this rut.

3) Therefore, in contemplating a new port authority system in Western Samoa, it is desirable that the Port Authority have semi-governmental status in the form of a nonprofit public corporation.

4) Even when the financial balance of a country falls into a deficit, the government should not try to obtain more revenue from port charges. Such a situation should be settled by adjusting custom tax rates as the inherent business of the customs.

5) Port authorities are usually entrusted with the following business matters:
   (a) collection of fees from port users
   (b) control and guidance of port users
   (c) administration of port facilities

(d) berth allocation for vessels
(e) control on stevedoring
(f) operation of tugboats
(g) supervision of private oil terminals and other private port facilities
(h) minor maintenance and repair work of port facilities
(i) personnel affairs of the Port Authority

All above are the business matters inherent to the Port Authority and it is desirable that the government not interfere in these affairs.

6) However, in regard to the above-mentioned matters, it is desirable that a governmental commission be organized to work with the parliament for the superintending of the Port Authority, guiding it in the following important matters which might affect the national interests:

(a) tariff rates change
(b) business expansion of the authority
(c) port development planning
(d) auditing on the authority
(e) permission to take on debt

(2) Enactment of laws

1) Such basic matters of the Port Authority as the jurisdictional area, the scope of business, the power and responsibility , and title to assets (the facilities to be administered) are usually stipulated by national law. It is advisable that a law be enacted so that the Port Authority is authorized to revise tariffs, to determine its own organizational structure, and to appoint executive staff, subject to approval of the national government. It would be desirable that periodical financial statements be submitted to the parliament, and that MOT be given the power to audit the Port Authority's books.

2) Correspondingly, the Port Authority is requested to clarify its operational rules and the scope of the rights and responsibilities of the users of port facilities, in a harbour act.

(3) Efficient organization

1) The Port Authority should be flexibly organized with as few personnel as practicable to minimize expenses.

2) Computer systems should be introduced in such areas as statistics and accounting to save manpower. By use of computer, fees could be calculated more efficiently on the basis of manifests and customs declarations. Accounting and harbour statistics (by type of vessel, commodity, average berthing time, average stevedoring time and other service-related indices) could also be handled by computer.

3) It is advisable that such business matters as application of statistical data, maintenance of deteriorating facilities, future development plans, engineering design, and cost estimation and supervision of construction work be separated from the routine business of the Port Authority. These might be handled by a specialized agent on a contract basis.

4) Regular inspection and maintenance work for the facilities which are under the administration of the Port Authority should be set in a routine program and be performed by the technical staff of the Authority. For this purpose, vehicles are provided in the grant program to facilitate traffic and transport of personnel and equipment and material.

(4) Financial independence of the Port Authority

1) The prosperity and growth of an island country like Western Samoa depend greatly on its ports and airport activities. Therefore, intensive subsidies by the government for improvement and expansion of these infrastructural facilities are indispensable.

2) On the contrary, in Western Samoa at present, it was found that all income collected by MOT is transferred directly to the national treasury, and MOT receives appropriations from the general account to cover its expenses.

The present budget for MOT seems to be not sufficient to cover the necessary maintenance of the port facilities, and as a matter of course, maintenance and repair of the port facilities have been remained for a long time with insufficient cares and the facilities are deteriorating.

3) For port authorities, the budget is usually set apart from the national general budget, and it is usually sustained by the port authorities' own revenues. Toward this, a self-sustaining accounting system for the new Port Authority should be considered.

4) The study results indicate that if the port revenue now collected by MOT could be transferred to the Port Authority, the financial position of the Port Authority could be balanced without difficulty to cover maintenance expense.

9.4 Improvement of Port Management

(1) Coordination among the port related authorities

By the time the Port Authority is established, MOT and the Ministry of Finance should to hold full collaborating meetings to reach a basic agreement so that the customs inspection can be incorporated into the cargo movement by the port management. It is desired that MOT and PWD, in devising functional plans for utilization of the container yard, provide some adequate inspection space to facilitate smoother customs inspection.

(2) Improvement of fee collection

1) The present system of collecting fees is rather complicated, since fees are charged on each cargo, each container and each passenger individually.

2) A new system might be introduced whereby shipping agents to make payments directly into a bank account on behalf of calling ships, on the basis of the manifest and customs declaration. Instead of collecting yard fees on each cargo, it is also advisable that yards and warehouses in the port be leased to shipping companies on an annual fee basis, for simplification of the fee collecting procedure. Also in the ferry terminal, instead of levying port fees on each cargo, rather charge fees could be charged to the shipping companies on a long term basis.

3) In case of leasing land or warehouses to stevedoring companies or charging fees to shipping firms , there is a need to clarify the users' responsibility in utilization of the port facilities. If the contract includes a clause requesting the user's practical care of the facilities and a clause specifying compensation for damages caused by the user's carelessness, damage to the facilities will be minimized.

9.5 Improvement of Cargo Handling Operations

(1) The main wharf

1) As the main wharf of Apia Port is a detached pier type, unloaded cargo from the ship must be transported by forklift or truck over a long distance to the yard behind through narrow bridge. This often causes pile-ups of cargo on the narrow apron (only 13 m wide), reducing the efficiency of container handling. As a result, stevedoring is not efficiently performed at this wharf.

2) These problems can be solved when the grant project for wharf expansion and yard expansion behind the main wharf is completed, and the efficiency of cargo handling operations can be very much improved. Though the stevedoring may be carried out by private companies as at present, the improvement is expected to result in a reduction of stevedoring costs and in quick dispatch of ships, resulting in stabilization of cargo prices and thus contributing the national economy.

3) In regard to cargo handling fees, the government should be able to give guidance to private enterprises and regulate tariffs. The stevedoring services should be operated on the premise that a multiple number of enterprises engage in free competition to prevent a monopoly or oligopoly. The Port Authority is advised not to operate stevedoring services by itself.

(2) Ferry terminal

1) The ferry transports virtually no trucks or passenger cars, since this ferry route links two small islands. The ferry's roll-on/off system is used solely for on-board stevedoring purposes. Most imported cargos are picked up by consignees by hand aboard the ship, paying custom duty and fees alongside the boat, and carried away by private cars waiting outside the terminal. Sometimes cargoes are carried out by trucks driven into the hull of the ship to pick them up (for outward cargo, a reverse procedure is followed).

Stevedoring in this terminal is inefficient, executed in a fractionalized manner in which each shipper has to handle his own cargo.

2) Taking the opportunity of the completion of the new ferry terminal facilities, the Shipping Corporation (WSSC) which is the terminal operator intends to introduce a new stevedoring system using small containers and forklifts. This system will greatly improve the cargo handling efficiency of the ferry terminal. The proposed new terminal will also provide adequate indoor space for ferry cargo operation.

3) Improvement of the ferry terminal will bring about such benefits as reduction of waiting time for cargo handling, and reduction of packing costs. These benefits will be enjoyed by most of the private enterprises depending on trade by the ferry. The Shipping Corporation will also realize the benefits due to reduced manpower costs.

4) Instead of collecting port charges from each cargo, the Port Authority could introduce a new scheme for the collection of port charges by charging a port entrance fee on the ferry boat to reduce the manpower cost for fee collection. The Port Authority is also advised to a introduce a terminal building fee. Such a fee could be levied at the ticket booking counter and be included in the ticket or freight charge. Introduction of a computer system at the ticket booking counter should also be considered.

CHAPTER 10 PROJECT EVALUATION

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10.1 Criteria of Evaluation

Apia Port handles all import and export cargos in Western Samoa except for timber exports , and is considered to be the basic infrastructural facility for the national economy and the people's livelihood. Accordingly, improvement and development of this port is indispensable for progress of the national economy, and high priority has been given in the context of the national plan of Western Samoa.

In the following section, benefits brought about by the development of Apia Port, classified into two categories, direct and indirect benefits, are qualitatively evaluated to be taken up as an object for grant aid from Japan.

10.2 Evaluation as Object for Grant Aid

Benefits to be brought about from the improvement and development of Apia Port are classified into two categories, direct and indirect benefits as follows:

(1) Direct benefits

1) Saving of time cost of ships

- time saving in manoeuvring and mooring operations of vessels due to provision of new tugboat;

- mitigation of increase of time cost to be induced by off-shore cargo handling, which take a long times for operation, due to the degradation of function of the main wharf in cases where no maintenance or repair work has taken place.

- shortening of cargo handling time, as well as mitigation of lost time due to reduction of the suspension of cargo handling by improvement of calmness of water in seasons of high waves with provision for the breakwater.

2) Cost saving from cargo handling in terms of:

- mitigation of increase of cargo handling costs to be induced by more expensive off-shore cargo handling in the case of no repair and maintenance

- saving of container handling costs due to expansion of the pier and the container yard facilitating faster operation.

- reduction of cargo handling costs due to increase of time efficiency by provision of the breakwater.

3) Saving of time costs for consignees due to smoother operation of cargo at the new ferry terminal

(2) Indirect benefits

1) Reduction of ship repair cost due to improvement and reinforcement of the main wharf, and due to improvement of safety in cargo handling.

2) Improvement of safety in manoeuvring operations by provision of the new tugboat.

3) Reduction of damage to cargos and ships, and reduction of accidents due to improvement in calmness developed by installation of the breakwater.

4) Reduction of trouble to cargo due to improvement of the container yard and ferry terminal.

5) Employment opportunities to be brought in by the project implementation.

6) Activation of the national economy in general due to the implementation of the project.

As the above direct and indirect benefits through the implementation of this project are highly recognized, this project is assessed justifiable to be taken up by a grant aid from Japan.

10.3 Evaluation on the Aspect of Management System

This project can be evaluated on the aspect of managerial state of Samoan ports as the following.

(1) In the proposed ferry terminal building, the offices of the Port Authority which will be established anew, a custom house, quarantine, immigration and police station are to be accommodated. As the result, port management functions will be better coordinated in this terminal.

(2) The repair of the main wharf, construction of the breakwater and a tugboat will facilitate in-and-out operation of ships and cargo handling operations in a smoother way. As a result, the port operational function will be improved.

(3) Rationalization of accounting and an upgrade of statistics services can be accomplished by introduction of computer system.

10.4 Evaluation on the Aspect of Maintenance System

This project can be evaluated on the aspect of a maintenance system of port facilities as following.

(1) Provision of maintenance vehicles will facilitate regular inspection and faster maintenance, thereby enhancing safety in the port. In addition, the skill of the maintenance workers is expected to be promoted through daily maintenance and repair operations.

(2) The thickness of the foredeck and bottom of the new tugboat will be designed using heavier plate and equipment will be also simplified in design to facilitate maintenance of the boat.

(3) Main structures such as the expanded pier and the ferry quay will be designed to be constructed with steel, so that durability will be high and maintenance easy.

10.5 Overall Evaluation

Considering the role of Apia Port as the major port of Western Samoa, the improvement project is indispensable for the development of the economy and industry as well as stabilization of people's livelihood.
The facilities in this project will be constructed taking into account efficiency, durability and ease of maintenance. Furthermore, it is considered that the Port of Apia's function will be more effective when management of the port is converted into a port authority system.

CHAPTER 11 CONCLUSION AND RECOMMENDATIONS

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11.1 Conclusion

Western Samoa, due to its geographical features, depends very much upon its port activities for both its economy and national livelihood.

In particular, its main port, Apia handles all of its imported goods and almost all exported goods except timber. However, the port facilities of Apia have obviously run down after many years of use and safety has also been affected. Furthermore, the delay of modernization of a cargo handling scheme has led to its cargo operations being inefficient. Since it is feared that if the above state continues, it would constitute a terrible waste of port activities, refurbishing Apia Port is indispensable and an essential task for the stability of the national livelihood and economic growth of the country.

Therefore, it is concluded that cooperation in the project by the Government of Japan in the form of grant assistance for its early realization will be of the highest benefit.

11.2 Recommendations

The refurbishing of Apia Port will raise its cargo-handling efficiency and capacity as well as upgrading its safety.

Incidentally, together with implementation of the project, promotion of the following items are considered most advisable to ensure the full effects of the project:

(1) Unifying control of port management:

By establishment of a Port Authority, port management will be unified and efficiency improved.

(2) Routine inspections and maintenance of port facilities:

In order to ensure effective use and durability of the facilities installed by the Project, routine inspection and maintenance by the Port Authority are advised, securing a budget from port revenue.

(3) Improvement in cargo handling operations

Modification of the yard layout and improvement of handling methods are advised for increase of cargo storage and handling efficiency, so as to cope with increase in cargo volume in future.

(4) Intensification of port statistics operation:

Intensification of port statistics will contribute to the evaluation of Apia Port's role in the national economy, as well as backing up its maintenance program and future expansion plans.

(5) Training of staff

Fostering and training of staff for management and maintenance of the port will enhance port activities in Apia.