No.

MINISTRY OF TRANSPORT
THE INDEPENDENT STATE OF SAMOA

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR CONSTRUCTION OF
THE TUG BOAT FOR APIA PORT
IN
THE INDEPENDENT STATE OF SAMOA

MAY 2000

Japan International Cooperation Agency

Fisheries Engineering Co., Ltd.

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PREFACE

In response to a request from the Government of the Independent State of Samoa, the Government of Japan decided to conduct a basic design study on the Project for Construction of Tug Boat for Apia Port and entrusted the study to the Japan International Cooperation Agency (JICA).

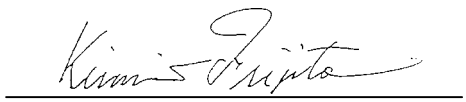
JICA sent to Samoa a study team from January 23 to February 9, 2000

The team held discussions with the officials concerned of the Government of Samoa, and conducted a field study at the study area. After the team returned to Japan, further studies were made, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two contries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Independent State of Samoa for their close cooperation extended to the team.

May, 2000



Kimio Fujita
President
Japan International Cooperation Agency

May, 2000

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Construction of Tug Boat for Apia Port in the Independent State of Samoa.

This study was conducted by Fisheries Engineering Co., Ltd., under a contract to JICA, during the period from January 7 to May 16, 2000. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Samoa and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Toyonori WATANABE
Project manager,
Basic design study team on the Project for
Construction of Tug Boat for Apia Port
Fisheries Engineering Co., Ltd.


THE INDEPENDENT STATES OF SAMOA
NATIONAL CAPITAL
DISTRICT BOUNDARY
MAIN ROAD
0 5 10 15 20 km
PAPUA NEW GUINEA
SOLOMON ISLANDS
KIRIBATI
TUVALU
SAMOA
Am. Samoa (U.S.)
Coral Sea
VANUATU
FIJI
TONGA
New Caledonia (FRANCE)
SOUTH PACIFIC OCEAN
AUSTRALIA
Tasman Sea
NEW ZEALAND
SOUTH PACIFIC OCEAN
SAMOA ISLANDS
APIA PORT
VAISIGANO
GAGAIFOMAUGA
Savai'i
GAGA'EMAUGA
FA'ASALELEAGA
PALAULI
SATUPA'ITEA
TUAMASAGA
A'ANA
ATUA
Upolu
SOUTH PACIFIC OCEAN

Abbreviations

CPP	Controllable Pitch Propeller
DWT	Dead Weight Tonnage
EPIRB	Emergency Position Indicating Radio Beacon
FPP	Fixed Pitch Propeller
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
GRT	Gross Tonnage
ISM	International Safety Management
LRS	Lloyd's Register of Shipping
MARPOL	International Convention for the Prevention of Pollution from Ships
MCR	Maximum Continuous Rating
MOT	Ministry of Transportation
NAVTEX	Navigation Telex
NK	Nippon Kaiji Kyokai
SAR	Search and Rescue
SART	Search and Rescue Radar Transponder
SOLAS	International Convention for Safety of Life at Sea
SPA	Samoa Ports Authority
SSB	Single Side Band
SSC	Samoa Shipping Corporation
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
USCG	United States Coast Guard
VHF	Very High Frequency

CONTENTS

1. Background of the Project

Samoa is an island nation in the Southwest Pacific, and its civil life and economy depend heavily on sea transportation due to its geographical situation. The Apia Port deals with 97% of the foreign trades in Samoa (1997), handling 150,000 – 250,000 tons of cargo by about 250 vessels per annum. Among vessels calling the Port, a share of large vessels is getting greater, as the number of vessels 10,000 gross tons and over counts 29% of the whole vessels (1997). Though two tugboats are assigned to the Port for berthing and unberthing operations of large vessels, one of them is too deteriorated by age to fulfill her duty, maneuvering of large vessels depends almost on the remaining one. Since the power of this working tugboat solely is not sufficient, workable wind force is limited, and smooth and safe maneuvering of the large vessels is not secured under strong wind or sudden gust.

Japan International Cooperation Agency (JICA) conducted the Study on the Development of the Port in Samoa in 1987 presenting a Master Plan for the development of ports in Samoa with the target year of 2005. The Phased Improvement Plan proposed in the Master Plan, such as repair of the main wharf of the Apia Port, expansion of the container yard, etc. were implemented under the Japan's grant-aid program in 1988 - 1989.

After the cyclones in early 1990s, for repairing port facilities seriously damaged, "Rehabilitation of Cyclone-Damaged Port and Construction of Quarry Plant" and "Rehabilitation and Improvement of Cyclone-Damaged Port and Foreshore Protection" were implemented under the Japan's grant-aid programs in 1990 – 1991 and 1992 – 1993 respectively.

Now that containerization of general cargoes is popular, number of vessels calling the Port is increasing and size of vessels becoming larger, aged and poor situation of the Port facility has became outstanding, the Government of Samoa has planned the improvement of the Port, and requested the Government of Japan a development study to prepare a long-term development plan of the Port as well as a grant-aid for rehabilitation and improvement of the Port in accordance with the plan.

In response to the request from the Government of Samoa, the Government of Japan decided to conduct a development study, and JICA conducted "Study on Improvement of Apia Port" on May – December, 1998. The Study worked out a Master Plan for the improvement of the Port with the target year of 2015. In the Master Plan, components of an introduction of a new tugboat as well as construction of new wharf, improvement of breakwater, etc., which require urgent improvement are compiled as the Phased Improvement Plan.

Request of the Samoan Government regarding the new tugboat is following.

One tugboat of 1,600 HP, engaging in tug assistance to ships calling the Apia Port

JICA conducted a preparatory study for the grant-aid on September, 1999, and validated background of the project, objectives and contents, site situations, implementing agencies, scope of the project and general conditions for grand-aid program.

Following the preparatory study, the Government of Japan decided to conduct the basic design study for building a tugboat in the Phased Improvement Plan, and JICA dispatched a basic design team to Samoa from January 23, 2000 to February 9, 2000.

2. Contents of the Project

2.1 Objectives of the Project

In the two tugboats assigned to the Apia Port, being MV Pualele too deteriorated by age to use for tug assistance, MV Tafola has been burdened with almost all tugboat duties in the Apia Port. Large cargo vessels such as container vessels of 10,000 GRT (about 14,000 DWT) and tankers of 25,000 GRT (about 42,000 DWT) call the Apia Port frequently, however, it is difficult to maneuver these large vessels with MV Tafola alone especially in the strong wind or at sudden weather change, and therefore smooth and safe berthing/unberthing operation have been hindered sometimes.

The objective of this Project is, by providing a tug boat in place of MV Pualele, to ensure safe and smooth berthing /unberthing operation of large vessels in the Apia Port.

2.2 Basic Concept of the Project

2.2.1 Contents of the Request

Principal contents of the Request for the planned tugboat are as follows.

Type of the boat: Tugboat for maneuvering the berthing and unberthing operation of large vessels in the Apia Port

Conditions on planning the tugboat:

(1) Ability of the boat

The boat is to have ability as a tugboat for maneuvering the berthing and unberthing operation of large vessels calling Apia Port, working jointly with MV Tafola or independently.

(2) Operation and maintenance of the boat

The boat should be operated by the crew of the Samoa Port Authority (SPA) without difficulty, which is the organization undertaking operation and management of the Plan tugboat. In addition, the daily maintenance and management of the boat can be carried out under the control of SPA except for cases of major repair work and periodical docking.

2.2.2 Wind Force Calculation and Capacity of Tugboat

Although the capacity of MV Tafola was determined to cope with cargo vessels of 10,000

GRT as the basic criterion referred to in the Study of the Development of the Port in Samoa, vessels larger than 10,000 GRT frequently call the Apia Port. Since tugboat assistance is more important for large vessels, the size of the vessels in this study is not limited to 10,000 GRT, but extended to actual large vessels which frequently call the Apia Port, i.e. a container vessel of 10,000 GRT (in empty and fully laden conditions), a container vessel of 16,000 GRT (in empty and fully laden conditions), a tanker of 28,000 GRT (in half laden condition) and a cruise passenger vessel of 50,000 GRT are examined. Cruise passenger vessels are generally fitted with powerful bow and stern thrusters to enable calling local resort port where tugboat capacity is low, but calculation is made for reference. Necessary tugboat capacities are calculated assuming 10 m/s wind force from the side and 0.25 m/s sideway movement. The cases of 15 m/s wind velocity to which tugboats in the ports of Japan should withstand in a sudden weather change are also calculated.

Theoretical capacity of tugboat required for each type of vessel

1) Assumption and formula

(i) Wind blowing from sideways, and tugboat pushing the vessel from lee side towards wharf.

(ii) Wind velocity of 10 m/s, as steady wind. Wind velocity of 15 m/s cases are also calculated as the criterion adopted in Japan against sudden weather change case.

(iii) Vessel's sideway moving velocity being 0.25 m/s, equivalent to mooring winch velocity.

(iv) Water depth / draft = 1.3, subject to the shallow water effect of 3.0 as the drag increase rate.

(v) Necessary tugboat thrust being 1.5 times a sum of wind and water pressures. The factor 1.5 is a reserve power to withstand the inertia force.

(vi) Normal rating of tugboat being calculated from 5.6 kW/kN as Kort nozzle propeller. Further, ratio of the normal rating / the maximum rating being 0.85.

Wind resistance = $Ra = 1/2\ \rho\ a\ Ca\ Sa\ Va^2 \times 10^{-3}$

where Ra = unit in kN; ρ a = density of air = 1.225 kg/m^3

Ca = wind pressure coefficient = 1.0; Sa = lateral windage area m^2

Va = wind velocity = 10 m/s and 15 m/s

Water resistance = $Rw = 1/2\rho w\ k\ Cw\ Sw\ Vw^2 \times 10^{-3}$

where Rw = unit in kN; ρw = density of sea water = 1.025 x 103 kg/m^3

k = shallow water coefficient = 3.0; Cw = water pressure coefficient = 0.95

Sw = underwater lateral area m^2; Vw = sideway velocity = 0.25 m/s

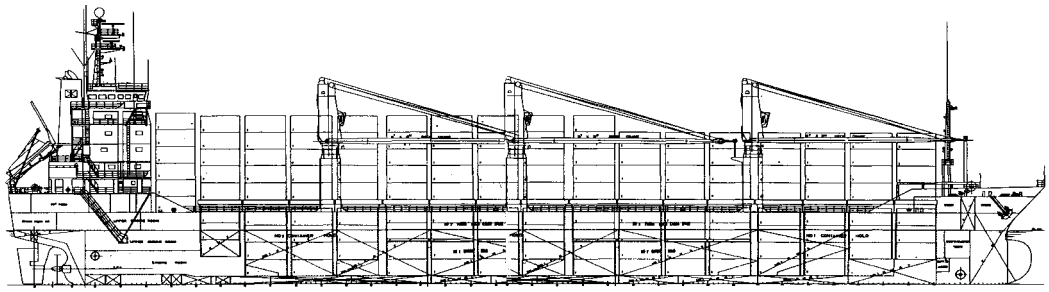
Total resistance = wind resistance + water resistance

Required thrust of tugboat = total resistance x 1.5

Horse power of tugboat (max rating) = required thrust of tugboat x 5.6 kW/kN / 0.85

（a）10,000 GRT Container Vessel

Length overall = 158 m　　Loaded draft = 8.30 m　　Gross tonnage = 10,000 tonnes



Empty hold condition

Draft = 5.60 m　　Lateral windage area = 1,662 m^2　　Underwater lateral area = 828 m^2

Wind velocity	10 m/s	15 m/s
Wind resistance	102 kN	230 kN
Water resistance	76 kN	76 kN
Total resistance	178 kN	306 kN
Thrust required for tugboat	267 kN	459 kN
Horsepower of tugboat	1,760 kW (2,390 ps)	3,020 kW (4,110 ps)

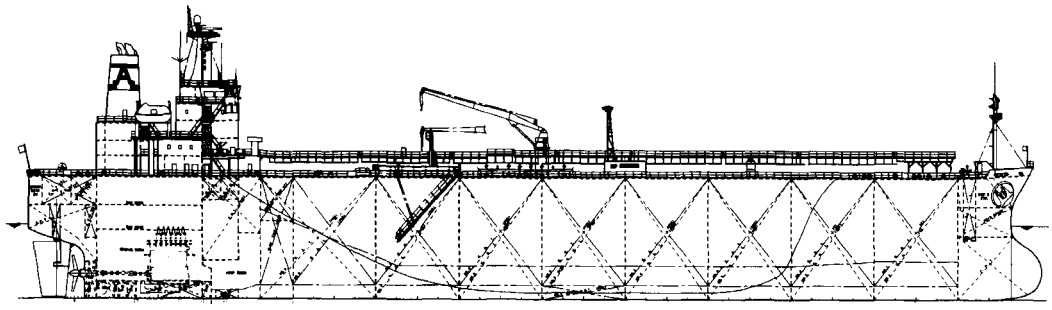
Fully laden condition

Draft = 8.30 m　　Lateral windage area = 2,539 m2　　Underwater lateral area = 1,228 m2

Wind velocity	10 m/s	15 m/s
Wind resistance	156 kN	351 kN
Water resistance	113 kN	113 kN
Total resistance	269 kN	464 kN
Thrust required for tugboat	404 kN	696 kN
Horsepower of tugboat	2,660 kW (3,620 ps)	4,590 kW (6,230 ps)

（b）28,000 GRT Tanker

Length overall = 182.5 m　　Loaded draft = 12.65 m　　Draft in Apia = 8.50 m

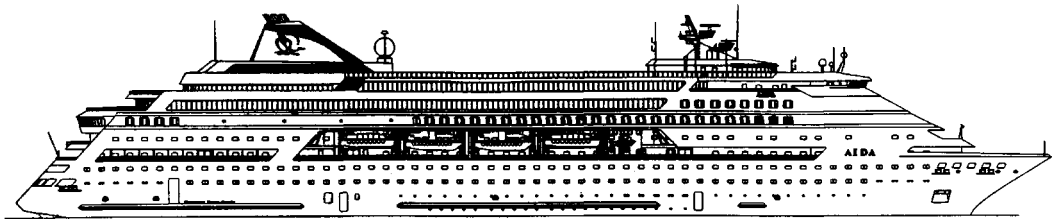


Lateral windage area = 2,526 m^2　　Underwater lateral area = 1,487 m^2

Wind velocity	10 m/s	15 m/s
Wind resistance	155 kN	350 kN
Water resistance	136 kN	136 kN
Total resistance	291 kN	486 kN
Thrust required for tugboat	436 kN	729 kN
Horsepower of tugboat	2,870 kW (3,910 ps)	4,800 kW (6,530 ps)

（c）38,600GRT Cruise Passenger Vessel

Length overall = 193.3 m　　Loaded draft = 6.00 m



Lateral windage area = 4,990 m^2　　Underwater lateral area = 1,080 m^2

Wind velocity	10 m/s	15 m/s
Wind resistance	306 kN	691 kN
Water resistance	99 kN	99 kN
Total resistance	405 kN	790 kN
Thrust required for tugboat	608 kN	1,185 kN
Horsepower of tugboat	4,010 kW (5450 ps)	7,810 kW (10,610 ps)

Based on the above calculation, necessary main engine horsepower of tugboat for each ship type at the wind velocity are summarized as follows. Data of 16,000 GRT container vessels is calculated from the results of 10,000 GRT container vessel as similar figure.

	Total engine horsepower required in 10 m/s wind	Total engine horsepower required in 15 m/s wind
10,000GRT Container (empty hold)	2,390 ps (1,760 kW)	4,110 ps (3,020 kW)
10,000GRT Container (fully laden)	3,620 ps (2,660 kW)	6,230 ps (4,590 kW)
16,000GRT Container (empty hold)	3,270 ps (2,410 kW)	5,620 ps (4,130 kW)
16,000GRT Container (fully laden)	4,950 ps (3,640 kW)	8,520 ps (6,280 kW)
28,000GRT Tanker	3,910 ps (2,870 kW)	6,530 ps (4,800 kW)
50,000GRTCruise passenger vessel	5,450 ps (4,010 kW)	10,610 ps (7,810 kW)

When the fore ship is fixed by dropped anchor or operated by bow thruster, necessary engine horsepower of tugboat in the stern is 1/2 of the figure in the above table. As cruise passenger vessel does not require tug assistance normally and even when needed a necessary power becomes far higher than the capacity of the Request tugboat, cases of cruise passenger vessel are excluded from this study hereafter.

Based on the above examination, maneuverability of MV Tafola for each type of vessel is judged as follows.

	Max. workable wind	Sideway velocity	Maneuverability
10,000GRT Container (empty hold)	12.3 m/s	0.25 m/s	◎
10,000GRT Container (fully laden)	9.4 m/s	0.23 m/s	△
16,000GRT Container (empty hold)	10.0 m/s	0.25 m/s	○
16,000GRT Container (fully laden)	8.0 m/s	0.20 m/s	×
28,000GRT Tanker	9.0 m/s	0.22 m/s	△

◎: Excellent ○: Good △: Fair ×: Poor

1,600 ps MV Tafola can cover 10,000 GRT container vessel in empty hold, but in the other cases the wind velocity have to be restricted and the sideway velocity should be a little slower. In the case of 16,000 GRT container vessel in fully laden condition, the limits of wind velocity and sideway velocity are so crucial that MV Tafola cannot withstand a sudden change in wind. Empty containers are piled high on deck in the case of fully laden condition of container vessel, but such container vessel in fully laden condition seldom enters in the Apia Port.

When the capacity of the Plan tugboat is set at 1,600 ps as the Request and therefore two 1,600 ps tugboats will cope with vessels calling the Apia Port, maneuvering of the tugboat are supposed as follows.

(a) Each one tugboat locating fore and aft ship

	Max. workable wind	Sideway velocity	Maneuverability
10,000GRT Container (empty hold)	12.3 m/s	0.25 m/s	◎
10,000GRT Container (fully laden)	9.4 m/s	0.23 m/s	△
16,000GRT Container (empty hold)	10.0 m/s	0.25 m/s	○
16,000GRT Container (fully laden)	8.0 m/s	0.20 m/s	×
28,000GRT Tanker	9.0 m/s	0.22 m/s	△

◎: Excellent ○: Good △: Fair ×: Poor

In so far as the maximum workable wind velocity and sideway velocity in the theoretical estimate are concerned, no change from the case when MV Tafola is working in the stern and fore ship is left at anchor. However, as the fore ship is now supported by one tugboat of 1,600 ps, unstable situation of the fore ship is recovered and reliability of whole maneuvering is thereby improved.

(b) Both two tugboats at stern

	Max. workable wind	Sideway velocity	Maneuverability
10,000GRT Container (empty hold)	19.8 m/s	0.25 m/s	◎
10,000GRT Container (fully laden)	15.3 m/s	0.25 m/s	◎
16,000GRT Container (empty hold)	16.3 m/s	0.25 m/s	◎
16,000GRT Container (fully laden)	12.3 m/s	0.25 m/s	◎
28,000GRT Tanker	14.8 m/s	0.25 m/s	◎

◎: Excellent

In this case, two tugboats can withstand strong wind force, but the fore ship remains unstable relying solely on dropped anchor(s).

For stable and safe maneuvering, two tugboats should support the fore and aft ship respectively, and should operate with slower sideway velocity in case of stronger wind.
53% of vessels calling Apia Port are fitted with bow thruster (JICA Study on Improvement of Apia Port, 1998). For vessels fitted with bow thruster, two tugboats can be arranged in the stern to allow maneuvering in strong wind.

When the Plan tugboat capacity is 2,000 ps, MV Tafola of 1,600 ps should support the fore ship and the 2,000 ps tugboat should support the aft ship, which means the 2,000 ps to withstand strong wind and the 1,600 ps to stabilize the fore ship. In this case maneuverability are judged as follows.

	Max. workable wind	Sideway velocity	Maneuverability
10,000GRT Container (empty hold)	14.7 m/s	0.25 m/s	◎
10,000GRT Container (fully laden)	10.9 m/s	0.25 m/s	○
16,000GRT Container (empty hold)	11.8 m/s	0.25 m/s	○
16,000GRT Container (fully laden)	9.0 m/s	0.22 m/s	△
28,000GRT Tanker	10.2 m/s	0.25 m/s	○

◎: Excellent ○: Good △: Fair ×: Poor

2.2.3 Capacity of the Planned Tugboat

(1) Main particulars of 1,600 ps and 2,000 ps tugboats

Particulars/Total power	1,600ps	2,000ps
Length overall	26.0 m	
Breadth, molded	6.80 m	
Depth, molded	2.80 m	
Draft, molded	2.10 m	

Particulars/Total power	1,600ps	2,000ps
Main engines	588 kW (800ps) x 2	736 kW (1,000ps) x 2
Propeller diameter	1.50 m	1.56 m
Bollard pull	205 kN (20.9 tf)	245 kN (25.0 tf)
Free running service speed	12.3 knot	12.7 knot

The engine room area can be identical in the both cases as no major difference in the size of main engines of 1,600 ps and 2,000 ps, therefore almost same hull sizes can be employed. Difference in the mass of engine is so small as not affecting the center of gravity and the draft. The bollard pull force and the service speed will increase by 40 kN and 0.4 knot respectively rendered by increment of 400 ps.

(2) Maneuverability and horsepower of the Plan tugboat

Maneuverability of 1,600 ps and 2,000 ps cases are summarized as follows.

	Tugboat of 1,600ps	Tugboat of 2,000ps
Existing boat	1,600 ps x 1	1,600 ps x 1
Work case	1,600 ps each one at fore and aft	2,000 ps at aft, 1,600 ps at bow
At anchor and each one tug at fore and aft	（able to maneuver in 10 m/s wind） 10,000 GRT Container (empty hold) 16,000 GRT Container (empty hold) （able to maneuver in 9 m/s wind） 10,000 GRT Container (full & empty hold) 16,000 GRT Container (empty hold) 28,000 GRT Tanker	（able to maneuver in 10 m/s wind） 10,000GRT Container (full & empty hold) 16,000GRT Container (empty hold) 28,000GRT Tanker

Joint operation of the existing MV Tafola and a tugboat of 2,000 ps, supporting fore and aft ship respectively, can cope with a 10,000 GRT container vessel and a 28,000 GRT tanker under the wind velocity of 10 m/s.

When the Plan tugboat is 1,600 ps, two tugboats in the fore and aft ship can work similarly on condition that the maximum allowable wind velocity is reduced to 9 m/s.

We suppose from the record of tugboat maneuvering in the Apia Port, the Plan tugboat of 1,600 ps capacity can cope with large vessels subject to lowering the maximum maneuvering conditions.

Based on the above study, we have decided that the capacity of 1,600 ps for the Plan tugboat should be appropriate. By MV Tafola alone, smooth and safe operation have been hindered sometimes and vessel had to wait outside the harbor when the weather is excessive for MV

Tafola, but reinforcement by the Plan tugboat will almost clear such situation.

Even by the same main engine horsepower, greater bollard pull thrust force is available by adjusting gear ratio of gearbox and propeller dimensions and thereby increasing propeller efficiency. In the Plan tugboat, propeller is to be so designed as to obtain greater thrust force.

2.3 Basic Design

2.3.1 Rules to Apply, Statutory Survey and Classification Society

(1) Maritime Rules and Regulations

As the Plan tugboat will fly the flag of Samoa and navigate in the coastal waters of Samoa as well as the Apia Port, following rules and regulations shall apply.

1) Classification Society's rules
2) Samoa Shipping Act, 1998
3) South Pacific Maritime Code, 1986 (Chapter for manning on board ships applies.)
4) Pacific Regulations (Safety Regulations for Non-Convention Sized Ships), 2000
5) Japanese Maritime Regulations（for the scope not covered by above rules and regulations and for the interpretative purpose）

South Pacific Maritime Code, consisting of chapters of manning on board ships (STCW), safety regulations and tonnage measurement, is the maritime regulations commonly used in South Pacific nations, but the Code has not updated since 1986 and therefore many regulations are in outdated situation. Under the circumstances, Pacific Regulations, consisting of safety regulations and tonnage measurement regulations, are going to be adopted by the South Pacific nations. The Government of Samoa plans to use South Pacific Maritime Code for manning on board and Pacific Regulations for safety regulations and tonnage measurement regulations.

(2) Statutory survey

While Samoan Ministry of Transport (MOT) is the administrative organization undertaking ship survey, MOT authorizes newbuilding surveys to a Classification Society. MOT has so far given the said authorization to Nippon Kaiji Kyokai (NK) and Lloyd's Register of Shipping (LRS).

Classification Society is non-governmental organization but the organization for ship survey recognized internationally, and undertaking newbuilding and periodical surveys on hull structure and safety system with its own standard as well as surveys on behalf of flag

administration.

In this Plan tugboat, appointing a Classification Society is a necessary procedure for newbuilding especially for survey on behalf of Samoan MOT.

In the past, all vessels under grant-aid from Japan to Samoa (tugboat MV Tafola, ferry MV Lady Samoa and ferry MV Lady Naomi) were built under NK classification, but all have given up NK classification. MV Tafola has been removed from the class registration and has been working without periodical class surveys for many years, MV lady Samoa and MV Lady Naomi has been removed from the NK class one year after newbuilding and re-classed to Lloyd's Register of Shipping, to which other ferry had been classed already. We feel it is appropriate in Samoa, a classification society for the Plan vessel should be identical with MV Lady Samoa and MV Lady Naomi in view of cost of inviting class surveyor all the way from New Zealand or Australia, and that the classification of newbuilding should be under Lloyd's Register of Shipping which can be maintained avoiding extra cost and complicated procedure for re-classing.

Though MV Tafola has given up classification, Samoan MOT requires SPA to maintain the class of the Plan tugboat and also to class MV Tafola again.

2.3.2 Ship Design Criteria

(1) Propulsion system

For tugboats three propulsion systems are popular: (1) ordinary line shaft + Kort nozzle, (2) Z drive and (3) Voith-Schneider, and naturally they have their advantages and disadvantages. Placing priority on familiarity for the crew and easier maintenance, the propulsion system for the Plan tugboat should be ordinary line shaft and Kort nozzle configuration as MV Tafola.

System	Propeller	Rudder	Complexity	Speed control	Maneuverability	Cost
Ordinary line shaft + Kort nozzle	FPP	Nozzle rudder	Simple	Good	Better	Low
		Separate rudder	Simple	Good	Good	Low
	CPP	Nozzle rudder	A little complex	Better	Better	Middle
		Separate rudder	A little complex	Better	Good	Middle
Z drive	FPP	—	Complex	Good	Best	Expensive
	CPP		Complex	Better	Best	Expensive
Voith Schneider	—	—	Very complex	Best	Excellent	Much Expensive

(2) Bollard pull

It is concluded that the main engine horsepower of 1,600 ps is appropriate. However, propeller is to be so designed as to maximize bollard pull force according to low revolution large diameter theory.

(3) Speed

As the harbor tugboat propeller is designed to maximize bollard pull force, and free running speed is determined accordingly. When free running speed has a priority on propeller design, then bollard pull force will decrease. In the Plan tugboat, propellers for maximizing bollard pull force should be adopted as the case of MV Tafola.

(4) Maneuverability

MV Tafola is fitted with the steering nozzle, which provides more powerful rudder force than ordinary rudder. Since the steering nozzle has been working well without causing problem, e.g. vibration, in MV Tafola, the Plan tugboat should adopt steering nozzle as well.

(5) Fuel oil tank and fresh water tank

In the ordinary service in Apia, endurance mileage and bunkering interval are not serious questions. However, capacity of fuel oil tank and fresh water tank should allow the Plan tugboat sailing from Japan to Apia even calling islands for bunkering. Therefore, the tank capacity equivalent to MV Tafola's should be maintained.

(6) Deck outfitting

Although deck fitting should in general follow those for MV Tafola, following improvements should be considered.

- Towing hook to be of strength corresponding to increased bollard pull force.
- Tug line reel to be added in the center of windlass, so as to avoid a situation of coiling tug rope loose on deck, and to pay-out and haul tug line quickly. The tug line reel should be suitable to wind 50 m of 60 mm dia. rope approximately. Power of the reel may not be for tugging but just suitable for slack line winding.
- Bow bollard to be of double type supported rigidly by bow chock flat.
- At stern end to be provided with mooring chock and corresponding bollard to be bigger.
- Crane to be of foldable jib type having service radius to cover starboard quay. Lifting capacity

to be about 10 kN (1 tf) at about 3.5 m radius and maximum radius to be about 6.5 m.

(7) Additional function

In harbors there are other duties such as fire fighting, operation against spilled oil, rescue operation, etc. than the tug duty. Because of financial constraints to prepare workboats independently for each function, in Japan there are many cases to add other functions to a tugboat and built as a multi-purpose boat. Following functions have been studied for the Plan tugboat necessary for the safety of Apia Port.

1) Fire-fighting

In Japan, the Maritime Safety Agency requires arrangement of a fire-fighting vessel in the passage of vessels over 50,000 GRT carrying dangerous cargoes including tankers. Tankers are frequently calling the Apia Port and there are two oil tanks of each 1,500 tons in the Port. As there is no vessel other than MV Tafola equipped with fire-fighting facility near the Apia Port, it is appropriate to apply the rule of Japanese MSA on the Plan tugboat. MV Tafola is already fitted with the fire monitor system for fire-fighting purpose. If the system of MV Tafola were at all times available, then the Plan tugboat does not need to be fitted with the system, but MV Tafola is off about 7 days at every two years at least for dry-docking and the fire-fighting system of MV Tafola cannot be used during the period. Since restriction of tankers during this period is not practical, there will be a probability of about 1/100 in which the Apia Port shall accept a tanker though it lacks marine fire-fighting facility. During the basic design study in Apia, seawater pump was in a breakdown and under repairing. To avoid such situation as fire-fighting system is not available due to dry-dock absence and breakdown, the fire monitor system should also be fitted to the Plan tugboat, even though the Apia Port has not ever experienced a fire of ship or oil tank requiring a fire-fighting boat.

2) Operation against oil spillage

Oil fence, spray of oil neutralizer and oil absorbing sponge are the equipment to work against oil spillage, but they should be dealt with in a plan of port facility as usually stowed in the warehouse, and thereby it shall not be dealt with in this Project.

3) Search and Rescue (SAR)

SAR operation might be extensively carried out outside the harbor upon request not limited to in the harbor area. Necessary equipment for SAR operation are rescue boat and on-scene safety

radio apparatus. The dinghy boat and radios (VHF radio telephone, MF/HF SSB radio telephone and two-way VHF transceiver) on board the Plan tugboat can be used for the SAR purpose, and thereby no special equipment exclusively for SAR is considered.

(8) Complement on board

According to the South Pacific Maritime Code the Plan tugboat is classified as the vessel of:

- 200 gross tons and less, or 35 m in length or less;
- Propulsion engine of 750 kW and over but less than 3,000 kW;
- Navigation area within harbor or smooth water.

And according to the Code, complements of the Plan tugboat in the ordinary duty should be as follows.

Captain	1 person
Chief Engineer	1 person
Rating	4 persons
Total	6 persons

The vessel's licensed number of complements should be then 9 persons, adding 3 temporary persons, e.g. 2 engineers and 1 pilot when the vessel goes to American Samoa for dry-dock.

Life-saving apparatus (life raft and life vests) shall fulfill 9 persons on board, but accommodation facility shall be prepared for ordinary crew members of 6 persons.

(9) Accommodation

Accommodation facilities (crew's rooms, galley, mess room, toilet, shower, etc.) should in general follow those for MV Tafola according to the way of life on board, but following should be considered.

Large water boiler in the galley of MV Tafola, excessive in Samoa, to be changed to small one; Capacity of freezer in galley to be larger; Electric washing machine to be provided in shower room to facilitate washing of working cloths used.

(10) Wheelhouse equipment

Following equipment should be fitted.
Magnetic compass, steering control stand, engine control and alarm panel, radar, echo sounder, GPS, weather FAX, air phone, public addresser, navigation light control, seach light, and chart table.

Weather FAX is fitted to prepare against weather change.

(11) Radio apparatus

VHF radio telephone, MF/HF SSB radio telephone and walkie-talkies should be provided.

There is no GMDSS shore station in Samoa, thus shipboard GMDSS radio apparatus may not be fitted in complete, but VHF radio telephone, EPIRB, two-way VHF transceivers SART, all of GMDSS type, should be fitted according to the Pacific Regulations.

(12) Electric generators

Two generators, comprising one main generator and one harbor generator, should be fitted. As electric power balance of generators on board MV Tafola is found appropriate, the capacity of generators should remain unchanged from those for MV Tafola and capacity of the harbor and main generators should be decided respectively.

The frequency of electric supply should be 50 Hz, and all AC electric supply should be in 220 V avoiding 100 V.

(13) Measures against sea pollution

Oily water separator should be fitted to comply with standard of effluent dischaged from ships according to the International Convention for Preventing Pollution from ships.

To comply with stringent USCG control on sewage discharge, and to minimize pollution from sewage discharge in Apia Port, sewage holding tank should be fitted. Sewage discharging pump should be installed to allow discharge overboard in the open sea and to shore facility at quay.

(14) Fire-fighting and life-saving apparatus

According to the Pacific Regulations and the Japanese Safety Regulations, followings should be fitted out.

Fire-fighting:	Fire pump, hydrant, fire hose, portable fire extinguishers
Life-saving:	Inflatable liferaft (to cover number of crew members), life vests, life buoy, various distress signals

(15) Long life policy

Samoa locates far from industrial countries. If maintenance of the vessel depended solely on

manufacturers in the countries far from Samoa upon requirements, close maintenance would not be possible, resulting in short life of the vessel. Considering the above circumstance, hull, machinery and equipment have to be robust and simple to allow maintenance in Samoa easier, and specifically followings should be taken into consideration.

- Make bottom shell thicker by 0.5 mm than rule requirements to withstand corrosion and thereby to allow long-life of the Plan tugboat. Increase in the hull weight will be by about 1.0 ton.
- Engine room cooling water system shall be independent seawater/freshwater cooling system. For seawater system, countermeasures against corrosion should be adopted throughout, e.g. plastic coating inside seawater piping, seawater/freshwater heat-exchanger of cupper alloy or plastic material. By inhibiting seawater system from corrosion, risk of leakage by quick corrosion will be avoided and thereby cost for maintenance will be reduced. Interval of dry-docking can also be made longer.
- Fine filtering equipment for lubricating oil of main engines should be adopted to keep expensive lubricating oil cleaned, proper lubrication of diesel engines, and thereby minimize wearing and breakdown to extend life of diesel engines.
- Special spare parts necessary to carry out periodical cyclic maintenance program for machinery should be supplied. The risk of suspension of the operation due to waiting for spare parts will be minimized and will make the duration of dry-dock period short.

Necessary cost for the above and the expected accountable benefits are estimated as follows.

	Item	Benefit
a.	Thicker bottom shell	Longer hull life
b.	Measures to inhibit sea water cooling system from corrosion	¥800,000/year after 3 years, i.e. ¥9,070,000/20 years; (*1) Longer docking interval
c.	Fine L.O. filter	¥2,025,000/20 years;(*2) Longer engine life
d.	Extra spare parts and cyclic maintenance program	¥27,900,000/20 years;(*3) Low risk of suspension of operation; Shorter docking period

(*1) In the conventional seawater cooling system, number of sea water pipes subject to risk of corrosion is 48. 1/3 in 48 pieces are assumed for replacement due to heavy corrosion, annually from 3 years after newbuilding.
In the proposed system, pipe pieces subject to corrosion and replacement will be reduced to 1/3. Cost to replace one piece of pipe is assumed ¥50,000.

(*2) Annual LO consumption x Unit price x Saving = 1.91kl x ¥137,500 x 1/2 = ¥131,000
New filter element is necessary from 4 years after newbuilding at cost ¥35,000/year.

(*3) Benefits of engine parts = (Spare pars purchase cost in case of minimum spare supply) – (Spare parts purchase cost in case of cyclic maintenance program with extra spare parts) =

(10 cylinders/20 years) – (2 cylinders/20years)
Benefits of other parts: for 20 years spare purchase of propeller shaft, propeller, crank shaft, governor, turbocharger and attached pumps is not necessary, while one set is normally necessary in the ordinary case.

2.3.3 Basic Design

(1) Hull and Machinery Particulars

1) Main particulars

Length overall	25.90 m
Length between perpendiculars	23.10 m
Breadth, molded	6.80 m
Depth, molded	2.80 m
Draft, molded	2.10 m
Gross tonnage	120 tons
Service speed	12.0 knots
Cruising radius	1,290 sea miles
Max. bollard pull	more than 205 kN (20.9 tf)
Complement	9 persons (6 berthed and 3 unberthed)
Tank capacity	
Fuel oil tank	25 m^3
Fresh water tank	13 m^3
Main engine	588 kW (800 ps) x 900 rpm x 2 sets
Propeller	4 blades fixed pitch in steerable Kort nozzle
Flag	Samoa
Classification	Lloyd's Register of Shipping

2) Deck machinery

Windlass	Electric, 14.7 kN (1.5 tf) x 9 m/min x 1 set
	With center drum of 60 mmφ x 50 m tug-line, slack line pull
Capstan	Electric, 9.8 kN (1.0 tf) x 12 m/min x 1 set
Steering gear	Electric hydraulic, 39 kN (4 tf.m) x 1 set
Crane	Electro-hydraulic, foldable jib type x 1 set
	9.8 kN (1.0 tf) SWL x 3.5 m radius; max radius of about 6.5 m
Towing hook	Manual release, 225 kN (23 tf) SWL x 1
Towing beam	1
Towing bit	1 at bow, double type

3) Life saving apparatus

Liferaft	Inflatable, for 9 persons x 1
Life jacket	13 (9 for personal use + 4 for duty crew)
Radio LSA	Two-way VHF transxeiver x 2, EPIRB x 1, SART x 1
Dinghy	3.8 m rubber/FRP composite type with about 18.4 kW (25 ps) outboard motor
Other	Life buoy, distress signal, etc. according to Rule

4) Fire fighting apparatus

Fire hydrant	2 positions (deck and engine room)
Portable extinguisher	Powder type
Fire monitor	Manually operated, 500 lit/min
Pump for above	35 m3/h x 50 m (driven by harbor generator)

5) Accommodation

Crew's room	Private cabin x 2 (Captain and Chief Engineer) 4 berth cabin x 1
Galley	Electric range, rice cooker, sink, refrigerator, freezer, water boiler
Mess room	3 seatings, with TV and video
WC	1
Shower room	1 (shower, water boiler, washing machine)

6) Ventilation

Engine room	Mechanical supply fan x 1
Galley	Mechanical exhaust fan x 1
Air conditioning	Packaged type A/C unit to lead ducting to wheelhouse, mess room and crew's rooms

7) Engine room machinery

Main engine	4 stroke cycle medum speed diesel engine MCR 588 kW (800 ps) x 900 rpm x 2 sets
Gearbox	Reverse/reduction gear, oil hydraulic multiplate wet type
Propeller	4 blades Kaplan type, in steerable Kort nozzle
Main generator	AC 225V, 50Hz, 50kVA x 1 set Driven by 45 kW (62 ps) diesel engine

Harbor generator	AC 225V, 50Hz, 30kVA x 1 set Driven by 28 kW (38 ps) diesel engine
Main air compressor	Electric x 2
Engine cooling system	Independent seawater/fresh water cooling, with plastic lined seawater pipes.
Main cooling SW pump	Electric or main engine driven x 2
Standby LO pump	Electric x 1
FO transfer pump	Electric x 1
Bilge/GS/fire pump	Electric x 1
Fresh water pump	Electric x 1
A/C cooling water pump	Electric x 1
LO filter	CJC type x 2
Oily water separator	1
Sewage tank	about 1 m^3, with sewage discharge pump

8) Inboard communication

Engine telegraph	2
Common battery telephone	5 lines x 1 (wheelhouse, mess room, crew's room, engine room and steering gear room)
Public addressor	Amplifier, speakers
Alarm system	1 set

9) Navigation aids

Magnetic compass	1
Steering control	1 (magnetic compass auto pilot)
Radar	72 miles, 10 W x 1
Echo sounder	1
Weather FAX	1
GPS	1
Air phone	1
Searchlight	1 kW x 1
Window wiper	1 at wheelhouse center window
Clear viw screen	1 at wheelhouse portside window
Other	aneroid barometer, binoculars, etc.

10) Radio apparatus

International VHF radio	1

MF/HF SSB radio	1
Walkie talkie	4

11) Rules to apply

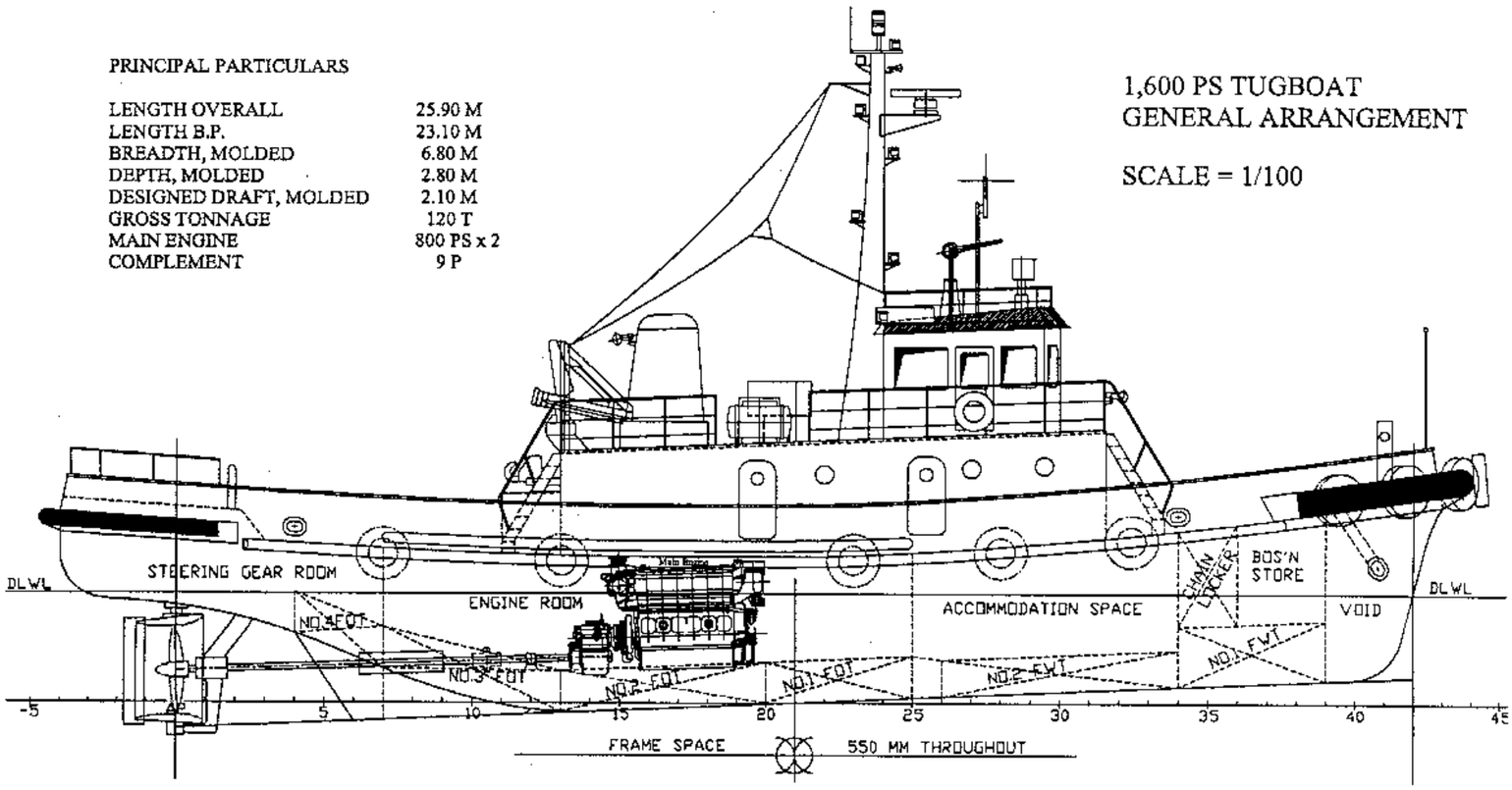
a. Classification Society's rules
b. Samoa Shipping Act, 1998
c. South Pacific Maritime Code, 1986 (Chapter for manning on board ships applies.)
d. Pacific Regulations (Safety Regulations for Non-Convention Sized Ships), 2000
e. Japanese Maritime Regulations（for the scope not covered by above rules and regulations and for the interpretative purpose）

PRINCIPAL PARTICULARS

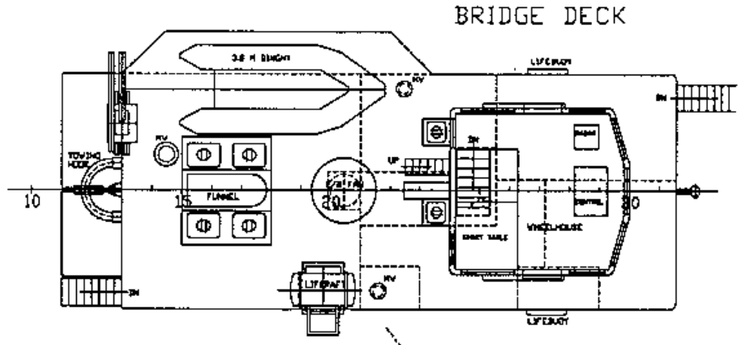
LENGTH OVERALL	25.90 M
LENGTH B.P.	23.10 M
BREADTH, MOLDED	6.80 M
DEPTH, MOLDED	2.80 M
DESIGNED DRAFT, MOLDED	2.10 M
GROSS TONNAGE	120 T
MAIN ENGINE	800 PS x 2
COMPLEMENT	9 P

1,600 PS TUGBOAT
GENERAL ARRANGEMENT

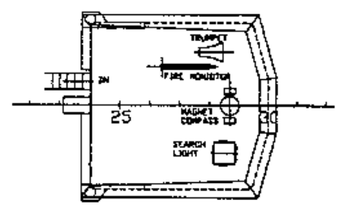
SCALE = 1/100



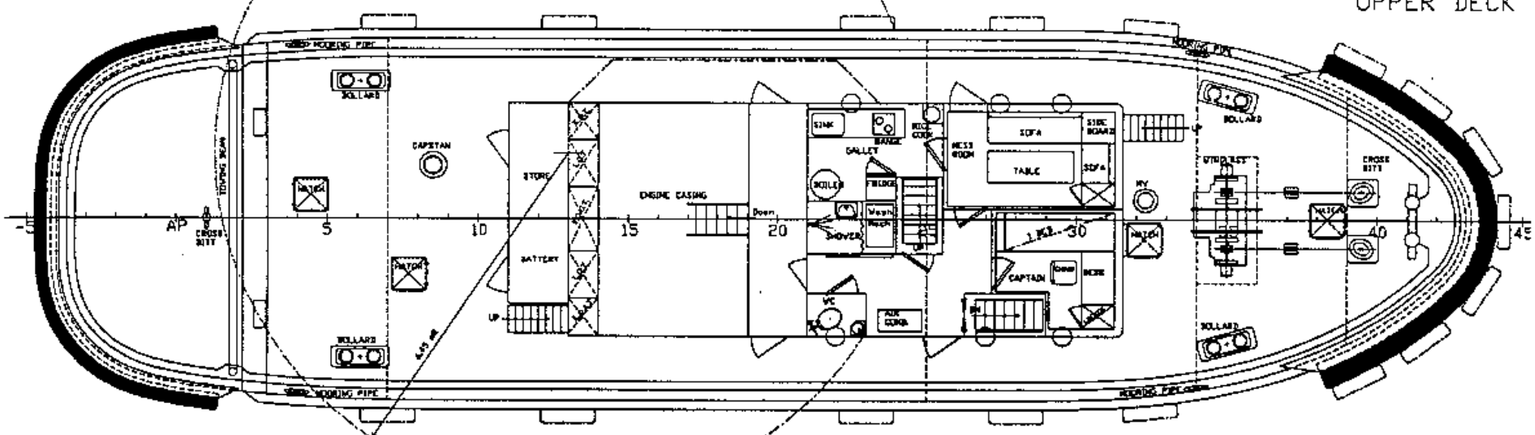
BRIDGE DECK



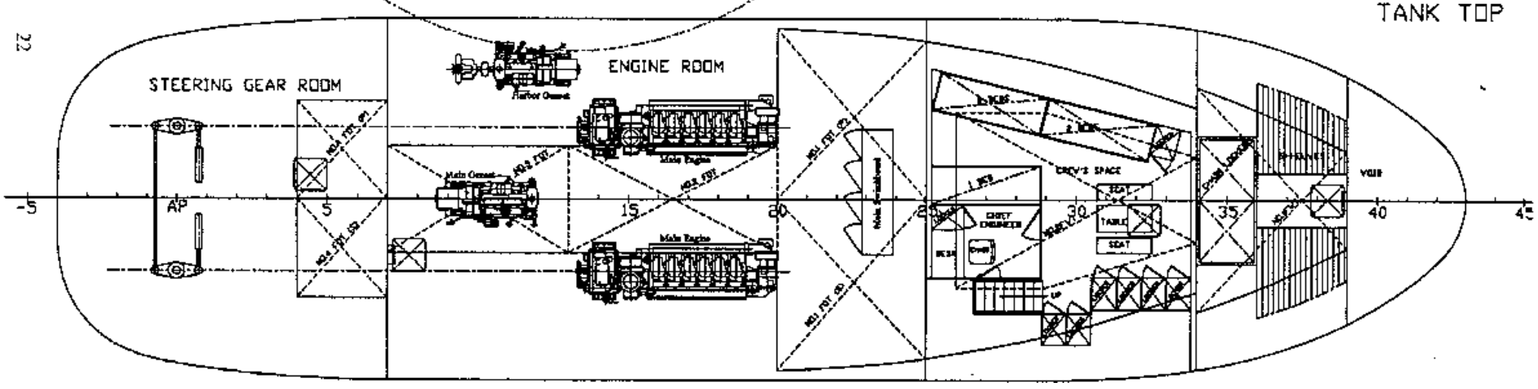
COMPASS DECK



UPPER DECK



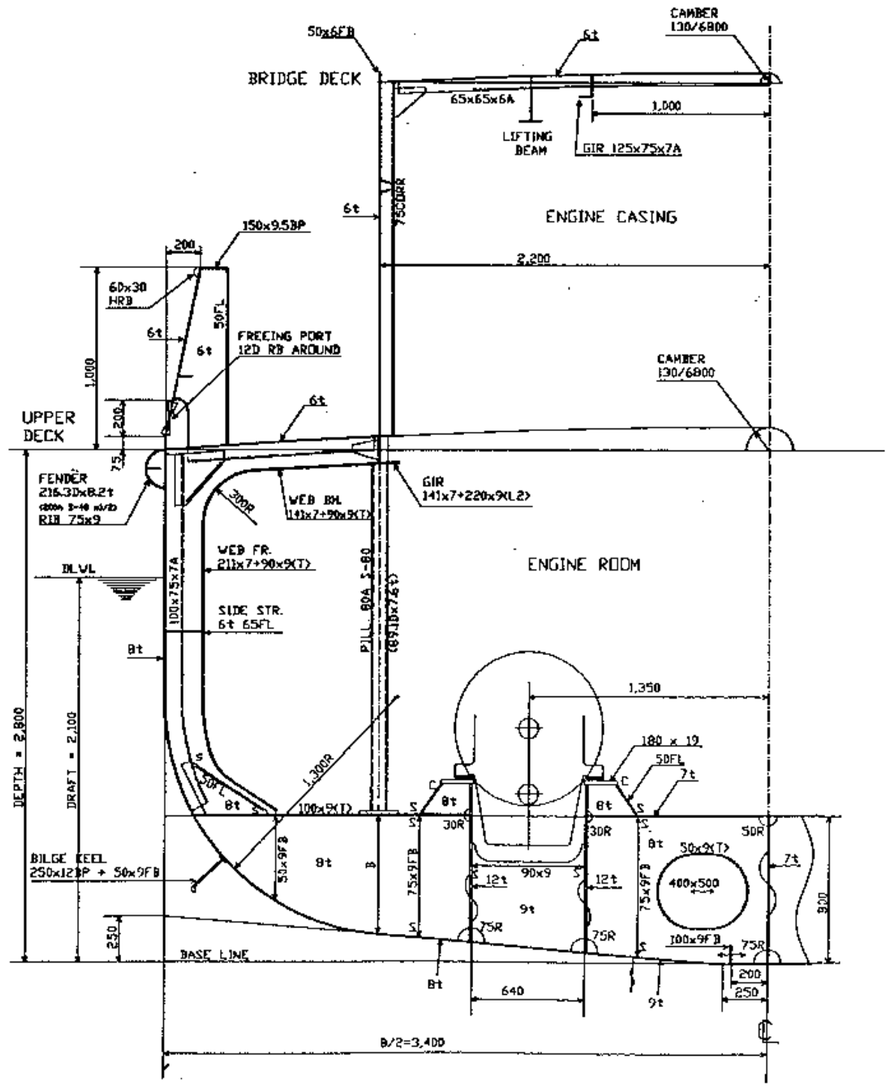
TANK TOP

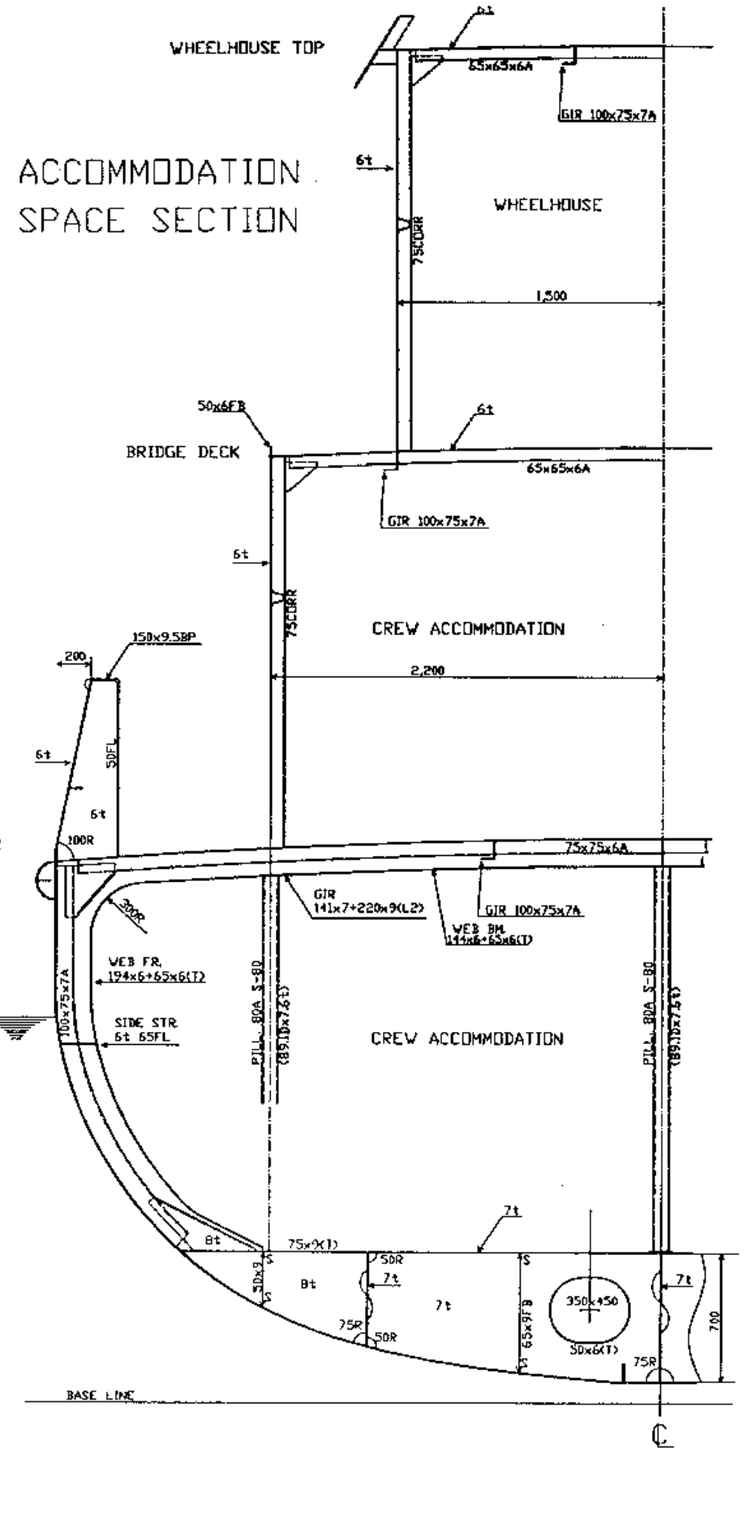


1,600 PS TUGBOAT
MIDSHIP SECTION

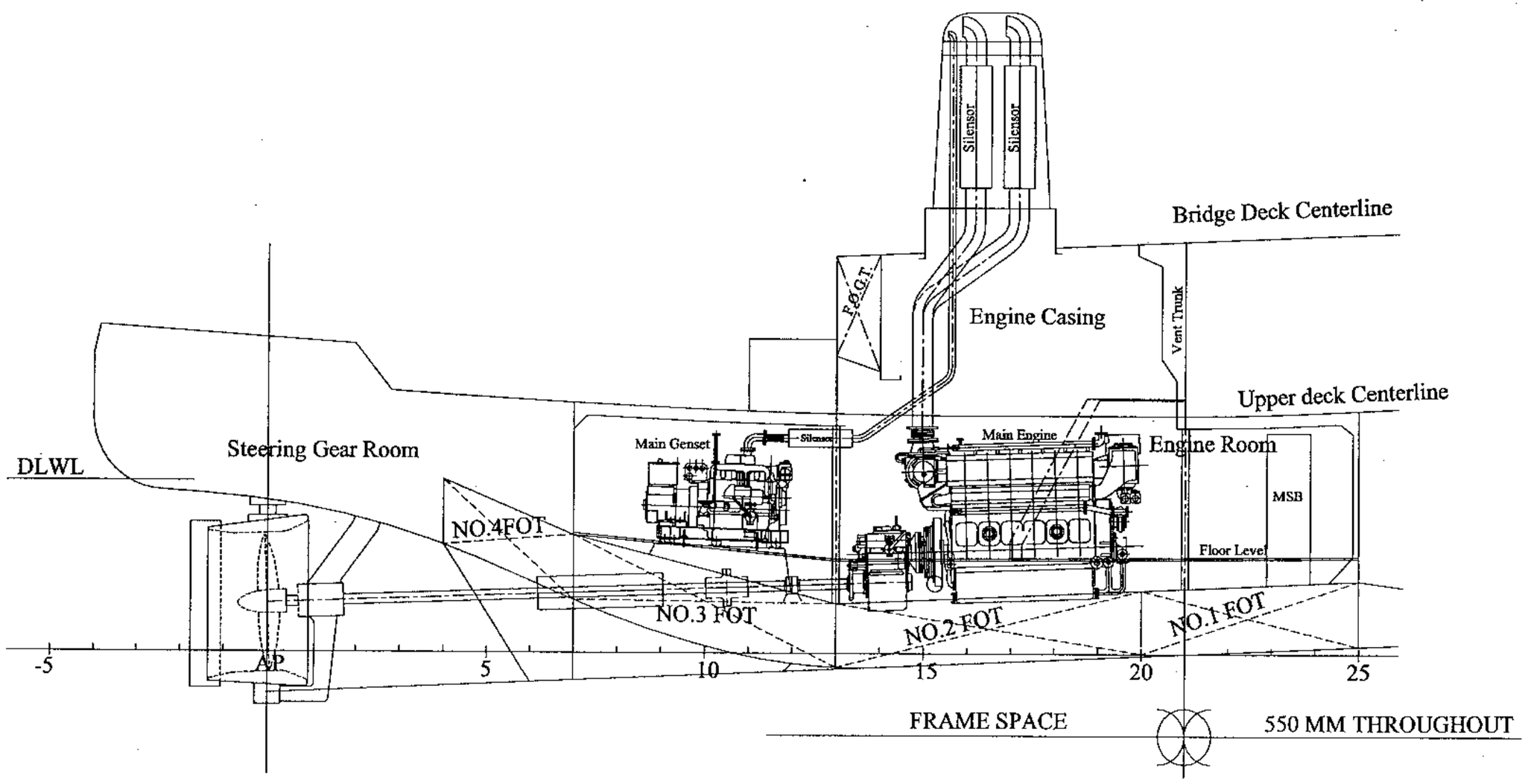
SCALE = 1/30

ENGINE ROOM SECTION (AT MIDSHIP)



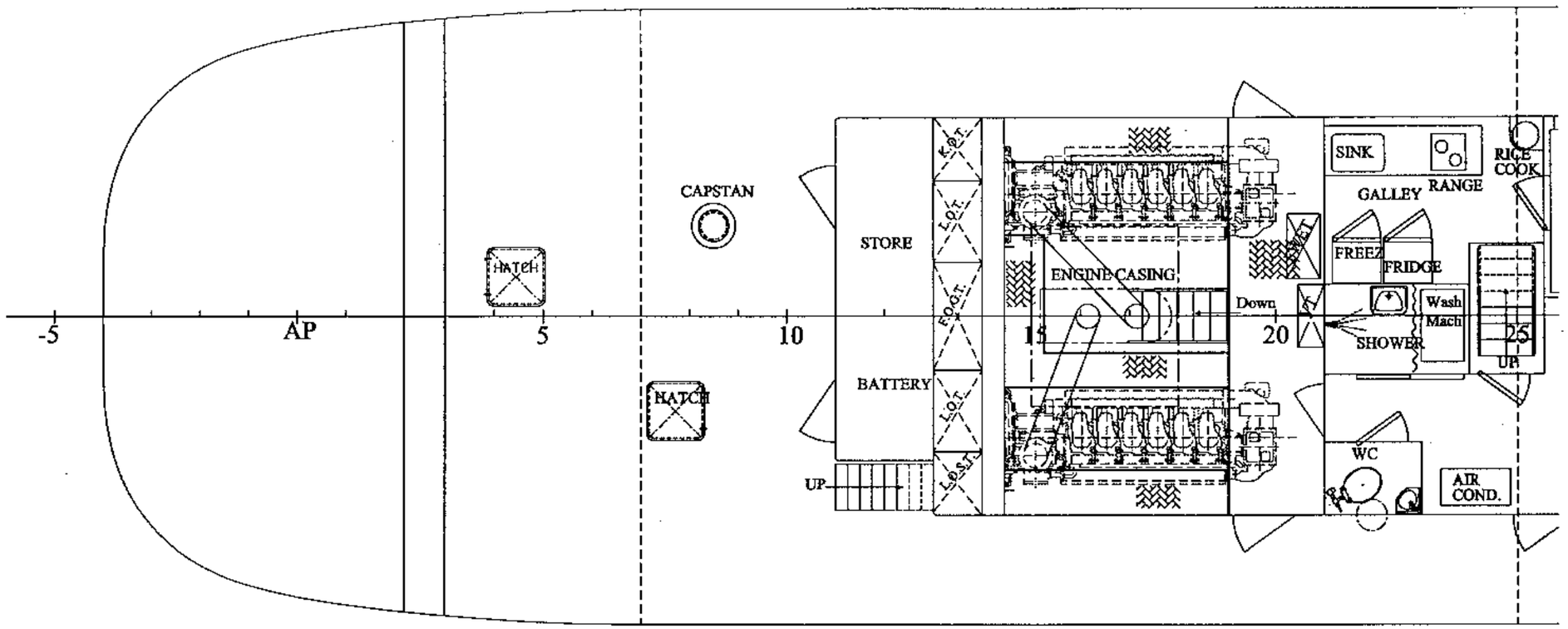


1,600 ps tugboat
Engine Room Arrangement
Part 1/3 Profile



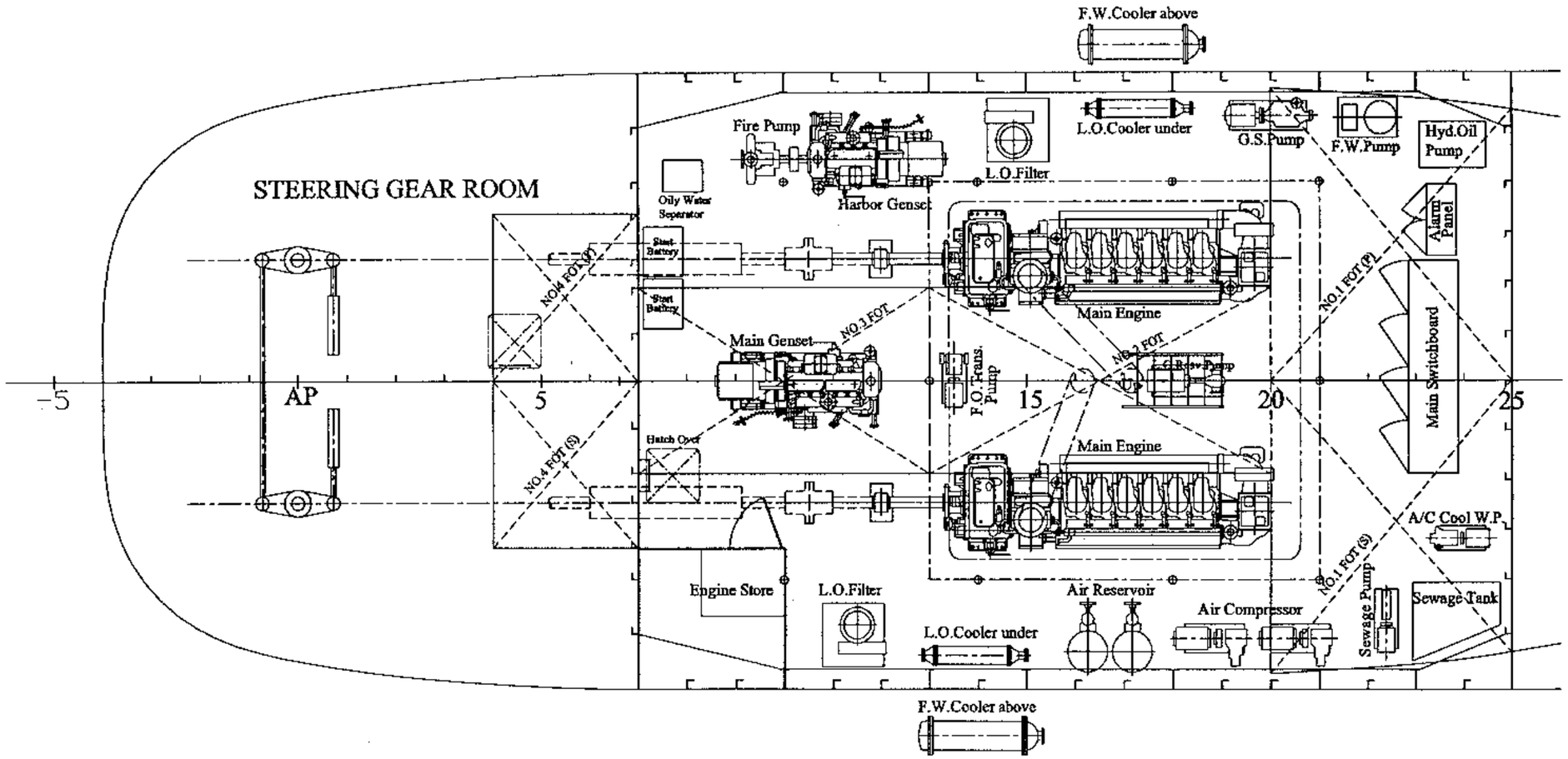
Scale 1/50

1,600 ps tugboat
Engine Room Arrangement
Part 2/3 Upper Deck



Scale 1/50

1,600 ps tugboat
Engine Room Arrangement
Part 3/3 Tanktop



Scale 1/50

3. Implementation Plan

3.1 Implementation Plan

3.1.1 Implementation Conditions

If this Plan is carried out on the basis of a grant-aid from the Government of Japan, construction of the Plan vessel will proceed in the following sequence :

1) Exchange of Notes between the Government of Japan and the Government of Samoa.

2) Conclusion of a Consultant Contract between a Consultant recommended by JICA and the Government of Samoa or its designated authority.

3) Verification of the Consultant Contract by the Government of Japan.

4) The Consultant will undertake the Detail Design and prepare draft tender documents for approval by the Government of Samoa. These will include methods of pre-qualifications, technical specifications, general and engine room arrangements, midship sections and other plans, project cost estimates, and a draft of ship building contract.

5) With the approval, the Consultant will assist the Government of Samoa to make a Notice of Tender public in Japan, to pre-qualify applicants for the Tender, who shall be Japanese Nationals, and to call for the Tender for the Project in accordance with the JICA's "Guideline for Procurement under the Japanese Grant".

6) After opening of the Tender in the presence of the Samoan authority, the Consultant will prepare a Tender Evaluation Report, in which tenders will be evaluated financially and technically, and a successful tenderer will be recommended to the Government of Samoa for awarding the contract for the Project.

7) The Consultant will assist in contract negotiations between the Government of Samoa and the successful tenderer and will witness the Building Contract.

8) Verification of the Building Contract by the Government of Japan.

9) Based on the Building Contract, the Ship Builder will build, conduct trial runs for, and deliver

the Plan vessel. The Consultant will, in accordance with the Consultant Contract, provide construction supervision, conduct tests, and be present at the hand-over of the vessel.

The following basic items must be carefully considered in connection with project implementation.

1) The Main Project Implementing Bodies :

The agency responsible for this Project within the Government of Samoa is the Treasury Department, while the implementing agency is the Ministry of Transportation, and the operating agency for the Plan vessel is the SPA. In connection with project implementation, the Treasury Department with assistance of the Ministry of Transportation and SPA, will review bidding qualifications, approve tender plans, technical specifications, and contract documents, receive monthly reports on construction supervision, and take delivery of the Plan vessel. SPA will serve as the liaison window in all dealings with concerned agencies of the Government of Samoa with regard to such matters as the issuance of a Provisional Certificate of Nationality and import procedures.

2) The Consultant

Assuming that this Plan is carried out under a grant-aid from the Government of Japan, following the Exchange of Notes, a Consultant Contract will be signed between a Consultant company, recommended by JICA, and the Government of Samoa. As the proxy for the Government of Samoa, the Consultant will prepare tender documents, including technical specifications, and assist, as required, in the bidding and contract phases, while also inspecting the construction work in the Ship Builder's yard. In the course of carrying out this inspection function, responsible engineers will be dispatched to the shipyard at appropriate intervals during the construction period. Other specialists in charge of vessel outfitting and equipment will also be dispatched as required.

3) Ship Builder:

The Ship Builder will be selected in accordance with the following process. After evaluating the tender qualifications of companies of Japanese nationals responding to Tender Notice, competitive bids will be solicited, based on bidding and contractual procedures established in advance. The successful bidder under this process will sign a blanket Building Contract with the Government of Samoa. The Ship Builder will then build the Plan vessel, conduct trial runs, and sail the ship to Samoa for turnover.

4) Construction Plan :

In connection with the vessel construction plan, the Ship Builder will, based on the Contract

and the technical specifications, design the hull and outfitting in a manner corresponding to conditions at its shipbuilding facilities.

The sequence of vessel construction stages, following preparation of the construction designs by the Ship Builder, will be as follows: hull construction, outfitting work (deck work, equipment work, electrical work), all tests, and sailing to Samoa.. The followings points should be given careful consideration when examining the Building Plan.

① Assuming that this Plan is implemented on the basis of a grant-aid from the Government of Japan, scrupulous adherence to the construction schedule will be a major premise. The construction plan, therefore, must be prepared so as fulfill all contract conditions within the term of validity stipulated in the Exchange of Notes.

② With regard to the delivery deadlines for engines and other equipment, careful consideration must be given to preventing disruption of the construction work flow by maintaining tight control of the equipment procurement and linking the hull and outfitting stages to the delivery schedules for the related equipment.

③ Various tests are to be carried out, as determined by the Classification Society, on behalf of the Ministry of Transport. The required trial runs are to be performed upon completion of the construction phase to certify vessel performance.

④ At the final stage of the construction phase, engineers will be invited from SPA to be present during the trial runs and turnover inspection. These engineers will also travel aboard the new vessel to Samoa, receiving appropriate guidance en route so as to acquire competence in and familiarity with new vessel operations.

3.1.2 Special Considerations with Regard to the Building Work :

In order to comply with applicable international maritime regulations and meet the demands of the Classification Society along with the conditions set forth in the construction specifications, it is assumed that the shipyard in charge of the construction work will have the technical ability to satisfy the conditions stipulated in the above regulations. The Plan vessel will be classified as a work boat in calm water.

3.1.3 Allocation of Building Responsibility

(1) Responsibilities to be Assumed by the Government of Japan

Assuming the Plan is carried out under a grant-aid from Japan, the Government of Japan will assume responsibility for the following phases :

① Construction of the plan vessel

② Sailing the Plan vessel to Samoa

③ Consultant services, including the Detail Design, assistance with the bidding process as well

as building supervision

(2) Responsibility to be assumed by the Samoa government

As both building of the Plan vessel and equipment procurement are carried out Japan, the Government of Samoa has no responsibility for these matters.

3.1.4 Construction Supervision Plan :

Following conclusion of the Ship Building Contract, the Consultant, based on the Consultant Contract with the Government of Samoa, will approve the construction plans prepared by the Ship Builder and conduct inspections on equipment manufacture. In addition, it will implement a program of construction supervision by dispatching engineers to the shipyard for required periods of time. Also, as construction progresses, the Consultant will dispatch personnel in charge of outfittings and equipment to manufacturing plants and the shipyard for short periods of time for attendance during inspections and tests.

3.1.5 Equipment Procurement.

Machinery and equipment, switchboards, and other electrical supplies are expected to be sourced in Japan, since Japanese products have been found to be advantageous from the standpoint of quality, stability of supply, and price in Japan. Following are the planned procurement arrangements for the main classifications of outfitting items incorporated in the Project.

Table 2-1. Sources for Procurement

Main Outfitting	Sources
Main engine	Japan
Generator engine	Japan
Radio navigation aids	Japan
Towing hook	Japan
Paint	Japan
Other equipment of outfitting	Japan

3.1.6 Implementation Schedule :

In preparing the construction progress schedule, it was necessary to examine the nature of each phase, determining those phases which must be finished in advance of the main construction work, those that can proceed simultaneously, and those which can be completed independently. After further consideration of equipment procurement, construction period, and construction costs, an optimum construction period has been established. It is presumed that the various outfitting items will be sourced in Japan.

The principal construction phases and the nature of the work involved in each phase may be broadly classified as follows .

①Hull work

As the structural core of the vessel, the hull construction phase is essential in terms of maintaining the requisite buoyancy as well as the strength to fully withstand wave action and other external pressures. This work generally comprises individual block assembly and final assembly of the various blocks on the dock.

②Oufitting

This phase follows completion of the hull work. It comprises mooring equipment, steering gear, galley, sanitary fixtures and other amenities, air conditioning, lifesaving and fire-fighting equipment, and incidental construction.

③Installation of Equipment phase

This phase will comprise rigging work on the main engine, generator engine and generator, and pumps in the engine room, along with incidental facilities and piping work.

④Electrical work

Board and wiring work will be performed to furnish and control power supply to the various outfitting items that have been installed during the above rigging and equipment phases.

⑤Tests to be conducted during or following the construction process

Pursuant to the above construction phases, a series of tests will be performed, as required by the Classification Society and the Ministry of Transport, along with trial runs. Inspections will also be made to certify the basic performance of the ship in motion, including sea worthiness, safety, and speed.

⑥Sailing Plan

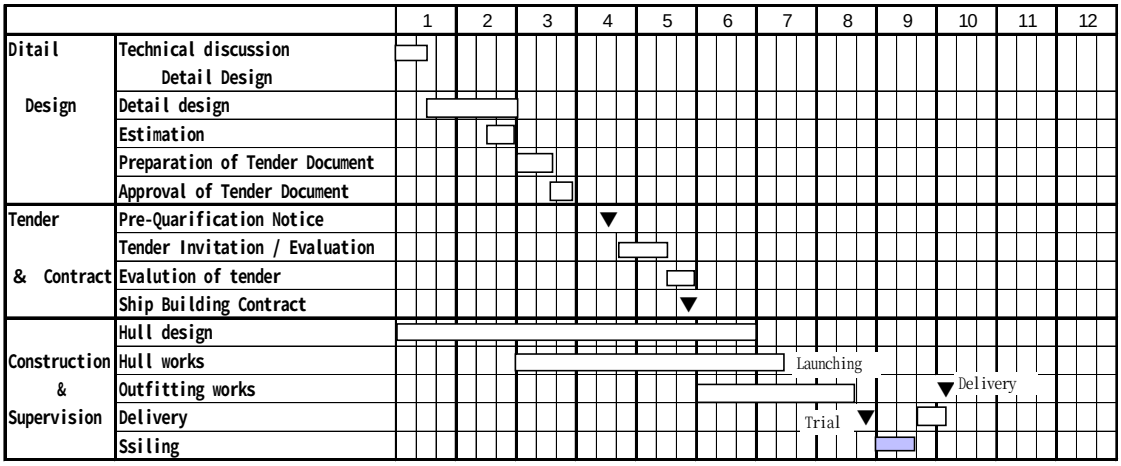
Following completion of construction at the shipyard and the trial runs, the Plan vessel will be delivered to the Government of Samoa. The Ship Builder is responsible under the contract for sailing the vessel from the shipyard to Samoa. Sailing time from Japan to Samoa, via the Central Pacific route, will be about 21 days.

The time required for project implementation is estimated at about 5 months for the Detail

Designs (including tender procedures), about 2 months from contract and hull design at the shipyard through the keel laying, 4.5 months from the start of steel plate processing through launching, and about 1.5 months from launching to trial test operations. The sailing time is expected to take about 21 days

The construction progress schedule is shown in the following table.

Table 2-2. Construction progress schedule



□：Work in Japan ■：Work in Samoa

3.1.7 Obligations of Recipient Country

Assuming that the Plan is carried out on the basis of a grant-aid from Japan, the Government of Samoa will be responsible for the following items :

1) Maintenance of base facilities, water channels, berthing jetty, and mooring areas, as required for Plan vessel operations
2) Obtaining those permits and approvals that must be issued in Samoa in connection with construction and sailing of the new vessel, such as a provisional certificate of nationality.
3) Duty exemptions and prompt customs clearance in connection with importation of the Plan vessel and all related equipment and materials into Samoa during project implementation.
4) Exemption from taxes and surcharges on Japanese nationals rendering project-related services in Samoa.
5) Making banking arrangements with a bank in Japan and issuing Authorization to Pay in connection with project-related contracts verified by the Government of Japan.
6) Any other items required for Project implementation that are not specifically included in the areas of responsibility assumed by the Government of Japan.

3.2 Operation and Maintenance Plan

3.2.1 Service :

The Port Charges of the Apia Port were revised thoroughly in July 1999, including the hire rate of the tugboat, which have been quintupled in comparison with the previous rates, in the classes of tugboat 1,300 ps or less.

SPA had not collected the standby (waiting) fee of tug boats, nor after the revision on July 1999. The steaming rate of tugboat is limited up to ST$ 700 per hour, though SPA will consider on the rates of tugboats of 1,000 ps or more.

The previous and the revised hire rates of tug boat are shown below.

Table 3-3 The Previous and the Revised Hire Rates of Tugboat

Power of tug boat	Previous rate	Revised in July, 1999
Less than 200 ps	ST$ 30 /hr	ST$ 100 /hr
201～400 ps	ST$ 40 /hr	ST$ 200 /hr
401～600 ps	ST$ 60 /hr	ST$ 300 /hr
601～800 ps	ST$ 80 /hr	ST$ 400 /hr
801～1,000 ps	ST$ 130 /hr	ST$ 700 /hr
1,001～1,300 ps	ST$ 130 /hr	ST$ 700 /hr
1,301～1,600 ps	ST$ 500 /hr	ST$ 700 /hr
a)Steaming rate	ST$ 500 /hr	ST$ 700 /hr
b)Standby(waiting) rate	—	—

(Source : SPA Regulations 1999)

After the Plan vessel enter into the work force, working conditions of the tug boats will be as follows;

- For calling ships of 5,000 GRT or less, one tug boat will be assigned to. For ships more than 5,000 GRT, two tug boats shall engage in maneuvering together. An average share, between 1995 and 1998, of ships more than 5,000 GRT in the total number of the ships calling the Port, is 44 %.
- We assume, for the calculation purpose, that number of calling ships to the Port in the night time and daytime are equal, that sending in and back of a pilot on board the calling ship will be done with the speed boat during daytime and a tug boat during night time, and that working hours of the tug boat which is not engaged in sending a pilot, therefore works within the Port, can be a half of that of the tug boat engaging in sending the pilot.

Provided that the steaming hours of MV Tafola in the present conditions is 100, steaming hours of the two tug boats on the above assumptions have been calculated, as follows:

Day time	(100 + 44) x 0.5(for day time) = 72
Night time	(100 + 44 x 0.5) x 0.5(for night time) = 61
Total	133

Thus, steaming hours of one tug boat, when two tug boats are in operation, will be 66.5 % of MV Tafola's steaming hours at the present.

As the hire revenue of tug boats correspond to their steaming hours, revenue of two tug boats will increase by 1.33 times only from the present revenue level. Similarly, as the oil consumption of the boats corresponds to their steaming hours, the fuel and lubrication oil cost increase by 1.33 times from the present oil cost.

MOT estimates that the number of vessels calling the Apia Port at 2001 will be 254. We assume that the ratio of standby hours by steaming hours will be the same as the record in 1997, i.e. the standby hours were 22% of the operating hours of 567 in a year, when the number of calling ships were 213. Thus the total operating hours in a year of the two tugboats is estimated at (254/213) x 567 = 676 hours, and the steaming hours at 676－(676 x 0.22) = 527 hours.

Table 3 – 4 Estimate of the Tugboat Hire Revenue at 2001

Number of Calling Vessel	254	
Operation Status	Standby	Steaming
Hire Rate	—	ST$ 700 per hour
Time to be hired	149 hr.	527 hr.
Hire Revenue per boat	—	ST$ 700 x 527 x 1.33 = ST$ 490,637

The horsepower of main engines of the Plan boat is 1,600 ps. Provided that the steaming fee is ST$ 700 per hour as the regulations revised in July, 1999, and the standby fee of tug boats is not charged, the annual revenue of two tug boats is estimated at ST$ 490,637. Accordingly, the revenue for one tug boat will be ST$ 245,000 / year.

3.2.2 Operation Cost

We have calculated the annual operation cost for the Plan boat solely, which will join the existing tugboat in 2001.

(1) Salary for tug boat's crew

The salary, with the present salary levels of MV Tafola, of the Captain, Chief Engineer, !st Engineer and two ratings make ST$51,153/year in total.

Post	Number	Annual Salary(ST$)
Captain	1	16,000
Chief engineer	1	16,000
1st engineer	1	10,000
Rating A	1	5,143
Rating B	1	4,010
Total	5	51,153

(2) Fuel & lubrication oil cost

As the assumption made on the above, the steaming hours of a tug boat in two boats operation system will 66.5 % of the present time.

Assuming that during steaming the load of the main engines is at 85% of the maximum continuous ratings (MCR), that when maneuvering the boats repeats several times of the operation which consists of pushing the ship about 10 minutes and idling some time around the ship, the specific fuel consumption for a steaming hour is estimated at 30 % of the continuous condition(MCR). Also, assuming load at the standby condition is set at 1/10 (idling condition) of the full load, the specific fuel consumption is at 160 g/ps/hr for a 800 ps main engine, the annual fuel consumption of the two main engines for steaming is 27.2 Klit. and that for standby is 3 Klit., and for the 62 ps auxiliary engine at 180 g/ps/hr, the annual fuel consumption is 5.1 Klit. Similarly, the specific fuel consumption for a 38 ps harbor generator is estimated at 200 g/ps/hr, the annual fuel consumption for the harbor engine will be 1.8 Klit. Provided that the lubrication oil consumption will be 1 % volume of the of total fuel oil volume, the volume of the lubrication oil consumed in a year will be 0.4 Klit. The prices of the oil bought by SPA are ST$ 1,080/Klit for the fuel oil and ST$ 5,730/Klit for the lubricating oil.

(3) Maintenance fee (out-contract)

Each cycle of maintenance work will require one week by 5 perosns, thus,

Working hours = 5 persons x 7 days x 8 hours x 2 times/year = 560 hrs.

Wage of a technician is assumed as equal to that of 1st engineer of the tug boat, ST$ 10,000/year, namely ST$ 5.2/hr.

Charges and overhead are estimated from the annual report of SSC 1996, i.e. the charges for the workshop is 132% of the wages and the overhead is 35 % of the total cost,

(5.2 x 2.32) x 1.35 = ST$ 16.3/hour.

Therefore, the annual maintenance fee will be 560 x (5.2 + 16.3) ST$ 12,000

(4) The other expenses

The other expenses, such as the dry docking fee, insurance, etc. are estimated by referring to the corresponding items of the MOT records, or by hearing from SPA. As the prices in Samoa are

stable for a while, the influence of the price index are not taken into account in the estimate.

The annual operation costs for the Plan tug boat solely is shown as follows.

Table 3-5 The projected operating costs for the Plan tug boat at 2001

Items	Remarks					ST$
Salary	Captain, Chief engineer, Crew					51,153
Stores						540
Fuel oil	Kinds of Engine	ps	Q'ty	Steaming (Klit.)	Stand by (Klit.)	40,057
	Main Engine	800	x 2	27.24	3.0	
	Main Generator	62	x 1	5.08		
	Harbor Generator	38	x 1	1.76		
Lubrication oil				0.37		2,827
Maintenance cost						4,000
Maintenance fee (out-contract)						12,000
Dry docking fee						18,950
Insurance						34,550
Life saving equipment						2,750
Total						166,827

(The depreciation is not included.)

3.2.3 Forecast of Net Operating Revenues and Costs:

The annual hire revenue of ST$ 245,000 for the Plan tugboat is projected over the annual operation costs of ST$ 166,827 by ST$ 78,173, so the operation of the Plan tug boat will be profitable, in case the depreciation could be ignored.

3.2.4 Maintenance Plan:

(1) Maintenance program

Samoa is far from industrial countries, and generally taking long time to procure spare parts and after-services, thereby suspension of operation can happen due to breakdown of important machinery. Therefore, daily maintenance is important especially in Samoa.

Understanding said importance of maintenance, Samoa Shipping Corporation (SSC) has established the maintenance system to maintain timetable of inter-island ferry MV Lady Naomi, which was built on 1998 under grant-aid from Japan. Following the success in SSC, SPA intends to adopt the maintenance system similar to SSC.

However, the SPA Maintenance Division has 5 staff personnel not trained proficiently and its

workshop lacks adequate machines and tools. Thus, SPA intends to out-contract a major part of the maintenance work for the Plan vessel (and also MV Tafola) to SSC. It is confirmed that SSC Workshop has an ample capacity and is accommodating in maintaining and repairing vessels of SPA.

We feel that it is appropriate to carry out following maintenance at different levels.

1) Daily maintenance by the tugboat crew:
2) Periodical maintenance and minor repair work by SSC workshop
3) Inspection (periodical and intermediate) and repair work requiring dry docking by Shipyard in Pago Pago

(2) SSC Workshop and maintenance system

In the SSC workshop there are total of 20 technical staffs including engineers and mechanics as well as a JICA expert. The workshop locating near the Apia Port is well fitted out, with various machine tools and a mobile workshop donated by the Japanese Government. In June 1998 SSC was certified as the Company in compliance with ISM (International Safety Management) Code by the Lloyd's Register of Shipping: i.e. the system of periodical internal inspection, reporting, maintenance, repairing and recording are established as satisfactory to the international standard. ISM Code is the software system for safety operation and management for ships recently laid down by the International SOLAS (Safety of Life at Sea) Convention, which had been dealing mainly with hardware, specifically ship's safety installation, however, realizing that sole pursuit of which can not secure the safety of the navigation. The system of periodical internal inspection, reporting, maintenance, repairing and recording in a shipping company are the part of ISM. Samoa is far from industrial countries, and generally taking long time to procure spare parts and after-services, thereby suspension of operation can happen due to breakdown of important machinery. SSC's maintenance system is not on occasional breakdown basis but on scheduled maintenance basis that necessary spare parts are kept in the workshop; working parts are exchanged for the reserved spare parts; removed working parts are overhauled and kept as spare parts in the workshop; and after the scheduled period working parts are exchanged for the spare parts even in case of normal functioning. This "Maintenance Cyclic Program" requires greater number of spare parts in the initial stage, but advantages are that breakdowns due to excessive wear caused by insufficient maintenance could be avoided and life of parts could be considerably extended.

(3) Mintenance program of important machinery

Troubles on the main engine, the shafting, and the generating engine depend very much on their

maintenance, and breakdown quickly leads to suspension of operation. As spare parts are expensive and take long time to obtain, it is important to minimize consumption and purchase of spare parts under a special maintenance program.

"Maintenance Cyclic Program" for the Plan tugboat shall be carried out with the following spare parts and maintenance cycles.

1) Necessary spare parts

For main and generating engines (major parts only)

Cylinder head assembly	1/2 of working nos.	for periodical exchange
Piston and connecting rod	3	for periodical exchange
Cylinder liner	3	for periodical exchange
Main bearing	1/2 of working nos.	for periodical exchange
Fuel injection pump	1/2 of working nos.	for periodical exchange
Governor	1	for periodical exchange
Turbocharger	1	for periodical exchange
Attached pump parts	each 1	for workshop maintenance
	Fuel oil supply pump to be complete spare	
Fuel injection valve	1/2 of working nos.	for workshop maintenance
Piston ring	2/2 of working nos.	for workshop maintenance
Crank shaft	1	as spare in emergency case
Gasket and consumables	2 times of working nos.	consumable

Shafting

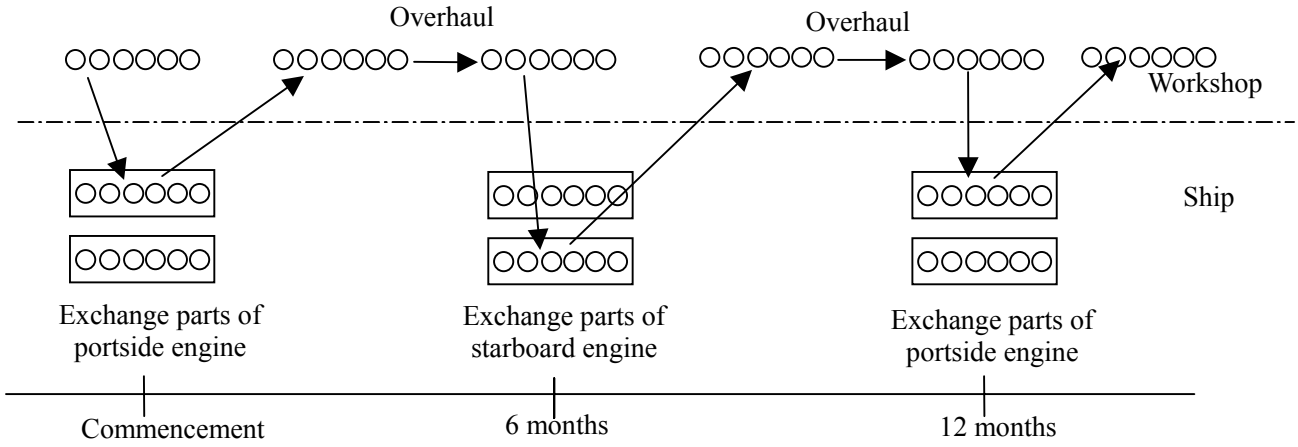
Propeller (ps and stb)	each 1	for exchange in dock
Propeller shaft (ps and stb)	each 1	for exchange in dock
Stern tube bearing	2	as spare in emergency case

2) Periodical maintenance of main engines and generating engines

Each engine part shall be scheduled for a standard exchanging interval respectively, either 6 months, 1 year or 2 years. At the periodical maintenance, working parts of the engine at one side are removed and exchanged for spare parts which have been maintained and kept in the workshop store; the removed parts are overhauled and kept in the workshop store; and after the scheduled period working parts at other side are exchanged. The scheme of periodical exchange schedule for the cylinder head is illustrated below: cylinder heads of the main engine at one side being exchanged at every 6 months, each engine will have maintenance at every year. Interval of the parts exchange is different part by part, e.g. a piston and a

cylinder liner have a longer interval than that of a cylinder head. The standard interval of exchange will be normally determined with manufacturer's recommendation based on running hours of the part.

As time for maintenance is sufficient until the next exchange, such parts as difficult to overhaul in the workshop, e.g. governor and turbocharger, can be sent to the manufacturer after exchange.



3) Periodical maintenance of shafting

In the Apia Port, propeller shaft bearing wears rather rapidly due to fine coral sands entering into the propeller shaft bearing. While withdrawal of propeller shaft is usually once at about every 4 years, tugboats in the Apia Port will have to withdraw the shaft once at every 2 years. As an extra stay in dry dock of about 3 days will be necessary to correct the withdrawn shaft for resetting, the spare propeller shafts as well as the propellers, which have corrected and prepared beforehand, shall be fitted in exchange of the withdrawn ones. And the withdrawn shafts and propellers shall be corrected and kept in the workshop for the next dry dock to exchange.

4. Project Evaluation and Recommendation

4.1 Project Effect

The objective of the Project is, by providing a tugboat in place of the aged MV Pualele, one of the two boats assigned to the Apia Port, virtually the only international trading port in Samoa, to ensure safe and smooth berthing/unberthing operation.

Effects by implementing the Project are summarized as follows.

Direct effects:

(1) Assigning the Plan tugboat in place of aged MV Pualele, safe berthing/unberthing operation will be secured for vessels, 227 container vessels, 44 tankers and 77 others, expected to call the Port on the year of 2015.

(2) When the Plan tugboat joins and two tugboats are available in the Port, it will be possible to cope with large vessels even under strong winds over 10 m/s. So far as 3 or 4 vessels annually, about 5.5 % of large vessels calling the Port, have to wait outside the Port due to excessive wind speed for maneuvering, such unfavorable situations will be eliminated and the daily berthing/unberthing operations will become safer and smoother.

(3) Since a fire monitor will be installed on board the Plan vessel, a fire monitor will be always available to fight against ship fires as well as quayside fires in and near the Port, even in case MV Tafola were not available due to dry-docking or repairing.

Indirect effect:

In Samoa, daily consumer goods, such as petroleum, industrial products, depend heavily on marine transport, and delay in discharge from ship could influence the civil life tremendously. The Plan tugboat will ensure safe and smooth berthing/unberthing of large vessels, and accordingly will secure stable supply of daily goods.

No problems are anticipated with respect to either the operating structure and the personnel plan developed by the Samoa side, with operation and maintenance costs expected to be fully covered out of tug hire revenues from the Plan vessel.

Implementation of the Project will ensure safe and smooth berthing/unberthing of large vessels calling the Port; secure berthing of vessels under sudden weather changes, and contribute greatly towards settlement of the issue, stable supply of daily products to Samoan people, which Samoa's national development plan is facing to. It is determined, therefore, that there would be considerable significance in implementing this project under a grant-aid from Japan.

4.2 Recommendation

In carrying out the subject project, results can be further enhanced by adopting following suggestion.

Maintenance program has been planned to carry out in cooperation with SSC, who has been already implementing the similar program successfully for their vessels. However, SPA, as the agency responsible for operation and management of the Plan vessel, should take initiative by incorporating the said maintenance program into the operation and management system and ensure execution of the system.

APPENDICES

APPENDIX – 1　MEMBER LIST OF THE SURVEY TEAM

(Field Survey)

FUNCTION	NAME	ORGANIZATION
Team Leader	Satoshi Umenaga	Third Project Management Division, Grant Aid Management Department, JICA
Chief Consultant / Naval Architect	Toyonori Watanabe	Fisheries Engineering Co.,Ltd.
Procurement Planner	Akio Yamada	Fisheries Engineering Co.,Ltd.

APPENDIX – 2　Survey Itinerary

(Field Survey)

DAY	DATE	ACTIVITIES	
1	Jan. 23(Sun)	Mr. Umenaga, Mr. Watanabe, Mr. Yamada (Lv. Narita → Ar. Apia)	
2	Jan. 24(Mon)	Visit to Ministry of Forging Affair, Ministry of Finance, Discussion with Ministry of Transport and SPA, Meeting with JICA office in Samoa	
3	Jan. 25(Tue)	Visit to M/V TAFOLA,M/V PUALALA Discussion with MOT, SPA, SSC Discussion with MOT, SPA	
4	Jan.26(Wen)	Tug boat works condition survey toward for Call ship in Apia port Discussion with SPA	
5	Jan.27(Thu)	Discussion with MOT for Minutes of Discussion Drafting Tug boat works condition survey toward for Call ship in Apia port	
6	Jan.28(Fri)	Drafting and Signing of Minutes and Discussion in MOT office Report to JICA office	
		Mr. Umenaga	Mr. Watanabe, Mr. Yamada
7	Jan.29(Sat)	Lv. Apia (Report to Embassy of Japan in N.Z)	Discussion within the study team
8	Jan.30(Sun)	Information and data analysis	
9	Jan.31(Mon)	Discussion with SPA, data collection	
10	Feb. 1(Tue)	Discussion with MOT for the New tug boat, Discussion with SPA for the New tug boat, Information collection	
11	Feb. 2(Wen)	Tug boat works condition survey toward for Call ship in Apia port Discussion with SPA for the New tug boat	
12	Feb. 3(Thu)	Onboard survey on M/V TAFOLA, M/V PUALELE	
13	Feb. 4(Fri)	Report to JICA office	
14	Feb. 5(Sat)	Tug boat works condition survey toward for Call ship in Apia port	
15	Feb. 6(Sun)	Data analysis	
16	Feb. 7(Mon)	Lv. Apia	
17	Feb. 8(Tue)	Ar. Oakland Report to Embassy of Japan	
18	Feb. 9(Wen)	Lv. Oakland → Ar. Narita	

APPENDIX – 3 List of Persons Met

NAME	FUCTION
Ministry of Transport	
Mr. VA'AELUA NOFO VA'AELUA	Secretary for Ministry of Transport
Mr. MASELINO SITAGATA TOMINIKO	Assistant Secretary, Marine Division, Ministry of Transport
Ministry of Foreign Affairs	
Mr. AIONO MOSE SUE	Secretary for Foreign Affairs
Ministry of Finance	
Ms. HINAURI PETANA	Financial Secretary
Samoa Ports Authority	
Mr. PAPALII JOHN J. RYAN	General Manager for SPA
Mr. ASALEMO TUIMAUGA	Operation Manager, SPA
Mr. TEPATASI RISALE	Port Master, SPA
Samoa Shipping Corporation Ltd.	
Mr. OLOIALII KOKI TUALA	General Manager for SSC
Mr. FALA ANAMANI	Deputy Manager, SSC
Mr. WILLIE NANSEN	Finance Manager, SSC
Mr. Masahiro Sato	Second Secretary, Embassy of Japan in New Zealand
Mr. Hidetoshi Takama	Resident Representative, Samoa Office Japan International Cooperation Agency (JICA)
Mr. Satoru Mimura	Assistant Resident Representative, Samoa Office JICA
Mr. Tomohiko Amimoto	JICA Expert, SSC
Mr. Satoru Kouno	JOCV, Port Office, SPA

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR CONSTRUCTION OF TUG BOAT FOR APIA PORT
IN THE INDEPENDENT STATE OF SAMOA

In response to a request from the Government of the Independent State of Samoa (hereinafter referred to as "Samoa"), the Government of Japan decided to conduct a Basic Design Study on The Project for Construction of Tug Boat for Apia Port (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Samoa the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Satoshi Umenaga, Deputy Director, Third Project Management Division, Grant Aid Management Department, JICA, and is scheduled to stay in the country from January 23, 2000 to February 7, 2000.

The Team held discussions with the officials concerned of the Government of Samoa and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Apia, January 28, 2000

梅永悟

Satoshi Umenaga
Leader
Basic Design Study Team
Japan International Cooperation Agency

Va'aelua Nofo Va'aelua
Secretary for Transport,
Ministry of Transport

Asalemo Tuimauga
Deputy General Manager
Samoa Ports Authority

witness:

Aiono Mose Sua
Secretary for Foreign Affairs,
Ministry of Foreign Affairs

ATTACHMENT

1. Objective of the Project

The objective of the Project is to secure safe and effective activities in Apia Port by constructing a tug boat which supports large vessels to approach or to leave from a quay.

2. Project site

The site of the Project is shown in Annex-1.

3. Responsible and Implementing Agency

The Responsible Agency is the Ministry of Transport (MOT). The Implementing Agency is Samoa Ports Authority (SPA). The organization charts are shown in Annex-2.

4. Components of the Draft Report

The Government of Samoa agreed and accepted in principle the components of the draft report explained by the Team.

5. Japan's Grant Aid Scheme

5-1. Samoan side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-3.

5-2. Samoan side shall take the necessary measures, as described in Annex-4, for smooth implementation of the Project, as a condition for the Japanese Grant Aids to be implemented.

6. Schedule of the Study

6-1. The consultants will proceed to further studies in Samoa until February 7, 2000.

6-2. JICA will complete the final report and send it to the Government of Samoa by May, 2000.

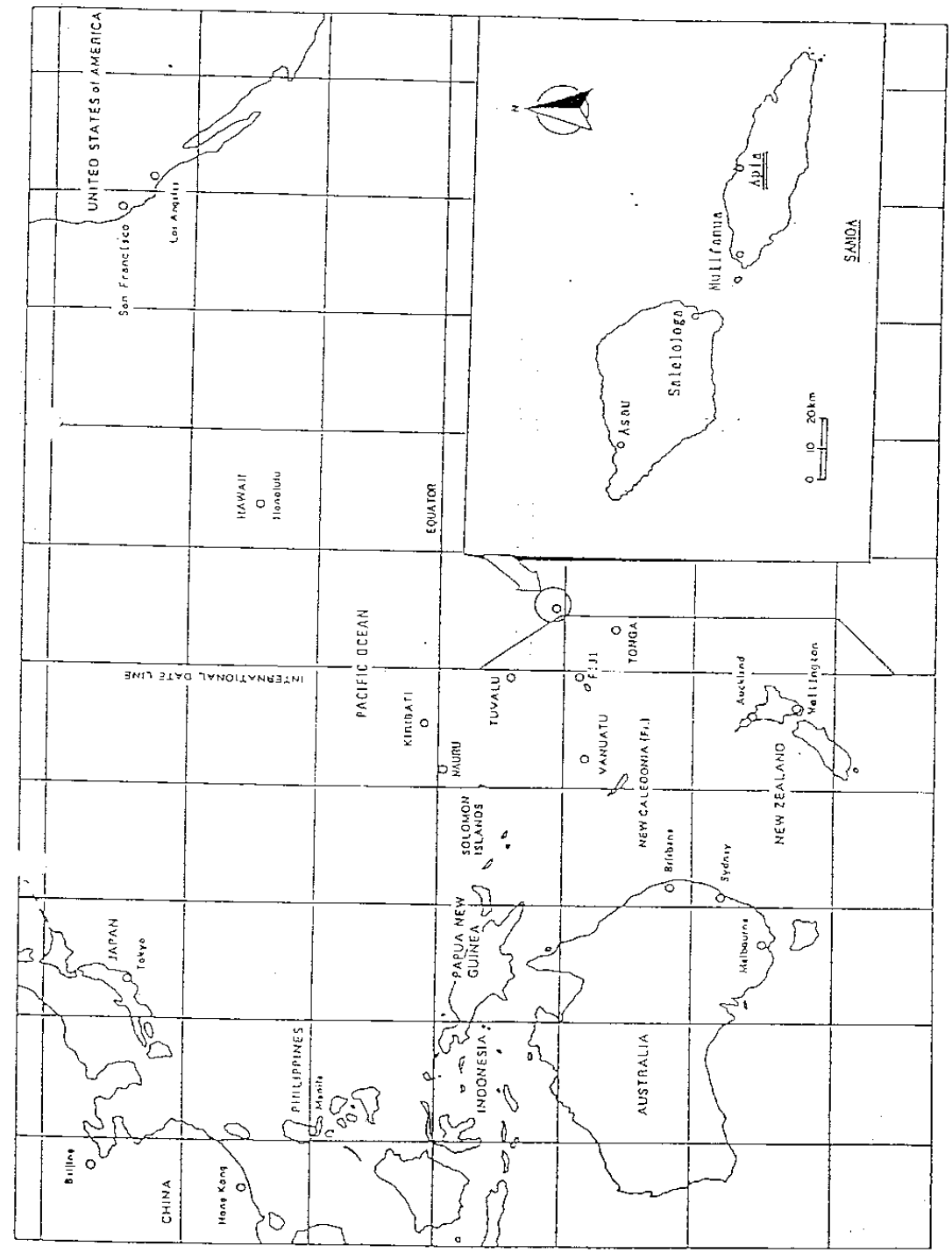
7. Other relevant issues

7-1. The representatives of the Government of Samoa re-emphasized the urgency of the Samoa Government's request for the acquisition of a new tug boat within the first quarter of year 2001 if at all possible. The Team explained that the above mentioned schedule was impossible in the Japan's grant aid scheme but Japanese side will intend to facilitate the procedure required.

7-2. The Team pointed out the importance of the "maintenance-cycle system" which is a kind of preventive maintenance carried out regularly as adopted by Samoa Shipping Cooperation (SSC). SPA agreed to implement the "maintenance-cycle system" for the new tug boat.

7-3. The Team agreed to prepare the manual for the "maintenance-cycle system" for the new tugboat.

7-4. The existing tug boat, MV Pualele, will be scrapped or sold after procurement of the new tug boat.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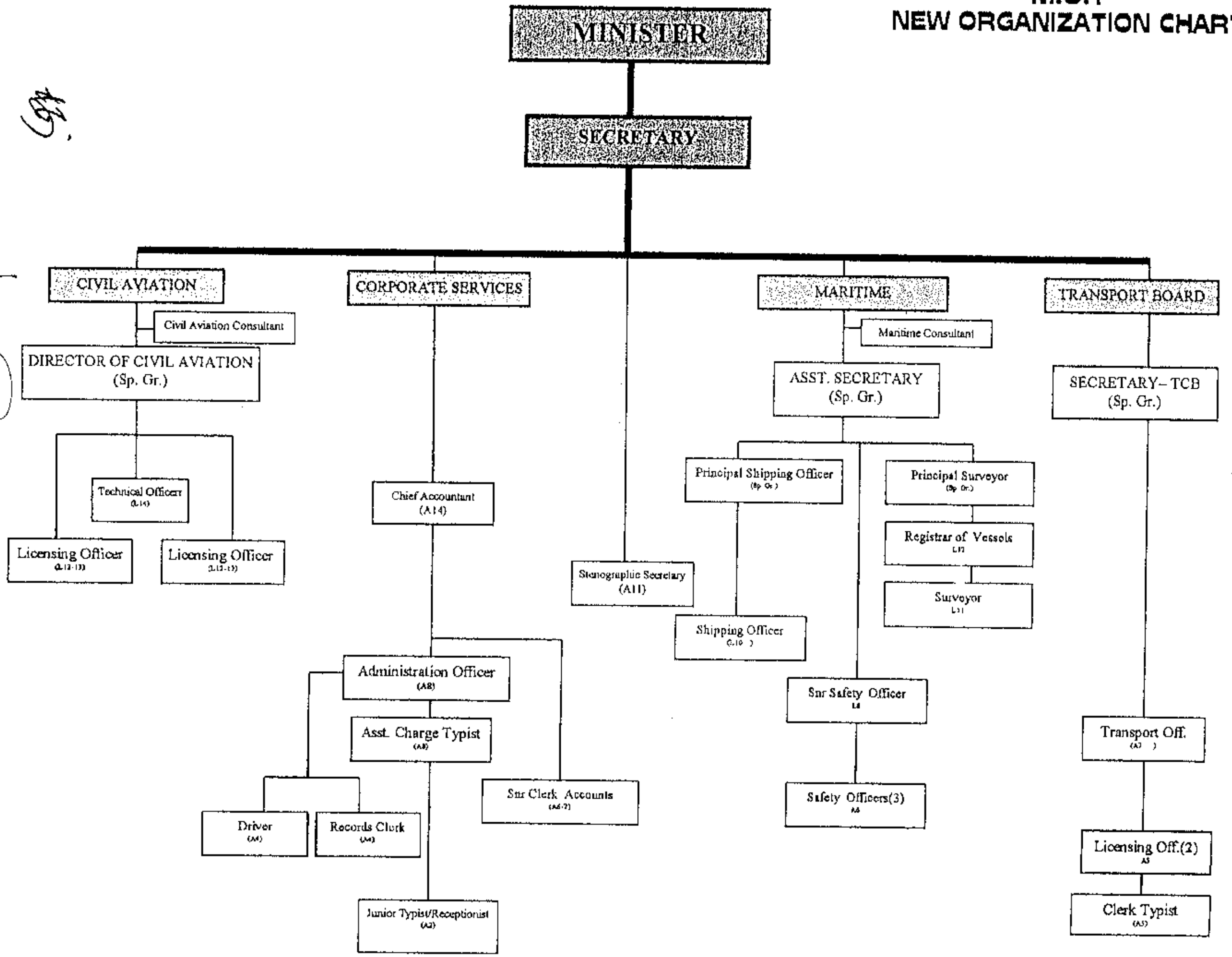
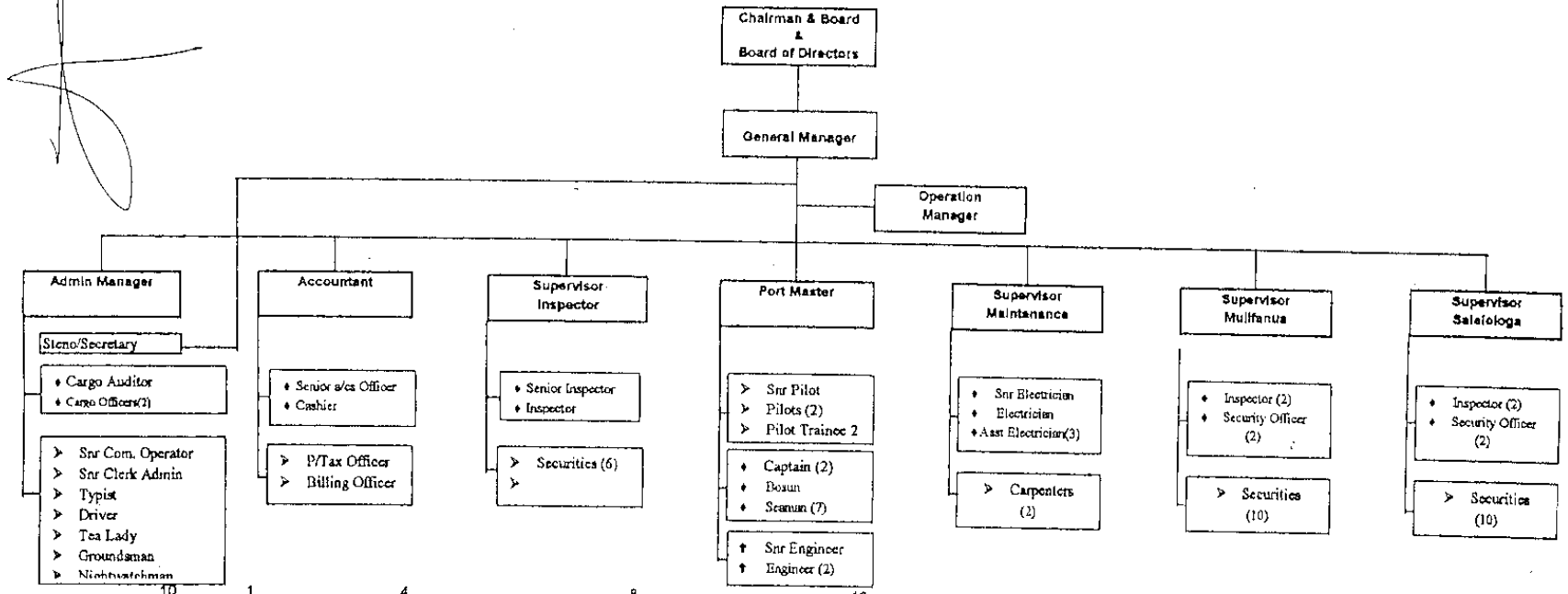
Annex-2

M.O.T
NEW ORGANIZATION CHART



SAMOA PORTS AUTHORITY

ORGANISATION STRUCTURE



Total Staff 77

JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

- Application	(Request made by the recipient country)
- Study	(Basic Design Study conducted by Japan International Cooperation Agency (JICA))
- Appraisal &Approval	(Appraisal by the Government of Japan and Approval by the Cabinet)
- Determination of the Implementation	(The Note exchanged between the Governments of Japan and recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study) using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the study

The aim of the Basic Design Study (hereafter referred to as "the Study") conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows :

a) Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.

b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.

c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.

d) Preparation of a basic design of the Project.

e) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The selected firm(s) carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA. The consultant firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

1) Japan's Grant Aid

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed. However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely, consulting, constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as the following:

(1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.

(2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.

(3) To secure buildings prior to the procurement in case the installation of the equipment.

(4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

9) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

Annex-4

Major Undertakings to be taken by Each Government

No	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
2	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
5	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●