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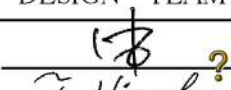
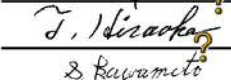
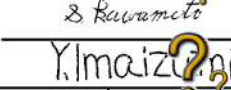
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FOR WORKING

(164 SHEETS INC. COVER)

CON-FERRED	BASIC DESIGN GROUP BASIC DESIGN TEAM		63,000 MT D/W TYPE BULK CARRIER	
	APPROVED		SPECIFICATIONS (GENERAL AND HULL PART)	
	CHECKED			
	CHECKED			
	DRAWN			
	SHIP NO.	CLASS	SCALE	DWG.NO.
	S-Z397	NK	***	C-9000



I - GENERAL PART



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I - GENERAL PART

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SECTION 1 GENERAL

1.1 INTENT OF SPECIFICATIONS

The Specifications and accompanying plans are intended to describe the details of technical matters in the Contract, i.e. performance, capacities, constructions of an ocean going diesel engine driven single screw bulk carrier, hereinafter called “the Vessel”.

If any discrepancy is found between the Specifications and the accompanying plans, the Specifications shall prevail.

In the event of conflict or inconsistency between the terms of these parts of the Specifications, the hull part shall prevail in respect of hull items, the machinery part in respect of machinery items, and the electric part in respect of electric items.

Where the word “or” is used in the Specifications to indicate that the use of alternative items will be permitted, it shall be understood to mean “at the Builder's option”.

Any item which is not expressly called for in the Specifications shall not be furnished in principle, but if it is required by the specified rules and regulations, it shall be furnished by the Builder without any charge to the Owner.

Any item mentioned twice or more in the Specifications shall be furnished or applied only once.

In general, the Vessel shall be built in accordance with the Specifications and any modifications and/or changes to the Specifications shall be agreed mutually by the Owner and the Builder, subject to adjustment of price, delivery, guaranteed figures and any other terms in the Contract and in the Specifications and those shall be confirmed by memorandum of discussions, letters, plans and/or available documents by both parties.

Also the Vessel shall be built in accordance with the Builder's practice with regard to other work than specified by the Specifications.

Spare parts shall be supplied by the Builder according to the Specifications to meet the requirements of the specified Classification Society, the regulatory bodies and manufacturer's standard.

Any additional spares required by the Owner shall be supplied by the Builder on the Owner's account.



1.2 OUTLINE OF THE VESSEL

The Vessel shall be of a single screw diesel engine driven ocean going bulk carrier suitable for carrying grain, coal, hot steel coil, long size steel, cement and ore (Density=3.0t/m³).

The Vessel shall have a raked stem with protruded bulbous bow and transom stern with mariner type stern frame having a hanging rudder.

Energy saving device shall be installed.

The Vessel shall have one (1) continuous upper deck with forecastle, engine room and accommodation deck house including navigation space shall be located aft as shown on the General Arrangement.

The Vessel shall be divided by seven (7) watertight transverse bulkheads into the following compartments as shown on the General Arrangement.

Fore peak tank (water ballast)

No.1 through No.5 cargo hold

Engine room

Aft peak tank (water ballast)

Double bottom shall be extended from collision bulkhead to aft peak tank bulkhead.

Fuel oil tanks, diesel oil tanks, water ballast tanks, top side tanks (water ballast), fresh water tank and drinking water tank shall be arranged as shown on the General Arrangement.

Lubricating oil sump tank etc. shall be arranged in double bottom under the engine room.

Lubricating oil sump tank shall be of triple bottom construction.

No.3 cargo hold shall be utilized as water ballast tank.

The cargo hold compartment shall be constructed with single hull with top side tanks and double bottom tanks with side hopper.

The Vessel shall have four (4) deck cranes for cargo gear on upper deck at center line.

The folding type cargo hatch covers shall be provided for each cargo hatch on upper deck.



The Vessel shall be able to load heavy cargoes into No.1, 3 and 5 cargo holds under the alternated condition and load/unload at different two (2) ports under the condition of the homogeneous cargo.

The Vessel including its material, workmanship and apparatus (machinery, equipment, piping, etc.) shall be complied with the requirements of the specified Classification Society, rules and regulations concerned and also shall be constructed in accordance with the Specifications and the Builder's/subcontractors' practices.



SECTION 2 CLASSIFICATION, RULE, REGULATION AND CERTIFICATE

2.1 CLASSIFICATION

The Vessel, including its hull, machinery, equipment and outfitings shall be constructed in accordance with the rules and regulations of the Classification Society and under special survey of the Classification Society's surveyors and shall be distinguished in the register by the symbol of :

NIPPON KAIJI KYOKAI (NK)

Classification Characters : NS* (CSR, BC-A, BC- X II , GRAB 20, PSPC-WBT,
EQ C DG) (ESP) (IWS) (PSCM) (IHM) / MNS*

Descriptive Note : Strengthened for heavy cargo loading where hold
Nos. 2 & 4 may be empty

Installations Characters : CHG, MPP, LSA, RCF, AFS

2.2 RULE AND REGULATION

The Vessel shall be registered under the flag of SINGAPORE.

The following rules and regulations effective at the date of signing the Shipbuilding Contract shall be applied :

- (1) Maritime Regulation of the Registered Country
- (2) Rules and Regulations for the Construction and Classification of Ships 2014
- (3) International Convention on Load Lines, 1966 and its PROTOCOL 1988
(incl. 2003 Amendment)
- (4) International Convention for the Safety of Life at Sea, 1974, its PROTOCOL 1978
and its PROTOCOL 1988
(incl. 1981, 1983, 1988, 1989, 1990, 1991, 1992, 1994, 1995, 1996, 1997, 1998,
1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008 and 2009
Amendments)
- (5) International Convention for the Prevention of Pollution from Ships, 1973
(Annexes I , IV, V and VI) and its PROTOCOL 1978
(incl. 1984, 1985, 1987, 1989, 1990, 1991, 1992, 1994, 1995, 1996, 1997, 1999, 2000,
2001, 2003, 2004, 2005, 2006 and 2009 Amendments and Annex VI Reg.13-Tier II
restriction of 2008 Amendment)



- (6) International Regulations for Preventing Collision at Sea, 1972
(incl. 1981, 1987, 1989, 1993, 2001 and 2007 Amendments)
- (7) Radio Regulations of International Telecommunication Union, Edition of 2012
- (8) International Convention on Tonnage Measurement of Ships, 1969
- (9) International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001
- (10) Rules of Navigation of the Suez Canal Authority, 1995
(incl. Tonnage Measurement Rules)
- (11) Rules and regulations governing navigation of Panama Canal and adjacent waters and rules for the measurement of vessels shall be applied as far as practicable
- (12) Pollution Prevention Regulation of USCG for foreign flag Vessel without certificate
 *Remarks :
 Concerning oil pollution prevention, marine sanitation and navigation safety regulations based on CFR TITLE 33 CHAPTER I, the following parts shall be applied to this Vessel.
 CFR TITLE 33
 CHAPTER I — COAST GUARD, DEPARTMENT OF HOMELAND SECURITY
 PART 155 OIL OR HAZARDOUS MATERIAL POLLUTION PREVENTION REGULATIONS FOR VESSELS
 PART 156 OIL AND HAZARDOUS MATERIAL TRANSFER OPERATIONS
 Subpart A - Oil and Hazardous Material Transfer Operations
 PART 159 MARINE SANITATION DEVICES
 PART 164 NAVIGATION SAFETY REGULATIONS only for Section 164.35 Equipment : All Vessels, item (g)
- (13) Australian Navigation Regulations, Marine Orders, Part 32
(Only for Access to Cargo Hold)
- (14) Maritime labour convention, 2006 (Title 3, Standard A3.1)
- (15) International Maritime Solid Bulk Cargoes Code (IMSBC Code)
- (16) Rules and regulations for bulk, grain, cargoes of SOLAS 1974
(“International grain code (Res. MSC. 23(59))”)
- (17) Performance Standard for Protective Coatings for Water Ballast Tanks
- (18) International Maritime Dangerous Goods Code (IMDG Code)
- (19) Regulation of In-Water Survey in the Classification Society’s Rule

Remarks :

Ballast water treatment system shall be installed.

The details of the ballast water treatment system shall be decided by the Builder.



2.3 CERTIFICATE

One (1) original and two (2) copies of the following certificates and documentations shall be obtained by the Builder and furnished to the Owner at the time of delivery of the Vessel.

When provisional documents are furnished at the time of delivery, the Owner and the Builder shall negotiate how to furnish the formal documents.

- (1) Provisional Certificate of Classification issued by the Classification Society
- (2) Provisional Certificate of Installations Registration issued by the Classification Society
- (3) Builder's Certificate issued by the Builder
- (4) Certificates for International Convention for the Safety of Life at Sea, issued by the Classification Society on behalf of the registered country as follows :
 - (a) Cargo Ship Safety Construction Certificate
 - (b) Cargo Ship Safety Equipment Certificate
 - (c) Cargo Ship Safety Radio Certificate
- (5) International Load Lines Certificate without Timber Freeboard issued by the Classification Society on behalf of the registered country
- (6) International Tonnage Certificate issued by the Classification Society on behalf of the registered country
- (7) Suez Canal Special Tonnage Certificate and Documentation for Panama Canal Special Tonnage issued by the Classification Society on behalf of the registered country
- (8) International Oil Pollution Prevention Certificate issued by the Classification Society on behalf of the registered country
- (9) International Sewage Pollution Prevention Certificate issued by the Classification Society on behalf of the registered country
- (10) International Air Pollution Prevention Certificate issued by the Classification Society on behalf of the registered country
- (11) International Anti-fouling System Certificate issued by the Classification Society on behalf of the registered country



- (12) Ship Sanitation Control Exemption Certificate issued by the Japanese Government
- (13) Register of Cargo Gear for New Zealand, Australia, Canada, India and Pakistan
- (14) Register of Ship's Lifting Appliance and Items of Loose Gear (Deck crane & Provision Crane) issued by the Classification Society
- (15) Cargo Hold Ladder Plan approved by the Gibson Minto & Aiton Pty. Ltd. of Australia
- (16) Certificate of Compliance with the IMSBC Code (Listed in the Group A and C (as far as practicable based on the Vessel's current equipment), and Coal listed in the Group B) issued by the Classification Society
(The certificate of compliance is to certify that the Vessel is suitable for the carriage in bulk of listed cargoes in the cargo holds stated in accordance with the provisions of the IMSBC Code. When the listed cargoes are actually transported, the compatibility between cargoes and paint etc. should be confirmed.)
- (17) Grain Loading Plan approved by the Classification Society
(inc. Untrimming End Calculation Sheets)
- (18) Test Certificate for Anchor, Anchor chain cable and Mooring rope issued by the Classification Society
- (19) Ballast Water Management Plan approved by the Classification Society
(only for Sequential-Method)
(including procedure of ballast water treatment)
- (20) International Energy Efficiency Certificate (IEE Certificate) issued by the Classification Society (Ship Energy Efficiency Management Plan (SEEMP) shall be prepared by the Owner.)
- (21) Other usual certificates including those for navigation light and magnetic compass issued by the NIPPON HAKUYOHIN KENTEI KYOKAI and magnetic compass adjustment table issued by the Builder
- (22) Document of Compliance for Special Requirements for Ship Carrying Dangerous Goods issued by the Classification Society
- (23) Shipboard Oil Pollution Emergency Plan approved by the Classification Society
- (24) Statement of Fact for Stern Tube Lubricating Oil (EAL) and Seal Ring of the Stern Tube Sealing Device issued by the Classification Society

Remarks :

Certificate of Ship's Nationality and Radiotelephones Station etc. issued by the registered country to be obtained by the Owner.



SECTION 3 PARTICULARS

3.1 PRINCIPAL DIMENSION

Length, overall	abt. 199.9 m
Length, between perpendiculars	195.00 m
Breadth, moulded	32.24 m
Depth, moulded	19.15 m
Designed loaded draught, moulded	11.30 m
Scantling draught, moulded	13.40 m

3.2 DEADWEIGHT AND TONNAGE

Deadweight at designed loaded draught	abt. 50,235 M.T.
Deadweight at assigned loaded draught	abt. 62,835 M.T.
Gross tonnage (I.C.T.M., 1969)	abt. 36,400

As for the definition of deadweight, refer to SUBSECTION **6.2 DEADWEIGHT**.



3.3 CAPACITY

Cargo hold and tank capacities (100%) shall be as follows :

Cargo Holds (Grain)	abt. 80,000 m ³
(Bale)	abt. 75,800 m ³
Fuel oil tanks	abt. 2,150 m ³
Diesel oil tanks	abt. 380 m ³
Fresh water tank	abt. 320 m ³
Drinking water tank	abt. 320 m ³
Water ballast tanks (incl. No.3 cargo hold)	abt. 34,000 m ³
Dirty water tanks	abt. 440 m ³



3.4 SPEED, FUEL OIL CONSUMPTION AND ENDURANCE

Trial speed at normal output of main engine on the Builder's favourable draught and trim condition

15.1 knots

Service speed on the designed loaded draught (11.30 m moulded) at normal output of main engine with 15% sea margin

abt. 14.5 knots

Designed fuel oil consumption (for main engine only), at normal rating on the basis of fuel oil of which net calorific value of 40,600 kJ/kg

abt. 26.0 tons/day

Note:

This consumption figure shall be subject to a tolerance margin of five (5)%
(Complying with MARPOL 73/78 ANNEX VI Reg.13-Tier II restriction)

Endurance at the above-mentioned service speed calculated from above-mentioned fuel oil consumption and aforementioned fuel oil capacity excluding diesel oil under the following conditions

Fuel oil filling ratio 0.90

Fuel oil specific gravity 0.98

abt. 24,600 sea miles

Designed fuel oil consumption (for main engine only), at 14.0 knots with 15% sea margin on the designed loaded draught on the basis of fuel oil of which net calorific value of 40,600 kJ/kg (for reference)

abt. 23.0 tons/day

Note:

This consumption figure shall be subject to a tolerance margin of six (6)%
(Complying with MARPOL 73/78 ANNEX VI Reg.13-Tier II restriction)

Endurance at 14.0 knots with 15% sea margin on the designed loaded draught, calculated from above-mentioned fuel oil consumption and aforementioned fuel oil capacity excluding diesel oil under the following conditions

Fuel oil filling ratio 0.90

Fuel oil specific gravity 0.98

abt. 26,800 sea miles



3.5 MAIN ENGINE AND PROPELLER

Main engine : MAN B&W 6S50ME-B9.3 (Japanese make) 1 set
Maximum continuous rating 7,560 kW × 99.0 min⁻¹
Normal output rating 6,425 kW × 93.8 min⁻¹ (85% M.C.R.)

High-load optimize shall be applied.

Propeller : Solid type, Nickel Aluminium Bronze casting 1 set

Neither spare propeller nor spare propeller shaft shall be provided.

As for detail Specifications for the above-mentioned items and other machineries in engine room, refer to **III- MACHINERY PART**.



SECTION 4 COMPLEMENT

Accommodations shall be provided in accordance with the accompanying table :

Accommodations of all persons onboard shall be classified as follows, in respect of furnishing, fitting facilities and so on to provide a suitable ranking of accommodations as described in **II - HULL PART**.

Department			Deck Part		Engine Part		Business Part	
Division	Class	No.	Ranking	No.	Ranking	No.	Ranking	No.
Officer	Captain	2	Captain	1	Chief eng.	1	—	
	Senior	2	Chief off.	1	1st eng.	1	—	
	Junior	4	2nd off. 3rd off.	1 1	2nd eng. 3rd eng.	1 1	—	
	Sum	8	4		4		—	
Crew	Petty officer	3	Boatswain	1	No.1 Oiler	1	Chief cook	1
	Rating crew	10	A. seaman O. seaman	3 3	Oiler Wiper	2 1	Cook	1
	Sum	13	7		4		2	
Officer and crew total							21 Persons	
Spare	Officer (Junior officer class)						2 Persons	
	Officer (Pilot) (Junior officer class)						1 Person	
	Crew (Rating crew class)						1 Person	
Grand total							25 Persons	

As for the total number of persons for life saving appliance,
refer to **3.4 LIFE SAVING EQUIPMENT** of **II - HULL PART**.



SECTION 5 TEST AND TRIAL

5.1 GENERAL

All test and trial shall be conducted in accordance with the requirements of the specified Classification Society and other regulatory bodies and the Builder's practice.

The Builder shall submit to the Owner and/or regulatory bodies the detailed schedule or memorandum for the test items mentioned hereinafter in due time prior to those tests.

The Owner's supervisor shall attend the inspections and tests when necessary. If the Owner's supervisor is unable to attend, such inspections and tests shall be performed in the presence of the Builder's inspector and/or the Classification Society's surveyor if required, and such party or parties attended being satisfied, the Owner shall accept the results as submitted.

5.2 SHOP TEST

The Vessel's machinery, equipment, fittings, constructions and so on shall be tested or inspected before installation onboard at the Builder's shops, subcontractors' shops or manufacturers' factories, etc., in accordance with the requirements of the specified Classification Society and/or the Builder's and/or the manufacturers' standard test schedules.

The scope of tests or inspections which necessitate the attendance of the Owner's supervisor shall be determined by the Owner's supervisor and the Builder on the detailed schedule prepared by the Builder.

As regards the substance of each test, refer to the descriptions in **II - HULL PART**, **III - MACHINERY PART** and **IV - ELECTRIC PART** respectively.



5.3 CONSTRUCTION TEST AND ONBOARD TEST

The constructions, machinery, apparatus and fittings shall be checked and examined onboard the Vessel to confirm that those are satisfactory for the purposes intended.

The items for which construction tests or onboard tests are necessary shall be inspected and/or tested according to the respective requirements of the regulatory bodies and the Builder's practice.

The Owner's supervisor and the Builder shall, on the basis of the Builder's detailed schedule, determine the scope of tests or inspections to be attended by the Owner's supervisor.

They shall also determine the extent of the tests to which the Owner's supervisor shall accept tests or inspections on the basis of subsequent reports without attendance at the tests.

As regards the substance of each test, refer to the descriptions in **II - HULL PART**, **III - MACHINERY PART** and **IV - ELECTRIC PART** respectively.

5.4 SEA TRIAL

When the Vessel is substantially completed, the Vessel shall be subjected to the sea trial as described below, provided that minor items of work which, at the discretion of the Owner, may be left unfinished until the trial are over.
(No final docking of the Vessel shall be carried out.)

The sea trial shall be carried out by and at the expense of the Builder who is to provide all necessary material and services for the operation of the Vessel, during the sea trial and the Vessel's trip to and from the Builder's shipyard.

The sea trial shall be carried out in accordance with the sea trial schedule submitted by the Builder and approved by the Owner.

The sea trial shall be carried out on the Builder's favourable draught and trim condition, under the weather condition which is deemed favourable enough by the judgement of the Builder.

During the sea trial, heavy fuel oil and diesel oil shall be used for main engine.



The trial consists of the following tests.

(1) Progressive speed test

The test shall be made under the following machinery loads, and each test shall include one (1) consecutive run alternating in direction, one (1) up and one (1) down, over about one (1) mile on the measured test course.

The Vessel's speed shall be measured by using "Differential Global Positioning System (DGPS)".

Machinery load : 1/2 load of maximum output
3/4 load of maximum output
Normal output
Maximum revolution
(Revolution corresponding to maximum output or revolution permitted by the engine manufacturer, whichever is less)

(2) Endurance test

The endurance test shall be carried out at maximum revolution for one (1) hour including above progressive speed test run at maximum revolution.

(3) Maneuvering test

The following tests shall be carried out to check maneuverability of the Vessel.

(a) Crash stop astern test

Revolution of : From ahead maximum revolution to astern revolution
main engine corresponding to about 70% of ahead maximum revolution

(b) Turning test of 360 degrees with helm angle of 35 degrees port and starboard

Revolution of : At ahead maximum revolution
main engine

(c) Zig-zag (Z) test of helm angle/heading angle (10° /10° and 20° /20°)

Revolution of : At ahead normal revolution
main engine



(4) Other test at sea

The following tests shall be conducted.

- (a) Steering gear test according to the requirement of the Classification Society
- (b) Anchor windlass test (refer to page **H1 – 5e**)
- (c) Adjustment of navigation equipment and instrument such as magnetic compass, etc.
- (d) Starting test of main engine
- (e) Minimum revolution test of main engine
- (f) Emergency trip test of main engine
- (g) Torsional vibration measurement for propeller shafting

Fuel oil consumption of main engine shall be measured for reference.

(5) Maneuvering data

During the sea trial, maneuvering data including aforementioned item (3) shall be obtained for drawing up the “MANEUVERING INFORMATION” which is required by the US rules as follows,

CFR 33 PART 164.35

Equipment : All vessels ; item (g) in the rule book



5.5 LIGHT WEIGHT MEASUREMENT AND INCLINING TEST

When the Vessel is substantially completed except for minor items of work, the light weight measurement and inclining test of the Vessel shall be carried out by the Builder.

5.5.1 Light weight measurement

The light weight measurement shall be carried out by reading the draught of the Vessel and measuring specific gravity of sea water and by investigation of weights to be added or to be deducted, in the presence of the Owner's supervisor or the person who is authorized by the Owner.

The draught of the Vessel shall be measured at the draught marks on both sides of stem, stern and midship.

Displacement of the Vessel at this light weight measurement shall be determined by reading the draught-displacement table on the corresponding draught obtained from the measured draught.

The correction for trim, deflection of the Vessel and specific gravity of sea water at the measurement shall also be made on the calculation.

If any superfluous weight is onboard the Vessel or any item belonging to the light weight is not onboard the Vessel at the time of the light weight measurement, such weight shall be adjusted by the calculation.

The calculation of the light weight and deadweight shall be made by the Builder and verified by the Owner's supervisor in order to determine "Light weight" and "Deadweight".

5.5.2 Inclining test

The inclining test shall be carried out in the presence of the Owner's supervisor or the person who is authorized by the Owner and the Classification Society's surveyor, and then the position of the center of gravity of the Vessel in light condition shall be determined by the Builder's calculation based on the test results.

The inclining test shall be conducted by shifting solid weight onboard and by measuring the Vessel's heel using "U-tube" water level.

The inclining test shall be carried out at pier of the Builder's yard.



5.6 DISPENSATION

For the second and successive sister Vessels (incl. other owner's Vessel), the following test may be dispensed with subject to approval of the Classification Society and other regulatory bodies.

- (1) Progressive speed test at 1/2 load of maximum output of main engine
- (2) Turning test
- (3) Zig-zag test
- (4) Torsional vibration measurement for propeller shafting
- (5) The test for the purpose of making the "MANEUVERING INFORMATION" required by the US rule
- (6) Inclining test



SECTION 6 TECHNICAL GUARANTEE

6.1 GUARANTEED FIGURE

The Builder shall guarantee the specified figures of the following items under the conditions mentioned in this section.

DEADWEIGHT : 62,835 metric tons at assigned loaded draught

TRIAL SPEED : 15.1 knots at normal output of main engine on the Builder's favourable draught and trim condition

6.2 DEADWEIGHT

The Builder shall guarantee that the deadweight of the Vessel upon completion is not less than the specified figure in sea water of specific gravity of 1.025 on the draught specified above.

“Deadweight” is the difference between the fully loaded displacement and the light weight.

“Fully loaded displacement” is the total displacement at the draught specified above in sea water including shell and all appendages and shall be determined from the relation between draught and displacement, under the conditions of no trim, no heel and no deflection of the Vessel.

“Light weight” is the weight of the Vessel completed, and shall consist of weights of hull, machinery and electric parts, including all equipment and fittings required by the rules, regulations and these Specifications, and shall be determined by the light weight measurement described in SUBSECTION

5.5 LIGHT WEIGHT MEASUREMENT AND INCLINING TEST.

The guaranteed figure of the deadweight shall be adjusted due to any alteration by the Owner's requirement beyond the scope of the original specifications described herein.



The deadweight shall include the following weights besides the cargo weight :

- (1) Fuel oil, diesel oil, lubricating oil and water in tanks, pipes and machinery except those included in light weight as noted below
- (2) Men and their effects onboard
- (3) All consumable stores, chandlery, charts and books, cook's and steward's utensils, napery, blankets, covers, etc.
- (4) Spare parts in addition to those required by the rules and regulations
- (5) Owner furnished equipment, if any, in addition to those required by the rules and regulations
- (6) Four (4) sets of grab buckets

The light weight shall consist of the followings :

Other items and details not shown hereunder shall follow the standard scope of light weight established by the Society of Naval Architects of Japan.

- (1) Weight of hull, machinery and electric part including all equipment and fittings required by the rules, regulations and these Specifications, but not including the above-mentioned items belonging to the deadweight
- (2) Water and oil in main machineries and pipes directly related to the main propulsion system as enumerated under
 - (a) Lubricating oil in main engine, main generator engines, lubricating oil coolers for main and generator engines and circulating piping from sump tank to each engine
 - (b) Sea water in air cooler for main and generator engines, fresh water coolers for main and generator engines and circulating piping from sea chests to overboard
 - (c) Fresh water in main engine, generator engines, fresh water coolers for main and generator engines and closed circulating piping from cooling fresh water pump to each engine



6.3 TRIAL SPEED

The Builder shall guarantee that the trial speed of the Vessel is not less than the specified figure aforementioned.

The measured speeds at the sea trial shall be corrected to that on calm sea under no wind and no current condition in accordance with Taniguchi-Tamura method.

The trial speed shall be determined on the “Speed-Power Curve” furnished by the Builder being based on the above-mentioned correction, as the speed on the curve corresponding to the specified horse power of main engine.



SECTION 7 BUILDING PROCEDURE

7.1 SUBCONTRACTING

The Builder may, at its sole discretion and responsibility, subcontract any portion of the constructing work of the Vessel to any domestic and/or overseas subcontractors including, but not limited to, the affiliated companies of the Builder.

7.2 WORKING PROCEDURE

The Builder shall submit a principal construction schedule to the Owner's supervisor in early stage of construction after signing of the Contract and these schedules shall be followed up with the cooperation of the Owner and the Builder.

7.3 PLAN

7.3.1 Wording, unit, etc. used in the plan

“The plan” stated hereunder in the Specifications shall mean those which are to be submitted to the Owner, such as the Contract plans, plans for approval, finished plans, instruction books and so on.

Generally all plans shall be written in English.

The units used in these plans shall normally be International System of Units (SI).

The symbols for valves, fittings, method of weld and electrical components on all drawings shall be in accordance with the Builder's or the subcontractor's standard.

The graduation on gauges or meters onboard the Vessel shall be in SI.

Instruction books shall be prepared also in SI in general.

The plans including finished plans shall be shown in suitable scales according to the Builder's usual practice, and shall be in white print and/or blue print.

7.3.2 Contract plan

The following plan shall accompany and form a part of the Specifications.

General Arrangement (DWG. No. C-0200)



7.3.3 Plan for approval

Prior to starting work, the Builder shall submit the specified working plans to the Owner and/or the regulatory bodies for approval in due time of design and construction schedules.

The list of plans for approval shall be submitted to the Owner in early stage of designing.

Plans for approval shall be submitted to the Owner with two (2) copies (Owner --- 1, Owner's supervisor --- 1) and "comment sheet" shall be returned to the Builder together with the Owner's approval stamp with signature on the sheet.

The Owner shall return the comment sheet within three (3) weeks after dispatching the plans from the Builder.

When the Owner finds it impossible to return the comment sheet within the specified period, the Owner shall inform the Builder without delay and they shall discuss on the matter.

When the Builder does not receive the comment sheet or information within the above-mentioned period, the Builder may proceed with the work as it is deemed to be approved by the Owner.

When any other plans or technical information such as detailed working plans are requested by the Owner or the Owner's supervisor in addition to the list of plans, the Builder shall show or submit them for reference, unless the said plans or information involve some confidential matter of the Builder or manufacturers.

The Builder's standard plans and subcontractors' or manufacturers' plans may be used as working plans or plans for approval with or without modifications.

The plans for the Owner's supply items shall not be submitted to the Owner.

For the second and successive sister Vessels for the same Owner, the submission of plans for the Owner's approval may be dispensed with so far as there involves no alteration of the design.



7.3.4 Finished plan

The list of finished plans or drawings shall be submitted to the Owner in due course.

The Builder shall furnish the Owner at the delivery of the Vessel with three (3) **hard and soft (CD-ROM)** copies of each finished plan written in English.

Two (2) copies of each of the above-mentioned three (3) copies shall be furnished aboard the Vessel.

Instruction book shall be furnished by the Builder as follows :

	To Owner	To Vessel
When written in both English and Japanese	1	2

or

English edition	1	2
-----------------	---	---

The following plans, one (1) copy each, mounted in wooden frame with transparent plastic cover shall be installed aboard the Vessel at such locations as designated by the Owner's supervisor.

General Arrangement

Capacity Plan with Deadweight scale

Pumping Plan (incl. Arrangement of fuel oil and diesel oil pipes concerning USCG requirement)

※ Fire Control and Life Saving Plan (depending on IMO standard mark)

※ Muster plan (Owner supply)

※ ----- Number of copy shall be decided as per rule requirement.

One (1) copy of maneuvering information sheet concerning USCG requirement and damage control plan shall be furnished with card case in wheelhouse.



7.4 SUPERVISION

The Vessel shall be constructed and equipped under the supervision of the Classification Society's surveyor and the Owner's supervisor according to the Builder's construction schedule.

The matters requested by the crew of the Vessel shall be submitted to the Builder after summarized by the Owner's supervisor.

7.5 DELIVERY

The Vessel shall be delivered by the Builder to the Owner at the shipyard, unless otherwise agreed, not later than the date of delivery defined in the Contract.

When the Vessel has been completed ready for service, has passed the tests and has been certified as prescribed in the Specifications, the Vessel shall be delivered to the Owner.



SECTION 8 OWNER FURNISHED EQUIPMENT

- (1) The following articles shall be supplied and stowed directly on the Vessel by the Owner with necessary instruction books, and the Builder is not responsible for these articles.
 - (a) Nautical instruments, in addition to those specified in the Specifications
 - (b) All bedding (blankets, covers, etc., except mattresses, pillows and covers)
 - (c) All napery (serviette etc.)
 - (d) All cook's and steward's utensils (silver wares, dishes, glasses, pots, pans, etc.)
 - (e) All chandleries (soaps etc.)
 - (f) All charts, sailing books and flags in addition to those specified in the Specifications
 - (g) All consumable stores
 - (h) Medical and surgical instruments as well as medicines
 - (i) Mooring ropes in addition to those specified in the Specifications
 - (j) Fireman's outfit in addition to those specified in the Specifications
 - (k) Boatswain's and work shop stores and stationery other than those specified in the Specifications
 - (l) All lubricants
 - (m) Canvas covers except the manufacturer's or the Builder's supply
 - (n) Portable apparatuses for IMSBC Code such as a gas detector(s) and litmus papers, etc.
 - (o) Personal protection tool from dust of the cargo for IMSBC Code such as protective clothing, goggles or other equivalent dust eye-protection and dust filter masks, as necessary
 - (p) Suez Canal searchlight
- (2) The Builder's crane will assist in such transportation to the Vessel in accordance with the schedule which is decided previously by the Owner and the Builder.



SECTION 9 MATERIAL AND SUBCONTRACTOR

The material and apparatus shall be in accordance with the Japanese Industrial Standard (JIS) or equivalent standard and/or Imabari Standard (IS) and/or the manufacturer's standard, except otherwise specified.

The Builder may employ subcontractors for execution of the work of the Vessel and may purchase the material and apparatus from the subcontractors including part manufacturers under the responsibility of the Builder.

Subcontractors of material and apparatus to be purchased shall be chosen at the Builder's option, as far as their products are in compliance with the requirements of the Classification rules and other regulations described in the Specifications.

Those products shall be made in accordance with the subcontractors' practice having their option for adopting part manufacturers.

The Builder shall submit to the Owner the list of subcontractors for major items such as machinery, equipment, outfittings, etc.

The Contract shall be based on the condition that those subcontractors will be employed. When two (2) or more subcontractors on one (1) item are proposed by the Builder in the list, the Builder may choose one (1) of them.

When the subcontractors specified in the Specifications and above-mentioned lists are changed at the Owner's request, the Vessel's Contract price shall be adjusted according to the difference in prices.

When any material, apparatus and equipment specified in the Specifications can not be obtained, the Builder shall be allowed to use available substitutes with approval of the Owner.

As regards the warranty of quality, the Contract clause shall be referred to.

Any details of the particulars including material, described in the Specifications, for subcontractors'/manufactures' machinery and equipment may be subject to change due to the current standards of those subcontractors/manufactures finally adopted.



II - HULL PART



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II - HULL PART

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SECTION 1 HULL GENERAL

1.1 HULL FORM

The Vessel's lines and propeller shall be determined by the Builder in view of sea going characteristics.

Bulbous bow shall be provided at the stem under water to improve the resistance characteristics.

Estimated power curves shall be submitted to the Owner prior to the official sea trial.

1.2 DECK HEIGHT, ETC.

(a) Deck height (at center line) :

Upper deck to Forecastle deck	(at F.P.)	3.000 m
	(at Fr. No. 228)	2.800 m
Upper deck to A deck		3.000 m
A deck to B deck		2.700 m
B deck to C deck		2.700 m
C deck to D deck		2.700 m
D deck to Navigation bridge deck		2.700 m
Navigation bridge deck to Compass deck		2.600 m

(b) Sheer :

On upper deck ; Nil on center line (Due to camber only)



(c) Deck camber :

On upper deck ; Straight camber with flat top of 4.00 m breadth,
0.30 m for 32.24 m breadth moulded

On forecastle deck ; Straight camber with flat top of 4.00 m breadth,
0.30 m for 32.24 m breadth moulded

On other decks above upper deck

In accommodation house ; Nil
(incl. engine casing top)

On exposed decks ; 7.5/1000 (Slope ratio)

On decks below upper deck ; Nil

1.3 **FREEBOARD**

The Vessel shall be designed to meet the requirement of International Convention on Load Lines, 1966 for type “B” ship.

The freeboard marks without timber freeboard marks will be positioned at the level corresponding to the assigned draught and to the loaded draught at the deadweight of not more than **49,999M.T** after approved by the Classification Society on behalf of the registered country.

1.4 **TRIM AND STABILITY**

The Vessel shall be designed to be afloat approximately on an even keel or slightly trim by the stern when loaded to the designed loaded draught with cargo, proper amount of bunker, crew stores, fresh water and water ballast aboard, in departure condition.

Preliminary trim and stability calculation sheets shall be submitted to the Owner to demonstrate that the Vessel will have suitable trim in normal service conditions.

The Vessel shall have positive metacentric heights under usual service conditions.

Loading conditions shall be designed as follows;



(1) Ore alternated loading

Slack loaded cargo holds: Nos. 1, 3 and 5 cargo holds
Empty cargo holds : Nos. 2 and 4 cargo holds
Cargo Density : 3.0 t/m³
Bunker : Half bunker (45% consumption)
Draught : Not more than assigned draught

(2) Homogeneous loading

Stowage factor : about 46 CF/LT
Bunker : Half bunker (45% consumption)
Draught : Not more than assigned draught

(3) Cement alternated loading

Slack loaded cargo holds: Nos. 1, 3 and 5 cargo holds
Empty cargo holds : Nos. 2 and 4 cargo holds
Stowage factor : 26 CF/LT
Bunker : Half bunker (45% consumption)
Draught : Not more than assigned draught

(4) Two (2) ports loading/unloading

Full loaded cargo hold : Nos.1, 3 and 5 cargo hold or Nos.2 and 4 cargo hold
Empty cargo hold : Nos.2 and 4 cargo hold or Nos.1, 3 and 5 cargo hold
Stowage factor : Homogeneous cargo on assigned draught
Bunker : Half bunker (45% consumption)

(5) Grain cargo loading

Stowage factor : 42 CF/LT ~ 65 CF/LT
Bunker : Half bunker (45% consumption)
Draught : Not more than assigned draught

As regards the description of hot steel coil loading, refer to
Subsection **2.2.8 DOUBLE BOTTOM.**



1.5 CONSTRUCTION TEST

Tight test for the hull structure in way of tank and watertight compartments in main hull shall be carried out by air in general, using a detective reagent on the building berth in accordance with the requirement of the Classification Society and the Builder's practice.

Hydrostatic test by sea water shall be carried out after launching as required by the Classification Society.

Tight test for rudder, non built-in tanks, etc. shall be carried out as required by the Classification Society or according to the Builder's practice.

Weathertight work shall be hose tested with water jet at the pressure specified by the Classification Society and/or the Builder's practice.

Radiographic or ultrasonic examination for welding shall be carried out in accordance with the Builder's practice under the approval of the Classification Society.

1.6 EQUIPMENT TEST

1.6.1 Shop test

Major equipment, such as deck machinery, refrigerating plant, etc. shall be tested according to the manufacturer's usual practice by using available facilities in the manufacturer's shop.

In general, these tests shall be carried out by the manufacturers on their responsibility without attendance of the Owner's supervisor and/or the Builder's inspector unless the Owner's supervisor request to attend such test.

Notice of approximate date of shop test shall be given to the Owner's supervisor two (2) weeks in advance and accurate date one (1) week in advance.



1.6.2 Onboard test

Anchor windlass test shall be carried out during sea trial.

The test shall consist of hoisting/dropping operation test and brake test which shall comply with the requirements of the Classification Society.

Dropping operation test shall be conducted so that anchor shall be lowered gradually from the housing position to water level, then immediately dropped into water.

Steering gear test shall be carried out during sea trial.

The test shall be conducted at maximum revolution of main engine in compliance with the requirements of the Classification Society.

Air conditioning tests shall be carried out, but cooling test in winter season and heating test in summer season may be omitted.

Cooling test of refrigerating plant for refrigerating provisions chamber shall be carried out. The compartments are cooled down to the specified temperature and then the refrigerating machine shall be stopped for six (6) hours to check the effectiveness of insulation.

Piping shall be tested under working conditions after installation.

Hydrostatic test for piping systems shall be carried out as required by the Classification Society.

Operation test or demonstration test shall be carried out for the following items to check and examine their satisfactory running.

Equipment and outfitting : Lifeboat davits, davit for rescue boat, accommodation ladder, etc.

Deck machinery : Deck crane, Windlass, mooring winch, emergency fire pump, provision crane, etc.



SECTION 2 HULL CONSTRUCTION

2.1 GENERAL

2.1.1 Scantling and material

The hull shall be of welded construction and the scantlings of the structural members shall be in compliance with the requirements of the Classification Society for the Vessel which having the scantling draught of 13.40 m (moulded).

Scantlings not specified by the Classification Society shall be in accordance with the Builder's practice.

Large sized steel plates may be used for the construction of hull as far as practicable to the Builder.

Structural steel of hull construction shall be of mild steel and/or high tensile steel approved by the Classification Society, and steel including castings and forgings shall be of qualities complying with the requirements of the Classification Society.

Steel materials not specified by the Classification Society shall be in accordance with Japanese Industrial Standard (JIS) or equivalent standard or the Builder's practice.

Any special strengthening and quality of material exceeding those approved by the Classification Society, except those specially noted in the Specifications and the Plans submitted to the Owner for approval, shall be applied on the Owner's account, so long as the work will not disturb the Builder's working schedule.



2.1.2 Construction practice

Works shall be executed under the survey of the Classification Society and in accordance with the Builder's current construction method including those specially mentioned hereunder.

(1) Erection

(a) Large sized assembly unit :

Size of blocks shall be as large as practicable within the limit of the Builder's facilities.

(b) Advance outfitting :

Trunks, pipes, valves, pumps, motor seats, deck fittings, etc. which are to be fitted to the hull structure shall be fitted as far as practicable during subassembly with necessary precaution being taken for the protection of them from damage.

(2) Marking

Numerically controlled marking and/or Electro-photo-marking and/or Optical marking shall be generally applied for structural members according to the Builder's practice.

Automatic cutting machines shall be applied for a part of hull structural members according to the Builder's practice and marking shall not be executed in general. However, in some cases marking may be executed with hand.

(3) Cutting

Cutting of steel structural material shall be executed by means of gas cutting and numerically controlled oxygen plasma jet cutting system.

(4) Bending

Bending of plates, bars and sections shall be executed by means of press, roller and line heating/water cooling as case may be.



(5) Welding

Electric welding shall be applied extensively for the connection of steel structural members.

Welding procedure including edge preparation and welding scheme shall be in accordance with the Builder's current practice which has been approved by the Classification Society.

Manual welding shall be executed with coated electrode.

Automatic and semi-automatic welding shall be executed by the following methods as the case may be,

Automatic welding

Submerged arc welding

- each side welding

- one side welding

- including CO₂ gas one side welding

Electro-gas welding

Electro-slag welding

- CO₂ gas welding (mechanical automatic welding)

Semi-automatic welding

Gravity welding

CO₂ gas welding

- one side welding

- fillet welding

Back chipping shall be carried out by arc air gouging where necessary.

Clamps, dogs and other suitable process of the Builder's practice shall be applied for execution of welding.

Outstanding distortion of hull structure after fabrication due to welding shall be cured by means of cold press, line or spot heating/water cooling or hammering as the case may be in accordance with the Builder's practice.

(6) Stress relieving

Stress relieving of hull structure shall not be executed except cast parts of stern frame and rudder which shall be annealed before fabrication at the casting shop.



(7) Miscellaneous

Temporary access opening may be provided on shell, bulkheads, decks, walls, etc. for the convenience of work and shall be closed by welding under the approval of the Classification Society.

Eye plates or similar small pieces fitted to the hull structure for hoisting the structure, staging and so on may be left so long as they are not injurious against appearance and intended service of the Vessel.

2.1.3 Slot and hole

Slots, air holes, drain holes, scallops and lightening holes shall be provided in accordance with the Builder's practice and under the approval of the Classification Society.

Longitudinal, transverse and horizontal stiffening members shall have air holes and/or drain holes in adequate position as far as the strength of these members are not adversely affected.

Drain holes in bottom longitudinal at the aftermost bay in double bottom tank around bell mouth shall have bigger area than usual.

Scallops shall be arranged where necessary for the execution of welding.

2.1.4 Local strengthening

Carling or suitable stiffening shall be provided, if necessary, under deck machinery, bollards, boat davits, etc.



2.2 MAIN HULL

2.2.1 General

Main hull consists of shell, upper deck, topside tank and double bottom.

Topside tank and double bottom shall be generally constructed with longitudinal framing system except double bottom in engine room and etc.

Longitudinally profiled steel plate may be used, if necessary.

2.2.2 Shell plating

Shell shall be plated with the thickness approved by the Classification Society and the thickness shall be tapered from midship part to both ends in compliance with the requirements of the Classification Society.

Stem throughout shall be of fair formed welded steel plate construction with bulbous form under water line and well raked forward with round face above water line.

Stem shall be provided with suitable breast hooks and shall be connected to shell and keel plating.

Shell plating in way of tug push marks shall be reinforced (Pushing force 50 ton).

Bottom forward strength shall be decided in compliance with the requirements of the Classification Society.

2.2.3 Deck plating

Upper deck shall be plated with the thickness approved by the Classification Society and the thickness shall be tapered from midship part to both ends in compliance with the requirements of the Classification Society.

Deck plating shall be increased in thickness or reinforced with outside doubling plate for opening where required by the Classification Society.

Cargo hatch openings on upper deck shall have well-round corners smooth edges for prevention from stress concentration.

Gunwale connection shall be of “T” connection type as approved by the Classification Society.

Lower decks and platforms except crown of tanks shall be non-tight construction.



2.2.4 Bulkhead

Transverse bulkheads shall be arranged as shown on the General Arrangement.

Transverse bulkheads within cargo hold compartments shall be of steel welded vertical corrugated type and shall be provided with upper and lower bulkhead stools.

Fore and aft bulkheads of No.3 cargo hold shall be designed as deep tank.

Engine room forward and peak tank bulkhead shall be of flat plate type with vertical stiffeners.

Other bulkheads shall be of steel welded construction of flat plate type and shall be of watertight, oiltight, gastight or non-tight according to their respective character.

2.2.5 Frame, beam and stiffener

Frame, beam and stiffener shall be of slab, rolled section or built-up section.

Hold frames shall be transverse system.

Beams of upper deck shall be longitudinal system supported by deck transverse and those for the space between hatch opening shall be of transverse system.

Longitudinal stiffeners shall pass through transverse bulkhead with slot which shall be closed with lapped plate by welding in accordance with the Builder's practice.

2.2.6 Web construction, pillar and girder

In engine room, adequate web frames shall be provided in conjunction with web beams and pillars.



2.2.7 Topside tank

Topside tank in way of cargo holds shall be subdivided into tanks as shown on the General Arrangement.

Topside tank construction shall be generally longitudinal framing system with transverse web rings.

2.2.8 Double bottom

Double bottom under cargo holds and engine room shall be subdivided into tanks and cofferdams as shown on the General Arrangement.

Double bottom with bilge hopper in way of cargo holds shall be longitudinal framing system with transverse floor and gradually transferred into transverse framing system in engine room.

Transverse floor in engine room shall be extended at every frame space, and side girders shall be arranged to suit the seating for main engine.

Bilge well or hat shall be provided for proper drainage.

The Vessel shall be able to carry steel coil on each cargo hold subject to following condition ;

Steel coil loading

Size	: 1.5m × 1.5m φ
Weight	: 15 t
Loading condition	: Two (2) tiers with four (4) lines of wooden dunnages per one (1) coil

Size	: 1.5m × 1.5m φ
Weight	: 20 t
Loading condition	: Two (2) tiers with five (5) lines of wooden dunnages per one (1) coil

Size	: 1.4m × 1.8m φ
Weight	: 20 t
Loading condition	: Two (2) tiers with five (5) lines of wooden dunnages per one (1) coil



2.2.9 Tank and chain locker

(1) Peak tanks

Fore peak tank shall be stiffened by longitudinal, web frame and side stringer.

Aft peak tank shall be stiffened by floor, stringer and center swash bulkhead.

(2) Deep tanks

Boundary bulkhead and top plate shall be made oiltight or watertight according to their respective character and strengthened as required by the Classification Society.

(3) Chain locker

The Chain locker having ample capacity shall be arranged as shown on the General Arrangement.

Manhole shall be provided on each chain locker for access from bos'n store.

A bilge well with perforated cover plate shall be provided at the bottom of each chain locker.

Manhole shall be provided in fore peak tank for access to bilge well.

2.2.10 Stern frame

Stern frame shall be of "Mariner type" welded construction fabricated of steel plates and steel casting as mentioned below :

(1) Neck bearing

Neck bearing shall be of steel casting with phenol resin bush (self lubricating type).

(2) Gudgeon

Gudgeon shall be of steel casting with phenol resin bush.

(3) Stern tube

Stern tube shall be of welded construction fabricated of steel plate and steel casting.
(refer to Fig. 2 - 1 STERN FRAME AND RUDDER)



2.2.11 Rudder

(1) Rudder (refer to Fig. 2 - 1 STERN FRAME AND RUDDER)

Rudder shall be of double plated hanging type forming stream line section in conjunction with mariner type stern frame and shall have an area ratio about 1/63 (without rudder horn) of an area of length between perpendiculars multiplied by the scantling draught.

Rudder shall be of welded construction fabricated of steel plates and two (2) pieces of upper and lower rudder castings.

Jumping stopper shall be provided between lower rudder casting and gudgeon to prevent rudder from undue lifting.

Drain and air plug of stainless steel shall be fitted on top and bottom of rudder.

(2) Rudder pintle

Pintle shall be of forged steel with cast stainless steel (SCS13) or stainless steel (SUS304) sleeve and shall be secured by forged steel nut to lower rudder casting.

(3) Rudder stock

Rudder stock shall be forged steel straight type with key way at the top to take connection with the steering gear and tapered lower end having key to take connection with upper rudder casting by forged steel nut.

Bronze (BC3) sleeve shall be provided on rudder stock in way of rudder bearer.

Cast stainless steel (SCS13) or stainless steel (SUS304) sleeve shall be provided on rudder stock in way of neck bearing.

Rudder trunk of steel welded construction shall be provided below steering gear flat.



(4) Rudder carrier and rudder bearer

A combined rudder carrier and rudder bearer shall be provided on steering gear flat to carry weight of the rudder.

The unit shall consist of carrier fixed to rudder stock and rudder bearer fixed to the hull which is arranged to receive the carrier.

Rudder carrier and rudder bearer shall be of steel casting.

Rudder carrier shall be of split type in halves.

Non-split type rudder bearer shall be provided with horizontal bronze (BC3) bearing liner and vertical bronze (BC2) bush in way of bearing surface with the carrier and the rudder stock respectively.

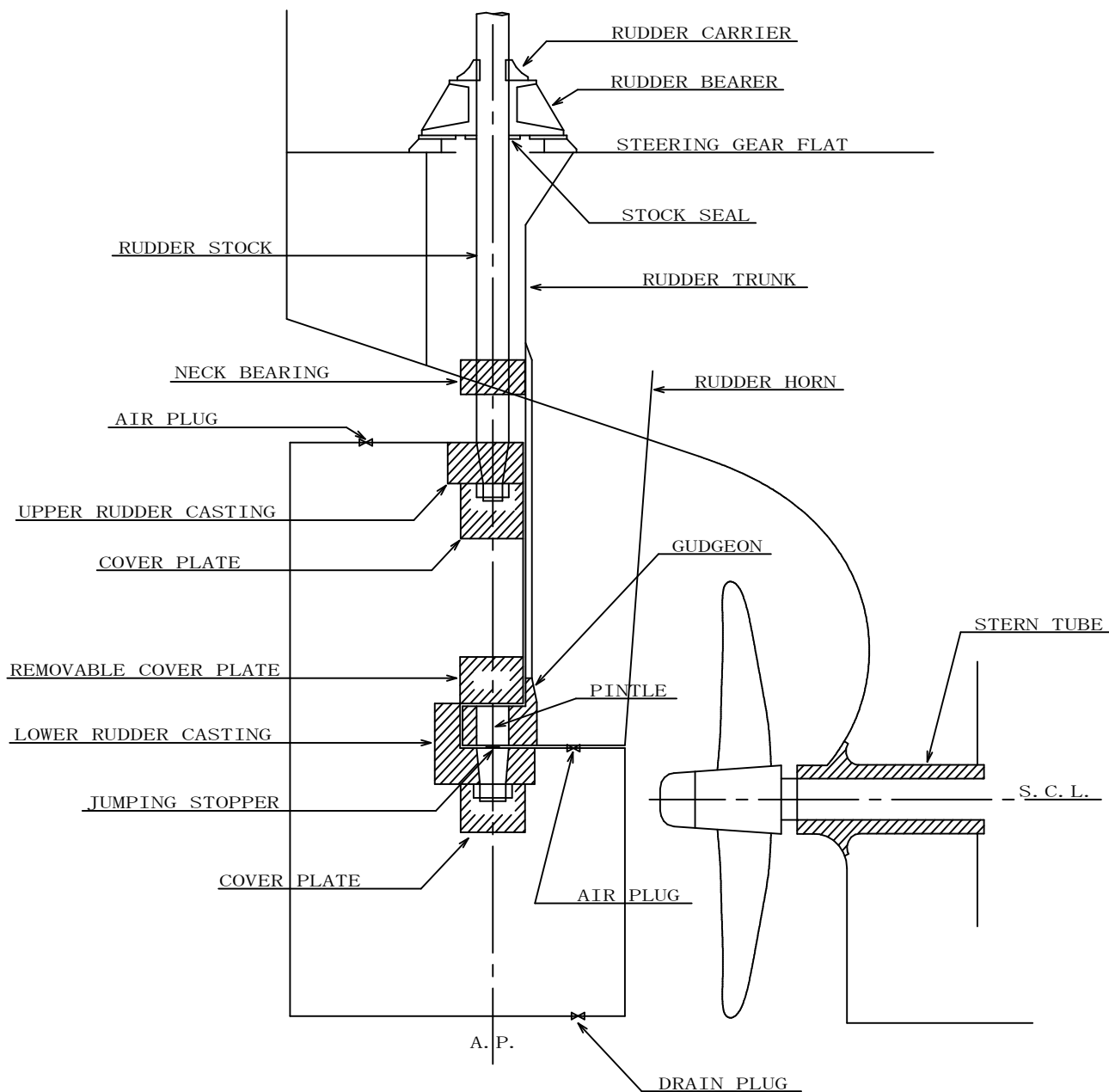
The horizontal bearing liner shall be provided with oil groove and lubricated by oil bath system.

The vertical bush shall be provided with grease groove and lubricated by grease supplied by grease hand pump.

Rudder stock seal shall be provided at the lowest part of rudder bearer for water/oil seal.



Fig. 2 - 1 STERN FRAME & RUDDER

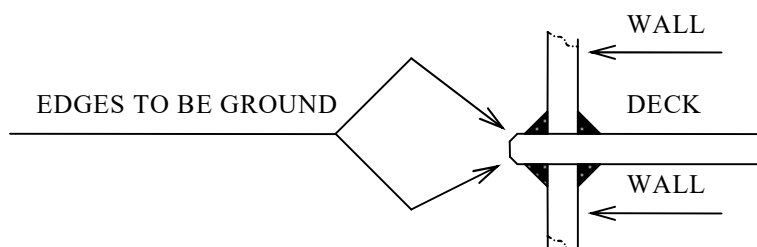




2.3 SUPERSTRUCTURE AND DECK HOUSE

2.3.1 General

External steel wall shall be of the following constructions.



Ordinary deck beam and wall stiffener of superstructure shall be carried out by one side welding except as follows.

- Stiffener on exposed wall from upper deck to A deck
- Stiffener on front wall from A deck to B deck
- Stiffener on engine casing
- Exposed beam
- Under beam of installed heavy machine
- Beam and stiffener of wet part (sanitary space and battery room, etc.)

2.3.2 Deck

Decks of superstructure and deck house shall be of steel welded plating stiffened with beams and girders.

The thickness of deck plating shall be in general 6 mm unless otherwise required by the Classification Society.

2.3.3 Steel wall

Steel wall of deck house including engine casing, shall be of welded steel construction.

The thickness of wall plating shall be in general 6 mm unless otherwise required by the Classification Society.

These steel wall shall be of corrugated type except front wall.

Steel wall shall be welded to the other structural members to be watertight, gastight or non-tight according to their respective character.



2.4 MISCELLANEOUS

2.4.1 Foundation

Foundation of main engine shall be of welded steel construction in conjunction with double bottom structure of thicker bed plate, floors and girders.

Foundation of auxiliary machinery, deck machinery, etc. shall be of welded steel construction with girders or carlings underneath if necessary.

Small tank may be fitted directly on base without foundation.

2.4.2 Bulwark and bow chock

Steel bulwark and bow chock shall be provided as shown on the General Arrangement.

A portion of front bulwark of about 1,100 mm high with wind deflector shall be fitted on navigation bridge deck.

Bow chock of about 1,050 mm high shall be fitted on the top of forward part of forecastle deck.

2.4.3 Bilge keel

Bilge keel of angle bar shall be provided for about 25% of the Vessel's length amidships and shall be intermittent at block joint.

Bilge keel shall have 400 mm depth and welded to pad plate on the bilge shell.

The bilge keel shall be tapered into shell at both ends.



2.4.4 Manhole

Two (2) manholes shall be provided for each topside tank and double bottom tank in cargo hold, and one (1) manhole shall be provided for each double bottom in engine room, peak tank, cofferdam and the other small compartment.

Manhole for double bottom tank in cargo hold shall be of flush type.

Manhole for double bottom tank in engine room shall have 100 mm high coaming.

Manhole covers shall be fitted with synthetic rubber packings and fixed with stainless steel (SUS304) bolt and mild steel nut.

But, as for manhole cover of exposed place and in cargo hold (including inside of lower stool), they shall be fitted with brass nut.

Opening shall be generally 600 mm × 400 mm.

2.4.5 Cargo hatch coaming

Cargo hatches shall be arranged as shown on the General Arrangement.

Coaming height shall be about 1,400 mm at the Vessel's center line.

Hatch coaming shall be fitted with horizontal stiffeners near the coaming top and stay at proper interval.

As for the cargo hatch cover, refer to **SECTION 3 EQUIPMENT AND OUTFIT.**



2.4.6 Ladder and step

Two (2) steel ladders of vertical and spiral type for each cargo hold shall be fitted on transverse bulkhead.

Vertical ladders or steps shall be fitted for topside tanks, double bottom tanks and peak tanks.

Item	Width	Side stringer	Step
Vertical hold ladder	350 mm	65 mm × 9 mm steel flat bar 100 mm × 75 mm × 10 mm steel angle bar 200 mm × 10 mm steel bulb plate	22 mm square bar 1 - rung
Spiral hold ladder	600 mm	-	22 mm square bar
Other vertical ladder	350 mm	65 mm × 9 mm steel flat bar	Inside of the tank 19 mm square bar 1 - rung
Step		-	Others 19 mm round bar 1 - rung

Hold side bulkhead of engine room and collision bulkhead shall be fitted with vertical ladder having slant plates.

Permanent Means of Access in accordance with the requirements of Classification Society shall be provided.



SECTION 3 EQUIPMENT AND OUTFIT

3.1 CARGO HATCH AND SMALL HATCH

3.1.1 Cargo hatch cover

Steel weathertight folding type hatch covers shall be provided for each cargo hatch on upper deck.

Each hatch cover shall be divided into four (4) panels and each two (2) panels of four (4) panels shall be folded forward and backward.

The hatch cover shall be constructed as double skin type.

Strength of hatch covers shall be as required by the Classification Society.

The hatch cover shall be fastened to hatch coaming with quick acting cleat by manual operation.

Suitable sponge gasket and compression bar shall be equipped for weathertight.

Material of compression bar shall be of SUS 304.

Number and size of hatch opening shall be as follows.

Hatch number	Opening size	
	Length (m)	× Breadth (m)
1	18.40	× 18.72
2 ~ 5	23.20	× 18.72

One (1) ullage hole shall be provided to No.3 cargo hatch.

Plug for sampling shall be provided to each hatch coaming for IMSBC code for the carriage of coal.

Vacuum relief valve shall be provided to No.3 cargo hatch.

Cement feeder hole (700mm diameter, 2-each cargo hold) shall be provided each hatch cover.

Cement feeder hole (common used as grain feeder hole) (1000mm/700mm diameter, 2-each cargo hold) shall be provided each hatch cover.



3.1.2 Cargo hatch cover operation system

The cargo hatch cover shall be operated by hydraulic operation system, refer to **Fig. 3 - 1 DIAGRAM OF ELECTRO-HYDRAULIC POWER SYSTEM.**

Simultaneous operation of any two (2) hatch cover sections, consist of two (2) hatch cover panels each, shall be considered and opening or closing time is about six (6) min. except cleating time. (refer to below)



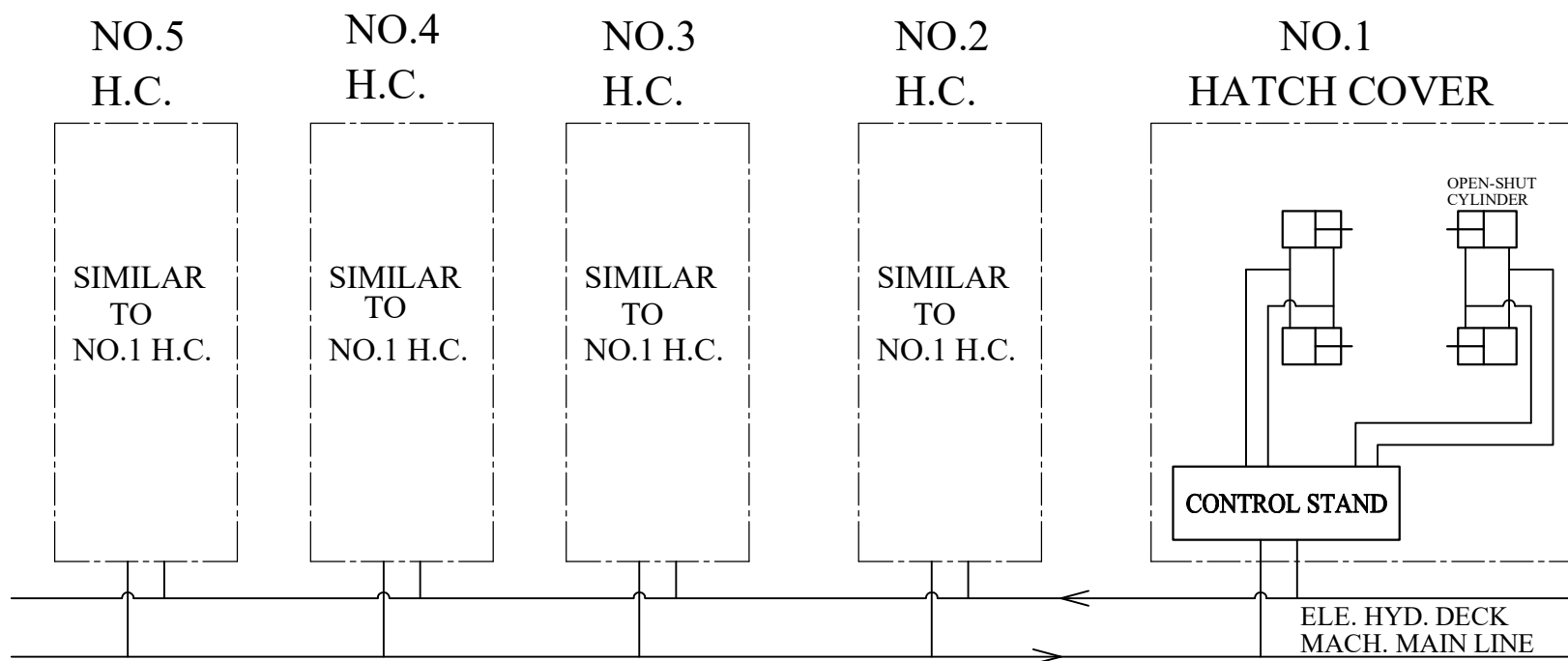
Hydraulic operating system for cargo hatch cover shall consist of following items.

- (a) Hydraulic pump used both as cargo hatch operation and deck machinery operation, as for system, refer to **Fig. 4 - 1 DIAGRAM OF ELECTRO-HYDRAULIC POWER SYSTEM**
- (b) Four (4) main cylinder for opening and closing for each cargo hatch cover
- (c) One (1) operating controller fitted on hatch side or hatch end for each cargo hatch cover

As for piping application, refer to **Table 8 - 2 PIPING APPLICATION SCHEDULE.**

Materials of above mentioned machineries shall be to the manufacturer's standard.

Fig. 3 - 1 DIAGRAM OF ELECTRO-HYDRAULIC POWER SYSTEM





3.1.3 Small hatch and cover

Small hatch and cover shall be fitted as follows :

Item	Location	Size (mm) × No.	Type	Securing device
Rope hatch	On fore deck forward	*1 1000 × 1000 -1	Steel weathertight hinge-up type	Butterfly nut and bolt (Brass)
	On upper deck	Hatch size 800 diameter - 1 Deck open 720 diameter		
Access hatch for cargo hold	*4 On upper deck	600 × 600 *3 - 2/1 hold		
Engine parts handling hatch	*2 On Bolted cover	about 1000 × 1000 -1		
Bolted cover for engine parts	Engine casing top	about 1100 × 1100-1	Steel weathertight bolted cover	Bolt (SUS) and nut (Brass)
	On upper deck	about 1900 × 1400 -1		

Coaming height shall be designed as per rule requirement.

*1 --- With counter weight, little hatch for mike handling shall be fitted

*2 --- With counter weight

*3 --- With Pad lock hanger

*4 --- As for No.1 cargo hold fore part, the access hatch shall be fitted on forecastle deck



3.2 MAST

One (1) foremast and one (1) radar mast shall be provided as shown on the General Arrangement.

Foremast of steel pipe shall be provided with stays and fitted with necessary fittings such as mast head light, air horn, steering light, etc.

Radar mast of steel pipe shall be provided with stays and fitted with necessary fittings such as radar scanner, mast head light, antenna, air horn, inmarsat-C, etc.

Inmarsat-FB post shall be provided on compass deck.

Steel wire rope without over-coating shall be used for mast stay, and turnbuckle shall be fitted.

As for antenna, refer to **IV- ELECTRIC PART**.



3.3 ANCHORING AND MOORING EQUIPMENT

3.3.1 Anchor and anchor chain

Anchor and anchor chain shall be provided in compliance with the requirements of the Classification Society.

Bower anchor	Cast steel, AC-14 type anchor 7,425 kg × 2 sets
Anchor chain cable	High strength steel (grade 3) flush butt welded stud link chain cable 78 mm diameter × 660 m total length

Spare anchor shall not be supplied.

Anchor chain cable shall consist of 55 m length × 10 and 27.5 m length × 4, and each length shall be jointed with kenter shackle.

Swivel piece shall be fitted at extreme outboard of end of chain cable and shall be connected to anchor shackle.

The specified length of anchor chain cable shall include shackles, swivel pieces, enlarged links, etc.

Inboard end of chain cable shall be fastened to equipments of quick release.
Hammer for quick release shall be provided near chain locker.
(Sledge hammer common use)

Marking of chain length shall be done every 27.5 m by white painting.

The following accessories and spares shall be supplied.

- 2 - Kenter shackle (spare)
- 5 - Taper pin for kenter shackle (spare)
- 1 - Anchor shackle (spare)
- 2 - Taper pin for anchor shackle (spare)
- 1 - Shackle punch
- 2 - Pin punch
- 6 - Chain hook
- 1 - Pin hammer
- 1 - Shackle hammer
- 1 - Tool box
- 1 - Disengaging tool for kenter shackle



3.3.2 Mooring rope

The following mooring ropes shall be supplied.

Mooring rope	Bell mix southern cross rope or equivalent 6 - 67 mm diameter × 220 m
--------------	--

Tow line shall not be supplied by shipyard.

3.3.3 Anchoring fitting

Anchoring fittings shall be fitted as follows :

Item	No.	Location	Type and material
Hawse pipe	2	From f'cle deck to side shell	Welded steel plate/pipe with cast steel shell piece, and with doubling plate on deck, with anchor convexity on side shell
Chain pipe	2	Chain locker top	Welded steel plate/pipe with cast steel bellmouth on f'cle deck and with round bar fitted around under steel bellmouth
Chain stopper	2	On f'cle deck	Steel body and steel seat welded on deck
Anchor stopper	2	On chain stopper	Eye plate and steel wire rope with turnbuckle

Cover plate and handrail shall be provided for hawse pipe on f'cle deck.



3.3.4 Mooring fitting

Mooring fittings shall be fitted as shown on the General Arrangement.

Item Name	Nominal size (mm)		Number			Type and material
			F'cle deck	Upper deck (Mid)	Upper deck (Aft)	
Bollard	400		4	2	8	Welded steel plate
	500		2	2	4	
Cross bitts	150		-	2*	-	
Roller fairleader	2-roller	350	4	-	4	Roller : Cast iron or welded steel plate
	3-roller		2	-	2	Seat : Welded steel plate
	5-roller		-	-	-	plate
Chock for Panama canal	S.W.L. 90ton		2	2	4	Seat : Welded steel plate
	S.W.L. 64ton		3	-	3	Body : Cast steel
Closed chock	500		-	2	-	Seat : Welded steel plate Body : Cast steel
Deck end roller	-		2	-	-	Roller : Cast iron Seat : Steel plate 2 - roller type
Deck stand roller	350		2	-	2	Roller : Cast iron or welded steel plate Seat : Welded steel plate

Jumping stopper for hawser shall be provided to mooring line.

One (1) eye plate shall be fitted to each bollard.

* --- Near Fr.100 (for bunker barge)



3.4 LIFE SAVING EQUIPMENT

3.4.1 General

Lifeboats and liferafts shall be arranged as shown on the General Arrangement.

Life saving equipments shall be provided as follows in compliance with the requirements of the regulatory bodies :

Item	No.	Material	Remarks
Lifeboat	1	Fiberglass	25 persons, 6 kt
Rescue boat	1	Fiberglass	6 persons, 6 kt
Boat davit and Boat winch	1 set	Manufacturer's standard	Free fall type
Liferaft	1	Rubber coated waterproof nylon cloth	25 persons inflatable for drop launching
	1		25 persons inflatable for davit launching
	1		6 persons inflatable type
Lifebuoy	2		4.3 kg With self-igniting light and self-activating smoke signal
	5*		2.5 kg With self-igniting light
	2		2.5 kg With buoyant lifeline (50 m)
	4		2.5 kg
Life jacket	35	Foamed plastics	With life jacket light
Lifeline throwing gun	1 set	Manufacturer's standard	With 4-320 m lines and 4-projectiles (Effective range of 230 m)
Immersion suit	-	Manufacturer's standard	As per rule
Emergency escape breathing device	-	Manufacturer's standard	As per rule

* --- One (1) lifebuoy with self-igniting light for pilot shall be provided.

Material of abovementioned equipments shall be to the manufacturer's standard.



3.4.2 Lifeboat

The free fall type lifeboat shall be provided.

The boat shall be provided with sea water-cooled diesel engine of cell motor starting type.

Equipments shall be provided as per rule requirement.

3.4.3 Rescue boat

The open type rescue boat shall be provided.

The boat shall be provided with sea water-cooled gasoline engine of hand starting type.

Equipments shall be provided as per rule requirement.

3.4.4 Life boat davit and boat winch

One (1) set of free fall type davit and winch shall be provided together with necessary blocks, tackles, and releasing gear for falling and hoisting or lowering lifeboat.

Boat shall be hoisted at two (2) persons loaded on lifeboat.

3.4.5 Davit for rescue boat and liferaft for davit launching

One (1) davit shall be provided to A deck S-side.



3.4.6 Inflatable liferaft

One (1) inflatable for drop launching (P-side) and one (1) inflatable for davit launching liferafts (S-side), having capacity of twenty-five (25) persons shall be provided on A deck in racks.

One (1) inflatable liferaft having capacity of six (6) persons shall be provided on upper deck.

Equipments for liferaft shall be provided as per rule requirement.

3.4.7 Lifebuoy

Twelve (12) lifebuoys shall be equipped suitable position.

Quick releasing device shall be provided only for lifebuoys fitted on bridge wing.

3.4.8 Life jacket

Life jacket shall be stowed on wardrobe in each cabin, and added two (2) in wheelhouse, six (6) in boatswain store and two (2) in engine control room.

3.4.9 Immersion suits

Immersion suits shall be provided as per rule requirement.

3.4.10 Emergency escape breathing device

Emergency escape breathing devices (EEBD) shall be stowed in accommodation space and engine room as per rule requirement.



3.5 AWNING AND CANVAS WORK

Awning for panama shelter shall be provided.

Vinyl canvas cover shall be supplied for the following weather exposed fittings :

- Magnetic compass
- Gyro repeater compass
- Projector in weather part
- Speaker in weather part
- Boat winch drum
- Accommodation ladder winch
- Pilot assistant ladder winch
- Rigging screw
- Provision crane winch drum
- Chain pipe
- Controller for deck machinery
- Embarkation light cover for lifeboat
- Jacob's ladder for liferaft
- Jacob's ladder for pilot



3.6 LADDER

Accommodation ladder, ladder winch, weathered deck ladder, etc. shall be provided as follows :

3.6.1 Accommodation ladder

Number of set	Two (2) sets
Material	Aluminum alloy
Type	Vertical stowing type with curved steps
Width	600 mm
Length	Sufficient length to reach within about 0.6 m of arrival ballasted water line at an angle of about 55 degrees to the horizontal
Designed load	Static load of 75 kg on every two (2) steps at horizontal level condition
Stowing position	On upper deck accommodation house both sides
Handling	Refer to “3.6.2 Ladder winch”
Fitting	Upper rotating platform and lower vertical tilting platform, Removable type stanchion of galvanized steel pipe, Handrail of vinylon rope

3.6.2 Ladder winch

Accommodation ladder shall be lowered, hoisted and stowed by means of fixed one (1) mechanical ladder winch driven by electric motor.

Material of ladder winch shall be to the manufacturer's standard.

3.6.3 Wharf ladder

Wharf ladder shall not be supplied.



3.6.4 Pilot ladder

Pilot access port shall be provided on upper deck both sides.

Two (2) sets of pilot assistant ladder shall be provided, and one (1) set of pilot jacob's ladder shall be supplied.

Particular of pilot assistant ladder shall be as follows.

Material	Aluminum alloy
Type	Curved steps, vertical stowing type
Length	Sufficient length to reach within about 1 m of arrival ballasted water line at an angle of about 55 degrees to the horizontal
Width	600 mm
Fitting	Removable stanchion of galvanized steel pipe, handrail of vinylon rope

Pilot assistant ladder shall be lowered, hoisted and stowed by means of one (1) mechanical ladder winch driven by electric motor.

Eye plate (3ton type) for jacob's ladder lashing, 0.1 ton davit for jacob's ladder hoisting and necessary fittings shall be provided on upper deck.

0.1 ton davit shall be of manual operating type, and the davit shall be fitted rope and sheave.

Sunken type eye plate shall be provided on side shell both sides.

3.6.5 Vertical ladder

Vertical ladders shall be provided as follows ;

Location	Width	Side stringer	Step
Mast, post, etc,	300 mm	65 mm × 9 mm steel flat bar	19 mm round bar 1 - rung

Rungs shall penetrate through side stringer.

Adequate back bar shall be provided.

Permanent Means of Access in accordance with the requirements of Classification Society shall be provided.



3.6.6 Inclined ladder

Inclined ladder in weather part shall be provided as follows :

Location	Width	Side stringer	Step	Hand rail
Weathered deck	700 mm	180 mm × 9.5 mm steel bulb plate	6 mm thickness steel checkered plate	25A SGP (GALV)

Inclined ladder shall be of welded construction and step shall not pass through side stringer.

Inclined ladder shall be inclined at the angle of below 50 degrees to the horizontal.

Countermeasure of pirates shall be provided to inclined ladder between A deck and upper deck.

One (1) inclined ladder for helicopter mark shall be provided.

3.6.7 Other ladder

Draught checking ladder shall not be provided.

Two (2) jacob's ladders for liferaft shall be provided on A deck, and one (1) jacob's ladder for forward liferaft shall be provided.

One (1) jacob's ladder for chain locker shall be provided.

As for interior stairways, refer to

SUBSECTION 5.7 STAIRWAY IN ACCOMMODATION.

As for hold ladder, refer to Subsection 2.4.6 ladder and step.



3.7 HANDRAIL AND LIFELINE

3.7.1 Handrail and stanchion

Handrail shall be fitted as follows except specified otherwise.

Location	Height	Top rail *	Mid rail		Stanchion	Stay
All deck	1,000 mm	25A SGP	19 mm Steel round bar	2	65 mm × 12 mm Steel flat bar	50 mm × 9 mm Steel flat bar

* ----- Galvanized steel pipe

Handrail stanchion shall be fitted about 1,500 mm apart.

Handrail stay shall be fitted to every three (3) stanchions.

Storm rail of 25A steel pipe (SGP) shall be fitted where necessary weather part.

3.7.2 Lifeline

Detachable type lifeline and stanchion shall be provided between accommodation house front and upper deck forward as required by the rules.



3.8 NAME PLATE AND IDENTIFICATION

Name plates, marks, etc. shall be fitted as follows :

Item	Location	Remarks
Ship's name	Stern shell and both sides of bow	Tuck bead and painted
Port of registry	Stern shell	
Funnel mark	Funnel both sides	
Draught mark	Both sides of bow, midship and stern	Steel plate welded and painted
Freeboard mark	Both sides of midship	SUS plate welded and painted
Bulbous bow mark	Both sides of bow	Tuck bead and painted
Pilot mark	Both sides shell of pilot access point	
	Both sides on deck of pilot access point	Welded bead and painted
Notice plate, Caution plate, etc.	Suitable location	Painted wooden plate
Name plate to identify quarters and space for tonnage		Engraved plastics
Ship's call letter		
Ship's name board	Both sides of compass bridge deck	Painted wooden plate
Hold depth mark	Fore or aft in each hold	Steel plate welded (6 mm × 32 mm F.B) 2m apart and painted
Tug pushing mark	Fr. 34 and Fr. 194 both sides shell	Corner bead and painted
Bottom plug	Bottom shell	Welded bead
CC mark	Hatch coaming port sides	Steel plate welded
IMO number	Stern shell and in engine room	Tuck bead (stern shell), punching (in engine room) and painted
S.W.L. mark	Mooring fitting	Welded bead and painted
Hold number	Access hatch cover both sides	Welded bead and painted
Helicopter mark (Landing type)	On No.3 hatch cover	Tuck bead only



Draught marks shall be of Arabic numerals of 10 cm projected height, where bottom of each figure indicate vertical height in meter and/or centimeter above bottom of keel.

Mark for IMSBC code shall be provided.

Name plate (Brass) shall be fitted on air pipe heads, sounding caps and valves in English.

Handle of valves shall be painted with same color of piping.

For machineries, name plate and instruction plate shall be written in English in general.

3.9 MISCELLANEOUS

- (a) Flag staff of steel pipe (SGP) with truck and halyard shall be fitted at the stern.

Flag staff shall be of collapsible type.

Flag halyard shall be of cotton rope.

- (b) Rain shade shall be fitted over the weather doors of wheelhouse sides.

- (c) Detachable Suez search light davit (0.1t), rope and necessary blocks shall be supplied.
And fitting socket shall be fitted in rope hatch on upper deck forward.

- (d) Panama shelter shall be provided to navigation bridge wing both sides.



SECTION 4 DECK MACHINERY

4.1 GENERAL

Deck machinery shall be arranged as shown on the General Arrangement.

Particulars of the deck machinery shall be as follows :

Name	Type	No.	Rated capacity
Steering gear	Electro-hydraulic ram type, Two (2) pumps and two (2) motors	1	As per rule
Windlass	Electro-hydraulic type combined with mooring winch	2	289 kN (29.5 t), 147 kN (15.0 t) × 12 m/min.
Mooring winch	Electro-hydraulic type	2	147 kN (15.0 t) × 12 m/min.
Emergency fire pump	Electric motor driven	1	72 m ³ /h × 65mTH
Deck crane	Electro-hydraulic type	4	30.5 t × 26 mR
Provision crane	Electric motor driven	2	0.9 t × about 8 m/min.
		1	2.5 t × about 8 m/min.
Grab bucket	Radio control opening type	4	12m ³

The rated capacity and capacity of the prime movers may be slightly modified according to the manufacturer's standard, and materials of above mentioned machineries shall be to the manufacturer's standard.

When the manufacturer changed, the rated capacity particulars of the prime movers may be modified according to new manufacturer's standard.



4.2 STEERING GEAR

One (1) set of electro-hydraulic type steering gear shall be provided.

The steering gear shall be designed in compliance with the requirements of the Classification Society.

The system shall consist of one (1) ram, two (2) cylinders, two (2) pump units ($100\% \times 2$) and necessary hydraulic piping.

The steering gear shall be capable of putting the rudder over from 35 degrees on either side to 30 degrees on the other side within 28 seconds at the Vessel's ahead speed specified by the rule, when actuated by **by one (1) pump unit**.

Hydraulic pump shall be of fixed flow type, and piping shall be so arranged that two (2) pump units **can not be actuated simultaneously** and each pump unit independently.

Hydro-lock alarm shall not be provided.

The steering gear shall be operated from wheelhouse by electric remote control system normally, and by a manual handle fitted with steering gear, in case of the failure of remote control system.

In case of main electric power failure, electric power shall be supplied from emergency generator to No.1 pump unit only, and steering gear shall be kept the condition required by the rule.

One (1) reserve tank and feed hand pump of system oil shall be provided in steering gear room.

Stage shall not be provided around the steering gear.

As for detail of electric control system, refer to **IV- ELECTRIC PART**.



4.3 WINDLASS

Two (2) sets of open type electro-hydraulic windlass shall be installed on forecastle deck.

Each windlass shall have one (1) wildcat, two (2) hawser drums and one (1) warping end.

The wildcat and hawser drum shall have individual mechanical claw clutch and be linked with hand brake.

The warping end shall have no whelp and be directly connected with driving shaft without clutching device.

The hawser drum shall be enough to take a 75 mm diameter and 200 m long fiber rope.

Hoisting speed of the anchor chain shall be of 9 m/min. at actual load (244 kN(24.9 ton)).

Chain drum and hawser drums shall not be operated simultaneously.

Each hawser drum of windlass shall not be operated simultaneously.

Speed and driving direction of the windlass shall be controlled by local control valve.

Auto-tension system shall not be provided.

SWL shall be marked on windlasses and hawser drums by welding bead and paint.

As for hydraulic system, refer to

THIS SECTION 4.5 ELECTRO-HYDRAULIC POWER SYSTEM.



4.4 MOORING WINCH

Two (2) sets of open type electro-hydraulic mooring winch shall be installed on aft upper deck as shown on the General Arrangement.

The mooring winch shall have two (2) hawser drums and one (1) warping end.

The hawser drum shall have individual mechanical claw clutch and be linked with hand brake.

The warping end shall have no whelp and be directly connected with driving shaft without clutching device.

The hawser drums shall be enough to take a 75 mm diameter and 200 m long fiber rope.

Each drum of mooring winches with two (2) hawser drums shall not be operated simultaneously.

Speed and driving direction of all mooring winches shall be controlled by local control valve.

Auto-tension system shall not be provided.

SWL shall be marked on hawser drums by welding bead and paint.

As for hydraulic system, refer to

THIS SECTION 4.5 ELECTRO-HYDRAULIC POWER SYSTEM.



4.5 ELECTRO-HYDRAULIC POWER SYSTEM

One (1) high pressure electro-hydraulic power system shall be arranged in steering gear room.

Capacity of the pump unit shall be able to operate one (1) windlass at actual load or two (2) mooring winch at rated load.

The pump unit shall serve hydraulic oil to hatch cover operation.

The system shall have two (2) electro-hydraulic pump, two (2) electric motor, filter, control valve, cooler, oil tank and so on.

As for detail of the system, refer to

Fig. 4 - 1 DIAGRAM OF ELECTRO HYDRAULIC POWER SYSTEM.

As for piping application, refer to

Table 8 - 2 PIPING APPLICATION SCHEDULE (HULL PART).

4.6 EMERGENCY FIRE PUMP

One (1) electric motor driven emergency fire pump shall be installed in the emergency fire pump room.

The pump shall have one independent suction from sea and discharge to fire main system through stop valve.

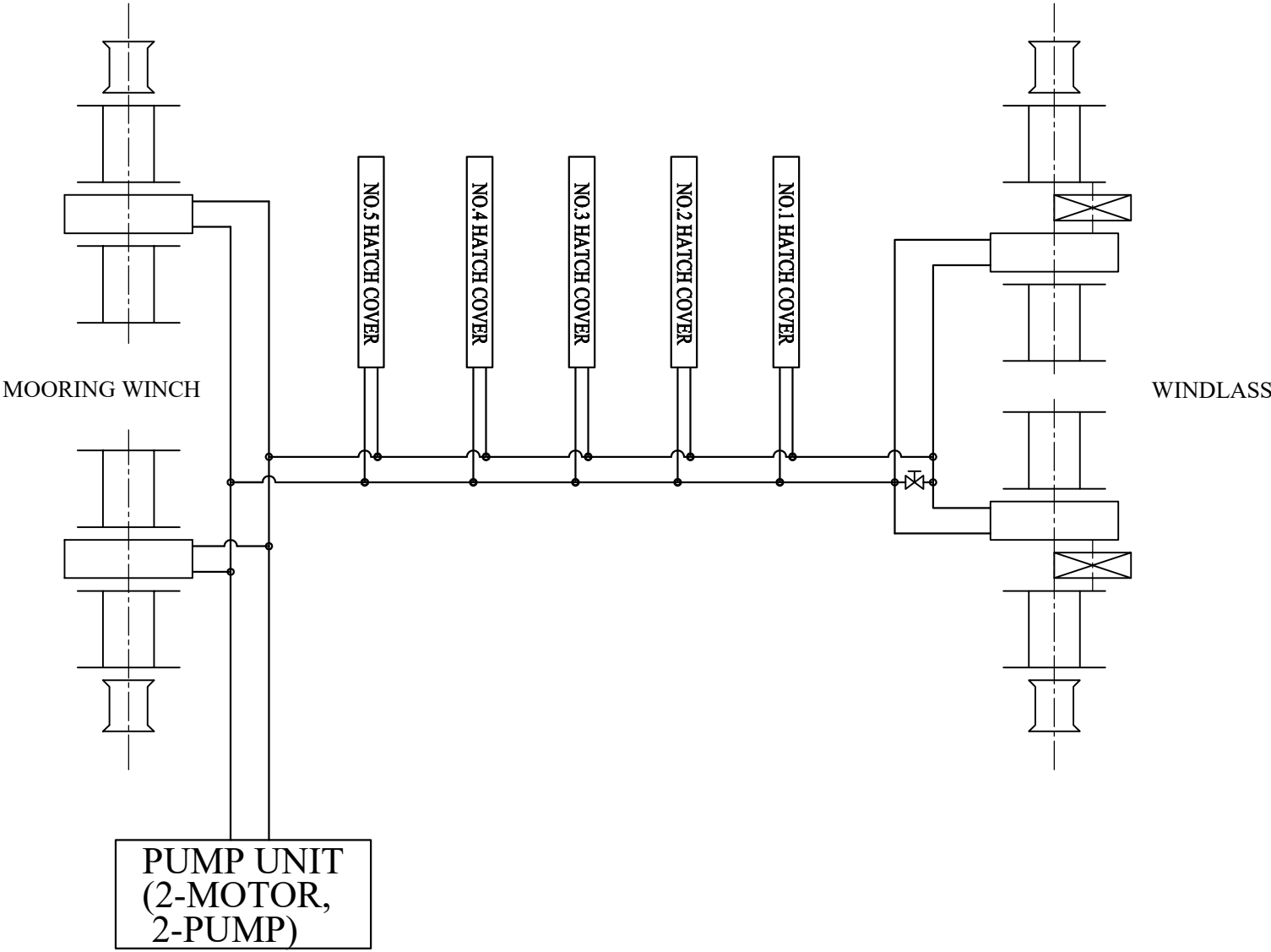
One (1) vacuum pump shall be fitted with the pump and shall be linked to driving shaft by automatic clutch.

Start and stop of emergency fire pump shall be controlled in emergency fire pump side.

The material of main parts for emergency fire pump shall be as follows;

Casing and cover	---	Cast iron
Impeller	---	Phosphor bronze
Shaft	---	Stainless steel
Shaft seal	---	Gland packing

Fig. 4 - 1 DIAGRAM OF ELECTRO - HYDRAULIC POWER SYSTEM





4.7 PROVISION CRANE

Three (3) sets of provision cranes shall be installed as shown on the General Arrangement.

Two (2) sets of 0.9 ton provision crane shall be common use with fuel oil bunkering davit.

Particulars of the provision crane shall be as follows :

Type	Electric motor	Electric motor
No. of set	2 sets	1 set
Hoisting load	0.9 ton	2.5 ton
Hoisting speed	about 8 m/min.	about 8 m/min.
Slewing speed	about 0.5 rpm	about 0.5 rpm
Luffing	Fixed	Fixed
Outreach	about 1.5 m	about 2.5 m

Limit switch shall be provided for Singapore flag requirement.

4.8 DECK CRANE

Four (4) sets of deck crane shall be installed on upper deck as shown on the General Arrangement.

Principal particulars shall be as follow ;

Type	Electro-hydraulic deck crane of single type
No. of set	4 sets
Hoisting load	30.5/12/5 ton
Hoisting speed	18.5/37/63 m/min.
Lowering speed	63 m/min.
Winding height	37 m
Slewing radius	26 ~ 4.5 m
Luffing time	49 sec. (26 ~ 4.5 m)
Slewing angle	360 degrees, endless
Slewing speed	0.6 rpm

Sufficient reinforcement for basic construction, access ladder, etc. shall be provided.

Four (4) shackle and cargo hook shall be provided.



4.9 GRAB BUCKET

Four (4) sets of grab buckets shall be installed as shown on the General Arrangement.

The grab bucket shall be jointed under falling block of deck crane.

The grab bucket shall be of radio control opening type.

Type of grab bucket shall be of EGF 24,0-1,25-12000.



SECTION 5 ACCOMMODATION

5.1 GENERAL

5.1.1 Arrangement of accommodation

Accommodation such as public space, living space, office space, navigation space, corridor space, sanitary space, commissary space, provisions space and sundry space shall be arranged as shown on the General Arrangement.

Each space shall consist of the following rooms :

Public space	Officer's mess room, Saloon, Crew's mess room, Crew's smoking room
Office space	Ship's office, Meeting room, Tally office
Living space	All cabins including hospital
Navigation space	Wheelhouse including chart space, Radio instruments room
Corridor space	Corridor, Stair way, Step-in compartment
Sanitary space	Laundry, Drying room, W.C., Shower room, Private lavatory
Commissary space	Galley, Pantry
Provisions space	Provisions store, Refrigerating provisions chamber
Sundry space	Air conditioning unit & ref. prov. machine room, Battery room, Changing room, Emergency generator room, Locker, Store, Paint store, Fire station, Seal locker, CO2 room, Gymnasium, etc.

Accommodation space shall be designed to have a clear height of about 2,050 mm from the top of floor covering to the bottom of overhead ceiling except protruding parts such as diffuser, ceiling lamp, louver, etc.

At wheelhouse, a clear height shall be of 2,100 mm.



5.1.2 Layout of living room

All rooms shall be arranged as shown on the General Arrangement.

The class shall be ranked as follows :

Class \ place	Cabin	Lavatory
Captain	Day and bed room	Private with shower
Senior officer		
Junior officer	Single room	Common
Petty officer		
Crew		Private with shower
Hospital		

5.1.3 Material of joiner wood

Hard wood :

Hard wood, so described in the Specifications, shall be of red lauan, in general.

Soft wood :

Soft wood, so described in the Specifications, shall be of needleleaved tree.

Plywood :

Plywood shall be glued with synthetic resin.

Lauan plywood shall be used in general.

Non-combustible board :

Non-combustible board means the board made from non-combustible materials approved by the Administration and the Classification Society.



5.2 JOINER WORK

5.2.1 General

Joiner work shall be applied according to the Builder's practice as specified in this SUBSECTION.

Wall and ceiling treatment, unless otherwise noted in this SUBSECTION, shall be finished with paint on bare steel.

As for the engine control room, refer to **SUBSECTION 5.12 SUNDRY SPACE**.

5.2.2 Joiner bulkhead

Corridor bulkhead and partition bulkhead shall be generally steel wall or B - O class wall finished with paint in compliance with rule requirements for fire protection.

5.2.3 Joiner lining and ceiling

Joiner lining and ceiling shall be generally applied as follows :

Lining panel and ceiling panel shall be fitted to steel wall or steel deck with steel joists.

Place		Material	Finished
Navigation space, Office space except tally off., Public space except saloon, Living space, Radio instruments room, Gymnasium	Wall lining	25 mm N.B.	P.V.C.
	Ceiling	25 mm N.B.	P.V.C.
Saloon	Wall lining	25 mm N.B.	P.V.C.
	Ceiling	6 mm N.B.	Cloth
Corridor (Above A deck)	Ceiling	25 mm N.B.	P.V.C.

N.B. --- Non-combustible board

P.V.C. --- Polyvinyl chloride overlay



5.3 **DECK COVERING, CEMENTING, ETC.**

5.3.1 **General**

Deck covering including cementing and tiling shall be applied according to the Builder's practice as specified in this SUBSECTION.

The floor not specified in this SUBSECTION shall be finished with paint on bare steel, in general.

As for engine control room, refer to **SUBSECTION 5.12 SUNDRY SPACE**.

5.3.2 **Deck covering**

Deck covering shall be generally applied as follows :

All weather deck surface shall have no covering.

Finish coating on deck composition shall not be applied in enclosed spaces under furniture, such as bed, wardrobes, etc.

Place	Material
Saloon	7 mm tile carpet on 6 mm thickness latex base deck composition
Captain class day and bed room, Public space (except saloon),	2 mm thickness vinyl sheet on 6 mm thickness latex base deck composition
Navigation space, Office space, Living space (except Captain class),	8 mm thickness latex base deck composition
Bridge wing	Non slip paint with sand
Hospital, Gymnasium	8 mm thickness latex base deck composition with acoustic insulation (camber adjustment)



5.3.3 Cementing and tiling

Cementing and tiling shall be generally applied as follows :

Place	Material
Common water closet, Shower room, Pantry Lavatory*	35 mm thickness cement and mosaic tile
Galley	35 mm thickness cement and non-slip tile
Laundry	8 mm thickness latex base deck composition

* ---- Unit type lavatory shall be of maker's standard

Galley shall have tile gutter without cover.

Other space in above list shall have slope to scupper without gutter.

Joining of cement or tile with side wall shall be covered up to horizontal.



5.4 HEAT, SOUND AND FIRE INSULATION

5.4.1 General

Heat and sound insulation shall be applied according to the Builder's practice as specified in this SUBSECTION.

As for ref. provisions chamber and engine control room, refer to **SUBSECTION 5.11 PROVISIONS SPACE** and **SUBSECTION 5.12 SUNDRY SPACE** respectively.

5.4.2 Heat and sound insulation

Heat and sound insulation shall be applied as follows :

Place		Adjacent to weather
Public space, Living space, Office space except tally office	Overhead	50 mm glass wool
	Side wall	
Navigation Space	Overhead	50 mm glass wool + cloth
	Side wall	
Provisions space except ref. provisions chamber, Locker	Overhead	50 mm glass wool + cloth
	Side wall	
Corridor	Overhead	50 mm glass wool
Stairway	Overhead	50 mm glass wool *
	Side wall	+ cloth

* --- Gutter coaming for sweat water shall be provided on the floor.

Beam in way of directly exposed to weather in public space, living space, navigation space and office space shall be insulated with 25 mm thickness glass wool, but stiffener shall not be insulated face.



5.4.3 Fire insulation

Fire insulation shall be done in compliance with rule requirements.

Detail construction shall be in accordance with the Builder's practice.

“Method I - C” shall be applied for fire protection, and details of construction shall be in accordance with rule requirement and the Builder's practices.



5.5 DOOR

Door shall be fitted as follows :

Type	Material	Door clearance (mm)	Location
weathertight (A)	Steel plate	800	Hospital, Provisions handling space
		700	Upper deck house entrance, Bos'n store entrance
weathertight (B)		600	Paint store, Deck store, Tally office
		700	Entrance to A deck
weathertight (C)	** Aluminum	700	Entrance to B deck and above
	Steel plate	600	Sundry space faced to weather part
Non-weathertight	*** Aluminum	1000	Wheelhouse sides (Sliding type)
※ A-60 class or A-15 class or A-0 class or B-0 class or C class	Non-combustible or hollow steel or plywood	700	Public space, Ship's office, Step-in compartment, Galley, Pantry, Hospital, Captain class day room, Engine room entrance
		600	Entrance other than abovementioned

As for ※ marked, door type and material shall be decided to meet the rule requirement.

** --- With 250 mm diameter fixed glass

*** --- With fixed square glass

Slot lock shall be provided to accommodation entrance door inside except wheelhouse sliding door.

Pentagon lock shall be provided to deck store entrance door.



All doors except wheelhouse sides shall be of hinge type, and sliding door shall be equipped for wheelhouse sides.

The steel weathertight doors (A) shall be fitted with clips and rubber packings.

While weathertight doors (B) and (C) shall be similar to the weathertight (A) except for reduced number of clips and stiffeners according to the purpose intended.

Door coaming of weather entrance except wheelhouse shall be of 200 mm in height above the deck where is no rule requirement.

Other door coaming shall be constructed according to the rule.

For all cabins and public spaces, the top of opening shall be of 1,900 mm from steel deck plate including sill.

Door sill top for joiner door shall be covered with stainless steel plate except for sundry space.

Self closing device shall be fitted according to the rule requirement.

As for the door of refrigerated provisions chamber, refer to
SUBSECTION 5.11 PROVISIONS SPACE.

Anti pirates lock shall be provided entrance door to steering gear room from upper deck.

One (1) anti pirates door shall be provided to entrance from engine room in addition to fire proof door.



5.6 SIDE SCUTTLE AND WINDOW

Side scuttles and windows shall be fitted as follows :

Material of frame	Side clear B×H (mm)	Location	No.	Remarks
Aluminum alloy	1200×800	Saloon	3	Fixed type
		Ship's Office, Cap. class day room, Meeting room	1	
	400×600 (350 φ) **	Off's mess room	3	Hinged type
		Crew's smoking room	4	
		Crew's mess room	3	
		Captain class	Each 3	
		Day room	Each 1	
		Bed room	Each 1	
		Senior officer class	Each 1	
		Day room	Each 1	
		Bed room	Each 1	
		Junior officer class	Each 1	
		Petty officer class, Crew class	Each 1	
		Hospital	1	
		Ship's office, Meeting room	Each 1	
		Gymnasium	2	
		Radio instruments room	1	
	800×600	Off's mess room	1	Fixed type
	2370×815	Wheelhouse	1*	
	1870×815		2*	
	1370×815		2***	
	715×815		2	
	1100×800		4	

* --- With wiper

** --- Scuttle (350 φ) with aluminum alloy cover shall be provided on upper deck.

*** --- With clear view screen (with defogger)

Size and number subject to change on the way of detail design.

The side scuttles or windows in public space, living space and office space where directly exposed to weather shall have drip pan.

The side scuttles and windows shall be fitted with tempered clear glass.

Portable insect screen and wind scoop shall not be provided.

Side scuttle shall not be fitted for provisions space and sundry space.

Visor shall not be fitted for side scuttles and windows.

The windows shall be fitted about 1500 mm height at window center above deck.

The side scuttles shall be fitted about 1550 mm height at side scuttle center above deck.



5.7 STAIRWAY IN ACCOMMODATION

Stairway in accommodation shall be fitted as shown on the General Arrangement and shall have steel stringer, steel back plate and steel handrail with vinyl cover.

Step shall be of steel plate with non-slips piece at edge and deck composition.

The clear width of stairway shall be of about 700 mm.

The stairway shall be fitted at an angle of below 50 degrees to the horizontal.

5.8 FURNITURE AND FIXTURE

5.8.1 Furniture and fitting

Cabin furniture shall be furnished as shown on Table 5 - 1 through 5 - 4 in this section.

Design and arrangement of the furniture shall be in accordance with the Builder's practice, and size and material shall be to the manufacturer's standard.

Steel furniture shall be of a commercial stock with durable construction.

In case the legs of table are steel-constructed, the legs shall be welded to deck directly.

Wooden furniture shall have clear finish with polyester overlay and the steel furniture shall be finished with enamel baking in general.

Size and number of furniture and fittings subject to change on the way of detail design.

A facing of chair and sofa shall be provided and material shall be to the maker's standard.

As for T.V., D.V.D. player and stereo, refer to **IV- ELECTRIC PART**.



5.8.2 Upholstery

Upholstery shall be supplied as shown on Table 5 - 1 through 5 - 4 in this section.

Sample of materials, patterns and colors of the upholstery used for the accommodation shall be submitted to the Owner for approval.

5.8.3 Hardware

Hardware shall be of chrome plated brass in general.

One (1) master key system shall be applied all cabin.

All doors of public space, office space, living space and commissary space shall be fitted with a cylinder mortise lock.

Lever tumbler mortise locks shall be fitted to the doors exposed to weather part, in living space and wheelhouse.

Pad locks shall be fitted to the doors exposed to weather in sundry space.

Locks for water closets shall be fitted with indicator bolt.

All joiner door handles shall be of lever type.

Door hooks shall be provided where necessary.

Chair fasteners shall be provided.

Coat and hat hooks shall be fitted in cabins, mess rooms, office space, etc.

Storm rail shall be fitted to stairways and corridor used as means of escape in accommodation on one side, where exceeding 1800 mm breadth shall be fitted on both sides as per rule.

Where exceeding 1200 mm breadth, corridor in accommodation shall be fitted with storm rail on one side.

Storm rail shall be fitted on front wall in wheelhouse.

**Table 5 - 1 LIST OF FURNITURE AND FITTING FOR PUBLIC SPACE (1/2)**

Name of room		Officer's mess room	Saloon
B e d	No. and size (clear)	-	-
	Bottom	-	-
	No. of drawer	-	-
	Matt-ress	Cloth	-
		Stuff	-
	Pillow	-	-
S o f a	No. and type	-	1 - L type under closed
	Seat	Stuff	Foam plastics
	Back	Stuff	Foam plastics
C h a i r	No. and type	12 - Arm common chairs (steel)	2 - Easy chair (wooden) 4 - Arm chair (wooden)
	Seat	Stuff	Foam plastics
	Back	Stuff	Foam plastics
D e s k	No. and type	-	-
Table		2 - Wooden	2 - Wooden
Book case		-	-
Side board		1 - Wooden	1 - Wooden
Curtain	Door	-	-
	Window	Fitted	Fitted
	Bed	-	-
Miscellaneous		-	1 - T.V. 1 - Stereo 2 - Side table 1 - D.V.D. player (Region free type) 1 - Book case

**Table 5 - 1 LIST OF FURNITURE AND FITTING FOR PUBLIC SPACE (2/2)**

Name of room			Crew’s mess room	Crew’s smoking room
Item				
B e d	No. and size (clear)		-	-
	Bottom		-	-
	No. of drawer		-	-
	Matt- ress	Cloth	-	-
		Stuff	-	-
Pillow		-	-	
S o f a	No. and type		-	2 - I type under closed
	Seat	Stuff	-	Foam plastics
	Back	Stuff	-	Foam plastics
C h a i r	No. and type		14 - Common chairs (steel)	2 - Arm chair (steel) 4 - Arm chair (steel)
	Seat	Stuff	Foam plastics	Foam plastics
	Back	Stuff	Foam plastics	Foam plastics
D e s k	No. and type		-	-
Table			2 - Wooden	1 - Wooden
Book case			-	-
Side board			1 - Wooden	1 - Wooden
Curtain	Door		-	-
	Window		Fitted	Fitted
	Bed		-	-
Miscellaneous			-	1 - Game table 1 - Corner table 2 - Side table 1 - T.V. 1 - Stereo 1 - D.V.D. player (Region free type) 1 - Book case

**Table 5 - 2 LIST OF FURNITURE AND FITTING FOR LIVING SPACE (1/4)**

Name of room		Captain class day room	Captain class bed room
B e d	No. and size (clear)	-	1 - 2100 mm × 1400 mm
	Bottom	-	Wooden bottom
	No. of drawer	-	1 - Tier
	Matt- ress	Cloth	Cotton
		Stuff	Foam plastics
	Pillow	-	1 - With two (2) covers
S o f a	No. and type	2 - I type under closed	-
	Seat	Stuff	Foam plastics
	Back	Stuff	Foam plastics
C h a i r	No. and type	1 - Rev. arm chair (steel) 2 - Easy chair (wooden)	1 - Small chair (wooden)
	Seat	Stuff	Foam plastics
	Back	Stuff	-
D e s k	No. and type	1 - Wooden double pedestal	-
Table		1 - Wooden	-
Book case		1 - Wooden	-
Wardrobe		-	1 - Wooden
Curtain	Door	-	-
	Window	Fitted	Fitted
	Bed	-	-
Miscellaneous		1 - Side table 1 - Corner table 1 - Type table 1 - Refrigerator (about 70 liters)	1 - Metal safe (only for captain) 1 - Chest of drawer 1 - Night table

**Table 5 - 2 LIST OF FURNITURE AND FITTING FOR LIVING SPACE (2/4)**

Name of room			Senior officer class day room	Senior officer class bed room
Item				
B e d	No. and size (clear)		-	1 - 2100 mm × 1400 mm
	Bottom		-	Wooden bottom
	No. of drawer		-	1 - Tier
	Matt-ress	Cloth	-	Cotton
		Stuff	-	Foam plastics
Pillow		-	1 - With two (2) covers	
S o f a	No. and type		1 - I type under open	-
	Seat	Stuff	Foam plastics	-
	Back	Stuff	Foam plastics	-
C h a i r	No. and type		1 - Rev. arm chair (steel)	1 - Small chair (wooden)
	Seat	Stuff	Foam plastics	-
	Back	Stuff	Foam plastics	-
D e s k	No. and type		1 - Wooden double pedestal	-
Table			1 - Wooden	-
Book case			1 - Wooden	-
Wardrobe			-	1 - Wooden
Curtain	Door	-	-	
	Window	Fitted	Fitted	
	Bed	-	-	
Miscellaneous			1 - Refrigerator (about 70 liters)	1 - Night table

**Table 5 - 2 LIST OF FURNITURE AND FITTING FOR LIVING SPACE (3/4)**

Name of room			Junior officer class	Petty officer class
Item				
B e d	No. and size (clear)		1 - 2100 mm × 900 mm	1 - 2000 mm × 900 mm
	Bottom		Wooden bottom	Wooden bottom
	No. of drawer		1 -Tier	1 - Tier
	Matt-ress	Cloth	Cotton	Cotton
		Stuff	Foam plastics	Foam plastics
Pillow		1 - With two (2) covers	1 - With two (2) covers	
S o f a	No. and type		1 - I type under open	1 - I type under open
	Seat	Stuff	Foam plastics	Foam plastics
	Back	Stuff	Foam plastics	Foam plastics
C h a i r	No. and type		1 - Rev. arm chair (steel)	1 - Rev. arm chair (steel)
	Seat	Stuff	Foam plastics	Foam plastics
	Back	Stuff	Foam plastics	Foam plastics
D e s k	No. and type		1 - Wooden single pedestal	1 - Wooden single pedestal
Table			-	-
Book case			1 - Wooden	1 - Wooden
Wardrobe			1 - Wooden	1 - Wooden
Curtain	Door		-	-
	Window		Fitted	Fitted
	Bed		-	-
Miscellaneous				1 - Wash basin with toilet cabinet

**Table 5 - 2 LIST OF FURNITURE AND FITTING FOR LIVING SPACE (4/4)**

Name of room			Crew class	Hospital
Item				
B e d	No. and size (clear)		1 - 2000 mm × 900 mm	1 - 2000 mm × 800 mm (steel bed)
	Bottom		Wooden bottom	Steel
	No. f drawer		1 - Tier	-
	Matt- ress	Cloth	Cotton	Cotton
		Stuff	Foam plastics	Foam plastics
Pillow		1 - With two (2) covers	1 - With two (2) covers	
S o f a	No. and type		1 - I type under open	-
	Seat	Stuff	Foam plastics	-
	Back	Stuff	Foam plastics	-
C h a i r	No. and type		1 - Rev. chair (steel)	1 - Rev. chair (steel), 1 - Small chair (steel)
	Seat	Stuff	Foam plastics	Foam plastics
	Back	Stuff	Foam plastics	Foam plastics
D e s k	No. and type		1 - Wooden with one (1) drawer	1 - Wooden with one (1) drawer
Table			-	-
Book case			1 - Wooden (book rack)	1 - Wooden (book rack)
Wardrobe			1 - Wooden	-
Curtain	Door		-	-
	Window		Fitted	Fitted
	Bed		-	-
Miscellaneous			1 - Wash basin with toilet cabinet	1 - Disinfection table 1 - Medicine locker 1 - Refrigerator (about 70 liters)

**Table 5 - 3 LIST OF FURNITURE AND FITTING FOR OFFICE SPACE**

Name of room		Ship's office	Meeting room	Tally office
Item				
B e d	No. and size (clear)	-	-	-
	Bottom	-	-	-
	No. of drawer	-	-	-
	Matt-ress	Cloth	-	-
		Stuff	-	-
	Pillow	-	-	-
S o f a	No. and type	-	-	1 - Wooden bench
	Seat	Stuff	-	-
	Back	Stuff	-	-
C h a i r	No. and type	8 - Common chairs	6 - Common chairs	-
	Seat	Stuff	Foam plastics	-
	Back	Stuff	Foam plastics	-
D e s k	No. and type	-	-	1 - Wooden
Table		1 - Wooden	1 - Wooden	-
Book case		Fitted (2 - book rack)	2 - Fitted	-
Side board		-	1 - Wooden	-
Curtain	Door	-	-	-
	Window	Fitted	Fitted	-
	Bed	-	-	-
Miscellaneous		1 - Folding chair 2 - File cabinet (2 tiers) 1 - Typewriting & copy table 1 - Wash basin 1 - Plan locker		1 - Hand wash basin

**Table 5 - 4 LIST OF FURNITURE AND FITTING FOR NAVIGATION SPACE**

Name of room		Wheelhouse	Radio instruments room
B e d	No. and size (clear)	-	-
	Bottom	-	-
	No. of drawer	-	-
	Matt-ress	Cloth	-
		Stuff	-
	Pillow	-	-
S o f a	No. and type	1 - I type under open	-
	Seat	Stuff	Foam plastics
	Back	Stuff	Foam plastics
C h a i r	No. and type	1 - Pilot chair (steel)	1 - Rev. chair (steel)
	Seat	Stuff	Foam plastics
	Back	Stuff	Foam plastics
D e s k	No. and type	-	-
Table		1 - Chart table	-
Book case		1 - Wooden	1 - Wooden (book rack)
Side board		-	-
Curtain	Door	-	-
	Window	Fitted (aft wall window only)	Fitted
	Bed	-	-
Miscellaneous		1 - Locker 1 - Dark curtain around chart table 1 - Working table 2 - Flag shelf 1 - Flag locker 2 - Folding table 1 - Book rack (above chart table) 1 - Sink	1 - Working table



5.9 SANITARY EQUIPMENT

5.9.1 Sanitary fixture

Sanitary fixtures shall be furnished as shown on Table 5 - 5 in this section.

All exposed metal fixtures, taps and accessories shall be of chromium plated brass in general.

Wash basin and hand wash basin shall be of white vitreous china.

Fresh water and hot water faucets with manual mixing valve shall be provided for each wash basin and hand wash basin.

Shower shall be composed of shower head of telephone type, stop valves and manual mixing valve for temperature control.

Water closet shall be of white vitreous china and fitted with a flush valve and cutout valve in water supply line. Urinal shall be fitted with a stop valve in water supply line.

Toilet paper holder shall be provided one (1) for each water closet.

Toilet cabinet shall be made of plastics, and mirror shall be fitted on toilet cabinet.

Soap dish shall be fitted one (1) for each wash basin and each shower.

Towel bar shall be provided one (1) for each wash basin.

Liquid soap rack shall be fitted for hand wash basin in all water closets and galley.

**Table 5 - 5 LIST OF EQUIPMENT FOR SANITARY SPACE (1/3)**

Name of room Item	Captain class	Officer class	Hospital
Wash basin	1	1	1
Shower	1	1	1
Water closet *	1	1	1
Toilet cabinet with mirror	1	1	1

Table 5 - 5 LIST OF EQUIPMENT FOR SANITARY SPACE (2/3)

Name of room Item	Tally W.C.	Common W.C.		
		Upper deck	A deck	Nav. deck
Hand wash basin	1	1	1	1
Water closet *	1	1	1	1
Urinal	-	-	2	-
Broom locker	-	-	1	-

Table 5 - 5 LIST OF EQUIPMENT FOR SANITARY SPACE (3/3)

Name of room Item	Crew's		Changing room (eng.)
	Shower room	W.C.	
Bath tub	-	-	-
Shower	3	-	1
Box	1	-	-
Urinal	-	2	-
Water closet *	-	3	-
Wash basin	1	1 **	1
Broom locker	-	1	-

* ---- European style

** ---- Hand wash basin



5.9.2 Laundry equipment

Crew's laundry shall be provided on B deck with the following equipments.

- 2 - Electric washing machine (5 kg, automatic)
- 1 - Washing tub
- 1 - Ironing table

Crew's drying room shall be provided on B deck with electric heater and hanging rope.

Officer's laundry shall be provided on C deck with the following equipments.

- 1 - Electric washing machine (5 kg, automatic)
- 1 - Electric dryer (4.0 kg)
- 1 - Washing tub
- 1 - Ironing table



5.10 COMMISSARY EQUIPMENT

5.10.1 General

In general, metal parts in direct contact with prepared food shall be of stainless steel.

Shelves of steel galvanized and/or wood shall be provided suitably.

The size of table, dresser, shelf, rack, etc. shall be designed according to arrangement of the room.

5.10.2 Galley

One (1) galley shall be provided with the following equipment.

- 1 - Electric cooking range with two (2) hot plates, one (1) grill and one (1) oven (23 kw)
- 1 - Steam soup boiler of fixed type (50 liters)
- 2 - Electric rice cooker of household type (3.6 liters)
- 1 - Electric refrigerator (about 300 liters)
- 1 - Serving table with stainless steel top
- 1 - Cooking table with stainless steel top with one (1) sink and knife holder (with key)
- 1 - Dresser with stainless steel top and two (2) sinks
- 1 - Meat grinder
- 1 - Dish rack
- 1 - Cup rack
- 1 - Hand wash basin
- 1 - Garbage can (steel, with cover)
- 1 - Disposer

5.10.3 Pantry

Officer's and crew's pantry shall be arranged with the following equipment.

- Each 1 - Electric refrigerator (about 135 liters)
- Each 1 - Dresser with stainless steel top and two (2) sinks
- Each 1 - Electric pot (4 liters)
- Each 1 - Garbage can
- Each 1 - Dish rack
- Each 1 - Cup rack



5.10.4 Drinking water fountain

Two (2) self-contained type drinking water fountains shall be provided at the following locations.

- 1 - Engine room
- 1 - Passage (A deck)

5.11 PROVISIONS SPACE

5.11.1 Provisions store

Provisions store shall be provided.
And heat insulation shall be applied as follows :

Part		Overhead	Wall	Floor
Adjacent to weather	Prov. store	WC50	WC50	bare steel painted

WC50 ----- 50 mm thickness glass wool and cloth

Wooden shelves shall be suitably provided.



5.11.2 Refrigerating provisions chamber

One (1) refrigerating provisions chamber shall be provided, which consist of meat room, fish room, vegetable room and lobby, according to the following table.

Place	Item	Capacity (m ³)	Temperature (°C)
Meat room		about 13.7	- 18
Fish room		about 10.4	- 18
Vegetable room		about 15.2	+ 2
Lobby		about 7.9	not specified
Total		about 47.2	-

Exterior bulkheads of the chamber shall be of steel.

The insulation on the floor, wall and overhead shall be as shown on the Fig. 5 - 1 Typical insulation for refrigerating provisions chamber.

Three (3) tiers steel shelves shall be provided in meat room, fish room and vegetable room.

Portable polyethylene grating shall be fitted except under shelves.

Each one (1) seal locker shall be provided in vegetable room and meat room.

Door for refrigerating provisions chamber shall have 700 mm clear opening and shall be able to be opened from both sides.

Electric heater for defrost shall be installed in the door packing of meat room and fish room.

Temperature of each room shall be displayed at outside of the refrigerating provisions chamber by a digital thermometer.

A calling bell switch, electric lamps, etc. shall be provided as necessary.

As for signal bell, refer to **IV - ELECTRIC PART**.



Fig. 5 - 1 Typical insulation for Ref. provisions chamber

Insulation panel for refrigerating provisions chamber shall be of prefab type.

Insulation for refrigerating provisions chamber shall be applied as follows :



Place		Thickness
Lobby and vegetable room	Ceiling	100 mm
	Wall	50 mm
	Floor	100 mm
Meat room and fish room	Ceiling	100 mm
	Wall	100 mm
	Floor	100 mm



5.11.3 Refrigerating plant for refrigerating provisions chamber

Two (2) sets of refrigerating plant shall be provided in air con. & ref. machine room.

The refrigerating plant shall be of R-404a direct expansion system, and shall consist of one (1) electric motor driven semihermetic reciprocating compressor, one (1) sea water cooled condenser and other fittings and piping in accordance with the manufacturer's standard.

The refrigerating plant shall be capable to maintain the specified temperatures with one (1) compressor working at full load not more than eighteen (18) hours per day.

One (1) of two (2) compressor to serve as stand by.

Cooling down to specified temperatures shall be working by two (2) compressors.

The refrigerating plant shall be able to maintain the specified temperature in refrigerated provisions chamber under the following conditions.

Cooling water temperature	-----	32 °C
Ambient temperature	-----	35 °C

Compressor shall be provided with suction, discharge stop valves and necessary fittings.

Cooling capacity shall be automatically controlled by pressure switch.

Evaporating temperature shall be automatically controlled by thermostatic expansion valve and magnetic valve, and be able to manually controlled by manual expansion valve.

Safety device such as high-discharge switch, safety relief valve shall be provided.

The condenser shall be of horizontal multipass shell and tube type and cooled by sea water.

Each one (1) set of air cooling unit shall be fitted in vegetable room, meat room and fish room.

The unit shall consist of an electric motor driven axial fan, a finned tube cooler, an adjustable louver, a drip pan and casing.

Electric heater with timer shall be provided with air cooler in meat room and fish room for defrosting.

Cooling grid shall be provided in lobby taking return refrigerant from freeze room by cooling coil.

Materials of refrigerating plant shall be as per the manufacturer's standard.



5.12 SUNDRY SPACE

5.12.1 General

Sundry space shall be arranged as shown on the General Arrangement and equipped in accordance with the following table.

5.12.2 Engine control room

Heat and sound insulation shall be as follows :

Overhead ----- 25 mm non-combustible board + P.V.C*
 Wall ----- 50 mm glass wool + 25 mm non-combustible board + P.V.C*
 Floor ----- 25 mm high heat board + 8 mm latex deck composition

P.V.C* --- Polyvinyl chloride overlay

5.12.3 Store and locker space in accommodation

Item Compartment	Floor	Wall	Overhead	Shelf
Bos'n store	Grating on bare steel	Bare steel painted	Bare steel painted	Steel 1-tier
Deck store				2-tier
Paint store				
Seal locker				Wooden 1-tier
Other locker **				*
Changing room	Bare steel painted			
Garbage storage store ***				

Grating ----- Batten grating shall be fitted under shelves only.

* --- Steel locker shall be provided.

** --- Gutter coaming for sweat water shall be provided at only side of adjacent wall to exposed part.

*** --- Door with insect screen shall be provided.



5.12.4 Miscellaneous

Item Compartment	Floor	Wall	Overhead	Shelf
Air conditioning unit & ref. prov. mach. room	Bare steel painted	Bare steel painted	Bare steel painted	-
Steering gear room				Steel shelf
Emergency fire pump room				-
Emergency gen. room				
Battery room				
CO2 room				
* , ** Gymnasium	Refer to 5.2.3 & 5.3.2			1-wooden bench 1-hand wash basin 1-game locker

* ---- Ping-pong table shall not be supplied by the builder

** ---- Gutter coaming for sweat water shall be provided at only side of adjacent wall to exposed part.



SECTION 6 PAINTING AND CATHODIC PROTECTION

6.1 GENERAL

Material of paints shall be of base synthetic resin type in general.

Paints used throughout the vessel shall be of marine paint.

As for PSPC, refer to SUBSECTION 6.6 PERFORMANCE STANDARD FOR PROTECTIVE COATINGS FOR DEDICATED SEA WATER BALLAST TANKS.

6.2 COLOUR SCHEME

Finished colour scheme shall be furnished by the Owner prior commencement of design works, but colour scheme for deck machineries, etc. shall be as follows :

Windlass, mooring winch, etc. on weather part

Mansell No. ---- N - 6.0

Air conditioning unit, ref. provisions machine

Mansell No. ---- 7.5 BG 7/2

As for main and auxiliary machinery in engine room and electric equipment, refer to the description in **III- MACHINERY PART** and **IV- ELECTRIC PART** respectively.

6.3 PRIMARY SURFACE PREPARATION AND SHOP PRIMER

The steel plates and section steels of 5 mm and above in thickness for hull structural members which are to be coated with paint shall be shot-blasted to remove mill scale and rust.

Other steel plates and section steels, equipment, pipes, forgings, etc. shall not be shot-blasted.

Generally, the grade of surface preparation shall be of Sa.2.5 of SIS (Swedish Standard SIS 055900-1967) for steel plates and Sa.2 for section steels.

Steel surfaces treated by the shot-blasting shall be coated immediately after the blasting, with one (1) coat of shop primer except otherwise specified to prevent rusting during the construction.

As to steel surfaces other than shot-blasting is specified, the steel surfaces shall be cleaned prior to painting by disc sanders and/or wire brushes manually in accordance with the Builder's practice.



6.4 SECONDARY SURFACE PREPARATION

Steel surface shall be cleaned prior to painting by disc sander and/or wire brushes manually according to the Builder's practice.

The grade of surface preparation shall be as follows :

Compartment	Damaged part	Processed part
Outside of shell and tank	Pt2	Pt2.5
Structure and outfitting in weather part	Pt2	Pt2
Interior area	Pt1	Pt1

The grade of surface preparation in above list shall be based on JSRA SPSS 1998 (Standard for the Preparation of Steel Surface prior to Painting).

Damaged part means steel surface having white zinc salt or rust in the form of spots.

Processed part means steel surface in way of hand welding, automatic welding or gas burning.

Surface treatment shall not be made to the area of F.O. tank, D.O. tank, etc. where rust preventive oil shall be coated.

The edges and corners of steel structure in fresh water tanks and drinking water tank except rolled sections shall be treated by builder's standard procedure. (One pass grinding)



6.5 PAINING

Painting schedule shall be as shown on SUBSECTION 6.7 PAINTING SCHEDULE.

Painting work shall be performed by airless spray as far as possible, and where the use of airless spray is restricted due to lack of working spaces, etc., roller and/or hand brush shall be used.

Generally, shop primer shall not be touched up wherever taken off due to burnt damage or mechanical damage after fabrication.

However, in case when over-coating is impracticable immediately after cleaning due to the Builder's construction schedule, shop primer shall be touched up.

Generally, galvanized parts, chromium plated parts, brass, bronze, aluminium, stainless steel, plastics, glass, rubber, copper, wooden shelf, etc. shall not be coated with paint except otherwise specified.



Application of stripe coat except the water ballast tanks

Stripe coat shall be applied by brush painting to edge part of following items fresh water tank and drinking water tank before or after application of the first coat.

Standard of stripe coat application

Item	Treatment	
	Grinding	Stripe coat
Air hole:(1)	One (1) pass	○
Drain hole:(2)	One (1) pass	○
Bracket end:(3)	One (1) pass	○
Snipped end of face plate:(4)	One (1) pass	○
Lightening hole:(5)	One (1) pass	○
Longitudinal (Built up)	One (1) pass	—
Longitudinal (Angle)	—	—
Back of Longitudinal	—	—
Manhole and access hole	One (1) pass	○
Edge of accommodation deck	—	○

- Note:
1. The corner of round section shall not be considered as free edge.
 2. Area corresponding to each item: (1)-(5) are illustrated in next page.
 3. Meanings of symbols ;

○ : applied

— : not applied

4. For holes of diameter 200mm and below, spray shall not be applied, but touch up paint shall be applied.

**Areas where stripe coat to be applied.**

Stripe coat shall be applied to areas shown in the sketch below.



- (1) Air hole
- (2) Drain hole
- (3) Bracket end
- (4) Snipped end of face plate
- (5) Lightning hole



6.6 PERFORMANCE STANDARD FOR PROTECTIVE COATINGS FOR DEDICATED SEA WATER BALLAST TANKS

6.6.1 General

Performance Standard for Protective Coatings (PSPC) for dedicated sea water ballast tanks required by IMO shall be applied.

6.6.2 Primary surface preparation and shop primer

The grade of surface preparation shall be of Sa.2.5.

Shop primer shall be of zinc containing inhibitor free zinc silicate based or equivalent. Compatibility with main coating system shall be confirmed by the paint manufacturer.

6.6.3 Secondary surface preparation

Secondary surface preparation shall be applied by shot blast Sa 2.5 to damaged part of shop primer and welded bead in the water ballast tanks.

The retained shop primer shall be cleaned by sweep blasting, high pressure water washing or equivalent method.

After erection, St 3 or better or Sa 2.5 where practicable shall be applied to butts. St 3 shall be applied to small damages up to 2% of total area shall be applied by mechanical tools.

However, contiguous damages over 25m² or over 2% of total area of the water ballast tank, shot blast Sa 2.5 shall be applied.

Edges inside the water ballast tanks shall be treated to a rounded radius of minimum 2mm, or smoothed by three (3) pass grinding or at least equivalent process before painting.



6.6.4 Painting

Nominal dry film thickness of epoxy based paint shall be $320\ \mu$ in the water ballast tanks.

Stripe coat shall be applied to edges and corners of steel structure in the water ballast tanks as per GUIDELINE FOR IMPLEMENTATION OF PERFORMANCE STANDARD OF PROTECTIVE COATINGS.

Dry film thickness in the water ballast tanks shall be such that 90% of the measurement points shall be greater than or equal to the specified thickness and none of the remaining 10% shall be below 90% of the specified thickness.

6.6.5 Inspection

Inspections thereto shall be carried out by the qualified inspector(s) of the builder and/or the qualified inspector(s) appointed by the builder, whose determination shall be deemed final so far as the application of the PERFORMANCE STANDARD FOR PROTECTIVE COATINGS to the vessel is concerned, under GUIDELINE FOR IMPLEMENTATION OF PERFORMANCE STANDARD FOR PROTECTIVE COATINGS.



6.7 PAINTING SCHEDULE

(1) OUTSIDE SHELL, RUDDER, ETC. (1/1)

Place		Number of coat				
		1	2	3	4	5
Bottom area	Flat part (up to bilge keel level)	PE A/C	SP A/F *	SP A/F *	-	-
	Riser part (between bilge keel level and ballast W.L.)	PE A/C	SP A/F *	SP A/F *	-	-
Boottop area (between ballast W.L. and load W.L.)		PE A/C	AR B/T	AR B/T	-	-
Topside area (above load W.L.)		PE A/C	AR T/S	AR T/S	-	-
Rudder	Outside	Similar to shell				
	Inside	ME	-	-	-	-
Stern frame	Outside	Similar to shell				
	Inside	ME	-	-	-	-
Rudder trunk		ME	-	-	-	-

* ---- Total 60 months



(2) SUPERSTRUCTURES AND DECK FITTING IN WEATHER PART (1/1)

Place		Number of coat				Remarks
		1	2	3	4	
Upper deck, F'cle deck		BTE	AR D/P	-	-	BTE : (160 μ)
Accommodation area decks						
Under machinery (within coaming)		BTE (HB)	-	-	-	
Under covering		No coating				
Accommodation house *2 (out side)		BTE	AR F/P	-	-	BTE : (160 μ)
Hatch cover	Outside					
	Inside (cargo hold side)	BTE	-	-	-	(250 μ)
	Void space	No coating				
Hatch coaming	Outside	BTE	AR F/P	-	-	BTE : (160 μ)
	Inside (cargo hold side)	BTE	-	-	-	(250 μ)
Funnel *1	Outside	BTE	AR F/P	-	-	BTE : (160 μ)
	Inside	H/R	H/R	-	-	
Mast and post	Outside	BTE	AR F/P	-	-	BTE : (160 μ)
	Inside	No coating				
Ventilator	Outside	Similar to circumference				
	Inside	BTE	-	-	-	
Deck machinery foundation		BTE	BTE	-	-	
Mooring fittings, etc.		BTE	AR F/P	-	-	BTE : (160 μ)
Outside of pipe	Galvanized pipe	Finish paint to be similar to circumference				
	Hydraulic pipe	Similar to circumference				
	Other than above					
Deck machinery (windlass, mooring winch, boat davit)		Maker standard				

*1 Outside of exh. gas pipe --- H/R \times 2 coat

Inside of exh. gas pipe --- No coating

Under insulation --- No coating

*2 ~~No.3 cargo hold --- (250 μ)~~

*2 Reverse side of bridge wing --- BTE(HB) (250 μ)+ AR F/P



(3) ACCOMMODATION SPACE & STORES (1/2)

Place			Number of coat				Remarks
			1	2	3	4	
Living, Public, Office, Corridor space	Ceil- ing	Bare steel	R/P(HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Wall	Bare steel	R/P(HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Floor	Under covering	No coating				
		Within gutter way	BTE (HB)	-	-	-	
Commissary, Sanitary space	Ceil- ing	Bare steel	R/P(HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Wall	Bare steel	R/P(HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Floor	Under covering	No coating				
		Within gutter way	BTE (HB)	-	-	-	
Emer. Fire pump room, Air con. & ref. Mach. room, Emer. gene. room, Steer. gear room	Ceiling, Wall		R/P (HB)	F/P	-	-	
	Floor		R/P (HB)	D/P	-	-	
	Under machinery		BTE (HB)	-	-	-	
	Within coaming		BTE (HB)	-	-	-	
Provisions store	Ceil- ing	Bare steel	R/P(HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Wall	Bare steel	R/P(HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Floor	Bare steel	R/P(HB)	D/P	-	-	
		Under covering	No coating				



(3) ACCOMMODATION SPACE & STORES (2/2)

Place			Number of coat				Remarks
			1	2	3	4	
Battery room		Ceiling, Wall, Floor	BTE	-	-	-	
Ref. prov. chamber	Ceiling, Wall	Bare steel	BTE	-	-	-	
	Floor	Bare steel	BTE (HB)	-	-	-	
Store	Ceiling, Wall	Bare steel	R/P(HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Floor	Bare steel	R/P(HB)	D/P	-	-	
		Under covering	No coating				
Deck house, Bos'n store	Ceiling, Wall	Bare steel	BTE	-	-	-	
	Floor	Bare steel	BTE	-	-	-	
		Within coaming	BTE (HB)	-	-	-	

(4) CARGO HOLD (1/1)

Place	Number of coat				Remarks
	1	2	3	4	
Ceiling	BTE	-	-	-	(250 μ)
Wall	BTE	-	-	-	(250 μ)
Tank top	No coating				
Bilge well	BTE (HB)				(250 μ)

Except No.3 cargo hold, for which refer to (6).



(5) ENGINE ROOM (1/1)

Place			Number of coat				Remarks
			1	2	3	4	
Ceiling		Bare steel	R/P (HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
Wall	Above lower floor	Bare steel	R/P (HB)	F/P	-	-	
		Under insulation	R/P (HB)	-	-	-	
	Under lower floor	Bare steel	BTE (HB)	-	-	-	
Floor	Engine flat		R/P (HB)	D/P	-	-	
	Top of double bottom		BTE (HB)	-	-	-	
	Checkered plate	Top	D/P	-	-	-	
		Under	No coating (except ceiling)				
	Under machinery (within coaming)		BTE (HB)	-	-	-	
	Machinery foundation		BTE (HB)	-	-	-	
	Bilge well		BTE (HB)	-	-	-	
	Under covering		No coating				
Outside of pipe	Galv. pipe	Above floor	F/P	-	-	-	
		Under floor	No coating				
	Steam pipe		No coating				
	Other than above	Above floor	R/P (HB)	F/P	-	-	
		Under floor and under insulation	R/P (HB)	-	-	-	

**(6) TANKS (1/1)**

Place		Number of coat				Remarks
		1	2	3	4	
Water ballast tank		Refer to SUBSECTION 6.6 PERFORMANCE STANDARD FOR PROTECTIVE COATINGS FOR DEDICATED SEA WATER BALLAST TANKS.				
Dirty water tank		ME	-	-	-	(250 μ)
Fuel oil tank		R/O	-	-	-	Block stage Only
Diesel oil tank		R/O	-	-	-	Block stage Only
L. O. sump tank		P/E	P/E	-	-	Total(200 μ)
Fresh water tank		P/E (N)	-	-	-	Average 300 μ
Drinking water tank		P/E (N)	-	-	-	Average 300 μ
Chain locker		ME	-	-	-	-
Cofferdam		BTE	-	-	-	-
Void space	With manhole	BTE	-	-	-	-
	Without manhole	No coating				-
Bilge sludge tank		ME	-	-	-	-
No.3 cargo hold	Ceiling and wall	BTE (HB)	-	-	-	(250 μ)
	Tank top	BTE	-	-	-	(100 μ)
	Bilge well	BTE (HB)	-	-	-	(250 μ)



Abbreviation

PE A/C	Epoxy type anti-corrosive paint
SP A/F	Self-polishing type anti-fouling paint not containing TBT (low friction type)
AR B/T	Acrylic resin boot-top paint
AR T/S	Acrylic resin top side paint
ME	Modified epoxy paint
BTE	Modified epoxy paint
PE	Pure epoxy paint
AR	Acrylic resin paint
U	Polyurethane paint
PE (N)	Non solvent type pure epoxy paint (Shipyard standard)
R/P	Rust preventive primer
F/P	Finish paint
D/P	Deck paint
H/R	Heat resisting paint
R/O	Rust preventive oil
O/L	Alkyd resin paint
(HB)	High-build type

Note

The dry film thickness in parenthesis shows only aim figure for reference.



6.8 GALVANIZING

Small steel fittings coming into contact with wood, canvas and fiber ropes including items described below shall be galvanized.

Galvanizing shall be carried out initially by hot dipping in principle and shall be touched up with zinc rich paint during outfitting work, where damaged except inside of pipe.

As for steel plate of 1.6 mm and below in thickness galvanized steel sheet shall be used instead of hot dipping galvanization.

Galvanized fitting :

Hand rails for ladder in weather part

Top rails for hand rail

Steel fitting for refrigerating provisions chamber

Steel parts of table and dresser in galley

Levers for steel door clips in weather part

Fittings for accommodation ladder

Fittings for pilot assistant ladder

6.9 CATHODIC PROTECTION

Suitable number of anode (60 months life) shall be fitted on stern part, sea chest and rudder.

The anodes shall be fitted with stainless steel bolts and nuts.



SECTION 7 VENTILATION AND AIR CONDITIONING

7.1 GENERAL

7.1.1 Application

The following compartment shall be ventilated by air conditioning system, mechanical ventilating system or natural ventilator according to the characteristics of each room as specified below.

Ventilation Schedule (1/2)

Compartment	Air conditioning or mechanical ventilation						Natural	
	Supply			Exhaust				
	System	Air change rate	Terminal	System	Air change rate	Terminal	Sup.	Exh.
Mess room	A	“ * ”	D	-	-	-	-	L
Saloon, Crew’s smoking room	A	“ * ”	D	-	-	-	-	L
Ship’s office, Meeting room	A	“ * ”	P	-	-	-	-	L
Tally office	A(* 1)	6	P	-	-	-	-	W
Captain class	A	“ * ”	D	-	-	-	-	L
Cabin	A	“ * ”	P	-	-	-	-	L
Hospital	A	“ * ”	P	-	-	-	-	MorW
Stairway	-	-	-	-	-	-	-	MorW
Wheelhouse	A(* 1)	10	P	-	-	-	-	MorW
Radio instruments room	A(* 1)	6	P	-	-	-	-	L
Galley	A(* 2)	20	P	K	40	G	MorW	-
Pantry	A(* 1)	6	P	-	-	-	-	L
Provisions store	-	-	-	K	10	G	MorW	-
W.C., Shower	* A(* 1)	1	P	K	10	G	L	-
Private lavatory	-	-	-	K	10	G	L	-

* --- Only for the use more than one person



Ventilation Schedule (2/2)

Compartment	Air cond. or mech. ventilation						Natural	
	Supply			Exhaust			Sup.	Exh.
	System	Air change rate	Terminal	System	Air change rate	Terminal		
Laundry	A(* 1)	1	P	K	10	G	L	-
Drying room	-	-	-	K	10	G	LorW	-
Boatswain store	-	-	-	-	-	-	M or W	
Paint store, Deck store	-	-	-	-	-	-		
Emergency generator room	-	-	-	-	-	-		
Air conditioning unit & refrigerating provisions machine room	-	-	-	-	-	-		
Steering gear room, Emergency fire pump room	-	-	-	-	-	-		
Battery room	-	-	-	-	-	-		
CO2 room	-	-	-	-	-	-		
Changing room (deck)	A(* 1)	1	P	-	-	-	-	MorW
Changing room (eng.)	A(* 1)	6	P	K	10	G	MorW	-
Fire station	A(* 1)	1	P	-	-	-	MorW	
Gymnasium	A(* 1)	6	P	-	-	-	L	-
Electric space	A(* 1)	1	P	K	2	G	MorW	-



(1) Abbreviation used in the table means as follows :

- A : Air conditioning system
- K : Mechanical ventilating system
- D : Anemostat diffuser
- P : Punkah louver
- G : Grill
- L : Door louver
- M : Mushroom ventilator or gooseneck ventilator
- W : Wall ventilator (elbow type)
- DL : Line diffuser

(2) Air change rate is shown in time/hour

Air change rate marked with “*” shall be designed to maintain the condition specified in **SUBSECTION 7.2 AIR CONDITIONING SYSTEM.**

(3) (*1) Spaces shall only be supplied with conditioned air without consideration of keeping temperature and relative humidity in the room.

(4) (*2) Independent air conditioning unit shall be provided to galley.



7.1.2 Ventilator coaming and duct

Ventilator coaming shall be built of steel plate and shall have approved height and thickness where required by the rules.

Air conditioning and mechanical ventilating ducts shall be made of galvanized steel sheet, and thickness of the duct shall be as follows :

	Diameter of duct (mm)	Thickness (mm)
Supply, return and exhaust duct	200 ϕ and less	0.5
	More than 225 ϕ	0.6

Duct shall be of the circular type normally. Rectangular type duct (low velocity type) shall be applied, in case that circular type is unable to be fitted.

The dimension of rectangular type duct shall be maker's standard.

Damaged part of galvanizing by welding shall not be regalvanized but coated with zinc rich paint.

Ventilator heads shall be of the Builder's standard type.

Suitable connections or collar plates shall be provided where ducts pass through bulkheads, decks and other structure as necessary.

Dampers shall be provided for adjusting air volume.

Non-return flap shall be provided in branch air supply duct for hospital.

7.1.3 Insulation

Supply air ducts of air conditioning system shall be insulated by 25 mm thickness glass wool where passing through accommodation space.

Finish covering for insulated ducts shall be made of glass cloth and shall be applied only for visible part except duct space.



7.2 AIR CONDITIONING SYSTEM

7.2.1 General

Air conditioning system shall be of central, high velocity and single duct system without terminal reheating and recooling.

The system shall consist of one (1) central unit and necessary distributing.

The system shall be designed under the following conditions.

Item	Outside		Inside		Sea water temp. (°C)	Recirculation air ratio (%)
	Dry-bulb temperature (°C)	Relative humidity (%)	Dry-bulb temperature (°C)	Relative humidity (%)		
For cooling	32	70	27	50	32	70
For heating	− 10(-1*)	-	20(21*)	50	-	70

* --- Singapore flag requirement

When the system works for cooling air temperature at the outlet of supply fan shall be controlled by an automatic expansion valve and a solenoid valve.

The automatic expansion valve shall control the evaporation temperature of refrigerant by the temperature of return refrigerant from air cooler.

The solenoid valve shall be operated by a thermostat installed at the return air inlet, and control the refrigerant quantity to supply to air cooler.

When the system works for heating, air temperature at the outlet of supply fan shall be controlled by the automatic steam regulating valve.

The automatic steam regulating valve shall control the steam quantity by a thermostat installed in air supply duct.

Air humidity shall be controlled manually by a needle valve at the air conditioning unit.

Room air temperature shall be controlled manually by adjusting supply air quantity at punkah louver or diffuser in each room.



7.2.2 Air conditioning central unit

Central unit shall be installed in air conditioning unit & refrigerating provisions machine room and shall contain the following equipment.

(1) One (1) air supply fan (electric motor driven, centrifugal type single speed).

(2) One (1) refrigerating plant

The plant shall be of R-404a direct expansion system and shall consist of one (1) compressor, one (1) condenser, cooling coil and other fittings and piping to complete refrigerating cycle in accordance with the manufacturer's standard.

The compressor shall be of single speed electric motor driven, multi-cylinder, semi-hermetic reciprocating type, and shall be provided with suction and discharge stop valve, dual pressure switch, relief valve and necessary fitting for automatic control by refrigerant pressure and oil pressure.

Automatic unloading system shall be provided.

The condenser shall be of horizontal multi-pass shell and tube type and cooled by sea water.

(3) Steam heater

(4) Steam spray type humidifier

(5) Manual damper to adjust the ratio re-circulation air

(6) Valves, cocks and strainers

(7) Air filter

Material of air conditioning central unit shall be to the manufacturer's standard.



7.3 MECHANICAL VENTILATION

Mechanical supply or exhaust system shall be provided for the space mentioned in **SUBSECTION 7.1 GENERAL.**

Each system shall consist of an electric motor driven axial flow fan, air ducts and terminals.

The following two (2) groups shall be ventilated separately.

- (1) Galley
- (2) Sanitary spaces

7.4 NATURAL VENTILATION

- (a) For cargo hold

Natural ventilators shall be provided at each cargo hold compartment.

The natural ventilators shall be provided to fore and aft end plate of hatch cover.

Each ventilator shall be fitted with weathertight closing apparatus and protective screen of stainless steel wire.

- (b) For other space

Suitable ventilator such as mushroom vent., wall vent., etc. shall be provided according to the Builder's standard.



SECTION 8 PIPING SYSTEM

8.1 GENERAL

Description of Hull part Specifications shall cover all piping system outside of engine room, however CO2 fire extinguishing pipe, deck scupper and plumbing drainage passing through engine room shall be as described in this section.

8.1.1 Standard

Pipes, valves, cocks, joints, schedule of threads, etc. which are to be fitted throughout the Vessel shall be in accordance with the Japanese Industrial Standard (JIS) or equivalent standard and the Builder's standard, except otherwise specified.

8.1.2 Leading procedure

Piping shall be designed to allow for stress due to thermal expansion and deflection of the Vessel's structure and shall be adequately protected against mechanical injury.

Pipes shall be led with minimum number of bend as far as practicable.

Welded sleeve joint and butt welded joint shall be applied for steel pipe except where necessary to provide flange, union, sleeve coupling and expansion joints for repairing.

Pipe passing through watertight bulkhead, deck or tank top plate shall be in accordance with the Builder's practice.

Penetration piece welded to insulated plate shall have sufficient length to permit access to joint without disturbing insulation.

Outboard discharge pipes shall be welded to side shell directly.



8.1.3 Processing

Bending work for pipes shall be carried out by electro-hydraulic bender in general.

The bending radius at center line of bend of steel pipe shall be about two (2) times of nominal diameter in principle and that of elbows shall be about one (1) time of the nominal size as the manufacturer's standard.

Steel elbows shall be used for the steel pipes where the small bending radius is applied as necessary.

Bending radius of copper pipe shall be about three (3) times of pipe diameter.

8.1.4 Support

In general, pipe shall be supported by U-bolt clip or band without sliding pad.

8.1.5 Pipe size and thickness

Pipe size of steel, copper, P.V.C. and stainless steel pipes shall be in accordance with the attached TABLE 8 - 1 respectively.

Pipe diameter described in the Specifications means "Nominal diameter" except where specially noted.



8.1.6 Material and application

Material, joint, etc. shall be in accordance with the **TABLE 8 - 2 PIPING APPLICATION SCHEDULE (HULL PART)**.

The steel pipes except the following shall be galvanized.

- (1) Air escape and sounding pipe in fuel oil tank, diesel oil tank and lubricating oil tank
- (2) Filling pipe for fuel oil, diesel oil and lubricating oil
- (3) Steam and exhaust pipes
- (4) Pipes in way of oil tank
- (5) Hydraulic oil pipes
- (6) Inside of cooling pipe for lobby of provisions ref. chamber

Galvanizing shall be carried out after fabricated with flange by welding, but where impracticable or damaged part shall be coated with zinc paint on board the Vessel.

8.1.7 Insulation and lagging

As for the insulation and lagging of pipe, refer to **Table 8 - 3 PIPING INSULATION AND LAGGING**.

**TABLE 8 - 1 PIPE TABLE (1/4) (STEEL PIPE)**

Unit : mm

Nominal diameter	Outside diameter	Pipe wall thickness			
		SGP	Sch40	Sch80	Sch160
10	17.3	2.3	2.3	3.2	-
15	21.7	2.8	2.8	3.7	4.7
20	27.2	2.8	2.9	3.9	5.5
25	34.0	3.2	3.4	4.5	6.4
32	42.7	3.5	3.6	4.9	6.4
40	48.6	3.5	3.7	5.1	7.1
50	60.5	3.8	3.9	5.5	8.7
65	76.3	4.2	5.2	7.0	9.5
80	89.1	4.2	5.5	7.6	11.1
100	114.3	4.5	6.0	8.6	13.5
125	139.8	4.5	6.6	9.5	15.9
150	165.2	5.0	7.1	11.0	18.2
200	216.3	5.8	8.2	12.7	18.2 *
250	267.4	6.6	9.3	12.7 *	18.2 *
300	318.5	6.9	9.5 *	12.7 *	18.2 *
350	355.6	7.9	9.5 *	12.7 *	18.2 *
400	406.4	7.9	9.5 *	12.7 *	18.2 *
450	457.2	7.9	9.5 *	12.7 *	18.2 *
500	508.0	-	9.5 *	12.7 *	18.2 *
550	558.8	-	9.5 *	12.7 *	18.2 *
600	609.6	-	9.5 *	12.7 *	18.2 *

STPY-400E shall be adopted for * marked size pipe.



TABLE 8 - 1 PIPE TABLE (2/4) (COPPER PIPE)

Unit : mm

Outside diameter	Pipe wall thickness	
	1.57 MPa (16 kg/cm ²) & below	8.8 MPa (90 kg/cm ²) & below
6	1.0	1.0
8	1.0	1.0
10	1.0	1.2
15	(1.5)	-
20	1.2	-
25	1.2	-
32	1.5	-
40	1.5	-
45	2.0	-
50	2.0	-

**TABLE 8 - 1 PIPE TABLE (3/4) (P.V.C. PIPE)**

Unit : mm

Nominal diameter	Outside diameter	Pipe wall thickness		
		V U	V P	H T
13	18	-	2.2	2.5
16	22	-	2.7	3.0
20	26	-	2.7	3.0
25	32	-	3.1	3.5
30	38	-	3.1	3.5
40	48	1.8	3.6	4.0
50	60	1.8	4.1	5.0
65	76	2.2	4.1	5.0
75	89	2.7	5.5	5.8
100	114	3.1	6.6	7.0
125	140	4.1	7.0	8.2
150	165	5.1	8.9	9.7



Note : VU --- Nominal pressure 0.49 MPa (5 kg/cm²)
 VP --- Nominal pressure 0.98 MPa (10 kg/cm²)
 HT --- For hot water piping

HT class pipes shall not be in accordance with the Japanese Industrial Standard (JIS).

**TABLE 8 - 1 PIPE TABLE (4/4) (STAINLESS STEEL PIPE)**

Unit : mm

Nominal diameter	Outside diameter	Pipe wall thickness					
		Sch 5s	Sch 10s	Sch 20s	Sch 40	Sch 80	Sch 160
6	10.5	1.0	1.2	1.5	1.7	2.4	-
8	13.8	1.2	1.65	2.0	2.2	3.0	-
10	17.3	1.2	1.65	2.0	2.3	3.2	-
15	21.7	1.65	2.1	2.5	2.8	3.7	4.7
20	27.2	1.65	2.1	2.5	2.9	3.9	5.5
25	34.0	1.65	2.8	3.0	3.4	4.5	6.4
32	42.7	1.65	2.8	3.0	3.6	4.9	6.4
40	48.6	1.65	2.8	3.0	3.7	5.1	7.1
50	60.5	1.65	2.8	3.5	3.9	5.5	8.7
65	76.3	2.1	3.0	3.5	5.2	7.0	9.5
80	89.1	2.1	3.0	4.0	5.5	7.6	11.0

Note :  mark ----- For pressure line 8.8 MPa (90 kg/cm²) & below.
 mark ----- For pressure line 24.5 MPa (250 kg/cm²) & below.

**TABLE 8 - 2 PIPING APPLICATION SCHEDULE (HULL PART 1/4)**

System	Nominal pressure MPa (kg/cm ²)	Nominal diameter	Pipe material	Thick.	Joint	Remarks		
Bilge line	-	All size	STPG-370E	* Sch 80	Flange Sleeve Butt	(* 1)		
Ballast line	0.49 (5)			SGP			Sch 40	
Fuel oil filling line			-					
Fresh water filling line			-					
Air escape pipe			50 & below				STPG-370E	Sch 80
			65 , 80				STPG-370E	Sch 40
			100 & above				SGP	-
Sounding pipe			40				STPG-370E	Sch 80
	65 , 80	STPG-370E	Sch 40					
Fire hyd. line (wash deck line)	0.98 (10)	All size	SGP	-	(* 2)			
Electric cable pipe	-					-		
CO ₂ line (CO ₂ cylinder to selection valve)	-		STPG-370E	Sch 80		-		
CO ₂ discharge pipe (Selection valve to discharge nozzle)	-		SGP	-		-		

* ---- Only double bottom (other : Sch 40)

**TABLE 8 - 2 PIPING APPLICATION SCHEDULE (HULL PART 2/4)**

System		Nominal pressure MPa (kg/cm ²)	Nominal diameter	Pipe material	Thick.	Joint	Remarks
Deck mach. and Hatch cover	Press. line	24.5 (250)	25 & below	STPG-370E	Sch 80	Flange Sleeve Butt	-
			32 & above	STS-370S	Sch160		
	Return Line	0.98 (10)	All	STPG-370E	Sch 40		
Valve remo. cont. sys.	Press. line	8.8 (90)	10 & below	C1220T	-	Union coupling Sleeve	

**TABLE 8 - 2 PIPING APPLICATION SCHEDULE (HULL PART 3/4)**

System		Nominal pressure MPa (kg/cm ²)	Nominal diameter	Pipe material	Thick.	Joint	Remarks
Sea water service line		0.49 (5)	15 , 20	STPG-370E	Sch 80	Flange Sleeve Butt	
			25 ~ 80	STPG-370E	Sch 40		
			100 & above	SGP	-		
Fresh water service line			All size	P.V.C.	V P	Flange Socket	-
Drink. water service line							
Hot water service line					H T		
Steam	gene. serv. line	0.39 (4)	10 & below	C1220T	ST/WT	Flange Sleeve Butt	-
			15 ~ 65	SGP	-		
	tank heat. line	0.83 (8.5)	All size	STPG-370S	Sch 80	Sleeve	
Compressed air pipe		0.98 (10)		STPG-370E	* Sch 80	Flange Sleeve Butt	

* ---- Only weather part (other : SGP)

**TABLE 8 - 2 PIPING APPLICATION SCHEDULE (HULL PART 4/4)**

System	Nominal pressure MPa (kg/cm ²)	Nominal diameter	Pipe material	Thick.	Joint	Remarks
Exposed deck scupper	-	All size	SGP	-	Sleeve Butt	(* 1)
Interior sweat scup., Deck scup., Soil pipe & plumbing pipe			P.V.C. (* 3)	V P	Flange Socket Butt	

Note :

1) Symbols in abovementioned tables means as follows ;

SGP ---- Carbon steel pipe for ordinary pipe
 100 & below ---- butt welded pipe (SGP-B)
 125 & above ---- electric resistance welded pipe (SGP-E)
 STPG-370 ---- Carbon steel pipe for pressure service
 STS-370 ---- Carbon steel pipe for high pressure service
 C1220T ---- Phosphorous-deoxidized copper pipe (seamless)
 P.V.C. ---- Unplasticized polyvinyl chloride pipe
 SUS304TP ---- Stainless steel pipe
 E ---- Electric resistance welded pipe
 S ---- Seamless pipe

2) (* 1) ---- The pipe thickness passing through unintended tank and compartment shall be determined in compliance with the requirements of the Classification Society.

(* 2) ---- The pipe thickness of suction line for emergency fire pump shall be determined in compliance with the requirements of the Classification Society.

(* 3) ---- Space of requirements of the rule : SGP

**TABLE 8 - 3 PIPING INSULATION AND LAGGING**

Piping system	Insulation and lagging			
	Nominal size (mm)	Thickness (mm)	Material	Finish cover
Steam pipe	All size	20	Glass wool	Glass cloth
Steam drain pipe		-	-	* 1 * 2 Glass cloth
Freon return pipe for outside ref. prov. chamber		20	Synthetic rubber	-
Fresh water, Sea water, Wash deck pipe line in accommo. space		-	-	* 3 Cotton canvas
Hot water				-

*1 ---- Except flange

*2 ---- Only frequently touched by human body.

*3 ---- Ceiling only



8.2 PUMPING SYSTEM

8.2.1 Bilge system

Hold bilge system shall be as shown on

Fig. 8 - 1 DIAGRAM OF BILGE, BALLAST LINE.

One (1) main bilge line shall be led from each bilge well in cargo holds to engine room through double bottom tanks, and connected to the bilge / ballast pump, fire / G.S. pump and eductor.

The pipe shall have butterfly valve, non-return valve and fabricated galvanized rose box except No.5 cargo hold.

Branch line from No.5 cargo hold shall have a screw down non-return valve and fabricated galvanized rose box.

The butterfly valve shall be operated from upper deck by air hydraulic remote control system (local operating type).

One (1) water eductor shall be provided for discharging bilge from chain locker, void space and bos'n store, and driving water for eductor shall be taken from wash deck line.

Bilge in steering gear room shall be led to bilge well in engine room by hand pump, and bilge in emergency fire pump room shall be led to bilge well in engine room by gravity.



8.2.2 Water ballast system

Water ballast system shall be as shown on

Fig. 8 - 1 DIAGRAM OF BILGE, BALLAST LINE.

One (1) main ballast line for double bottom water ballast tanks, fore peak tank and aft. peak tank shall be provided and connected to the ballast pump in engine room.

Branch pipe for each double bottom ballast tank (except No.3 cargo hold) shall have stop valve which is operated on upper deck with air hydraulic remote control system and shall have steel fabricated bellmouth at the end.

Branch pipe for No.3 cargo hold shall have stop valve which is operated from upper deck with air hydraulic remote control system (local operating type).

One (1) water eductor shall be provided in engine room to take suction from water ballast main line.

Ballast water treatment system (BWTS) shall be provided.

Ballasting and de-ballasting operation with BWTS shall be assumed as follows;

Ballasting operation

- By ballast pump

De-ballasting operation

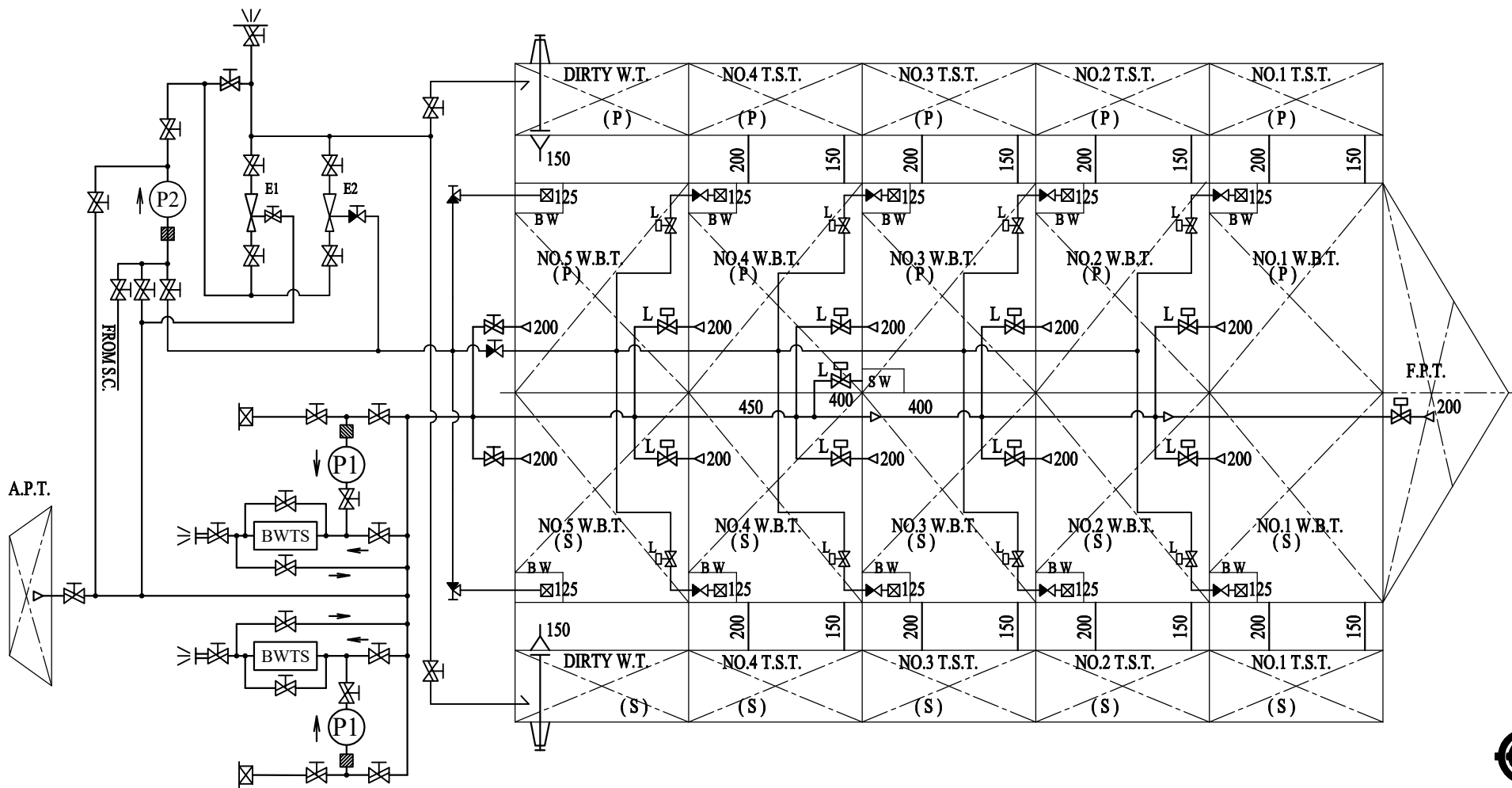
- By ballast pump
- By bilge & ballast pump
- By ballast eductor (Driving pump: bilge & ballast pump)

Above operations shall not be actuated simultaneously.

Ballasting operation by using bilge & ballast pump shall not be considered.

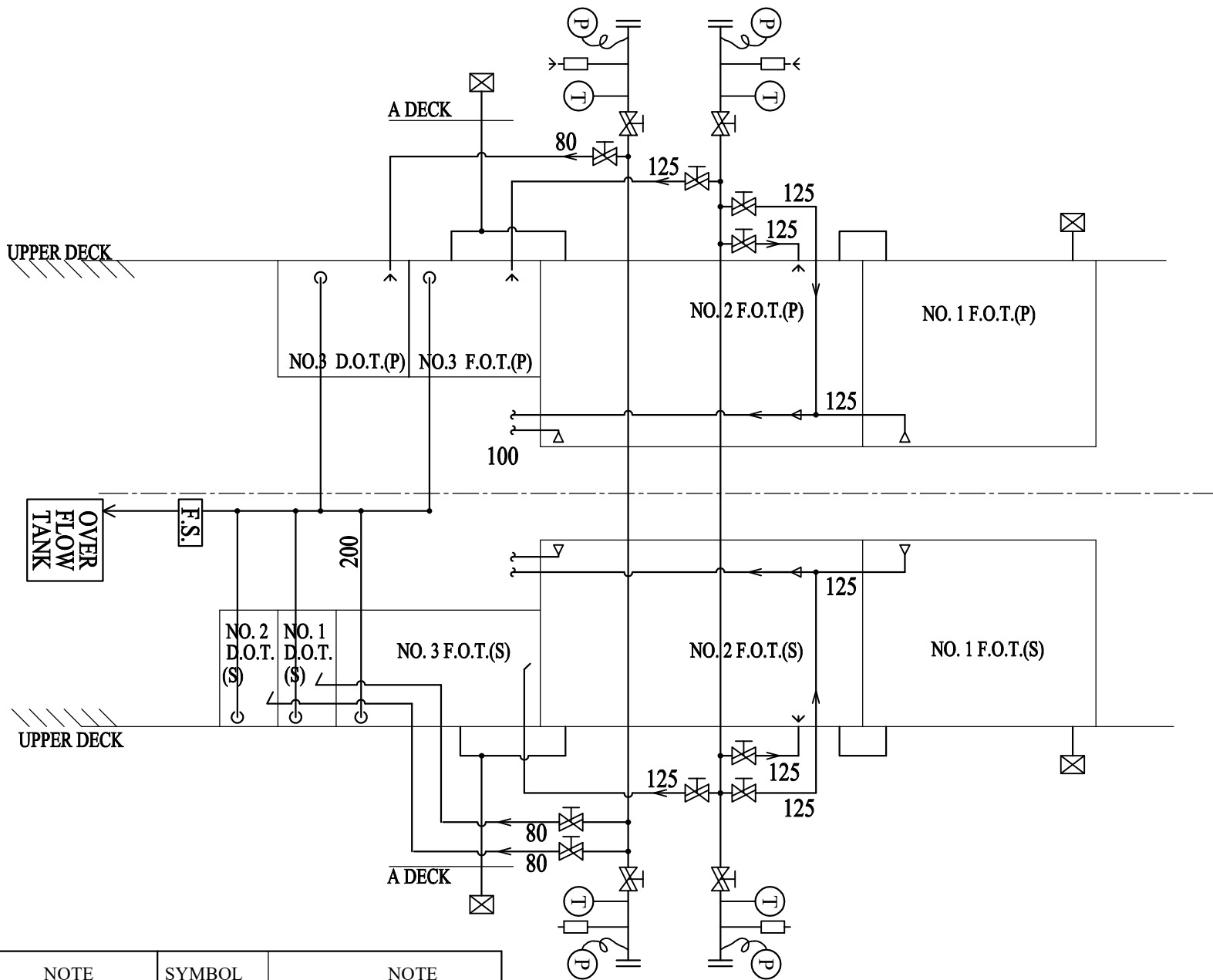
A Fire & G.S. pump shall not be used in conjunction with BWTS.

Fig. 8-1 DIAGRAM OF BILGE, BALLAST LINE



SYM BOL	NOTE	SYM BOL	NOTE	SYM BOL	NOTE	SYM BOL	NOTE	SYM BOL	NOTE
	BUTTERFLY VALVE (OPEN/SHUT LOCAL REM.CON.)		STOP VALVE (MANUAL OPE.)		BELLMOUTH		BALLAST WATER TREATMENT SYSTEM		BALLAST PUMP 900 m3/h x 25 mTH
	BUTTERFLY VALVE (OPEN/SHUT FROM W/H)		STOP VALVE (MANUAL OPE.)		ROSE BOX		BALLAST EDUCTOR 50 m3/h		BILGE/BALLAST PUMP 220/90 m3/h x 20/70 mTH
	BUTTERFLY VALVE (MANUAL OPE.)		NON-RETERN VALVE (MANUAL OPE.)		SURFACE VALVE		BILGE EDUCTOR 50 m3/h		
			NON-RETERN VALVE (SWING CHECK)		DECK STAND				





SYMBOL	NOTE	SYMBOL	NOTE
	BUTTERFLY VALVE (MANUAL OPERATING)		PRESSURE GAUGE
			TEMPERATURE GAUGE
			SAMPLE PIECE





8.2.3 Fresh water and drinking water filling system

A fresh water and drinking water filling line and connection shall be provided with steel blank flange at both side of engine casing aft side.

8.2.4 Fuel oil, diesel oil and lubricating oil system

Fuel oil piping shall be as shown on **Fig. 8 - 2 DIAGRAM OF F.O. & D.O. LINE.**

Fuel oil filling connection shall be provided with a valve and steel blank flange at each side of accommodation house front on upper deck.

Each filling pipes of fuel oil and diesel oil shall be provided independently.

A lubricating oil filling connection shall be provided with a steel blank flange at each side of the accommodation house on upper deck.

Spill oil tank shall be provided at fuel oil and/or diesel oil and lubricating oil filling stations in compliance with the stipulation of USCG.

Volume (litter) shall be indicated to spill oil tank by welded bead and painted.

As for fuel oil lines in engine room and fuel oil transfer pump, refer to
III- MACHINERY PART.

8.2.5 Air escape pipe

Air escape pipes of suitable size shall be provided at all construction tanks, and shall be terminated above the weather deck in general as required by the Classification Society.

Each construction tank shall have one (1) or two (2) air escape pipes.

Air escape pipe head shall be of ball type in general, and stainless steel wire net screen shall be fitted as required by the regulatory bodies.

Spill oil tank shall be provided on weather deck in way of air escape pipe for fuel oil, diesel oil and lubricating oil tank in compliance with the stipulation of USCG.

Construction drawing of air escape pipe head shall be placarded to ship's office.



8.2.6 Sounding pipe and sounding equipment

Sounding pipe shall be provided one (1) for each structural tanks, bilge well in holds, cofferdam, chain locker, etc. except fresh water tank and drinking water tank.

Sounding pipe shall be of 40A for water ballast tank, chain locker and peak tanks, 80A for fuel oil tanks and 65A for diesel oil tank in general.

Sounding pipes shall be led as straight as possible.

A striking plate or other effective device shall be fitted at the bottom of each sounding pipe.

Sounding pipe shall be terminated on suitable deck with sounding cap marked for identification.

Glass gauge shall be fitted for fresh water tanks and drinking water tank and sounding pipe shall not be provided.

Temperature sensor for fuel oil tank shall be provided.



8.3 DRAIN AND SCUPPER

8.3.1 Weather deck scupper

Suitable number of scupper shall be fitted on the top of deck house and weather decks.

Drain from weather decks shall spill to lower weather deck, and to lowest weather deck, which shall be led overboard around the load water line keeping clear of accommodation ladder and pilot access area.

Scupper pipes from weather decks shall be led outside of deck house.

Grating for weather deck scupper shall be of oval type in general, and suitable number of scupper plug (screw type) shall be supplied for fuel oil filling.

8.3.2 Plumbing and interior deck drain

Suitable number of scupper shall be fitted in accommodation.

Drain line of galley and refrigerated provisions chamber shall be provided independently and led to outboard through storm valve.

Other drain shall be gathered into several mains and led to outboard through a storm valve.

Scupper for gutter in accommodation space shall spill to lower interior deck, and to the lowest interior deck.

Scupper for washing of passage way in accommodation space shall be fitted.

Water seal type rose plate shall be fitted to drain holes for wetted space such as galley, refrigerated provisions chamber and other space, grating of oval type shall be fitted in general except sweat scupper.



Soil pipes from water closets shall be gathered into mains having proper slope to the Vessel's side and branched off to sewage treatment unit line and direct discharge line.

(a) Sewage treatment unit line :

Sewage treatment unit line shall be led from main line to sewage treatment unit in engine room through three (3)-way changing over valve.

Capacity of sewage treatment unit shall have 25 persons and the sewage treatment unit shall be of MED type approval.

(b) Direct discharge line :

Direct discharge line shall be led from aforementioned main line to outboard through a storm valve.

Treated water of sewage and gray water can be stored in clean drain tank and can be led from clean drain tank to dirty water tank by bilge & ballast pump.

8.3.3 Bottom plug

Each double bottom compartment and peak tanks except oil tanks shall be provided with a stainless steel bottom plug and mild steel boss welded to shell.

Bottom plug shall have 50 mm diameter and arranged shall be screwed from outside of the vessel.



8.4 FRESH AND SEA WATER SERVICE SYSTEM

8.4.1 General

Water service system shall consist of sea water, fresh water, drinking water and hot water system.

Sea water shall be served by continuous running system, and fresh water and drinking water shall be served by hydro-pneumatic system.

Pump and pressure tank shall be located in engine room.

As for particulars refer to **III - MACHINERY PART**.

Water service system shall be divided into sections to suit arrangement of accommodation.

8.4.2 Sea water service

Sea water shall be supplied to condenser of air con. and ref. provisions machine.

The sea water shall be supplied by ref. machine cooling sea water pump in engine room.

The cooling water line for electro-hydraulic pump unit shall be supplied by cooling sea water pump in engine room.

8.4.3 Fresh water service

Fresh water service of sanitary and general service line shall be provided.

Fresh water shall be supplied to upper deck on weather part, water closets, wash basins, showers, laundry, private lavatory, galley, pantry and washing nozzle for front glass of wheelhouse.

The system shall consist of one (1) fresh water service pump and one (1) pressure tank.

One (1) fresh water service main line shall be provided (sanitary and general service line shall be common used).

Fresh water service line on weather upper deck forward part near No.1 cargo hold shall be provided, and suitable numbers of connection valve (15A) shall be fitted on upper deck.



8.4.4 Drinking water service

Drinking water shall be supplied to galley, pantry, wheelhouse sink and water fountains through water sterilizer.

The capacity of water sterilizer shall be of about 1,000 liters/h, and installed in galley.

The system shall consist of one (1) drinking water pump and one (1) pressure tank.

8.4.5 Hot water service

Hot water shall be supplied to galley, pantry, wheelhouse sink, wash basin, hand wash basin, shower, and private lavatory.

The system shall consist of one (1) calorifier unit and one (1) circulating pump, necessary valve, etc.

Fresh water for hot water shall be supplied to calorifier unit from fresh water system.



8.5 WASH DECK SYSTEM

Wash deck line shall be in common use with fire main line.

A chain wash line shall be branched from the wash deck line and led to each hawse pipe.

Branch with shut-off valves shall be arranged to drive eductor for bilge of bos'n store and chain locker.



8.6 **FIRE FIGHTING SYSTEM**

8.6.1 **Hydrant main system**

The hydrant main system shall be led fore and aft in common use with wash deck line, which shall be served by one (1) bilge / ballast pump, one (1) fire / G.S. pump and emergency fire pump.

The pumps shall take suction from sea and discharge to the fire main system.

The fire main in accommodation shall be isolated from the fire main system on weather deck, and shut-off valves shall be provided.

Fire hydrant (NAKAJIMA TYPE) shall be of 65A for weather deck and engine room, 40A for inside accommodation.

Fire station shall have emergency stop switches for fans in engine room, emergency shut-off valve for fuel oil tank, etc.

Fire hydrant, fire hose, etc. shall be supplied by the rule requirement.

Spray nozzle for paint store shall be provided and the handling shall be of manual type.

As for the details of emergency fire pump, refer to
SUBSECTION 4.6 EMERGENCY FIRE PUMP.

As for the details of bilge & ballast pump and fire & G.S. pump, refer to
III- MACHINERY PART.

8.6.2 **CO2 gas fire extinguishing system**

A fixed type CO2 gas extinguishing system shall be provided for protection of engine room and cargo hold in compliance with the rule requirement.

CO2 gas bottles shall be arranged in CO2 bottle room.

CO2 gas discharge to engine room shall be done in CO2 bottle room.

CO2 gas discharge to cargo hold shall be done in CO2 bottle room.

The quantity of CO2 gas shall be sufficient to give a volume of free gas required by the rule.



8.7 STEAM AND EXHAUST PIPING SYSTEM

8.7.1 General service

Steam shall be used for galley, air con. unit and hot water heater.

Necessary drain traps with strainer shall be provided and exhaust pipe shall be led to the cascade tank in engine room.

8.7.2 Tank heating

Fixed type heating lines shall be provided in fuel oil tanks, and shall not be provided in diesel oil tanks.

Steam for heating lines shall be taken from auxiliary boiler in engine room and drain from the heating lines in fuel oil tanks, etc. shall be led back to cascade tank through a drain trap.

8.8 COMPRESSED AIR SYSTEM

Deck service compressed air line shall be led from the air reservoir in engine room to upper deck forward and branched to valve control stand, etc.

Necessary hose connections shall be provided.

8.9 TEMPERATURE PIPE

Temperature pipe of cargo hold shall be common used to hold bilge sounding pipe.

Independent temperature pipe shall not be provided.

8.10 WATER LEVEL DETECTORS AND DEWATERING SYSTEM

Water level detectors in each cargo hold, F.P.T. and boatswain store shall be provided.

Alarm panel shall be provided in wheelhouse.

Remote control system for drainage of boatswain store and F.P.T. shall be provided as per rule requirement.

9.1 NAVIGATION EQUIPMENT

As for following equipments, refer to **IV- ELECTRIC PART.**

9.2 COMMUNICATION EQUIPMENT

As for telephone and engine order telegraph, refer to **IV- ELECTRIC PART.**



9.3 FLAG

Flag shall be stowed in flag locker and pigeon holes in wheelhouse.

The following shall be supplied :

- 1 set - Register flags (Large & medium size)
- 1 set - International signal flag (Medium size)
- 2 sets - Hand signal flags (Medium size)
- 1 set - Ship's call letter flag (Medium size)
- 1 set - Pilot flag (Medium size)
- 1 set - Quarantine flag (Medium size)
- 1 set - Blue peter (Medium size)

All the other flags shall be supplied by the Owner.

9.4 DISTRESS SIGNAL

The following distress signals shall be provided in compliance with the regulations concerned.

- 12 - Bright red light distress signals with parachute
- 2 - Self activation smoke signals
- 6 - Self igniting signals



9.5 NAVIGATION LIGHT, SIGNAL LIGHT AND SIGNAL

The following electric navigation lights shall be provided.

- 2 - Mast head light
- 1 - Stern light
- 1 - Port side light
- 1 - Starboard side light
- 2 - Anchor light
- 2 - Not under command light
- 2 - Steering light

Electric running lights shall be connected to navigation light indicator panel mounted on a group panel in wheelhouse.

The following electric signal lights and signal means shall be furnished.

- 1 - Daylight signal light (Portable type)
- 1 - Maneuvering light
- 3 - Black balls (610 mm diameter folding type)
- 1 - Gong (300 mm diameter)
- 2 - Air horn
- 2 - Megaphone
- 1 - Bell (300 mm diameter)

As for details of these lights, refer to **IV- ELECTRIC PART**.



SECTION 10 INVENTORY

10.1 BOATSWAIN'S STORE

Inventories shall be supplied according to the Builder's standard and a details list shall be prepared and submitted for approval.

The following equipments shall be supplied :

- 2 - Sounding tape (30 m)
- 1 - Paint stage
- 1 set - Fid (L=300, 400, 450)
- 1 - Chipping hammer
- 1 set - Marline spike (L=200, 350, 450)
- 1 - Sledge hammer
- 2 - Hand hammer (0.5 kg-1, 1.0 kg-1)
- 1 - Chisel
- 1 - Claw hammer
- 1 - Hand saw
- 1 - Hand plane
- 1 - Hatchet
- 1 - Gimlet
- 1 - Tinner's hand snip
- 1 - Maul
- 1 - Tape measure (30 m)
- 1 set - Sharpening stone (Coarse, Medium, Fine)
- 1 - Carpenter's chest
- 1 - Boatswain's chair
- 2 - Heaving line
- 1 - Paint scraper
- 1 - Long paint scraper
- 1 - Long paint brush
- 1 - Paint pot
- 1 - Wire brush
- 1 - Wire cutter
- 1 - Oiler
- 1 - Oil funnel
- 1 - Bottom plug
- 1 set - Common spanner
- 1 - Spanner for bottom plug
- 2 - Spanner for sounding pipe head
- 1 - Pliers
- 1 - Crow bar
- Necessary - Scupper plug (Rubber, quick acting type)
- 2 - Anchor buoy
- 5 - Garbage can with cover (steel)
- 2 set - Air/water nozzle (MAXI GUN : Cargo hold cleaning equipment)
- 2set - High pressure cleaner (MARI-CLEAN)



10.2 BOX AND MISCELLANEOUS

As for box and miscellaneous, refer to detailed list of inventory.

The following items shall be supplied :

- 2 - Binocular box
- 1 - Flag box
- 3 - Key box
- 2 - Thermometer box
- 2 - Board for beware of propeller
- 3 - White board
- 1 - Crew's name plate board
- 1 - Sounding board

List of room shall be placarded to each stair way.



10.3 FIRE FIGHTING APPARATUS

A fire fighting apparatus shall be provided as follows :

10.3.1 Fire extinguishers

Fire extinguishers shall be supplied as requirement by the rules.

Spare charge for portable extinguishers shall be supplied as required by the rules.

10.3.2 Fireman's outfit

Two (2) sets of fireman's outfit shall be provided as per rule requirement.

10.3.3 Alarm system

General alarm system shall be provided as per **IV- ELECTRIC PART**.

10.3.4 Emergency escape breathing devices

Emergency escape breathing devices (EEBD) shall be stowed in accommodation space and engine room as per rule requirement.

10.3.5 Protection / Breathing Apparatus for IMDG Code

Additional four (4) sets of full protective clothing resistant to chemical attack shall be supplied.

Additional two (2) self-contained breathing apparatuses with 200% spare shall be supplied.

10.4 SPARE PARTS

Spare parts for deck machineries such as steering gear, windlass, mooring winch, etc. shall be supplied according to the manufacturer's standard.

A detail list shall be prepared and submitted for reference.

10.5 OTHER

Equipment of helicopter mark shall be supplied by owner.

A-60 insulation shall be fitted inside of engine room forward bulkhead.