Specification

2200 TEU Container Vessel

Project No 02012

June 28th 2002

A Company
Of ThyssenKrupp
Technologies

Thyssen Nordseewerke

TK

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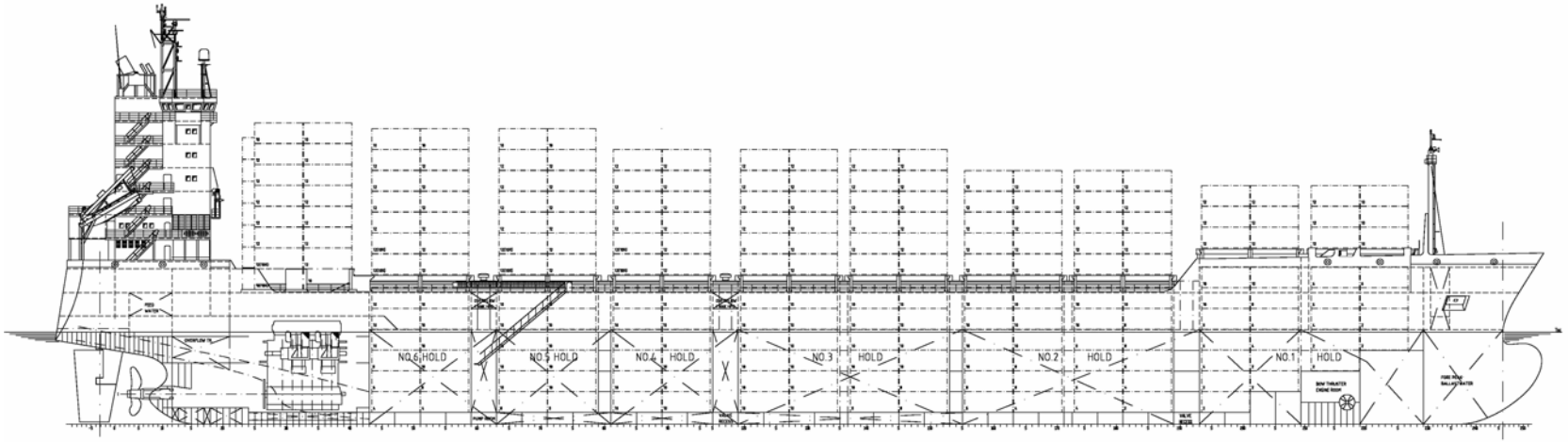
Project No 02012



Class:
GL + 100 A5 E IW CONTAINER SHIP,NAV-O RSD STAR
SOLAS II/2 Reg. 54, + MC E AUT

Main Dimensions:

Length over all	appr. 187.25 m
Length between perpendiculars	176.48 m
Breadth moulded	29.80 m
Depth to upper deck	16.50 m
Design draught	10.10 m
Scantling draught	11.55 m

Deadweight

Deadweight on design draught	appr. 23,500 t
Deadweight on scantling draught	appr. 29,870 t

Complement
Crew of 24 in 18 single cabins + 3 double cabins
+ pilot + owner's suite
complement : 27

Tonnage:
Gross appr. 23,200 GT

Container Capacity:
In holds 866 TEU equiv. 416 FEU + 34 TEU

Container Stowage
In holds 10 rows 6 tiers
(1 tier high cube)
On hatch covers 12 rows 6/7 tiers

Container Stability:
14 t homog. Loaded:
On design draught 1,430 TEU
On scantling daraught 1,645 TEU

Dangerous Cargoes
Nos. 1 – 6 holds:
Classes 1.4S, 2, 3, 4, 5.1, 6.1, 8, 9

Hatch Covers:
Pontoon type hatch covers
No. 1 hatch, 12.8 x 15.52 m, 2covers
No. 2 -9 hatch, 12.8 x 25.68 m, 3 covers

Stack loads in holds 180 t / 20' and 210 t / 40'
Stack loads on deck 65 t / 20' and 100 t / 40'

Deck Machinery:
Electrically driven
2 combined windlass / self-tensioning mooring winches
10 t each

Other Outfit:
1 fix propeller with 5 blades
1 bow thruster 900 kW, electrically driven
80 socket outlets for reefer containers on deck

Tank Capacities:

Heavy fuel oil	2,870 m^3
Diesel oil	300 m^3
Fresh water	170 m^3
Ballast water	9,270 m^3

Endurance 20,000 sm

Main Engine:
Make: MAN/B&W
Type: 6 L 70 MC
Rating: 16,980 kW, 108 1/min
Fuel: HFO 600 cSt

Auxiliary Engines:
3 diesel generators each 970 kWel at 900 1/min
running on HFO
1 emergency diesel gener. 130 kWel at 1800 1/min

Navigational Aids:
Wireless communication system acc. to GMDSS
Gyro compass with auto pilot
Magnetic compass
2 ARPA radars
Speed log
Echo sounder and recorder
GPS satellite navigators,
2 satcom systems (B and C)
Voayge Data Recorder
Automatic Identification System

Speed on design draught:

Service speed (90 % MCR, 15 % sea margin)	appr. 20.9 knots
Trial speed (90 % MCR)	appr. 21.5 knots

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On deck	1,322 TEU equiv. 658 FEU + 6 TEU	4 self-tensioning mooring winches 10 t each
Total	2,188 TEU equiv. 1,074 FEU + 40 TEU	

0 BASIC DATA

OBJECTIVES

The intent of this specification is to describe standards, special features and generally outline the design and construction of a modern overall cost-effective (for production and operation) and environmentally friendly container vessel for world-wide services.

The vessel described in this specification is a modified repeat of Builder's 2500 TEU Standard Container Vessel:
Modifications will be generally limited to following items:

- shortening by one 40' hatch
- deletion of cargo cranes
- main engine with reduced number of cylinders
- reduced auxiliary diesel output
- reduced number of reefer containers
- class notation
- installation of incinerator
- layout of A/C

The item BASIC DATA is divided into

0100 GENERAL DESCRIPTION and
0200 GENERAL CLAUSE.

Following drawings are attached and form an integral part of the specification:
- General Arrangement Plan, Drw. No 010-0100, dated 21.06.2002
- Accommodation in Deckhouse Drw. No 236-0001, dated 21.06.2002

0100 GENERAL DESCRIPTION

The vessel will be built as a single screw, diesel propelled cellular container ship for the carriage of 20'/40'/45' containers. It will have a bulbous bow, six cargo holds, a forecastle and a poop. Engine room and deckhouse will be located aft. Cargo holds to have cell guides. Socket outlets for reefer containers are to be arranged on deck.

0101 MAIN DIMENSIONS

Length over all:	approx.	187,25 m
Length between pp.:		176,48 m
Breadth moulded:		29.80 m
Depth to main deck:		16.50 m
Draught design:		10.10 m
Draught, scantling:		11.55 m
Tonnage:	approx.	23,200 GT

0102 DECK HEIGHTS, SHEER, CAMBER

a) Decks below main deck

- 2nd deck (tween deck)	in way of holds	11.926 m above base
	in engine room	13.500 m above base
- 1st platform deck		10.300 m above base
- 2nd platform deck		7.300 m above base
Tanktop in way of holds		1.510 m above base

b) Decks above main deck (measured on centre line)

Poop deck	3.000 m
All superstructure decks aft to have a height of	2.950 m
Forecastle deck to have a height of	3.200 m

All decks to be built without sheer.

The main deck only to have camber 100 mm high, consisting of horizontal part in-between the outer longitudinal hatch coamings and a straight portion rising from either side, as indicated in the midship section drawing.
Main deck in front of superstructure to have a box 300 mm high extending to 9,878 mm from centreline. The bottom container foundations will be built flush on this deck.

Forecastle deck to have a straight camber abt. 400 mm high, knuckle amidship.
Poop deck to have polygon camber abt. 200 mm high, knuckle at abt. 4,000 mm from centreline.

All open decks including wheelhouse top and outside pedestals in the superstructure area to have a small camber.

All other decks above and below main deck to have no camber.

0103 DEADWEIGHT, CARRYING CAPACITY

The deadweight is the difference between the displacement of the vessel in seawater with a specific gravity of 1.025 t/m³ at the draught mentioned and the light weight of the empty, clean, completed vessel.

The contractual deadweight capacity of the vessel in seawater of the specific gravity 1.025 t/m³ at

design draught	10.10 m	abt. 23,500 t
scantling draught	11.55 m	abt. 29,870 t

The deadweight all told will include

a) Cargoes,
b) Persons on board with their effects,
c) Consumable and operating liquids on board such as fuel, lubricating oils, fresh water, brine and similar except those proportionate quantities of liquids which are normally carried in machinery and piping systems constantly,
d) Provisions and stores,
e) Spare parts in excess of those required by Classification requirements and which are not already included in Builder's scope of supply stipulated in the Contract,
f) Water ballast,
g) Increases in the light weight of the vessel, caused by application of additional amended or revised rules and regulations etc. requested by the Owners after the date of signing the contract,
h) Loose stowage equipment to be used for cargo carrying purposes,
i) Owners' inventory.

All weights of the clean vessel, which is ready for handing over, are included in the weight of the vessel in the light condition, unless they are included in the deadweight as defined above.

0104 SPEED

SERVICE SPEED at

- 10.10 m mean design draught,
- output on propeller :90 % MCR (15,282 kW)
- with 15 % sea margin added on trial conditions

will be abt. 20.9 knots

TRIAL SPEED at

- 10.10 m mean design draught,
- output 90 % MCR

will be about 21.5 knots

Trial conditions:

Unrestricted, i.e. deep and open waters,
No current,
Wind force Bft. 2,
Sea water temperature 15° C,
density of sea water 1.025 t/m³,
Clean underwater hull surface

The speed trials of the vessel to be conducted on ballast draught corresponding as near as possible to model tank experiments.

Contractual fulfilment of required speeds to be verified by comparison of speed trial results with relationship of predicted trial speeds from ship model basin for ballast and design draught.

If actual trial conditions differ from those stipulated above, corrections to be made in accordance with Builders practice.

105 ENDURANCE

Based on the entire fuel tank capacity and under ISO-conditions with 20.9 knots service speed at 90% MCR the cruising range will be abt. 20,000 nautical miles with 3 days spare.

0106 TRIM AND STABILITY

The stability of the vessel will be adequate for all conditions occurring in normal operation.

Typical loading conditions calculated and presented in the Stability Booklet for approval by the Classification Society include:

1. Complete ship in light condition

2. Ship in ballast condition
   a) on departure with full bunkers and all stores,
   b) on arrival, stores consumed and used up (10 % bunkers).

3. Ship homogeneous loaded with containers, 14t each VCG 0.45h on scantling draught
   a) on departure with full bunkers and all stores,
   b) on arrival, stores consumed and used up (10 % bunkers).

4. Ship homogeneous loaded with containers, 14t each VCG 0.45h on design draught
   a) on departure with full bunkers and all stores,
   b) on arrival, stores consumed and used up (10 % bunkers).

5. Dry docking conditions
   Docking conditions for the ship without cargo
   a) with full bunkers and all stores,
   b) stores consumed and used up (10 %)

Other loading cases can be calculated in agreement with the Owners.

Intact stability calculations will be done according to IMO Resolution A 749, while damage stability according to Regulation 25, Part B-1, Chapter II-1 of SOLAS 74 (Amendments 1990).

The Trim and Stability Booklet will contain all information necessary for safe operation of the vessel, such as container stowage, capacities of bunkers and tanks, stability data etc.

Loading recommendations by Classification Society, if any, will be incorporated.

0107 KIND OF CARGOES

The vessel will be designed for the carriage of 20'/40'/45' containers.

The vessel will have socket outlets for **reefer containers** on deck.

All kinds of **dangerous cargoes** can be carried in containers on open deck.
Stowage above engine room not allowed.

In hold nos. 1-6, dangerous cargoes of type

Class 1.4.S	-	substances which present no significant hazard,
Class 2	-	gases, except flammable or poisonous gases,
Class 3	-	flammable liquids, except liquids with flashpoint below 23°C,
Class 4	-	flammable solids or substances,
Class 5.1	-	oxidising substances,
Class 6.1	-	poisonous substances, except liquids,
Class 8	-	corrosives, except liquids with flashpoint below 23°C,
Class 9	-	miscellaneous dangerous substances,

can be carried, packed in closed containers.

0108 CARGO HOLD CAPACITY

The cargo hold capacity will be about 45,500 m^3.

0110 CONTAINER CAPACITY

The container carrying capacity is based on 20' x 8' x 8'6" units (TEU).

With six/seven tiers on deck, the vessel can normally carry (eight tiers in front of superstructure)

in holds:	866 TEU	(or 416 units of 40' and 34 of 20')
on deck:	1,322 TEU	(or 658 units of 40' and 6 of 20')
total:	2,188 TEU	(or 1,074 units of 40' and 40 of 20')

1 layer of high-cube containers (20' x 8' x 9'6") can be stowed at uppermost tier in holds. One bay of 45’ containers (45' x 8' x 9'6") can also be stowed in front of superstructure.

A total of 80 electric plug sockets for reefer containers, 11.0 kW 440 V each, will be arranged on main deck.
No remote control will be provided, but monitoring.

The arrangement of plugs is to enable the stowage of 80 40’-reefer containers.

On scantling draught of 11.55 m, the vessel can carry abt. 1,645 TEU homogeneously loaded with 14 tons/TEU (based on IMO criteria).

On design draught of 10.10 m, the vessel can carry abt. 1,430 TEU homogeneously loaded with 14 tons/TEU (based on IMO criteria).

0111 STACK LOADS

On tank top in holds	210 t for 40’ container stack
	180 t for 20’ container stack
On deck in front of superstructure	100 t for 40’/45’ container stack
	70 t for 20’ container stack
On hatch covers and upper deck	100 t for 40’/45’ container stack
	65 t for 20’ container stack

Lashing of the deck containers will be in compliance with the regulations imposed by the classification society.

0112 BUNKER AND TANK CAPACITIES

(100 % filled)

Heavy fuel oil incl. settling and service tanks	2870 m³
Diesel oil incl. service tanks	300 m³
Lubricating oil tanks (storage)	170 m³
freshwater tanks incl. feedwater, cooling water etc.	210 m³

In cargo hold area heavy fuel oil will be arranged in deep tanks in way of two crane positions and in one double bottom tank below number 3 hold.

0113 BALLAST WATER CAPACITY

Ballast water	9,270 m³	100 % filled

0114 CREW AND CABIN ALLOCATION

See GENERAL ARRANGEMENT PLAN and chapter 2 (accommodation).

27 persons.

0115 PRINCIPAL PARTICULARS OF ENGINE PLANT

Main diesel engine:	low speed, two stroke, direct driven reversible diesel engine output 16980 kW - 108 1/min capable of burning heavy fuel up to IF 600
Auxiliary engine plant:	three diesel engine sets, running on HFO generator output 970 kW - 900 1/min each
Emergency/harbour generator:	abt. 130 kW at 1,800 1/min
Bow thruster:	abt. 900 kW, electrically driven

0200 GENERAL CLAUSE

It is the intention of this specification to set forth the requirements and works for constructing an effective vessel for world-wide feeder service. The vessel will comply with requirements of the regulatory bodies for vessels of this class as stated in Paragraph 0202 Classification, Regulations and Tonnage.

Definitions

"Contract"	SHIPBUILDING COLLABORATION CONTRACT Between: ISOICO (‘BUILDER’ acc. to contract) MPC (‘PARTNER’ acc. to contract) TNSW (‘NOMINATED SUB-CONTRACTOR’ acc. to contract)
"Owner"	means the orderer of the vessel. In terms of SHIPBUILDING COLLABORATION CONTRACT: ‘BUILDER’
"Builder"	means the Shipyard constructing the contracted vessel in joint resonsibility with ‘PARTNER’. In terms of SHIPBUILDING COLLABORATION CONTRACT: NOMINATED-SUBCONTRACTOR
"Supervisor"	The person or persons authorised by the Owner to supervise the work performed and materials furnished by the NOMINATED SUBCONTRACTOR.

0201 VALIDITY OF SPECIFICATION

This Specification is an essential part of the Contract. In case of discrepancies between the Specifications, the Contract and/or the drawings, the Contract to have precedence to the Specifications and/or drawings, whereas the Specification to have precedence to the drawings.

Alterations of Plans and Specifications requested by Owners are to be given to Builders in writing and Builders shall incorporate the same, if such alterations do not affect the performance of the vessel as specified in the Specification and do not affect costs and delivery schedule. However, Builders have the right to refuse to carry out such alteration which in Builders' judgement will adversely affect Builders' planning or programme in relation to the Builders' other commitments, or if no immediate agreement of both parties can be reached regarding kind and costs of execution. Builders to convey the refusal in writing, giving full reason for refusal.

A list showing the extras and credits will be maintained by the Builders, and agreed upon with the Owners continuously.

Should the Builders object in writing against the alterations requested by the Owners, then the Builders will be released from responsibility in respect of these alterations and their consequences.

If items are mentioned more than once in the Specification although they are needed once only, they will be supplied and/or installed once only.

0202 CLASSIFICATION, REGULATIONS AND TONNAGE

The vessel and its equipment will comply with the relevant regulations valid on the date of Contract, as listed in the following. Any amendment or changes in Rules and Regulation issued after the effective date of the Contract shall be treated as modification to the Contract. Builders will inform the Owner immediately after such amendment and ask the Owners whether such amendment shall be applied. Any extra charges and or any influence on the delivery date incurring by alterations of Rules and Regulations issued after the date of contract will be for Owners' account.

CLASSIFICATION

The vessel will be built under the survey of Germanischer Lloyd

Class notations:
GL ✠100 A5 E IW CONTAINERSHIP NAV-O RSD STAR
SOLAS II-2, REG. 54
✠ MC E AUT

REGULATIONS

For the construction, outfit and accommodation of the vessel the legal instruments and statuory requirements governing German flag vessels and in force on the date of signing the contract will be complied with.

Construction, equipment and accommodation are further to comply with the following Rules and Regulations:

- International Load Line Convention, 1966 and amendments,
- International Convention for the Safety of Life at Sea (SOLAS 1974) with amendments
- International Convention for the Prevention of Pollution from ships, MARPOL 1973/1978 with amendments incl. Annex VI reg. 13
- International regulations for preventing collision at Sea, 1972 with amendments
- U.S.C.G. Regulations for foreign vessels entering into U.S. Waters
- International Telecommunication Convention 1973
- Radio-Regulation 1974, WARC 1982, GMDSS
- Suez and Panama Regulations
- Australian W.W.F. regulations for cargo gear and safety
- ILO Conventions for safety and cargo gear
- IMO International Code of Safe Practice for Cargo Stowage and Securing, 1991
- IMO Res. A749(18) chapter 3

TONNAGE MEASUREMENTS

shall be done according to

International	(International Tonnage Measurement Convention)
Panama	(Tonnage Measurement Regulations of the Panama Canal Authority)
Suez	(Tonnage Measurement Regulations of the Suez Canal Authority)

0203 INSPECTION AND SUPERVISION

The construction of the vessel to be carried out under the supervision by the Owners and their representatives respectively. Supervisors to be given admittance to the Builders' and subcontractors premises during working hours to supervise the construction of the vessel. The inspection will be at Owners' risk and expense.

Objections made by Owners and Owners' representatives to be made good by Builders without Owners being involved in costs, provided that such objections have been shown to be justified after consultation with the Builders' departments concerned, and in addition, if necessary, with the surveyors of the Classification Society.

Out of Owners' representatives, delegated to supervise the construction of the vessel, Owners shall designate one person as the chief representative to co-ordinate with the Builders', represented by their nominated Project Manager.

All Classification plans and shop drawings and those necessary for an efficient supervision of the construction of the vessel are to be made available to Owners' representatives. In addition, all Classification approved drawings shall also be given to Owners' representatives, if required.

Supervisors to receive from Builders copies of all correspondence and minutes of meetings on discussions regarding technical matters between Owners and Builders.

Builders shall provide the Supervisors with office space, equipped with tables, chairs, lockers, personal computer / modem, telephone.

Costs which Builders are involved in by Supervisors during their stay at the Yard, such as

telephone fees,
supply of typists, etc.

are for Owners' account.

0204 GUARANTEE

See Building Contract.

0205 MATERIAL, WORKMANSHIP AND STANDARDS

All material used to be of good quality and has to be chosen with respect to the purpose intended.
Construction and workmanship to be in accordance with Builders' practice and to Classification requirements, where applicable.

Details not described in this Specification are to be carried out in accordance with Builders' applicable standards, such as DIN- and ISO-standards, the "PRODUCTION STANDARD OF THE GERMAN SHIPBUILDING INDUSTRY", VSM, 5th edition 1996, as well as Builders' own design standards. Steel for the hull structure to be of qualities to rule requirements and with test certificate issued by the Classification Society. In addition, material without test certificate of the Classification Society is allowed for those parts, the dimensions and scantling of which need not be approved by the Classification Society, however, they have to be shipbuilding quality steel.

All aluminium aboard to be seawater-resistant.

All flat grease nipples to be uniform to AM 10 x 1 DIN 3404 - MS.

All bolting used on open deck up to M 24 to be stainless steel.

All paints, varnishes and oils to be suitable for the purpose intended.

TEMPORARY FITTINGS

such as lifting eyes, erection plates or similar are to be limited to the extent necessary according to Builders' practice.

Temporary attachments are left in place where it does not obstruct. It must be fully welded and suitably preserved.

Non-obstructing areas are:

- Behind panelling,
- within tanks, bunkers and cargo oil tanks,
- within cargo holds on stiffened surfaces within the alignment line of the stiffening level,
- within cargo holds with container facilities.

Where obstructing, temporary attachments are cropped above the weld seam. The remainder must be fully welded and preserved correspondingly.

PREPARATION FOR COATING

- Slag removal, removal of weld spatters and edge preparation,

- preparation of welding seams

in accordance with “Production Standard of the German Shipbuilding Industry” (VSM, 5th edition)

0206 TANK TESTS

TESTING OF TANKS, TESTING OF WATER TIGHTNESS,
TESTING OF STRUCTURAL PARTS

X-ray photographs of welding seams are to be made to an extent as required by the Classification Society. Those may be examined by Owners or their representatives.

Where fabricated sections are to be accepted by the Classification Society in the workshop, such an acceptance to be made simultaneously by Owners' supervisors as well.

Supervisors to be informed in time of dry inspections of tanks and compartments to be done by Builders or the Classification Society.

Testing of water tightness, hose testing and pressure testing for tanks are to be carried out to Classification requirements and in witness of surveyor and Owners' supervisors. Leak testing shall generally be done prior to preservation and floor covering work, priming paints excepted. Subject to approval by the Classification Society, the test may also be carried out after preservation (acc. to Builder's standard).

Supervisors to be informed of such testing.

Tanks and compartments below the empty ship's waterline to be tested on tightness before launching or in dry dock. Subject to approval by the Classification Society, the test may also be carried out after launching and after application of a coating.

Pressure lines for tank testing are to be connected to special manhole covers with pipe inserts. No holes to be fitted for test pressure lines.

Owners' supervisors and the surveyors of the Classification Society to be informed of such testing in due course of time.

Hose testing of bulkheads, superstructure walls, hatches etc. to be done as per Classification rules.

0207 SHOP TESTING

Following machinery and equipment shall be shop tested in the presence of Owners' representatives in addition to the Classification surveyor and statutory authority:

Main Engine and Auxiliary Engines, Generators.

Other machinery, electricals, and equipment to be shop tested as required by Classification Society and statutory authority and manufacturers standard practice. Owners will have the right to attend.

0208 ON BOARD TESTS

After installation on board the ship all machinery, electricals, equipment and various systems to be tested to the satisfaction of Classification Society and statutory authority in the presence of Owners' representative.

Testing programme to be prepared in consultation between Owners' representative and Builders.

0209 DRY DOCKING

The vessel to be dry-docked for under water inspection before sea trials.

0210 HEELING EXPERIMENT

The final deadweight to be determined prior to the delivery of the vessel by subtracting the weight of the ship in the light condition from the displacement of the vessel at the respective loaded draught. The respective displacement of the loaded vessel to be taken from the hydrostatics taking into account the deflections, if any. The weight of the ship in the light condition to be determined by reading the draught marks of the vessel in the inclining test condition or in the condition before trial trip, giving the displacement for such condition from the hydrostatics, and to be corrected

a) for trimmed condition,
b) by reducing all weights not belonging to light ship weight, however, aboard, and
c) by adding all weights belonging to the light ship weight, however, not aboard

In case of a contracted series of sister ships with identical hull forms, the inclining experiment to be done for the first ship only, subject to the approval by Classification Society.

An evidence of deadweight carrying capacity to be carried out on all sister ships by light ship displacement test. This experiment to be carried out under the survey of the authorities mentioned before.

0211 TRIAL AND PERFORMANCE TESTS

The vessel has to be substantially completed for trials so that only minor remaining work has to be completed between the trials and handing over of the vessel.
The vessel's functions to be workable in all respects for trials.
Duration of trial trip according to the trial programme to be agreed.
Builders to send trial trip programme to Owners for approval.
During the trial trip, all functional trials and tests for hull, machinery and electric plant required by regulatory bodies, such as:

Anchor trials,
Testing of steering gear, incl. emergency steering test,
Bow thruster test,
Testing of fire fighting equipment,
Manoeuvring trials (circle test, stopping test, astern test, etc.),
Engine trials including up to 6 hours duration and simulation
of automation for 24 hours unattended engine room; dead slow test,
Operating tests for all nautical and navigational equipment,
all alarms, telephone systems, public address system, fresh water
generator, etc.

to be performed, unless those have not already been performed at the fitting-out quay.

GPS based speed trials to be done with abt. 50%, 75 %, 90 % and a maximum power which could be achieved in the ballast trial condition. Speed at MCR will be considered as proven in such cases by extrapolation of the measured power-speed curve to MCR.

Progressive speed trials will be carried out for all sisterships of the series.

0212 ENDURANCE TRIAL

Endurance trial according to Classification requirement to be conducted on all vessels, duration of trial to abt. 4 hours. The main engine shall run at maximum permissible revolution.

0213 EXECUTION OF TRIAL TRIP

A detailed trial programme including the test procedures to be prepared in consultation between Owners' representatives and Builders in due course of time.

The crew for the trial trip to be supplied by Builders including the Captain. Builders being free to entrust the Captain, whom Owners have appointed to take over the ship after delivery, with the command of the vessel during the trial trip, under the risk of Builders.

After delivery, the vessel will return to bring back Builders' personnel and material.

Builders have to arrange that the vessel will be provided with all necessary supplies for running and maintaining the vessel such as fuel, lub oils, fresh water, provisions, stores, etc., which are required for dock and sea trials.

The supplies consumed until delivery and acceptance of the vessel (fuel oil, lub. oil, hydraulic oil) to be borne by Builders. The unconsumed fuel oil shall be taken over by the Owners at a rate as mentioned in the Contract.

After completion of the trial trip, piston, crosshead, crank and main bearing of one cylinder section will be inspected, if Classification require as such.

Owners in any case to bear the costs for all those inspections which are in excess over the requirements by the Surveyor of the Classification Society.

0214 MODEL BASIN TEST

The vessel will be built to lines developed by Builders, especially with regard to best resistance and propulsive efficiency.

The hull form of 2500 TEU Standard Container Vessel of TNSW has been optimised by testing in model basin.
The lines of 2200 TEU container vessel are gained by shortening this hull form in way of parallel midbody.
In order to confirm the speed/power performance of the shortened vessel and as a basis for the verification of the contracted speed after trial tests following model tests will be carried out:

- Resistance and self propulsion test at design draught
- Resistance and self propulsion test at ballast draught

The speed prognosis for full scale condition will be made using the prediction method of the model basin as well as Builder’s correlation factors, which were established by mile measurements with Builder’s 2500 TEU Standard Container Vessel.

Upon Owners' request all reports and documents will be presented for information without costs for the Owners, but will remain property of Builders.

0215 VIBRATION ANALYSIS

A complex 3-dimensional finite element model has been made for this design (for parent vessel 2500 TEU) in order to optimise the global vibration characteristics of the vessel.

0216 VIBRATIONS AND NOISE

VIBRATIONS

The vessel to be designed and constructed that all vibrations occurring shall not exceed the limits given in the ISO-" Guidelines for the Overall Evaluation of Vibrations in Merchant Ships" (ISO 6954 - 1984).

In order to achieve this, the lines of the aft body and, in particular, the screw aperture as well as the propeller is designed accordingly, all foundations for main engine and for the auxiliary engines are carried out sufficiently rigid, and the arrangement of steel walls in aft body as well as in way of the accommodation are built in view of vibration considerations.

NOISE

Noise levels shall be in accordance with regulations of the German See-Berufsgenossenschaft (See-BG) including the tolerances mentioned therein.

Noise level **measurements** to be taken at the various points of the vessel during endurance trial in ballast condition. Should there be local vibrations and/or noise which are mutually by Owners' and Builders opinion deemed to be excessive, Builders will take suitable measures for their reduction.

0217 BUILDING PLANS, DELIVERY DOCUMENTS

The construction of the vessel shall be carried out in accordance with this Specification, the General Arrangement Plan, scale 1 : 200, and Engine Room Arrangement Plan, scale 1 : 100.

The following plans are to be submitted to Owners for information. Drawings which have to be submitted to the Classification Society, administration etc. for approval should preferably be approved by the regulatory bodies before submission to Owners.

STEEL PLANS

Midship Section
Longitudinal Section
Shell Plating
Longitudinal and Transverse Bulkheads
Double Bottom Structure
Forebody and Aft body
Deckhouse Structures

EQUIPMENT AND FITTING-OUT PLANS

Accommodation Plan, scale 1 : 50
Deck Covering Plan
Insulation Plan
Lists of Name Plates over Doors in Accommodation (to be approved by owner)
Arrangement of Provision Store Rooms and Store Rooms
Windows and Doors Plan
Manholes Plan
Drain Screws Plan
Ventilation and Air Conditioning Plan
Cargo Hold Ventilation
Ladders, Rail and Stanchions
Arrangement of Accommodation Ladders
Weather Deck Hatch Covers

Container Stowage Plan
Anchoring Equipment
Warping and Mooring Arrangement
Stern Frame and Rudder
Steering Gear Arrangement
Arrangement of Lifeboat
Arrangement of Navigational Aids and Bridge Command/Controls
Radar - Signal Mast
Provision Cold Store Rooms
Hull Piping Systems
Sanitary Piping, Drain Pipes, Freshwater Piping
Overboard Discharges
Wash Deck and Fire Main
Fire Extinguishing System
Safety Plan
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Arrangement of the Machines and Apparatus
Line Shafting, Assembly Drawing
Stern Tube Assembly
Arrangement of Air Ducts for Engine Room
Double Bottom Arrangement in way of Engine Room
Funnel Arrangement
Funnel Mark
Arrangement of Engine Control Room
Diagram of Fuel Oil Installation for Boiler Plant
Diagram of Separator Plant
Diagram of Hydrofor Plants
Diagram of Sea and Fresh Cooling Water Lines
Diagram of Fuel Oil Lines
Diagram of Lubricating Oil Lines
Diagram of Compressed Air Lines
Diagram of Steam, Condensate and Feed Water Lines
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ELECTRIC PLANS

One-Line Diagram of the Electric System
Lighting System
Main Switch Gear
Auxiliary Switch Gear
Cable Diagrams for Communication Systems
Cable Diagrams for Navigation Aids
Cable Diagrams for Automatic Control System
Electric Load Balance
Engine Control Desk
Bridge Control Desk and Bridge Wing Consoles

DELIVERY ("As finished") DRAWINGS

Prior to the delivery of the vessel, the amount of necessary drawings will be proposed by the Builders and a detailed list of "Delivery Drawing" containing drawing numbers etc., shall be established.

The list to be based on the "List of Drawings for Information".

The amount of documents shall also incorporate all drawings necessary for the ship's service and as required by regulatory bodies such as:

General Arrangement Plan
Capacity Plan
Docking Plan
Damage Control Plan
Container Stowage Plan
Trim and Stability booklet incl. hydrostatic particulars
Sounding tables
Container securing manual
Cargo securing manual
Wheelhouse poster
Navigation Bridge Visibility Plan

All drawings shall show "As finished"-status. The Builders will deliver two sets (1 to Owners, 1 on board).

Test reports of all functional tests and trials done, including evidence of speed will be handed over to Owners.

Furthermore, to be supplied (1 to Owners, 1 on board) descriptions, **operating manuals** and operating instructions for the respective equipment installed on board the ship as far as supplied by subcontractors.

Test certificates got from subcontractors to be supplied.

All documents to be in English language.

0218 DOCUMENTS AND CERTIFICATES

All documents and certificates necessary for the operation of the vessel to be supplied by Builders according to the following list:

Classification Certificate
Builder's Certificate
Cargo Ship Safety Equipment Certificate
Cargo Ship Radio Telegraphy Certificate
Cargo Ship Safety Construction Certificate
International Load Line Certificate
Certificate of Compliance with:
- US Coast Guard-Regulation
- Code of Federal Regulations 35 Panama Canal
- Suez Canal Authority
International Tonnage Certificate
Suez Canal Tonnage Certificate
Panama Canal Tonnage Certificate
De-ratisation Exemption Certificate
Potable Water Certificate
Dangerous Goods Certificate
Certificate of Surgical/Medical Equipment
I.O.P.P. Certificate
Certificate for sewage plant

Certificates, testing documents and attestations for lanterns, compasses, nautical equipment, navigational aids etc. as required by Class.

Certificates testing documents and attestations for the entire machinery and machinery equipment as required by Class.

0219 LABELLING

Language on warning plates and name plates: English.

0220 MEASURING UNITS

Metric measuring system is to be used.

Scales to be graduated as follows:	Capacities:	m^3
	Pressures:	bar
	Temperatures:	°C
	Quantity:	m^3/h
	Viscosity:	cSt

Exceptions, if any, are particularly mentioned in the respective passages in this specification.

0221 REFERENCE TEMPERATURES

The machinery to be designed for a sea water temperature of 32° C, a fresh water temperature of 36° C in low temperature circuit, air temperature 45° C, relative humidity 60 %.

0222 OWNERS' SUPPLY

In case equipment is supplied by Owners or on Owners' behalf, this equipment as well as the technical documents regarding this equipment and necessary in advance for the proper execution of the construction of the ship has to be delivered free of charge to the Builder and in due time according to Builders' production schedule. Owners are obliged to take care that each item of Owners' supplies is clearly identified on inside and outside of packing with intended purpose aboard and Builders' newbuilding number of the relevant ship.

Forwarding of equipment supplied by Owners will be on their own risk.

Purchase of Owners' supply by Builders on Owners' behalf will be paid for by Owners.

If equipment supplied by Owners shall be installed by Builders, Owners shall procure the necessary information in English language (drawings, installation manuals etc.) enabling the installation work.

Instruction books, certificates etc. for such equipment will not be supplied by Builders.

0223 SPARE PARTS

Spare parts supplied by Builders will be according to the requirements of the Classification Society or other regulatory bodies concerned in this specification.

Above-mentioned spare parts will be stored on board the vessel so as to be well protected against humidity and condensed moisture.

If practicable, heavy weight spare parts will be stored in the vicinity of where they are to be used. All other spare parts will be stored in places as agreed with Owners' surveyors.

All those spare parts which are not required by the above-mentioned bodies and this specification but requested by Owners will be transported and stowed according to time schedule on Owners' account.

0225 MAKER'S LIST

Following „List of Subcontractors“ contains the main subcontractors, corresponding to those chosen for Builder’s 2500 TEU Standard Container Vessel, of which the herein decribed vessel is a modified repeat.
The Makers were chosen after technical and commercial evaluation of different supplies of equal standing.
The existing detail design is adapted to these Makers.

Subcontractors for equipment not mentioned in the „List of Subcontractors“ are chosen by Builders without approval.

Makes possibly mentioned elsewhere in the specification are not binding and for guidance only.

Group No.	Item	Maker	Country
2250	Insulation:		
	Provision Cold Store a)	Kaefer a) d)	Germany
	Engine Room b)	Felix Schuh b) c)	Germany
	Piping c)	Ideh Sazan	Iran
	Exhaust Lines d)	Pashme Sang Iran	Iran
		Glass Wool Co. Of Iran	Iran
2361	Accommodation, Panelling	INEXA (TNF)	Denmark
2370	Galley Equipment	Bohnhoff	Germany
	Electrical	Elektrolux	Germany
2411	Laundry Equipment	Bohnhoff	Germany
	Electrical		
2446	Air conditioning plant	Noske-Kaeser	Germany
2478	Deck cranes	Krupp Fördertechnik	Germany
2478	Provision crane	Schröder	Germany
2481	Hatch covers	MacGregor-Navire	Finland / France
2502	Container fittings and	MacGregor-Conver	Germany
	Lashing material		
2551/2563	Windlass / Winches	Bröhl	Germany
2574	Steering gear	Hatlapa	Germany
2581	Life boat	Faßmer	Germany
2582	Life boats davits	Davit International	Germany
2575	Bow thruster	Lips	Netherlands
2672	CO_2-plant	Noske-Kaeser	Germany
2583	Life rafts	Dunlop	Germany
2740	Paint and conservation	Jotun	Germany
		Rang Afarin	Iran
		Queshm (Sigam) Paints	Iran
		Hempel - Bajak	Iran
3022	Auxiliary boiler /	Saacke	Germany /
	Exhaust gas boiler		Croatia
3022	Burner	Saacke	Germany
3121	Main diesel engine	MAN / B & W	Germany
3160	Propeller FP-type	Lips	Netherlands
3162	Stern tube seals	John Crane	Netherlands
3173	Centrifugal pumps	Allweiler	Germany

Group No.	Item	Maker	Country
3173	Butterfly valves	Ebro	Germany
3173	Heat exchanger plate-type	Alfa Laval	Germany
3173	Temperature regulating valves	Pleiger – M.E. Gestra – Tank Heating	Germany Germany
3175	Viscosimeter	Alfa Laval	Sweden
3175	Separators	Alfa Laval	Sweden
3176	Oil pumps (screw type)	Allweiler	Germany
3176	Oil filters	Boll + Kirch	Germany
3177	Compressors	Sauer+Sohn	Germany
3181	Freshwater generator	Alfa Laval	Sweden
3201	Auxiliary diesel engines	MAK	Germany
3201	Emergency diesel engine	Caterpillar	USA
3251	Bilge water separator	Blohm + Voss	Germany
3275	Sewage treatment plant	Steinbach	Germany
3280	Remote control valves	Danfoss	Denmark
3280	Tank level indication	Danfoss/IPH	Denmark
3331	Refrigerating plants (plants and cells are integrated)	Kaefer Zagros Electro Steel	Germany Iran Iran
4145	Monitoring system	Janssen, Aurich	Germany
4572	Bow thruster drive	Ben Buchele	Germany
4170	Electric Equipment Windlass, Winches	Ben Buchele	Germany
4200	Aux. generators Emergency generator	AEM Caterpillar	Germany USA
4211	Switchboards	Janssen, Aurich Electro Kavir Yazd	Germany Iran
4601	Gyro compass	C. Plath	Germany
4601	Magnetic compass	Cassens & Plath	Germany
4601	Auto Pilot	C. Plath	Germany
4602	Speed Log	C. Plath	Germany
4603	Echo Sounder	ELAC	Germany
4616	Telephone Intercom System	TELESTE /Cristie	Germany/Eng.
4621	Wireless Communication Sys.	Hagenuk	Germany

Group No.	Item	Maker	Country
4622	Satellite communication	Nera Skanti / Sailor	Germany Denmark
4622	Satellite Navigation System	SIMRAD / Koden	Norway
4623	Radar/Bridge Master	Sperry / Litton	Great Britain
4671	Fire Detecting System	AUTRONICA	Norway
	Pipes	Kalup Kaveh Precision Tubes Saveh Rolling & Profile Mills	Iran Iran Iran

0 BASIC DATA

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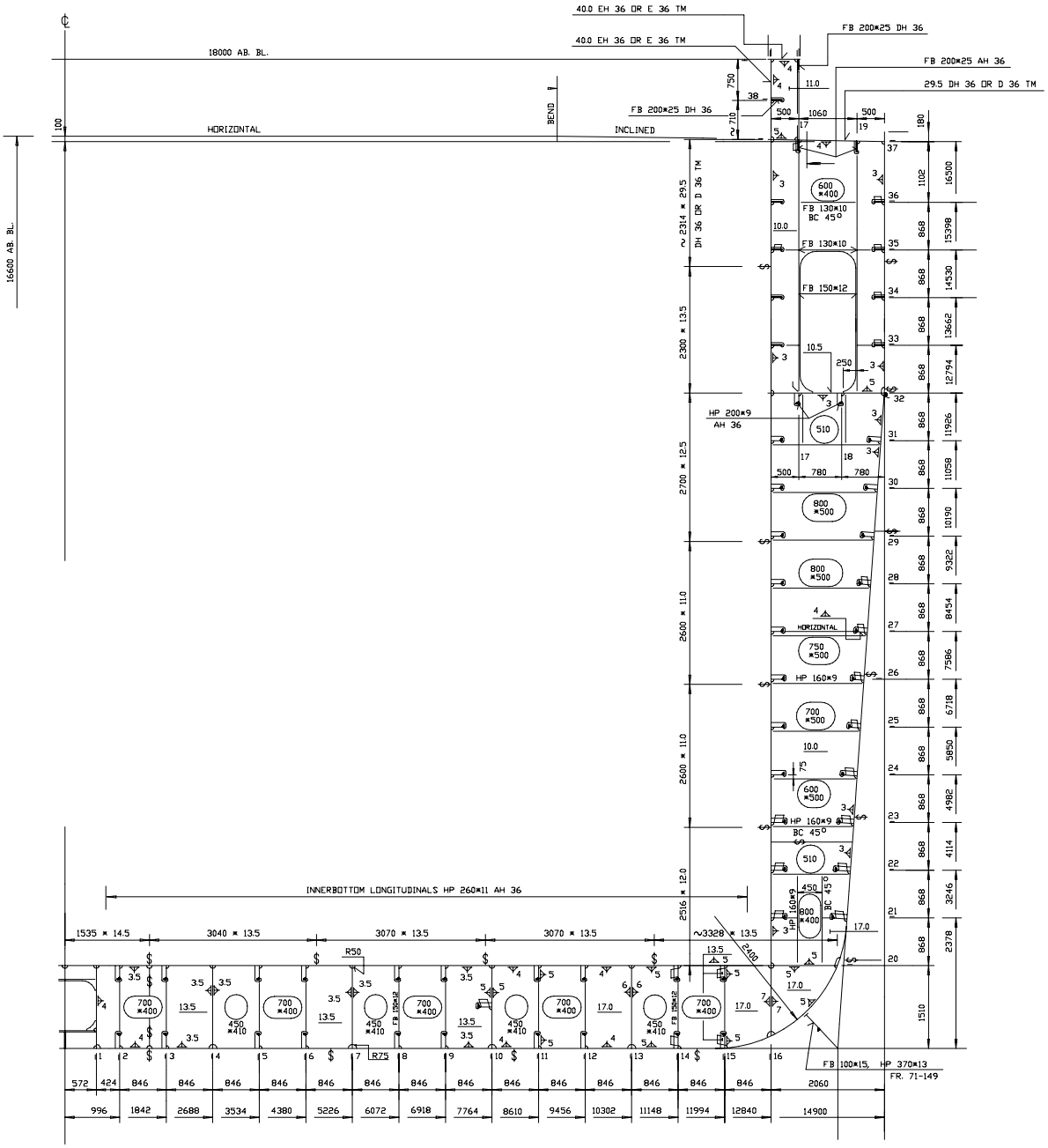
1 HULL

Midship Section
For guidance only



1100 STEEL STRUCTURE

The layout of midship section, material dimensions and section moduli are identical to the design of Builder's 2500 TEU Standard Container Vessels, thus enabeling a lengthening by one 40' cargo hatch (13.80 m).

The design of the steel hull as well as the arrangement and scantlings of the structure will be to Builders' practice in accordance with Classification requirements.

Subject to the approval by the Classification Society, Builders may employ designs and scantlings which are considered advisable on account of experience gained.

All structural parts and components will be of scantlings as indicated in the plans approved by the Classification Society, see MIDSHIP SECTION attached.

Exceptions:

a) Plates and sections may deviate from the approved dimensions within the milling tolerances to DIN.

b) Builders to strengthen structural parts in excess over Classification requirements where this is particularly called for in the Specification. Scantlings increased in excess over Classification requirements are to be extra indicated in the drawing. The contractual deadweight carrying capacity of the vessel will not be affected by such strengthening.

Builders are free to use higher tensile steel (yield strength up to 355 N/mm^2) and TM steel to an extent which is considered appropriate.

1110 WELDING

The entire steel hull of the vessel including deck houses, foundation etc. will be of welded construction.

Double continuous welding or scallop welding will generally be employed, e.g. in tanks, under exposed decks, at outer walls, wet spaces and highly stressed areas. As far as possible, Builders will perform one side welding.

Chain welding or zigzag welding will be employed as far as permissible according to Classification society with structural parts not exposed to weather.

The welding of the main structures of the hull will be X-rayed in compliance with the Classification rules. The X-ray photographs will be submitted to the surveyor and to Owners` supervisors for checking.

Welding to be manual or machine welding to Builders' decision.

1120 BOTTOM STRUCTURE

DOUBLE BOTTOM IN WAY OF CARGO HOLDS

The height of double bottom is abt. 1,510 mm. Stiffening of double bottom is a longitudinal frame/longitudinal girder construction. The inner bottom generally is horizontal from side to side and will be perforated in way of wing tanks. Where necessitated by the hull form forward and aft., side boxes may be provided according to container dimensions. Side boxes, if any, to be integral part of side tanks. No bottom ceiling is arranged.

As foundations for hold-container-loads, doubling of 30 mm thickness are fitted on top of inner bottom underneath all container corner points, these doublings to get holes for stacking cones.

Strengthening for container stack loads resulting from 6 tiers of containers on inner bottom with

30 t weight / 20'-unit, and
35 t weight / 40'-unit.

Underneath of container foundations, considerably strong stiffening has to be provided. Below Nos. 4, 5 and 6 holds longitudinal girders of double bottom are arranged to form a pipe duct centre line with dry recessed spaces for valves and pumps. Intercostal floors are arranged at least at every fourth frame. The transverse frame spacing is shown on General Arrangement Plan, scale 1:200.

Fore and aft of midship region, the construction is adjusted to hull form and to more narrow spacings of floors and side girders in fore body, according to rule requirements.

Air and drain holes will be provided as necessary.

Feed holes close to suction bell mouth; size abt. 2.0 to 2.5 times bell mount area. All parts of double bottom are accessible through lightening holes.

For drainage of cargo holds, the double bottom construction is fitted with drain sumps of abt. 1.0 m^3 volume. Number according to rules. Drain sumps of one compartment design.

DOUBLE BOTTOM IN WAY OF ENGINE ROOM

Height of inner bottom in way of engine room with respect to necessary height for installation of main engine. Floors are fitted to every frame. Longitudinal girders in way of engine room are welded to hold girders/frames. Cofferdams to be provided around main engine lub oil sump tank. Main engine foundation bolts not to be located inside the tanks.

MANHOLES AND DRAIN PLUGS

Each individual compartment of double bottom has at least two manholes. Manholes in way of container stowage area have covers flush with top of tanktop. All other manholes according to DIN 83402. A drain plug of stainless steel is provided at aft end of each double bottom tank, or at the deepest point, if possible outside of keel block area.

BILGE KEEL

Bilge keels are fitted P + S for abt. 25 % of ship's length. Bilge keels are of Holland-type bulb sections abt. 370 mm deep, welded to a flat bar. The flat bar is continuously welded to the bilge strake and arranged parallel to shell. Fore and aft ends of keels are parabolically shaped, and reach in longitudinal direction to a floor or stiffener respectively.

1200 WALLS AND BULKHEADS

Number and arrangement of bulkheads will be as per General Arrangement Plan.

The hold bulkheads will be built as double or single plate bulkheads supported by stiffenings and web plates where necessary.

The transverse bulkheads between holds nos 1-2, 3-4, 5-6 will be fitted with strengthenings for the possible future installation of cargo cranes.

The longitudinal bulkheads (double skin) in way of holds will be flat with horizontal stiffeners where possible. Stiffeners will be fitted inside the wing tanks supported by web plates. Web plates will be arranged in line of double bottom floors.

ACCESS MANHOLES TO WING TANKS

All wingtanks are to be provided with two access manholes per tank from the cargo hold side or from 2nd deck respectively.

INTERIOR STEEL WALLS

Engine casing bulkheads are of flat plate construction with vertical stiffeners or of swedged walls. Special stiffening will be provided under heavy machinery. Tank bulkheads in way of engine room are to be flat plate construction with stiffeners fitted inside tanks.

Other lined and non-lined interior walls of flat plate construction with stiffening by means of sections or swedged construction, to Builders' choice. Cofferdams for separation of tanks and cofferdam under deckhouse are arranged as necessary.

1300 SHELL PLATING

In way of wing tanks the shell to be stiffened by longitudinal frames in general, longitudinal framing to continue into fore- and aft body as far as possible. Transverse frame construction, if practical, to be applied to Builders' discretion.

Tug points to be strengthened according to Classification requirements.

A substantial rubbing bar (75 mm Ø half round, in way of 2nd deck) to be arranged on each side of the ship in way of the parallel mid body.

Shell plating in way of the engine room is stiffened by transverse frames. In addition web frames and stringers of built/milled profiles will be arranged to Classification requirements. Openings for sea chests etc., are well rounded, no strengthening for shell provided

Shell and main deck connection to be of rectangular corner joint type, the shell sheer strake plating to extend above main deck level abt. 150 mm.

1400 BODY

1410 AFT BODY

The aft body will be constructed with transom stern and builtup stern frame to Builders' standard. For arrangement of spaces and tanks situated in the aft body, arrangement of rudder, stern frame etc. see General Arrangement Plan, scale 1:200.

The after peak bulkhead will be a flat plate construction and stiffened by vertical stiffeners.

Emergency escape trunk leading from engine room floor level to main deck shall be incorporated in the bulkhead construction.

Aft of the after peak bulkhead, solid floors/web frames will be fitted to every frame, which reach up to steering gear deck level. A swash plate is provided at ship's centre line.

Above tweendeck, the shell plating is stiffened by transverse frames or longitudinals. For improvement of the transverse structure, web frames will be fitted which reach up to main deck.

Longitudinal beams of main deck and tweendeck are provided as far as to transom stern and will be supported by web beams in line with web frames.

The curved transom will have vertical stiffeners. Longitudinal stiffeners of decks will be connected to the transom via brackets. Additional stiffeners will be incorporated to avoid buckling of plates.

The stern frame will be constructed to Builders' experience and of an approved shape. The rudder horn is attached to take the rudder of semi balanced underhang type.

SEATINGS

Seatings for main and auxiliary engines will be of a rigid design. The seating of the main engine with integrated thrust bearing will be incorporated into the double bottom structure.

Foundations for auxiliary machinery and main engine will be constructed in agreement with machinery builders.

Scantlings will be adequate to weight of machinery and possible vibrations. Supports of foundations will be constructed with special care.

Pillars in way of platforms will be fitted according to the rules.

As far as indicated in the General Arrangement Plan the engine room is designed to take the engine room outfitting modular system.

1420 FORE BODY

For arrangement of spaces situated in the fore body, see General Arrangement Plan, scale 1:200.

In the fore peak, solid floors are fitted to every frame. All decks in the fore body are stiffened by transverse beams.

STEM

The vessel will have a bulbous bow and a raked stem above the water line. Additional stiffening by breast hooks is arranged to Classification requirements.

COLLISION BULKHEAD

The bulkhead is of flat plate construction. Stiffenings are arranged at the side, facing the fore peak, girders intended to support stiffeners are adequately dimensioned.

CHAIN LOCKERS

Chain lockers are of circular construction and extend from tween deck up to forecastle deck.

Chain lockers are sufficiently large to give abt. 1.5 m free height from chain pipes to top of the stowed anchor chain cables. Each chain locker has a perforated steel plate for diaphragm. Sumps under drain lockers are accessible through manholes.
For storage of bow anchors pockets to be provided in the shell.

BOW THRUSTER ROOM

The bow thruster will be arranged in the space behind collision bulkhead.

1430 MAIN DECK

Main deck to be built without sheer.

Camber of 100 mm is provided outside the hatch openings. Stiffening of the deck generally by longitudinals. The longitudinals are supported at least at every fourth frame by webs or transverses, which in way of engine room are in line with the web frames of the shell.

Coaming height is abt. 1,460 mm.

Clear height from main deck to underside of first tier of deck container to be min. 2000 mm.

No outer bulwark will be arranged on main deck. Protection of ship`s side will be given by pipe railing between outer container foundations on deck.

Longitudinal hatchway coamings arranged continuously. The coamings are included in the longitudinal strength. Horizontal stiffening of hatchway coamings at top edge and at abt. half height: vertical brackets are arranged at side and end coamings, as necessary. Top edge stiffening will be flush on top except for hatch cover fixing arrangements; i.e. coaming will not extend above upper stiffening. Brackets of side coamings are positioned on top of transverse deck girders. Clear hatch openings, as shown on General Arrangement Plan, scale 1:200.

Space between transverse hatchway coamings to be covered by top plating from side to side, as far as necessary.

1440 TWEENDECKS

Tweendecks to be arranged in the vessel as shown on the General Arrangement Plan, scale 1:200.

All tweendecks and platform-decks without sheer and camber. Stiffening by deck longitudinals in conjunction with transverses at every 4th frame or only by transverse beams.

Where necessary for supporting auxiliaries, Units, Modules, etc., decks and structure are strengthened locally by girders or beams, and the deck structure is carried out as a part of the foundation, respectively.

The 2nd deck forms a tween deck over the entire ship's length. Bottom plating of transverse box girders arranged at same level.
Access to cargo holds to be provided from top of transverse hatch coamings, at forward and aft end.

1450 SUPERSTRUCTURE DECKS

FORECASTLE DECK

Forecastle deck to be constructed with transverse beams and supported by fore and aft girders.

Strengthening under windlass and mooring winches to Builders' experience.

Longitudinal and transverse walls in forecastle are of flat plate constructions with vertical stiffeners.

Bulwark to be arranged as shown on the General Arrangement Plan. Height of bulwark to be 1050 mm minimum. Bulwark to be stiffened with vertical stays every alternate frame. Bitts and chocks are incorporated.

Coaming height is abt. 1,400 m (clear height from the deck to underside of first tier of deck container to be minimum 2,000 mm).

Wave breaker to be arranged forward of number 1 hold.

POOPDECK

Poopdeck to be constructed with longitudinal beams and supported by fore and aft girders.

Strengthening under mooring winches to Builders' experience.

1500 DECK HOUSE

For arrangement and subdivision of deck house aft, see General Arrangement Plan, scale 1:200. Supporting walls of deck house aft are erected in line with longitudinal beams and transverse beams or bulkheads underneath of main deck wherever possible.

The deck house will have a cofferdam of abt. 800 mm to poop deck.

Outer walls are of swedged construction. Decks to project to outwards.

Boundaries for overhanging decks are formed by arranging face plates. Inner walls are of steel and generally swedged, plate thickness of internal decks and walls to be not less than 6 mm.

Cut-outs for channels or pipes to be provided outside of swedges, reinforcements to be placed in said positions where necessary.

Superstructure decks are stiffened by longitudinal beams . Girders are arranged, where necessary.

Bulwarks forward of navigation bridge (wings) fitted with wind deflectors.

1600 FUNNEL

Vent lines, exhaust gas pipes, drainage pipes, platforms and ladders, etc. will be prefabricated in a rack, which forms a "Funnel Module". This module will be an integrated part of the engine casing.

1 HULL

1100	**STEEL STRUCTURE**	**3**
1110	WELDING	4
1120	BOTTOM STRUCTURE	5
1200	**WALLS AND BULKHEADS**	**7**
1300	**SHELL PLATING**	**9**
1400	**BODY**	**10**
1410	AFT BODY	10
1420	FORE BODY	12
1430	MAIN DECK	13
1440	TWEENDECKS	14
1450	SUPERSTRUCTURE DECKS	15
1500	**DECK HOUSE**	**16**
1600	**FUNNEL**	**17**

2 OUTFITTING

200 OUTFITTING GENERAL

The vessel will be built without cargo gear.
The electrical plant and installation is layd out for a gearless vessel.

2478 LIFTING GEAR

PROVISION HANDLING GEAR

For handling provisions, engine parts, spare parts etc., one transverse crane arrangement with travelling unit to be installed aft on vessel, trolley crane in front of deck house. Trolley to be protected in parking position against environmental influences by a suitable canvas cover and to be properly lashed against vibrations.

Lifting capacity:	5 t SWL0
Outreach:	abt. 4 m beyond maximum beam of vessel

For electrical equipment see Electric Specification.

248 CARGO HATCHES / HATCH COVERS

All hatchways over cargo holds are open over entire breadth.

Clear openings (appr.)

		(length x width)	
Hold no. 1	hatch no. 1	12.80 x 15.52 m	2 covers
	hatch no. 2	12.80 x 25.68 m	3 covers
Holds nos. 2 - 6	hatch nos. 3 - 9	12.80 x 25.68 m	3 covers

Hatchways are covered by steel, pontoon-type hatch covers. Pontoons are built in open bottom construction with horizontal cover plate.

Opening of covers: independent of each other.

Resting of hatch covers on resting points on hatch coamings. Counter points fitted to hatch coamings are of special steel.

Hatch covers to get rubber sealing on longitudinal and transverse coamings.

The longitudinal gap between hatches to be as small as possible. Along the gap vertical flat to be fitted on covers. Suitable sealings in between cover sections, i.e. all hatches to be closed weather tight completely.

Manually operated closing appliances, number to regulatory requirements.

Static layout of hatch covers according to Classification rules and considering point loads from container stowage on deck:

Generally	65 t per 20' stack and 100 t per 40' stack.

Built-on raised type sockets for taking twist locks are arranged on top of hatch covers, height abt. 150 mm. Arrangement of foundations for athwartship block stowage, container distance 25 mm. In longitudinal direction on all hatches, stowage in 20' and/or 40'- units.

Operation of hatch covers through lift-on/lift-off procedure. Handling of hatch covers to be done by fittings for 20' and 40'-container-spreader as well as for cargo hook-operation.

Transverse hatch coamings are fitted with suitable centring arrangements for covers.

Access hatchways see para. 2433.

257 STEERING EQUIPMENT

2571 RUDDER

The vessel will be equipped with a semi-balanced underhang type rudder. Rudder body to be built with streamlined sectional area.

Construction:	Rudder body to be of welded construction. Material and dimensions to Classification requirements.
Rudder area:	Rudder area to be determined to Builders' experience and to Classification requirements, if applicable.
Rudder head:	Material and nominal diameter to Classification requirements, rudder head and rudder body to be securely connected by means of a conical coupling.
	Guide of rudder by means of two guide bearings:
	1 guide bearing above counter-line (upper stern bearing) 1 guide bearing consisting of a pintle in connection with the rudder horn (lower stern bearing).
Links:	For rudder stock and pintle in bearing area to be of stainless steel.
Bearing rudder body:	If not already installed in steering gear: Slide bearing with plastic or bronze bushes suitable for lub. oil greasing.
Guide bearings:	Casings of cast steel, double bushing. Inner bushing of plastic material shrunk into outer steel bushing. Common bushing glued into the cast steel casing.

2574 STEERING GEAR

Type: Electric-hydraulic type engine

The system to operate on two independent pump units and to be laid out according to Classification requirements.

Operation time: With one pump unit the rudder can be turned from 35 degrees on the one side to 30 degrees on the opposite side within 28 seconds.

One oil tank, capacity 200 litres, to be provided in steering gear compartment for storage of hydraulic oil. Oil tank fitted with oil gauge, one hand pump to be supplied.

Oil sills to be provided on steering gear deck as necessary.

The steering gear to be seated on resin chocks.

2575 BOW THRUSTER

The vessel will be equipped with a lateral thrust propeller in fore body.

Output:	abt. 900 kW
Drive:	electrically
Propeller:	controllable pitch-type, 4 blades, material bronze
Cross tunnel:	made of shipbuilding steel, in way of propeller chromium steel cladded.

Controlling of propeller from nautical control desk in wheelhouse and from control stands in bridge wings port and starboard side.

255 ANCHORING

Ground tackle to be laid out in accordance with Classification requirements. Bow anchors to be stowed in anchor pockets. Anchors and chain cable when dropped from stowage position by gravity to fall clear of bulbous bow.

2551 WINDLASS

Two of the mooring winches installed on forecastle deck shall be combined windlass/mooring winch units, and shall be fitted with anchor part, with declutchable cable lifter.

Construction, pull, speed of wildcats and spare parts to Classification requirements.

ANCHORS

Number:	2
Weights:	According to classification requirements
Type:	D'-Hone-type folding stockless anchor of high holding power
Arrangement:	two bower anchors, stowage in anchor pockets. Three-point-resting of anchors in pockets must be observed. Reinforcement to be provided for resting.

ANCHOR CHAIN CABLES

Type:	Calibrated stud-link type.
Diameter:	76 mm
Material:	High tensile steel, K 3-grade

Detailed information on component parts, length of shots, outboard shots, swivel etc. to be given during design stage.

Spare parts:	2 anchor shackles, Kenter type
	1 anchor shackle, three-link type

CHAIN STOPPERS

One roller type chain stopper to DIN standard to be provided for one each anchor chain cable. Chain stoppers to be fastened to deck separately from bower anchor windlass. Lashing of anchor to Builders' experience.

SLIP ARRANGEMENT

Each anchor chain cable to be secured by a quick release arrangement in the respective chain locker, to be fitted above main deck and to be operable from outside of chain locker.

CHAIN LOCKERS, HAWSE PIPE

On deck steel chain-guideways to be arranged in front of hawse pipes. Hawse pipes and chain pipes are to have steel sliding type covers (steel galvanised) to Builders' standard. Covers to be secured by locking device.

Chain lockers to be accessible through one each hatch. Drainage of chain locker sumps to be provided by means of one each educator actuated by the fire main. Discharge opening to outboard to be arranged above load line.

256 WARPING

2563 WARPING AND MOORING FACILITIES

The warping and mooring equipment to be provided to Builders' experience as necessary for a vessel of these dimensions, and as required by rules and regulations. Arrangements of winches as well as bitts, chocks and guide rollers generally to be as shown on General Arrangement Plan.

2561 BITTS AND CHOCKS

All bitts to Builders' standard of welded construction according to DIN 82607.

All mooring chocks provided are of multipurpose type (Panama type), according to DIN 81915.
All guide rollers with self-lubricating bushes in accordance with DIN 81907.

	nominal size (mm)	**Number**		
		forward	**amidships**	**aft**
Bitts	D8	-	8	-
	D12	7	-	6
	D20	1	-	1
Mooring chocks (Panama type)	A8	-	8	-
	A12	4	-	7
	A20	1	-	1
Guide rollers	A5	2	-	-
	A8	1	-	-
	A12	6	-	2
Roller chocks		6	-	6

WARPING WINCHES

The vessel is equipped with a total of 6 mooring winches, whereof 2 winches of the combined windlass/mooring winch-type.

Drive:	Electrically
Design:	Each winch is fitted with 1 declutchable mooring drum 1 fixed warping head 2 winches with anchor part.
Pull:	10 tons each
Mooring speed at rated power:	abt. 15 m/min.

Mooring winches of constant tensioning type.

One each winch forward and aft with additional 2nd drum, these drums without constant-tensioning.

Cable lifter as per Classification requirements.
Winches are of welded construction with drive flange to gear box. Drums fitted with lever spindle band brake. Winch drums to be of suitable size to take 200 m polypropylene rope.

Location:	3 winches on forecastle deck 3 winches on poop deck aft, behind deckhouse
Winch controllers:	On forecastle deck and on poop deck one each double control and one single control column P & S

HAWSERS AND WARPS

Hawsers and warps to be supplied to Classification requirements. These to be stored on mooring drums.

6 sets of Scan Rope KARAT winchline mooring ropes, each 200 m long, breaking strength 820 kN, 64 mm dia.

258 LIFE BOAT EQUIPMENT

2581 LIFE BOAT

The vessel to be equipped with 1 free-fall life boat.

Design:	The life boat to be of the closed type. Boat to be equipped with a diesel engine.
Capacities:	Seating for 30 persons.
Material:	Glass fibre reinforced plastic.
Drive:	Water cooled diesel engine for 6 knots speed. Engine starting electrically by battery, charging of battery by solar panel.
Location:	As shown on General Arrangement Plan

Equipment and inventory to regulatory requirements applicable. Emergency ration to be Builders' supply.

For life boat wireless telegraphy equipment, see Electric Specification.

Additionally 1 **rescue boat** (hardplast) with outboard motor as per regulations.

2582 LAUNCHING AND RECOVERING DEVICE

The launching device for the freefall life boat will be hydraulically operated with an integrated davit system.

The freefall boat will be placed on an inclined launching way aft of the deck house (see also General Arrangement Plan).

Hoisting of the freefall boat will be done by integrated davit with hydraulic cylinders and special purpose winch.

The launching device will fulfil following functions:

1. to launch the boat in free fall,
2. to lift the boat with maximum 6 persons from the water level by means of winch and davit to the launch way.

One davit with electric driven boat winch for the **rescue boat and life rafts**.

2583 LIFE RAFTS

The equipment comprises

4 life rafts, seating for 16 persons
aft on vessel.
(Two life rafts to be lowered by the rescue boat davit.)

Location see G.A.P.

1 life raft, seating for 6 persons
forward on vessel.

Life rafts to be of the inflatable type, rafts and complete equipment contained in plastic bags, hydrostatic releasing.

2592 ANTI-HEELING PLANT

Wing ballast tank P&S (tanks between frame 43 and 63) is provided as heeling compensation tank. Ballast water will be pumped automatically from one side to the other by the reversible heeling pump arranged in double bottom between the tanks.

Control of anti heeling pump, see 4607.

One reversible heeling pump.

Capacity:	250 m^3/h
Head:	1.2 bar
Drive:	Electric motor reversible
Speed:	1,750 1/min
Construction:	Propeller
Material:	Pump housing: bronze
	Propeller: bronze
	Shaft: stainless steel

ACCOMMODATION

General
The deckhouse will be constructed and fully outfitted either at Builder's premises or by subcontracor in Poland.
All the major material and equipment will be supplied by the Builder.
Equipment with minor importance may be delivered by Polish subsuppliers.

Arrangement of cabins, public rooms and service rooms are shown on the General Arrangement Plan. Number of crew: 26.

CABINS			QTY of Persons
3	apartments	- Captain, Chief Engineer and Owner	4
2	apartments	- Senior Officers' standard	2
4	single cabins	- Junior Officers' standard	4
4	single cabins	- Petty Officers' standard	4
7	single cabins	- Crew standard	7
3	double cabins	- Crew standard	6
23	cabins total		27 persons

Cabins with private washroom/WC.

PUBLIC ROOMS AND SERVICE ROOMS

Officers' mess and recreation room
Crew's mess and recreation room
Duty mess
Separate Offices:
- Captains Office / Conference room
- Chief Eng.'s Office
- Cargo Office
- Tally Office

Wheelhouse/chartroom, combined
Hospital with dispensary
Change room
Stores and linen lockers, as necessary
Prayer Room
Swimming pool

236 FURNITURE

Detailed arrangement of furniture see drawings of accommodation in deckhouse, drawing no 236-0001

2361 FURNITURE AND CABIN FITTINGS

All furniture, such as tables,
desks,
sofas, chairs,
beds,
wardrobes,
shelves etc. with all fittings

will mainly be supplied by subcontractors. Material to be used shall be chipboard plates of quality suitable for marine use in ships. Furniture to be veneered with plastic panels with wood pattern. Type and patterns to be chosen and proposed by Builders' to suit the respective rooms.

Fittings of furniture to be brass chrome, where not of plastic material. Doors of wardrobes and clothes' lockers to have mechanical door stops and to be lockable. Drawers to have push button spring locks. Coat hooks, hat hooks and towel hooks are to be provided as necessary.

TABLES AND DESKS

All tables to have cigarette-proof covering, tables in mess rooms with anti-slip covering. All tables to have steel legs. Desks in Officers' rooms to be of the double pedestal type, all others to be of single pedestal type.

BEDS

Inside measurements:

2,000	x	1,200 mm	Cabins for Captain, Chief Engineer, Owner two of Senior Officers’ standard
2,000	x	1,000 mm	Officers’ standard
2,000	x	900 mm	Crew standard

MATTRESSES

All beds and berths to have foam rubber mattresses 100 mm thick in fire impregnant drill covers and one foam filled pillow per person.

WARDROBES AND LOCKERS

	Size mm	provided for	Remarks
Wardrobes, three doors with compartments for clothing and cont. rod	1,500 x 600	Apartments, Captain, Chief Engineer and Owner	with mirror inside
Double door wardrobe with compartment for clothing and continuous rod	1,000 x 600	Senior Officers standard	with mirror inside
	1,000 x 600	Junior Officers standard	
	1,000 x 540	Crew standard	
Dirty clothes wardrobe steel-made	300 x 500		in change rooms and passageway respectively
Book shelves	750 x 220	all cabins	

Half-height lockers and/or side boards to be provided as practicable in mess and recreation rooms, see "Furnishing of rooms".

Lockers for oil skin to be provided in way of accommodation within change room.

CHAIRS

Portable chairs in mess rooms are to have lashing devices. Chairs in cabins are to have rubber discs under steel legs to avoid skidding.

Chairs:	with plastic or plywood sitting bowl, no upholstery
Upholstered arm chairs:	with upholstered seat and back
Easy chairs:	with upholstered seat, arms and back, light type.

HAND RAILS

The steel hand rails on banisters of steel will be lined with a plastic section bonded to the steel top rail.

UPHOLSTERY AND DECORATION

Pattern, colours and qualities of covers for upholstery and of curtains are to be proposed by Builders to match the furniture of the rooms and to be to Owners' approval.

Upholstered benches to have upholstered seats and backs. Sofas to have foam-rubber-upholstered seats, arms and backs. Seats and backs to be detachable.

Upholstered furniture to be covered with artificial leather in all crew class cabins, in mess room and in recreation room and to be cloth covered in Officer class cabins and in Captain class cabins, as well as in saloon.

Protecting covers not to be supplied.

CURTAINS

Curtains to be provided in front of all windows and portholes in cabins and public rooms.

All curtains to be guided in rails and to be fastened by means of metal rollers or plastic clips.

235 LINING AND CEILING, INSULATION

2351 PARTITION WALLS

Generally non-steel partition walls as well as lining and ceiling on walls and deckheads in way of accommodation to be made of material to Builders' standard accommodation system, except wet spaces surrounded by steel boundaries (laundry), wheelhouse in way of front windows and staircase.

Lining and ceiling shall be incombustible where required by Regulatory Bodies. Free height in all living quarters shall be at least 2,075 mm.

BUILDERS' ACCOMMODATION SYSTEM

Bulkhead and deckhead linings as well as the partition walls to consist of approved materials complying with applicable rules.

For the interconnection between ceiling and bulkhead panels, an approved construction will be employed.

Panelling at walls and deckheads is to be easily removable in way of ducting/piping/cable work installed behind.

Lining and ceiling to be provided for:

- cabins, public rooms and service rooms,
- mess rooms, offices,
- wheelhouse/chartroom,
- passageways

Surface finishing shall be plastic coated/veneered, and coloured to Owners' approval.

Walls and deckheads in wet spaces surrounded by steel boundaries, such as laundry and change rooms to be painted. No lining and ceiling to be provided except at outer walls and deckheads under weather exposed decks.

Stairways in way of accommodation to get no lining, steel walls and deck heads to be painted.

2352 CABIN DOORS, WINDOW BOXES, JALOUSIES

CABIN DOOR IN ACCOMMODATION

Dimensions:	Clear height abt.	1,950 mm
	Clear width min.	700 mm

Material of cabin doors according to regulatory requirements. All door lock latches, ajar hooks, stoppers, grids and louvers etc. to Builders' standard. Door sills to be covered with treads of abt. 1 mm stainless steel plate. Doors to staircases to get self-closing device.

DOORS WEATHERDECK/ACCOMMODATION

Entrance doors to accommodation to be hinged GRP-made doors, otherwise steel doors. Doors with self-closing device, no windows to be provided.

Entrance doors to wheelhouse to be hinged GRP-made doors. Clear width abt. 800 mm. Doors fitted with locks, latches. Fixed window abt. 400 x 600 mm in each door.

NAME PLATES

Name plates of plastic to be fitted above all doors. Name plates to be glued to walls inside of accommodation as well as on open deck.

Language: english

LOCKS AND KEYS

In general, all interior doors to be equipped with cylinder safety locks.

The doors to private sanitary rooms and any fire doors will not be lockable. Public toilets to have locking bolts.

In general, three keys will be supplied for each room.

A master key system to be provided.

KEY CABINETS

Key cabinets and key boards, respectively, to be supplied and fitted to later agreement. All keys to be permanently marked.

WINDOW BOXES, JALOUSIES

All windows and portholes to have steel window boxes with white finish. All windows in the front wall of superstructure and at side in 3. Officers' cabin, in cabins, public rooms etc. to have curtains and roller blinds except where deadlights (of steel) are fitted.

242 WINDOWS

For arrangement and number of windows, see General Arrangement Plan.

All fixed and hinged windows will be manufactured to meet DIN/ISO standards.

Safety glass for all window panes. Frames for windows to be brass with steel welded rims, in way of the compass-zone with non-magnetic welded rims.

Dimensions of windows provided:

Location	**Windows (mm)**	**Remarks**
Generally all cabins, public room, service rooms above poop deck	450 x 630	
Wheelhouse incl. front bulkhead	1,000 x 1,000	All of fixed type

All sanitary rooms to be provided without windows.

HINGED WINDOWS

If not specified otherwise in the above table, each cabin, public room and service room above poop deck to be fitted with at least one window of hinged type.

If more than 3 windows will be arranged in a room, 2 windows to be of the hinged type, all others to be fixed windows. All hinged windows to be arranged to open outside and to be fitted with hook to secure them in the open position.

CLEAR VIEW SCREENS

Windows in wheelhouse front bulkhead to be fitted with clear view screen, number according to authorities.
Size: 350 mm diameter.

WINDOW WIPERS

Window wipers to be fitted to wheelhouse windows, number according to authorities.

WINDOW WASHING DEVICE

Wheelhouse front windows to be provided with freshwater washing device.

HEATING

2 windows in wheelhouse front bulkhead to be fitted with electric heating.

234 COVERING

Weather decks to receive no covering, but a coat of preservation.

Interior rooms such as cabins, public rooms, service rooms etc. and passageways including stairways in way of accommodation have floor covering.

Colours and patterns of floor covering inclusive floor tiles to be chosen and proposed by Builders to match the furniture and decoration of the various rooms.

2343 FLOOR COVERING IN ACCOMMODATION

In cabins, public rooms etc. passageways and provisions store situated above engine room, and in rooms situated above tanks and bunkers as well as in rooms above exposed decks, thermal insulation to be applied with the floor covering. The insulation to be applied directly on the steel deck with the floor covering laid on top.

Material: 1 layer hard wearing mineral wool, 30 mm thickness (minimum).

Floors covering:

Rooms	Interior
All cabins for Officers' class, Officer's mess + day room	Carpet
Crew cabin, mess room, day room, alleyways, stairs, offices, hospital, dispensary, conference room	Plastic underfooting
Galley, laundry, sanitary spaces	Ceramic tiles
Deck store, lockers, provision room, etc.	Painted

Floor covering to be laid from steel wall to steel wall, no gutterways to be provided.

Interior deck underlay of 8 - 10 mm in living and service spaces where required.

2344 CEMENT FLOOR, FLOOR TILES

40 mm cement subfloor (under ceramic tiles) for galley.

30 mm cement subfloor (under ceramic tiles) for common sanitary spaces, harbour toilet and laundry.

DRAINAGE

Tiled floors to be arranged with slope so as to ensure good flow of water to scuppers and gutterways. Gutterways to be arranged in way of galley only. In way of doors and service alleyways covering by perforated plates of stainless steel.

Foundations in galley, such as for galley range, baking oven, refrigerators etc. and in laundry to have light concrete filling with cement covering. Otherwise the equipment to be bolted to the floor.

All walls in wet spaces except shower cabinets will have steel walls. Steel walls to be painted. No wall tiles to be provided.

2345 GRATINGS

Lath gratings of spruce to be provided under shelves and at places in provisions store rooms, bonded store, under shelves in ship's workshop, under shelves in the various store rooms, around compasses and for storing of wooden ladders (like boat ladder etc.) and ropes.

Rubber ring mats will be laid both on the bridge wings and swimming pool area.

240 SANITARY FACILITIES

PRIVATE WASH ROOMS

Prefabricated sanitary cabinets will be installed throughout the accommodation as shown on the General Arrangement Plan.

The units are of sheet metal constructions with mineral wool insulation. Floor and wall socket with ceramic tiles, walls above socket and deckhead coated with foil. Each unit to get:

1 vacuum WC,
1 shower,
1 wash basin,
1 toilet cabinet with mirror (2 off in units provided for 2 men each),
1 light fixture with electric razor outlet socket and protection transformer
1 electric heather

The bath room for the hospital will have a bath tub instead of a shower.

PUBLIC SANITARY ROOMS

A wheelhouse toilet, total 2 public toilets in way of mess rooms/offices as well as a harbour stevedores' toilet will be provided and outfitted with:

1 vacuum WC,
1 wash basin,
- mirror,
- lighting and utility shelf as per local conditions.

Fresh water taps will be provided on each superstructure deck outside as well as in galley and laundry.

241 LAUNDRY EQUIPMENT

For arrangement of laundry, see the General Arrangement Plan, scale 1 : 200.

The ship's laundry to be equipped with electrically driven machines as follows:

2 automatic type washing machines, abt. 10 kg capacity per filling, marine type,
1 hydro-extractor, abt. 8 kg capacity per filling, marine type,
2 drying tumblers, abt. 8 kg capacity per filling, marine type,
1 ironing machine, marine type,
1 electric iron with thermostat.

Other equipment to include

1 washing trough, abt. 600 x 500 x 320 mm of stainless steel,
1 ironing table,
2 shelves for linen.

237 GALLEY EQUIPMENT

Generally galley to be equipped with:

1 marine type galley range with 4 hot plates, baking muffle and griddle plate, abt. 25 kW
1 combi steamer, abt 10 kW
1 universal type galley machine
2 marine type refrigerators of abt. 375 litres capacity
1 deep fat fryer, 15 litres capacity, abt. 12 kW
1 electric hot water boiler, abt. 5 litres capacity
1 frying pan, frying area abt. 500 x 450 mm, abt. 5 kW
1 rice cooking kettle, abt. 30 litres capacity
1 dish washing machine, abt. 3 kW
1 coffee machine for abt. 18 ltrs./h, marine type
1 toaster, four slices, domestic type

cook's table, with locker underneath,
baker's table, with kneading through,
rack for stowage of baking tins underneath,
dresser with 2 sinks and double pedestal locker underneath,
pot/pan rack, with detachable fiddles,
spice lockers,
chopping block, solid,
stools (steel with wooden seat),
garbage boxes,
1 battery-driven clock.

All galley furniture to Builders’ standard.

Cook's table, baker's table, dresser with respective substructures entirely to be made of stainless steel. Pot/pan rack of galvanised steel.

A **provision lift** to be provided between galley and provision stores.

4382 MISCELLANEOUS EQUIPMENT

1 each domestic type refrigerator of abt. 130 litres capacity to be integrated within the furniture for Captain, Chief Engineer, Owner and Captain's Office / Conference room. All other cabins to be fitted with 1 domestic type refrigerator of abt. 130 ltrs. capacity.

1 each domestic type refrigerator of abt. 130 litres capacity to be installed in dispensary, officers' recreation room and duty mess.

2 drinking water coolers with 5 ltrs. tank to be installed in accommodation area.

On navigating bridge one pantry cabinet (with 1 domestic type refrigerator of abt. 130 litres capacity, 2 hot plates and 1 dish washing sink) to be installed, additional 1 marine type coffee machine for abt. 10 cups per filling and one electric hot water heater (abt. 5 litres, temperature range abt. 35 - 85°C).

1 marine type coffee machine for abt. 10 cups per filling to be installed in duty mess.

203 OTHER OUTFITTING

266 PROVISION COLD STORE ROOMS

Provision cold store rooms are to be provided as specified below. The rooms are arranged on main deck. Arrangement of rooms in accordance with General Arrangement Plan.

CAPACITIES AND TEMPERATURES

	Net Capacities	Temperatures
Meat	abt. 25 m³	- 20° C
Vegetable room	abt. 25 m³	+ 2° C
Total	abt. 50 m³	-

INSULATION

Cold store rooms are provided of panel-made type. The cooling units (compressor, condenser and evaporator) are integrated and part of the rooms

Floors, walls and ceiling of sandwich type panels.

Insulation of rigid polyurethane foam sheets, for walls and ceilings on both sides covered with galvanised steel sheet, inside sheeting with suitable acryl varnish coating.

Floors outside galvanised steel sheet, inside stainless steel sheet, pattern rolled, glued with plywood and foamed in.

Insulation material: Specific weight abt. 43 kg/m³, class B 1, overall heat transmission coefficient for design purpose 0.40 W/m² K.

Doors to Cold Store Rooms
2 cold store doors.
All doors with open-position hooks and emergency call from inside.
Outer doors to be lockable.

OUTFITTING OF COOLED PROVISION ROOMS

Shelves and racks are to be arranged in respective rooms as necessary.
Shelves to have fiddles.
Material: Stainless steel.

Each cold store room with remote thermometer outside cold rooms.

Automatic defrosting to be provided for meat room and vegetable room.

3331 PROVISION REFRIGERATING PLANT

MODE OF OPERATION

Effective operating time to be 18 hours per day.
Automatically controlled intermittent operation of the cooling compressor.

COOLANT

Cooling medium environmental friendly, i.e. 134 a.

COOLING UNITS

2 units for the meat and 1 for vegetable room will be provided.

CONDENSER

Recooling of cooling medium in condenser to be effected by air-cooling.

239 FACILITIES OF PROVISION STORE ROOMS AND STORE ROOMS

2391 DRY PROVISION STORE ROOMS

Storage racks of steel, stove enamelled, with 3 shelves having a fixed front ledge as well as a removable storm rail. Total length 18 m, depth 600 mm.

1 grating for bagged flour,
2 two-door cabinets,
1 semi-high cabinet.

BEVERAGE STORE

The beverage store will be fitted with partitions.
Guide strips on the bulkheads and shifting boards of fir wood up to 1,500 mm in height between the bulkheads. Floor covered with open steel gratings.

2392 STORE ROOMS AND WORKSHOPS

Store rooms, workshops etc. for deck service to be provided as follows:

Boatswain's store	-	forward in the vessel
Paint store	-	forward in the vessel In paint store will be arranged a locker for chemical products
Deck stores	-	aft and forward in the vessel
Deck workshop	-	aft in the vessel
Electric relay rooms	-	forward and aft in the vessel where practical

Location of rooms as indicated in General Arrangement Plan.
Fitting of rooms, type and size of equipment to Builders' standard.
Shelves installed in store rooms generally to be pre-fabricated shelving systems, steel galvanised.

BOATSWAIN'S STORE

Store room to be fitted out with

wooden shelves, heavy type (supports of angle bar with brackets),
each with 2 boards of 50 mm spruce laths, abt. 1,000 mm in depth,
hooks and rods for storage of blocks and tackles,
number and arrangements as necessary.
Stowage arrangement for Suez-search light.

Access to boatswain's store from forecastle deck via access hatch and ladder.

DECK STORES

Deck stores (rope stores) aft and forward in the vessel to be fitted with wooden shelves of heavy type, hooks and rods for storage of blocks and tackles.

PAINT STORE

Paint store to be fitted out with

1 working table with working plate of 3 mm galvanised steel plate,
4 steel plate shelves, 1,000 x 750 mm each, 4 compartments,
1 wooden shelf, 3 compartments, abt. 5,500 mm long.

DECK WORKSHOP

1 working table with strong wooden working plate and vice, 150 mm,
1 carpenter's bench
1 grinder, electrically driven,
1 tools locker,
1 steel plate shelf, 1,000 x 750 mm, steel galvanised, 4 compartments.

LOCKERS FOR OXYGEN AND ACETYLENE BOTTLES

Lockers for oxygen and acetylene bottles to be arranged on poop deck. For welding equipment supplied by Builders, see Machinery Specification.

STORAGE OF CONTAINER LASHING GEAR

Steel boxes to be provided for storage of loose lashing gear on weather deck and in cargo holds. Racks for lashing rods to be arranged mainly alongside hatch coamings. Number and size as necessary.

Arrangement and type of stowage boxes to be in accordance with the choosen lashing system for containers.

243 LOCKS AND DOORS

2431 STEEL DOORS

Arrangement of doors, openings, etc. as shown on General Arrangement Plan, scale 1 : 200.

For size and design of watertight steel doors, weathertight steel doors and interior steel doors to be provided see the following table.

All doors to be of Builders' standard, flanged steel plate adequately stiffened.

Weathertight doors to be fitted with rubber gaskets. Dogs to be provided in number as required by regulatory bodies. Unless specified otherwise, dogs to be capable of being operated from both sides of the door.

Height of door coamings to regulatory requirements. If necessary, treads to be fitted at high coamings.

All steel doors without self-closing device to have hooks to secure them in the open position.

All exposed entrance doors are to be protected by water sheds.

All doors to be provided with locking arrangement from outside, unless same is not permitted by rule.

No windows to be provided in steel entrance doors.

Arrangement of steel doors provided

Location	**Clear opening mm**	**Height of coaming mm**	**Thickness of panels (as per DIN) mm**	**Rubber gasket**	**Number of dogs**	**Self-closing**	**Locks**
Outer doors on main deck	600 x 1,600 800 x 1,600	400/600	8	X	6	X	chest lock
Interior doors on main deck	800 x 1,800	200	5	X	2		chest lock
Doors to engine room	700 x 1,550	400	5	X	2	X	chest lock

Clear width of doors from exposed deck area to CO_2-room and to hospital to be not less than 800 mm.

2436 WATERTIGHT SLIDING DOORS

No watertight sliding door is provided.

2433 HATCHES

Arrangement for access hatchways to store rooms, cargo holds, provisions store rooms etc. as shown on General Arrangement Plan.

Hatchways to Builders' standard.

HATCHWAY OVER BOATSWAIN'S STORE IN FOREBODY

Location:	On forecastle deck
Size:	Clear opening abt. 1,300 x 1,300 mm height of coaming abt. 800 mm
Covering:	Weathertight steel cover, 8 butterfly fasteners hinged, with counterweight, manually handed. Locking arrangement to be provided from inside, with access ladder.

One removable roller device to be provided for handling of ropes to rope stores.

HATCHWAY OVER DECK STORE AFT

Location:	On poop deck aft
Size:	Clear opening abt. 1,000 x 1,000 mm height of coaming abt. 800 mm
Covering:	Weathertight / watertight (acc. to final damage stability calculation) steel cover, 8 butterfly fasteners hinged, with counterweight, manually handled. Locking arrangement from outside to be provided.

One removable roller device to be provided for handling of ropes to deck store.

HATCHWAY LEADING TO PROVISIONS STORE

Location:	On extended poop deck in front of deckhouse, port side
Size:	Clear opening abt. 1,400 x 1,400 mm , height of coaming abt. 800 mm
Covering:	Weathertight steel cover, hinged, with spring supported opening device, manually handled.

8 butterfly fasteners. Locking arrangement from outside.

HATCHWAY LEADING TO ENGINE ROOM

Location:	On ext. poop deck in front of deckhouse, starboard side.
Size:	Clear opening abt. 1,400 x 1,400 mm, height of coaming abt. 800 mm
Covering:	Weathertight steel cover, hinged, with spring supported opening device, manually handled.

8 butterfly fasteners. Locking arrangement from outside.

HATCHWAY LEADING TO GARBAGE PRESS

Location:	On ext. poop deck in front of deckhouse midships.
Size:	Clear opening abt. 1,600 x 1,600 mm, height of coaming abt. 800 mm
Covering:	Weathertight steel cover, hinged, with spring supported opening device, manually handled.

8 butterfly fasteners. Locking arrangement from outside.

ACCESS HATCHWAYS

Access to cargo holds is provided as indicated in General Arrangement Plan. Generally they are from open main deck on transverse hatch coamings via access hatches at forward and aft-hold positions. Where hold having length not greater than 40’ container (holds 5 and 6) only one access to each hold is provided.

All hatches are to Builders’ standard:

Size: Clear opening abt. 600 x 600 mm,
height of coamings abt. 600 mm.

Covering: Weathertight steel cover, hinged.
Type of closing appliance to rule requirements.

Hatches of this type are further provided over the several emergency escape trunks, leading to open deck as indicated on the General Arrangement Plan.

245 STAIRS AND RAILS

2451 ACCOMMODATION LADDERS

For port and starboard side one each accommodation ladder to be provided.

Dimensions:	abt. 13.5 m in length (angle of inclination not to be more than 55° to horizontal, to reach light water line).
Design:	With fixed curvatured steps, foldable rails and hinged top railing. Top platform as swivel platform, lower platform adjustable.
Handling:	By automatically working accommodation ladder davits, for 90°-stowage. Davit winches with attached electric-driven motor. Stowage of accommodation ladders on main deck, in recess of railing.
Material	Accommodation ladder and swivel platform Aluminium. All wire ropes steel galvanised.

Accommodation ladders also to serve as pilot ladder platform.

2452 EXTERIOR AND INTERIOR INCLINED LADDERS, LADDERS

Exterior and interior inclined ladders, ladders, steps, etc. to be built to Builders' standard.

EXTERIOR INCLINED LADDERS

Material:	Steel
Hand rails:	Steel pipe 42.2 x 2.6 mm
Steps:	6 mm pinned plate
Strings:	Angle bar 150 x 75 x 9 mm
Inner width:	abt. 700 mm
Fastening:	Screwed connection.

All parts to be galvanised.

INTERIOR INCLINED LADDERS

Material:	Steel
Hand rails:	Flat iron bar 40 mm with plastic-covering in way of accommodation, gas pipe 1 ¾" steel galvanised otherwise.
Steps:	3 mm plate, to get Mipolam-covering in way of accommodation, non-skid edge treads.
Inner width:	abt. 800 mm

The inclined ladders to be welded to the decks.

LADDERS

Fixed or movable ladders to be fitted as necessary, such as under manholes in bunkers and tanks, in access/emergency casings, to posts, masts, ventilators, on navigating bridge for access to wheelhouse top, in bulkheads for holds, etc.. Pedestals and steps on deck treads fitted at high door coamings and hatches as necessary.

Tear plates for pedestals etc. on open deck to have min. 6 mm thickness.

2453 RAILS

Rails and stanchions according to DIN 81702 to be arranged as shown on General Arrangement Plan, scale 1 : 200.

Material:	Steel for all parts, galvanised.
Design:	Hand rails to be steel pipe NW 32, 2 rails round iron bar 20 mm Ø below as safety protection - if necessary, stanchions to be flat iron bar 60 x 15 mm, stanchions spacing and stays as practicable, height abt. 1,050 mm.

Portable sections of rails to be provided at either side in way of life raft stowage places.

Guard rails of steel pipe NW 32 to be fitted outer walls on exposed decks, according to regulations.

2456 MOVABLE LADDERS

The vessel to be equipped with shore gangway, bulwark stairs, movable ladders etc. as follows:

1 SHORE GANGWAY

Dimensions:	Length abt. 9.0 m, inner width abt. 700 mm
Material:	Light metal
Type:	Detachable stanchion; stanchions of light metal, rails to be ropes of plastic material.

One top platform portable for P. and S. side to be delivered, for fixing the shore gangway and to be suitable stored on deck.

2 BULWARK STAIRS

Height:	abt. 1.0 m
Material:	Light metal
Design:	Detachable stanchions.

BOAT'S LADDER

Ladder according to regulations.

Length:	According to regulations
Type:	With wooden treads

LADDERS

Acc. to SOLAS regulations 1 each **pilot ladder** port and starboard with electrically driven ladder winches.

Length:	abt. 9 m
Type:	with wooden treads and spreaders.

The further equipment to comprise of **2 ladders, sliding-out type**, of suitable length to permit working on containers stowed on deck. Ladders to be made of light metal.

250 OUTFITTING OF CARGO HOLDS, CONTAINER STOWAGE

CONTAINER STOWAGE IN HOLDS

All cargo holds are arranged for the carriage of 20’- and/or 40’-containers, whereby one layer of high cube containers (9' 6" high) can be stowed at uppermost tier in all holds. Container stowage places are so arranged that on one 40’-container place two 20’-containers can be stowed.

Fixed container cell guides to be provided. The 20'-containers are between each other and with tank top secured by stacking cones.

Underneath all containers corners doubling plates of 30 mm are fitted on inner bottom. These doubling plates fitted with pockets - one to four, as required by the respective position - for inserting the stacking cones.

Transverse supporting of the containers by pressure elements and/or tension/pressure pieces, connected to the longitudinal inner hull P & S. Number and arrangement according to Classification requirements.

Entire stowage arrangement to be laid out for container stacks as shown on General Arrangement Plan, i.e. maximum 6 high.

Maximum stackloads will be about

180 tons/20' containers
210 tons/40' containers

Alternatively a lashing system in compliance with OSHA rules can be provided, to Owner’s option. Loose container lashing material will be supplied only for one lashing system.

Where containers are to be stowed according to OSHA rules, the maximum stackloads will be reduced to be about as follows:

100 tons for 6 tiers 20' containers or
120 tons for 5 tiers 20' containers topped with 40' container.

Loose stowage equipment for carriage of a full number of 20'-containers will be supplied by Builders. Stowing boxes to be provided in suitable places.

CONTAINER STOWAGE ON DECK

Containers can be stowed up to:

3 tiers on hatch cover 1 - 2,
5 tiers on hatch cover 3 - 4,
6 tiers on hatch covers 5 - 7,
7 tiers on hatch covers 8 - 9
8 tiers in front of superstructure

as shown on General Arrangement Plan.

For container stowage on deck, container bottom fittings are arranged on top of hatch covers and on resting posts in way of railing P & S.

Bottom fittings on top of hatch covers etc.: raised-type sockets for taking twist locks.

Athwartship block stowage of containers, with abt. 25 mm spacing.

Stowage in longitudinal direction:

1. 20’ or 40’-units on hatch covers
2. 20’ or 40’ or 45’-units on deck in front of superstructure

Spacing between all 20'-blocks to be minimum permissible to minimise loose lashing fittings.

STACKLOADS FOR LAYOUT OF LASHING EQUIPMENT

The maximum stackloads on hatch covers according to classification rules and considering point loads from container stowed on deck to be:

65 t for 20’ containers
100 t for 40' containers

On deck in front of superstructure one bay of 40’/45’ containers up to 7 tiers, stackloads to be:

70 t for 20’ containers (both ends lashed)
100 t for 40/45' containers,

Securing of complete deck load basically by means of twist locks at bottom and by means of midlock stackers between all layers.

Beside this suitable lashing of all 20' and 40' blocks to hatch covers as well as to container pedestals P & S by lashing rods and turnbuckles.

Loose lashing equipment for the entire number of 20'-containers for max. 6 tiers on hatch covers and max. 7 tiers on deck in front of superstructure to be supplied by the Builder. Amount to be based on calculations based on the rules of Classification Society. The number of midlock stackers shall cover about 80% the total capacity of the 20' container on deck, the rest of the container being assumed to be 40' container.

Storage boxes for twist locks as well as storage arrangements for lashing rods etc. in way of hatchway coamings shall be provided by Builder.

260 NAVIGATIONAL AIDS AND SIGNALLING EQUIPMENT

For electrical equipment, such as gyro compass, automatic steering system, echo sounding system, indicators etc., see Electric Specification.

2601 NAUTICAL EQUIPMENT

Apart from the fixed equipment installed in the control consoles on navigating bridge and in way of chart table, respectively, the equipment to comprise of:

2 micrometer drum sextants with telescope 4 x 40, in locker
2 prismatic binoculars 7 x 50, both to be night glasses
1 aneroid barometer 50/115,
2 thermometers for air temperature, -30° C / +50° C
1 thermometer for water temperature, -30° C / +50° C
1 inclinometer, pendulum type,
1 middle lead 10 kg with 100 m line,
2 hand leads 5 kg, with 45 m line each,
1 chart divider, 18 cm length,
2 course triangles with graduation,
1 parallel rule, 50 cm length,
1 lead block of wood
1 reading glass with handle
2 thermometer boxes
1 chronometer for wheelhouse, in locker
1 eight-day-clock for deck office, fitted with large seconds hand and marking for radio quietness.

Charts, nautical books and tables as well as books containing rules and regulations are to be Owners' supply.

2602 OPTICAL SIGNALLING EQUIPMENT, LAMPS AND LANTERNS

All navigating lights including emergency lights are of electric type.

Material: Polycarbonate type.

Each light to be supplied with cable and socket:

1	side light, green,	double high type,
1	side light, red,	double high type,
2	mast head lights,	double high type,
1	stern light,	double high type,
4	N.U.C. lanterns,	double high type,
2	anchor lights,	double high type,
1	customs light,	
1	manoeuvring / Morse signalling light on radar mast	

For electric equipment, see Electric Specification.

Furthermore, to be installed

	complete set of Suez-lights, as per rules,
2	blue steering lights, on foremast.

Spare parts to be supplied:

2	each spare glass cylinders for side lights
1	complete set of spare bulbs.

For searchlights, Suez-canal-searchlight, manoeuvring / Morse signalling lamp, life-boat flood lights etc, see Electric Specification, group no. 419, 4604 and 4605.

EMERGENCY SIGNALS:

1 locker, containing
1 signal pistol, with 12 fulminating cartridges
12 blue lights
12 parachute signals

One instruction board for emergency signals to be installed in wheelhouse.

FLAGS

1	national flag	120 x 200 cm
1	national flag	120 x 200 cm
1	set of signal letters	
1	customs flag	120 x 135 cm
1	pilot's flag "G"	100 x 120 cm
1	pilot's flag "H"	100 x 120 cm
1	quarantine flag	100 x 120 cm
1	complete set of code flags consisting of	
	26 letters	100 x 120 cm
	10 numeral pennants,	
	3 repeaters and	
	1 answer pennant	
	1 pair of hand flags	
	1 blue peter flag	

3 signal balls, canvas, black, 61 cm Ø
1 right of way cylinder, canvas, black
60 cm Ø, 1,200 mm long
3 oil bags
1 flag staff with line for stern, steel.

House flags and ensigns are supplied by Owners.
Halyards with blocks to be provided in sufficient number:
on signal- and radar mast on wheelhouse top and on signal post forward on the vessel.

2603 ACOUSTIC SIGNALLING EQUIPMENT

For electric ordering and communicating systems, such as engine order telegraph system, telephone system etc., see Electric Specification.

Speaking tube to be provided from magnetic compass zone to wheelhouse.

A fog signalling system to be installed.
1 ship's bell with engraved ship's name, 300 mm Ø.

For whistle see Electric Specification.

262 RADAR AND SIGNAL MASTS

2621 RADAR MAST

Location: One mast on wheelhouse top
Material: Mild steel.
Design: Stayed post, fitted with:

1 top platform, arranged athwartship, serving as signal yard for flags, too,
1 gaff, hingeable
3 yards for signalling lamps, hand and foot ropes fastenings for navigation lights, blinker lights, etc. fittings and shackles, blocks, lines etc. as necessary.

The top platform is intended to take the radar scanners. The necessary fittings are to be installed.

Platform: grating, fitted with railing (handrail and 2 rails).

Steel ladder to Builders' standard to be fitted outside on the mast for access to platform.

Arrangement of aerials, aerial masts etc. to be laid down after decision on apparatus to be installed.

For electric equipment, wireless equipment etc., as well as for deck illumination, see Electric Specification.

2622 SIGNAL MAST

The vessel to be equipped with a forward signal mast, to Builders' standard.

Location:	on forecastle deck
Material:	Steel
Design:	Stayed post without stays, fastenings for lamps, lanterns and ship's bell. Foundation for No. 1 crane jib. Steel ladder to Builders' standard with back circles fitted outside to mast.

For electrical equipment, see Electric Specification.

267 FIRE EXTINGUISHING EQUIPMENT

2673 FIRE FIGHTING EQUIPMENT

The vessel to be equipped with sets of fireman's outfit, protective clothing, etc. according to rules and regulations.

Two lockers for storage of fireman's outfit to be arranged in way of accommodation.

Other fire fighting equipment to be supplied:

dry fire extinguishers with spare filling,
wet fire extinguishers with spare filling,
fire hoses, 20 m long each, with instantaneous coupling and nozzles,
wrenches for hose couplings, fire axes.

Fire extinguishers in engine room, steering gear room, forward and aft stores, workshops and emergency fire pump/bow thruster room to be arranged as per rule requirement and shown on safety plan.

A hose valve with 65 mm hose coupling to be arranged on each engine room pl-deck and floor port side and starboard side as well as in way of each entrance door to engine room. Each of these valves to have a fire hose complete with nozzle and hose drum.

2 international shore connections are to be provided.

In way of accommodation fire recesses to Builders' standard are to be arranged in passageways, fitted with:

hydrant,
hose drum,
fire hose with nozzle, stored on drum,
wrenches for hose coupling.

Fire recesses to have doors with snap lock and to be marked conspicuously.

Hand fire extinguishers to be located in suitable places.

The definite number and type of fire fighting and safety equipment as well as definite arrangement to be laid down in the Safety Plan in accordance with the rules and regulations applicable.

For fire pumps, see Machinery Specification.

272 MISCELLANEOUS

2721 MARKS

DRAUGHT MARKS

Draught marks to be fitted at bow, at stern and amidships at either side of the vessel.

Marking:	Outlined by welding and painted.
Measuring Units:	Decimetres on either side.

FREEBOARD MARKS

Freeboard marks to be fitted on port and starboard side.

Marking: Outlined by welding and painted.

SHIP'S NAME

Ship's name to be painted on both P & S on bow and centre line aft on stern.
Computerized adhesive stencil plastic laminate to be supplied by Builder.
Size of letters: abt. 1,000 mm on bow,
abt. 800 mm on stern.

PORT OF REGISTRY

Port of registry to be painted at stern below ship's name.

Size of letters: abt. 700 mm.

BOW INSIGNIA

Bow badge or insignia if any to be fitted to stem.
Shape and colours to Owners' sketch.

Marking: Outlined by welding and painted.

TUG PUSHING MARKS

Tug pushing points (3 each side) are to be marked on the hull by two vertical stripes each.

Marking: Outlined by short bead of weld and painted.

FUNNEL MARKS

Charterers' insignia (letters or symbols respectively) to be fitted on bridge wings, P and S.
Owners' insignia on deckhouse side (small, screwed).

PAINT LINE

Paint line to be marked by weld bead two meters apart on shell plate.

BULBOUS BOW AND BOW THRUSTER MARKS

These marks to be marked on shell plate by weld beads.

TANK MARKINGS

All drain plugs to be marked by weld beads on shell plating.

2722 AUXILIARY HULL FITTINGS

LIFTING EYES

Lifting eyes for propeller and rudder to be fitted aft at the vessel on shell plating.

Escape trunks for emergency escapes to be fitted with lifting eyes.

EYES FOR PAINTER'S STAGES

Eyes for painter's stages to be fitted

in way of flaring shell plating forward and aft,
in engine casing,
below wings of navigation bridge, at deckhouse front and side bulkheads.

Number and arrangement as practicable.

FOOT RAILS AND HAND RAILS

Foot rails and hand rails of gas pipe NW 32 to be fitted at deck house front bulkhead and side walls, and to be provided as emergency escape from cabins and living rooms on superstructure deck, where necessary.

STORE DAVITS

2 portable store davits to be supplied for handling **Suez Canal searchlight** as well as to serve boatswain's stores and deck stores fore and aft in the vessel.

Location:	one davit on upper deck aft near hatchway to deck store one davit on forecastle deck near hatchway to boatswain's store
Type:	Ordinary steel davit with hand tackle, lifting capacity 500 kg each

OIL BUNKERING STATION

The oil bunkering stations will be installed on main deck aft port and starboard.

2724 CATHODIC PROTECTION

An impressed current system (involving low voltage DC) will be installed to counteract and protect the ship (under water part). The system consists essentially of 4 pieces of semi-permanent inert anodes, 4 reference electrodes and 2 control power units. The current demand will normally vary according to the ship's draft, speed and the salinity/conductivity of the seawater. This will be automatically controlled and passed through the anodes. The control power units will be located in the engine room (for aft part area) and bow thruster room (for for part area).
A shaft slip ring installed on the propeller intermediate shaft provides electrical continuity between propeller and hull.

Long life zinc anodes will be provided for sea chests and bow thruster tunnel.

2725 FRAMED PLANS, BOARDS, ETC.

Following plans to be framed under glass and to be fitted on board:

1 General Arrangement Plan
1 Capacity Plan, with Container Stowage Plan
1 Diagram of Bilge and Ballast System and Fire Main
1 Diagram of Fuel Oil System
1 Docking Plan
1 Wheelhouse Poster
3 Safety Plans

Plans to be fitted in suitable places on board the vessel. Layout plans to be fitted in suitable place in staircase on each superstructure deck on board the vessel.
Boards of wood, painted, letters in English:

1 sign board "No Admittance"
2 sign boards "Attention, Turning Propeller"
2 notice boards
1 watch table
1 "Officer on Board" table

2 notice boxes with glass front and green velvet base
2 open boxes for sounding register book.

Total 6 frames for

boat roll,
alarm roll,
safety roll.

Further

1 frame for table with regulations for prevention of fire,
1 frame for watch bill,
2 frames for approval documents,
1 frame for manoeuvring data.

Warning board required by Regulatory Bodies to be fitted in endangered rooms, such as paint lockers, CO_2-rooms etc. Instruction boards for use of live jackets etc. as per rules.

2727 SWIMMING POOL

A permanently installed swimming pool is to be provided in way of super-structure, see General Arrangement Plan, scale 1:200.

Swimming pool to be filled with seawater directly via wash deck and fire main. Heating and circulating of water are not to be provided. Swimming pool to be emptied via shut off valve and drain pipe led to overboard discharge valve on shell side. Overflow pipe to be fitted abt. 200 mm below top of swimming pool. Safety arrangements, such as hand rails, covering net etc. according to Rules and Regulations applicable.

235 INSULATION

2353 THERMAL INSULATION AND SOUND INSULATION

Walls and deck heads in way of accommodation and other rooms to have thermal and sound insulation and/or fire protecting insulation, respectively, as necessary, and as required by Regulatory Bodies.

For rooms to be insulated, thickness of insulation etc. see the following table.

Material: Mineral wool,
where required A 60 or A 30 material to be used.

Insulation material to be secured by steel needles and clips. At deck heads insulating material to be partly adhered and to be applied around stiffeners.

In rooms where walls and deck heads are lined and ceiled, insulation to be covered by lining and ceiling respectively.

Other covering to be of chipboard plates or steel plates, see the following table.

Location	1)	2)	3)	Thickness of insulation			
				on surface	**around stiffeners**	**around beams**	**covering**
Deck heads under exposed decks cabins and bed rooms, offices, mess rooms and day rooms, wheelhouse/chart room, passageways, sanitary rooms, provisions store room, hobby room	x			abt. 80 mm	abt. 30 mm		in rooms not to be ceiled: glassfibre cloth
Outer walls cabins and bed rooms, mess rooms and day rooms, offices, wheelhouse/chartroom, galley, sanitary rooms, provisions store room, hobby room	x			abt. 50 mm			in rooms not to be lined: glassfibre cloth
Interior/outer walls, deck heads wheelhouse, CO_2-room, emergency diesel room			x	according to rules and regulations applicable			
Deck head and walls in fan rooms facing accommodation		x		abt. 50 mm	abt. 30 mm	abt. 30 mm	
Engine Casing facing provisions store	x			abt. 50 mm		abt. 30 mm	
Engine Casing facing public rooms and service rooms	x	x		abt. 50 mm		abt. 30 mm	

In way of accommodation insulating draught stops above deckhead ceiling to be provided as required by Regulatory Bodies.

1) thermal, 2) sound, 3) fire

3661 INSULATION OF WALLS IN ENGINE ROOM

TANKS

Plates of mineral wool, 50 mm thick covered with glassfibre cloth.

WALLS OF HEAVY FUEL OIL DAILY SERVICE AND SETTLING TANKS

Plates of mineral wool, 50 mm thick covered with glassfibre cloth.

TANK TOPS OF HEAVY FUEL OIL DAILY SERVICE AND SETTLING TANKS

Detachable glass-fibre-mats filled with mineral wool, 50 mm thick. Not to be lined nor covered.

ENGINE CONTROL ROOM

Walls in light-weight structure, 50 mm thick.

3662 INSULATION OF PIPING AND APPARATUS

STEAM PIPING

Mineral wool mats quilted on glass fleece, covered with wire gauze. Suction lines from the feed water storage tank are not to be insulated.

CONDENSATE AND FEED WATER PIPING

Protection against touching in reach of hand, where necessary.

COOLANT PIPING FOR AIR CONDITIONING REFRIGERATING SYSTEMS

Armaflex (or similar), diffusion-tight glued.

HEAVY FUEL OIL PIPING WITHOUT ADJACENT HEATING

Where necessary, mats of mineral wool quilted on glass fleece, covered with wire gauze.

HEAVY FUEL OIL PIPING WITH ADJACENT HEATING

Mats of mineral wool quilted on glass fleece. To be covered with wire gauze.

PREHEATERS

Mats of mineral wool quilted on galvanised wire netting. To be lined with galvanised plate 0.75 mm thick.

3663 INSULATION OF EXHAUST GAS PIPES

MAIN DIESEL ENGINE

Mineral wool 100 mm resp. 80 mm thick quilted on galvanised wire netting. To be lined with galvanised plate 0.75 mm thick.

AUXILIARY DIESEL ENGINES

Mineral wool 70 mm thick quilted on galvanised wire netting. To be lined with galvanised plate 0.75 mm thick.

EMERGENCY/HARBOUR DIESEL ENGINE

Protection against touching in reach of hand, where necessary.

COMPOSITE BOILER

Mineral wool 50 mm thick quilted on galvanised wire netting, to be lined with galvanised plate 0.75 mm thick.

244 VENTILATION, AIR HEATING AND AIR CONDITIONING

All ventilator heads, goose necks, jalousies, cabin fans etc. to be to Builders' standard.

Suction- and exhaust openings of all ventilators to be fitted with fire dampers. Where required by rules and regulations applicable to this ship, ventilator heads, goose necks etc. to be capable of being closed watertight.

2441 VENTILATION CARGO HOLDS

Cargo hold ventilation will be designed for dangerous cargo of class 1.4S, 2, 3, 4, 5.1, 6.1, 8 and 9 according to SOLAS 1978 (with exceptions as defined in paragh. 0107) hold 1- 6.

Cargo holds to get natural supply and mechanical exhaust ventilation.
For mechanical exhaust ventilation electrically driven axial-flow fans to be provided.
Minimum **air changes** related to empty hold will be 2-fold per hour according to Classification Society’s regulation.

Air inlet as well as exhaust air openings to be fitted with grid and to be capable of being watertight by means of flaps, arranged outside.

2442 VENTILATION ACCOMMODATION

The vessel to be equipped with an air conditioning system for accommodation.
Rooms in way of accommodation which are not connected to the system to have adequate mechanical or natural ventilation.

3441 VENTILATION ENGINE ROOM

For details of the ventilation system, see the ventilation plan of the engine room.

The engine room to be equipped with at least 2 electrically driven supply ventilators fitted in suitable place, whereof one of reversible type (suction and discharge).
The entire supply ventilator capacity to correspond to the rules of GL.
The reversible ventilator to be connected to the emergency switch board.

The supply air to be led through ducts, the surplus air getting to the atmosphere in a natural way.

Each main air duct to be equipped with fire damper. Fire dampers to be remote operated.

In addition all main air ducts to be fitted with access covers and with climbing rods inside.

Branch ducts to be led from main air ducts and to be arranged so as to ensure an efficient ventilation of engine room.

In particular, branch ducts with controllable dampers are to be led to workshops, store rooms, separators, to boiler plant and auxiliary engines.

Accumulation of heat to be prevented by providing main air ducts with short length branch connections which are to be directed at the spots susceptible to heat accumulation. If necessary, the outlets of these branch connections to be provided with adjustable baffle plates, in order to be able to attain the maximum possible ventilation effect during operation.

Above separators a separate exhaust fan to be provided.

2444 VENTILATION IN OTHER SPACES

The rooms listed below which are not connected to the air conditioning system are to have adequate mechanical or natural ventilation and to be heated, as specified.

Mechanical ventilation: An adequate number of supply systems and exhaust systems to be provided. All sanitary rooms to be connected to a high velocity exhaust air system. The system to be designed such as to preclude the possibility of air from these rooms travelling into other rooms.

3446 ENGINE CONTROL ROOM AIR CONDITIONING SYSTEM

The engine control room to be provided with a separate air conditioning unit.

AIR CHANGES

Rooms	**Supply Air**	**Exhaust Air**
Galley	(mechanical) 40 times	(mechanical) 40 times
Laundry	(mechanical) 10 times	(mechanical) 15 times
Linen lockers and other store rooms in way of accom-modation	natural	(mechanical) 10 times
Sanitary rooms, such as wash rooms and change rooms	natural	(mechanical) 10 times
WC-spaces	natural	(mechanical) 15 times
Dry provisions store room, and bonded store	(AC-plant)	5
Steering gear compartment	(mechanical) 8 times	natural
Bow thruster room	(mechanical) 10 times	natural
CO_2-room	natural	10 times (mechanical)
Mess rooms, public rooms, offices	(AC-plant) abt. 12 times	(mechanical) 16 times
Paint store	natural	(mechanical) 10 times
Electric relay room	(mechanical) 8 times	natural
	AC-plant supply as far as practicable in way of superstructure	
Hospital	AC-plant with non-return flap	(mechanical) independent as per rule
Pipe duct and pump recess in double bottom	natural	(mechanical) 20 times
Operational spaces	AC-plant 12	(mechanical) 12 times
Pantries	AC-plant 12	(mechanical) 25 times

Rooms with exhaust air ventilation to have air supply through louvers or grids in doors from the adjacent passageways and air conditioned rooms respectively, or through ducts from weatherdeck.

Air outlets and inlets to have grids of galvanised steel.

Exhaust air suction units in sanitary rooms to be special type high velocity exhaust air nozzles.

HEATING

Separate heating to be provided for:

outer sanitary rooms,
by means of electric heating,

galley, laundry
by means of electric heating, or
by means of steam heated radiators

NATURAL VENTILATION

The following rooms to have adequate natural ventilation through ventilator heads, goose necks, cabin fans or jalousies,

boatswain’s store in forecastle,
deck stores (rope stores).

2446 AIR CONDITIONING PLANT

All cabins, dayrooms and bedrooms, public rooms, service rooms and wheelhouse with chartroom are to be connected to an air conditioning system with individual control in cabins and rooms.

Air conditioning plant to consist of 1 air conditioning unit, laid out for 100 % of the total capacity necessary. The unit to be installed in the air-conditioning room.

An energy regeneration disk for the air conditioning system is not planned.

The air-conditioning unit to be fitted with:

mixing section,
fan,
heating battery,
air cooler,
air humidifier and air filters.

System:	To be a twin-pipe high velocity air conditioning system.
Control:	Automatic control (pneumatic-proportional) in relation to outside air temperature.
Air filters:	Regeneratable dry layer filters. Dust freeing degree 90 % referred to a test dust having the following grain composition:

30 %	10 my
65 %	6 my
78 %	4 my
93 %	2 my
2 %	1 my

Heating:	Heating medium to be steam. Heating battery to be laid out according to air conditions provided.
Cooling:	Environmental beneficial medium R404a or equal
Humidification:	To be provided for heating. Humidification medium to be steam, pneumatic control.
Ducts:	Spiral ducts of galvanised steel plate, mineral wool insulation with steam-tight covering. With suitable standard fittings as elbows, branches etc. A pre-insulated duct system to be installed.

TEMPERATURE CONDITIONS

Heating:	Outside temperature	- 20° C
	Inside temperature	+ 22° C
		50 %
Cooling:	Outside temperature	+ 45° C
	rel. humidity	70 %
	Inside temperature	+ 23° C
	rel. humidity	50 %

Air conditioning plant to be dimensioned according to these data and to be calculated for fresh outside air supply according to rules. Sea water temperature 32° C.

CHANGES OF AIR, AIR QUANTITIES

The air quantities to be calculated according to the thermal loads in the rooms concerned. The following minimum values to be provided:

6 times/h	in cabins, private day rooms and wheelhouse
12 times/h	in public rooms, such as mess rooms, offices, recreating rooms, hospital

The air quantities to be referred to empty rooms.

INDIVIDUAL TEMPERATURE CONTROL

Air outlets to be installed in ceiling without special covering. Hot air/cold air quantity control to be manually performed at air outlets.

Exhaust air to be led from rooms through louvers or grids in doors into adjacent passageways and rooms with exhaust air ventilation, respectively.

3334 AIR CONDITIONING REFRIGERATION PLANT

MODE OF OPERATION

Cooling compressor to have automatic step-by-step capacity control.

REFRIGERANT

Environmental friendly cooling medium: R404a or equal.

COOLING COMPRESSOR (Screw Type)

Number:	2 of 100 % capacity each
Spare:	none
Driven by:	electric motor

CONDENSER

Recooling of cooling medium in 2 condensers (each 100%) to be effected by fresh water.

PIPING

Pipes.	Steel St. 35
Valves and fittings:	Steel/Niro

274 COATING

Before processing, plate material of 5 mm thickness and more as well as sections to be cleaned from mill scale and rust by shot-blasting, up to Sa 2.5 of the Swedish Rust Degree Scale and to receive a two-component shop primer to Builders' standard .

It has to be ensured that the primer is compatible with the subsequent paints to be applied.
The shop primer is not included in the following painting schedule.

Welding seams, burnt spots and damaged shop primer surfaces in underwater hull will be prepared for paint application by spotblasting to PSA 2.5 (Sweeping).

All remaining coating surfaces will be prepared for application by wire brushing to a degree of cleanliness of Grade St 2 or equivalent.

Fastenings etc. and components of subordinate kind are not to be derusted and primed.

Conventional paints and preservation material to be used for the entire preservation work.

Paints to be applied by airless spray method according to Builders' standard, wherever practicable.

Otherwise paint application by means of rollers or brush.

Deviations of - 10 % from the dry film thickness specified in the following painting plan are permissible.
Before preservation, tanks have to be tested by filling with pressed air. Welded seams made by hand must be covered by adhesive tape. Preservation later.

Underwater coating will be applied for 5 years operation.

Steel surfaces behind deck covering will receive no coating. Surfaces to be re-derusted to St 2 of the Swedish Rust Degree Scale and to be cleaned before laying the deck covering.

Steel surfaces of internal structures will receive no further coating behind walls and linings.

Non-steel components, such as of aluminium, CuNi-pipes and galvanised steel work will not be painted.

Surfaces of plastic material, such as lining and ceiling, will not be coated.

Paints to be used in way of engine room and accommodation to be heat resistant type.

Colours of the respective finishing coats are to comply with Owners' request.

2741 PRESERVATION OF TANKS

GENERALLY

Deep places and those not easily accessible in tanks, bunkers etc. are to be filled up with slag and cement.

OIL TANKS

Oil tanks, such as fuel oil tanks and bunkers, diesel oil tanks, lub oil tanks etc. to receive no preservation by painting. Welding seams and damaged spots on interior surfaces of shop primer to be manually re-derusted, the tanks other than heavy fuel oil tanks to be cleaned and coated with oil before the first filling up.

FRESH WATER TANKS

Stripe coat

1 coat of pure epoxy
non toxic, non-taste and non-smell
abt. 300 my total thickness.

SWIMMING POOL

2 coats of pure epoxy each 150 my
+ 1 coat of acryl 40 my
non toxic, non-taste and non-smell
abt. 340 my total thickness.

CLEAN BALLAST TANKS
stripe coat
2 coats of tarfree epoxy solventfree
each 200 my thickness.

CHAIN LOCKERS
stripe coat
1 coat of tarfree epoxy solventfree
abt. 300 my total thickness.

OTHER VOID SPACES

1 coat of epoxy solventfree,
200 my total thickness.

INTERIOR OF RUDDER

to get a coat of bituminous solution (float coat).

2743 COATING OF SHELL PLATING

UNDERWATER COATING

2 coats epoxy tarfree	150 my	
1 coat sealer tarfree epoxy	75 my	
3 coats anti fouling	150 my	(flat bottom 2 coats only)

Underwater coating will be applied for 5 years operation and will comply with impressed current cathodic protection. Antifouling system will be free from tributyltin (TBT).

ABOVE WATER COATING, OUTSIDE OF BULWARKS

1 coat epoxy	200 my
1 coat epoxy	90 my
1 coat acryl paint finish	50 my

Note:

Hull above waterline may be painted at quay, if necessary to meet production schedule.

2744 OUTWARD COATINGS EXCEPT SHELL PLATING

Outer walls of superstructures and houses, undersides of all overhanging steel deck, funnel outside, davits and masts.

1 coat of epoxy	abt.	80 my
1 coat of epoxy	abt.	80 my
1 coat of acryl paint finish	abt.	40 my

EXPOSED MAIN DECK, POOP DECK, FORECASTLE DECK, FORECASTLE BULKHEAD, BULWARK INSIDE, OUTSIDE OF HATCH COAMINGS

1 coat of modified epoxy paint	abt.	50 my
1 coat of modified epoxy paint	abt.	200 my

On exposed decks, finish paint in way of deck machinery, bitts, stairs etc. to be anti-slip prepared.

OTHER EXPOSED STEEL DECKS

1 coat of modified epoxy paint	abt.	50 my
1 coat of modified epoxy paint	abt.	200 my

DECK EQUIPMENT, SUCH AS BITTS, FOUNDATIONS, CONTAINER STANCHIONS

1 coat of modified epoxy paint	abt.	50 my
1 coat of modified epoxy paint	abt.	200 my

OUTSIDE OF HATCH COVERS

1 coat zinc silicate primer	abt.	75 my
1 coat of modified epoxy paint	abt.	40 my
1 coat of acryl paint finish	abt.	40 my

Parts of weather decks which are to be galvanised, such as: exterior stairways and ladders, rails and stanchions.

1 coat of epoxy tiecoat	abt.	40 my

to be followed by painting as surrounding.

2745 INSIDE COATING CARGO ROOM AND ENGINE ROOM

CARGO HOLDS: WALLS AND DECKHEADS INCLUDING HATCH COAMINGS INSIDE, CONTAINER CELL GUIDES

1	coat of epoxy primer	abt. 50 my
1	coat of epoxy solventfree	abt. 200 my

HATCH COVERS UNDERSIDE

1	coat of epoxy solventfree	abt. 200 my

CARGO HOLDS: TANK TOPS

1	coat of zinc silicate primer	abt. 80 my
1	coat anchoring pattern	abt 50 my
1	coat of epoxy solventfree	abt. 50 my

VENTILATION DUCTS IN CARGO HOLDS, INSIDE

1	coat of epoxy solventfree	abt. 200 my

ENGINE ROOM INCLUSIVE CASING AND INNER ASSEMBLY, INCLUDING DECKS, STORES, WORKSHOP, PASSAGE WAYS

1	coat of zinc-phosphate primer	abt. 75 my
1	coat of alkyd paint finish	abt. 45 my

TANKTOP IN ENGINE ROOM, INTERNAL WORK AND PIPING BELOW FLOOR PLATES, UNDERSIDE OF FLOOR PLATES

1	One coat of modified epoxy paint	abt.	100 my
1	One coat of modified epoxy paint	abt.	100 my

Upper sides of floor plates to receive no preservation.

ENGINES, AUXILIARIES ETC.

to be painted from manufacturer (manufacturer's standard paint), touch-up only, if necessary.

STEEL SURFACES BEHIND WALLS AND LINING OF OUTER STRUCTURES

One coat of zinc-phosphate primer abt. 75 my.

COFFERDAMS INSIDE OF ENGINE ROOM

1	coat of epoxy solvent free	abt. 150 my

Other inside coating, as in store rooms, workshops, provisions store rooms, and in service rooms as well as in steering gear compartment, fan rooms etc. to be carried out as described under - Inside Coatings.

Steel galvanised gratings in way of walkways in cargo holds as well as steel galvanised cable trays to get no preservation.

2746 INSIDE COATING IN WAY OF ACCOMMODATION

ALL INTERIOR STEEL WALLS AND DECK HEADS WITHOUT LINING, CEILING

1	coat of alkyd primer	abt. 60 my
1	coat of alkyd primer	abt. 60 my
1	coat of alkyd paint	abt. 45 my

DECKS WITHOUT FLOOR COVERING

1	coat of alkyd primer	abt. 60 my
1	coat of alkyd primer	abt. 60 my
1	coat of alkyd paint	abt. 40 my

LININGS AND COVERINGS CONSISTING OF GALVANISED STEEL PLATES

No coating.

SANITARY SPACES AS GALLEY, LAUNDRY, WC, SHOWER

1	coat of pur epoxy	abt. 100 my
1	coat of PU	abt. 40 my

ROOMS AND STORES WITH MOISTURE AS BOWTHRUSTER ETC.

1 coat of epoxy solventfree	abt.200 my

273 INVENTORY OUTFITTING

GENERAL DECK

8	cork fenders
2	tube fenders, 120 cm long, 60 cm diameter
50	kg wave subduing oil (5 cans of 10 kg)
2	boatswain's chairs
3	sounding rods, straight
3	sounding rods, flexible
2	wrenches for screw plugs on deck
2	wrenches for drain plugs with countersunk square plug
2	wrenches for drain plugs with countersunk hexagonal plug
10	rat guards
2	axes with handle
2	hatches with handle
2	pad saws
2	hand hammers
2	crow bars
1	grinding wheel, electric drive
6	shovels, ordinary
4	painters' stages
10	protective helmets
10	dust masks
10	eye protectors
1	gas leak detector

for each size of windows 2 spare panes with seal to be supplied.
Sundry canvas covers for ventilator heads, compass, life-boat winches, ventilator coamings, etc..

BOATSWAIN'S AND CARPENTER'S INVENTORY; TOOLS ETC.

All mandatory items to be supplied by Builders.

LAMPS, LANTERNS AND ACCESSORIES

3 electric torch lights, 3 batteries each, with 1 set of spare batteries and one set of spare bulbs

LIFE SAVING APPLIANCES

1 line throwing gun, reaching at least 230 m, together with 4 lines and projectiles
32 life belts
5 life belts for children
12 life buoys, whereof 4 ordinary,
4 with night light
2 with night light and smoke signal
2 with life line abt. 28 m length
2 benches for stowage of life belts (plastic material)
12 life buoy clips, steel galvanised
6 fastenings for night lights of life buoys

SAFETY APPLIANCES FOR DANGEROUS CARGO

2 breathing apparatus
8 spare bottles (1800 litres each) for breathing apparatus
2 safety lines
4 safety lamps (explosion proof, stowage batteries)
4 chemical-protective suites
2 fire extinguishers, 12 kg, A, B, C-powder

INVENTORY FOR PROVISIONS STORE ROOM AND PROVISIONS COLDSTORE ROOMS

to be Owners' supply.

INVENTORY FOR GALLEY, MESS ROOMS, GENERAL INVENTORY FOR ACCOMMODATION

Loose galley inventory, such as pots, cutlery sets and similar items and loose inventory for mess rooms, such as cans, plates, cutlery sets, glasses, cups, trays, cleaning gear etc. to be Owners' supply.

INVENTORY FOR OFFICES

such as computers, typewriters, writing sets, adding machines etc. to be Owners' supply.

OTHER INVENTORY FOR ACCOMMODATION

such as bed linen, table clothes, towels, blankets etc. to be Owners' supply.

INVENTORY FOR HOSPITAL

1 stretcher (marine type).

CLOCKS IN WAY OF ACCOMMODATION

Total 5 battery-driven clocks in rooms where necessary (service and public rooms).

2 OUTFITTING

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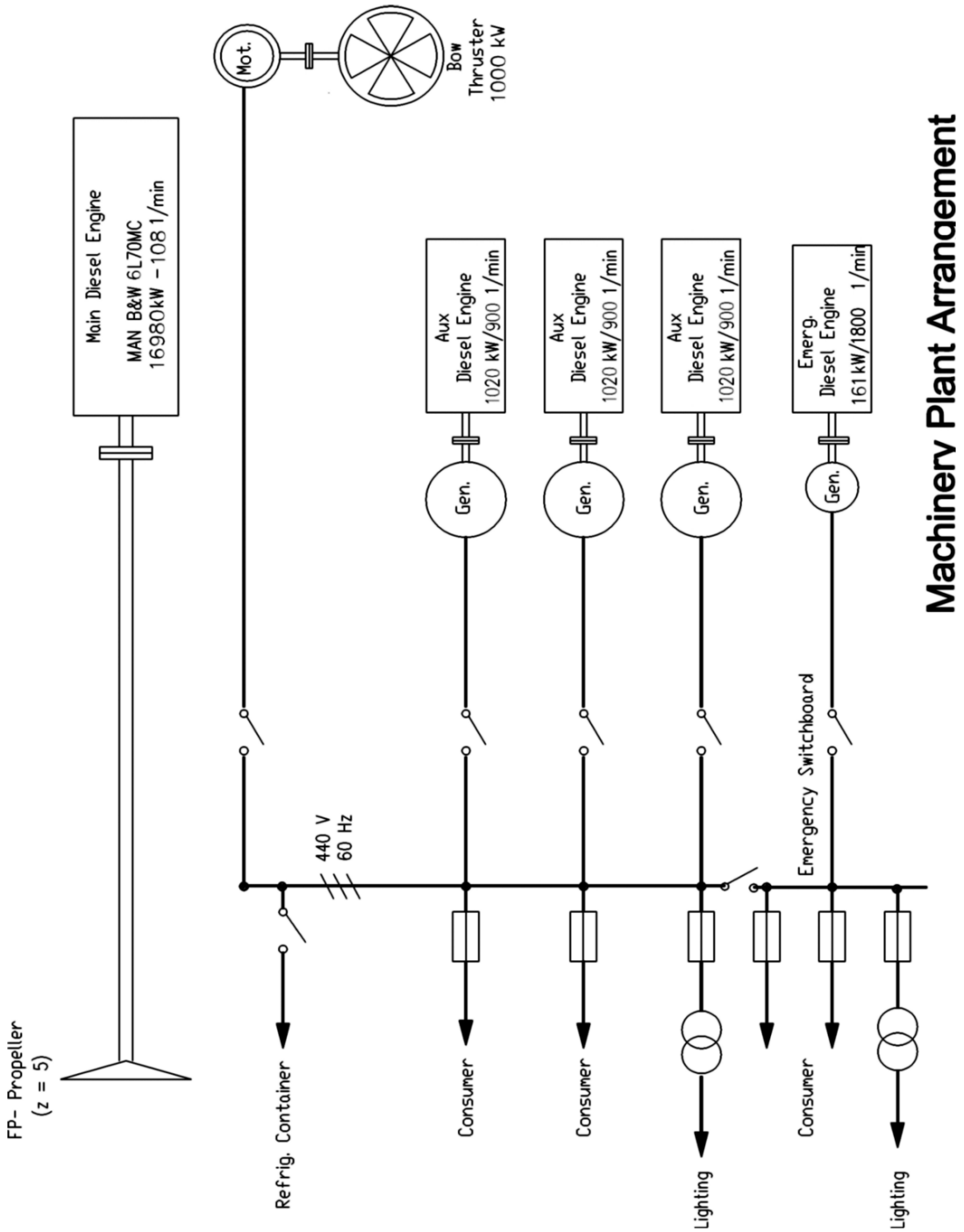
3 MACHINERY

For guidance only



ENGINE PLANT DESIGN

The design and construction of the machinery to be extensively in accordance with DIN (German Engineering Standard) or EN (European Standards) Specifications resp.

For components not covered by the DIN standard specifications parts to Builders' standards specifications are to be used.

Builders to use in principle screws and bolts with metric threads on metric shank.

The capacities and heads are to be considered preliminary for all pumps specified. Final lay out of pumps and the respective piping systems by Builders is definitely possible when subsuppliers are chosen.

In order to facilitate the assembly of the internal parts, centrifugal pumps preferably to be of inline pump type.

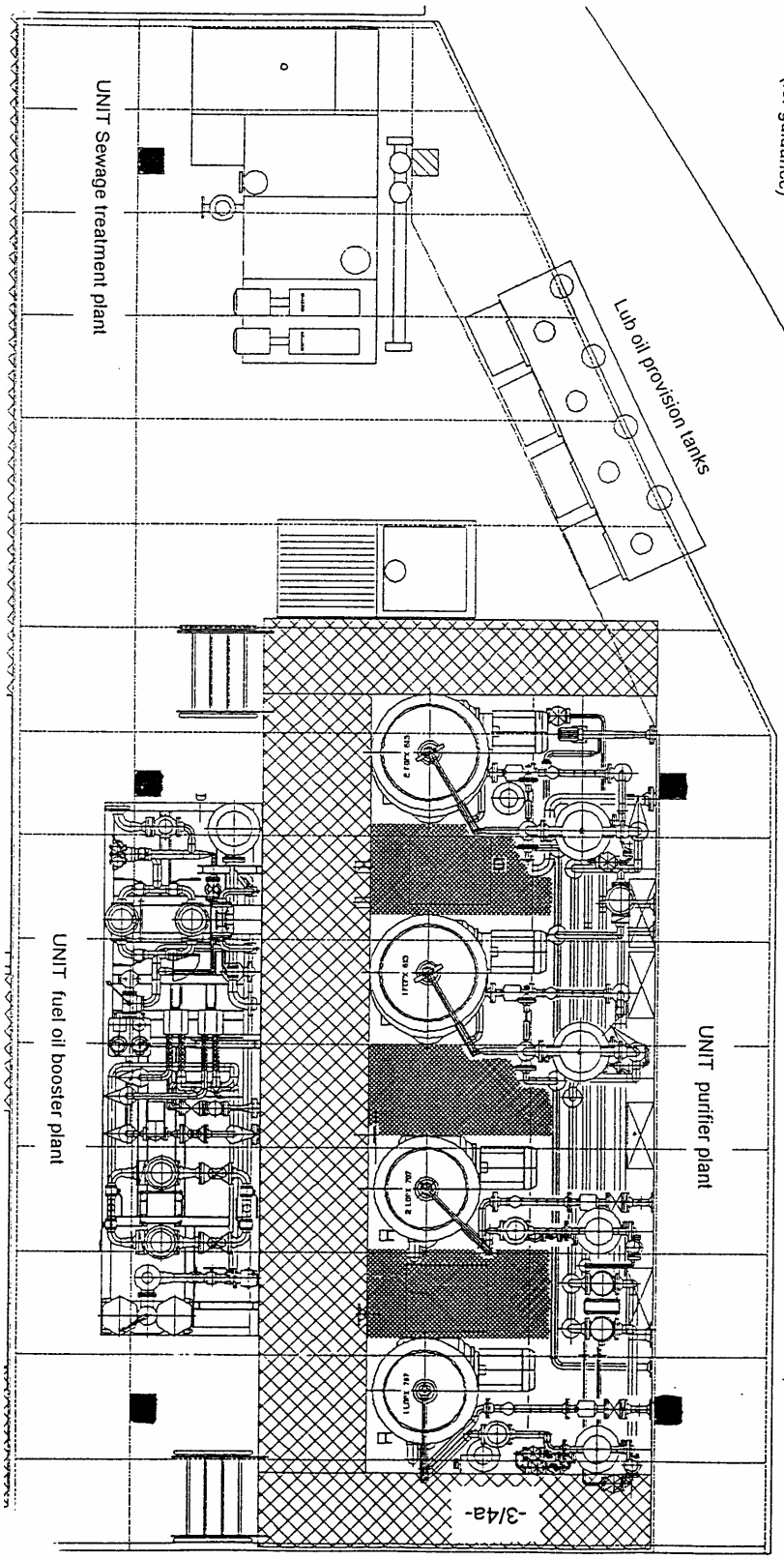
Builders not to take influence on the design of those pumps which are normally attached to machines delivered assembled and ready for installation, though responsibility remains with Builders.

The arrangement of components in engine room is shown in ENGINE ROOM ARRANGEMENT PLAN.

MODULE CONSTRUCTION

In the engine room generally the modular design method (MODULES) will be applied.

Table MODULE port



PIPING GENERALLY

The pipe lines will be arranged on the basis of attached diagrams.

Pipes to DIN standards will be used. Quality and wall thickness according to purposes and operating pressure as well as to Classifications regulations.

In particular:

Steel pipes
DIN 2391 and DIN 2458 (DIN 2448)

Technical terms of delivery to DIN 1629 and DIN 1626 or DIN 17175.

Material testing to DIN 50049, so far as Classification Society has no other rules.

Copper alloy pipes
CuNi 10 Fe 1.6 Mn, DIN 86019 with normal wall thickness.
Technical terms of delivery to DIN 85004, part 4.

Ordinary copper pipes
SF-Cu

Measurements to DIN 1786, material to DIN 17671

Stainless steel pipes
DIN 2462, DIN 2463, DIN 2464

Joints up to DN 32 will be of screwed type, above DN 32 of flanged type or by means of couplings.

Connection of CuNi 10 Fe pipes by means of steel/metal flanges . Pipes will be crimped.

After manufacturing the pipes will be carefully cleaned and protected against impurity during mounting procedure.

Draining screws will be provided at the lowest point of the water pipe systems to enable complete drainage.

Valves up to DN 32 will be of screwed type, above DN 32 of flanged type.

Oily water will be collected in dripping pans and directed either to leak tank or sludge tank.

Pressure tests will be performed in the presence of the Owners` surveyor and representative of Classification Society.

Suction and delivery lines of all pumps will be fitted with pressure gauges.

Scale graduation of pressure gauges in "bar".
Scale graduation of thermometers in "° C".

The piping system will be suitably designed to allow expansion for thermal and/or deflection on hull structure by means of expansion joints or bends.

Piping will be led as straight as practicable with minimum number of bends and joints.

Piping will have ample strength and will be supported by U-bolts or steel bend plates with locking nuts.
Where necessary, valves will be identified by name plates.

Following piping will be well flushed and well cleaned, before put in service:
Lubricating oil
Fuel
Compressed air
Hydraulic oil
Refrigerant

3120 MAIN PROPULSION

The main diesel engine to be coupled direct to the propeller.

The layout of engine plant and subsequent figures in this specification are based upon the MAN / B&W 6L70 MC and auxiliary diesels type
MAK 6M20.

3121 MAIN DIESEL ENGINE

1 diesel engine

Make:	MAN B&W
Type:	6L70MC
Design:	Crosshead, single acting, two stroke, clockwise, reversible, direct fuel injection, integrated thrust bearing, hydraulically operated exhaust valves, turbocharged uniflow scavenging system
Number of cylinders:	6
Continuous output (MCR):	16,980 kW
Speed:	108 1/min
	Output based on the following ambient conditions:
	45° C engine room temperature
	32° C seawater temperature
	36° Cooling water temperature at air cooler inlet
	1,000 mbar air pressure
	60 % relative humidity of air
Mean effect. pressure:	18,0 bar
Mean piston speed.	8.1 m/s
Bore:	700 mm
Stroke:	2268 mm
Fuel.	IF 700 (heavy fuel of 700 cSt/50° C)
	The diesel engine is capable of being changed over to operation on diesel oil.
Specific fuel consumption:	in accordance to ISO standard reference:
(measured on test bed)	at MCR = 16,980 kW
	174,0 g/kWh.
	+ 5 % margin in accordance with **ISO 3046**
Lub oil consumption	
System oil:	abt. 9 kg / cyl. 24 hours
Cylinder oil:	abt. 0.9 - 1.4 g/kWh

Supercharging:	turbocharger, MAN NA .... scavenging air cooler – Arrangement for easy dismantling and cleaning of intercooler, – Freshwater washing of turbocharger (turbine side), – Rotor bearings: slide bearings – Lubrication: effected by main lubricating oil
Scavenge space CO_2-plant:	A separate CO_2-plant complete with bottles, pipes and connections for the scavenge space to be provided. The CO_2-bottle will be installed in engine room.
Starting:	By compressed air
Cooling:	Main engine is part of a centralised cooling water system. – cylinders, nozzles and turbo chargers: fresh water – Pistons: lubricating oil – Charging air: fresh water
Equipment:	– Electric governor – Turning motor – Oil mist detector

3191 ENGINE CONTROL

The control and central monitoring of the whole machinery plant will be effected from ECR.

FOUNDATION

The main engine to be seated on resin chocks. Fastening of engine base plate to the hull seating to be by means of hydraulically tightened holding down bolts.

3286 PIPING EXHAUST GAS MAIN DIESEL ENGINE

Material:	steel
Diameter:	1,400 mm
Compensators:	steel
Installation:	elastically mounted
Drainage:	at lowest point

316 SHAFTING

Arrangement will be made after definite investigations and be based on results of vibration calculations, see sketch.

1. Main diesel engine
2. Aux. diesel engines
3. Bearing
4. Fixed flanges

3161 INTERMEDIATE SHAFT

1 intermediate shaft to be provided

Material: SM steel, forged and machined.

In way of bearing point the intermediate shaft to be increased by 5 mm in diameter and 50 mm in extension on both ends of bearing.

LINE SHAFT BEARING

1 journal bearing to be provided in way of intermediate shaft.

The bearing to be of self lubricated type and to be cooled by air.

Lower and upper shell to be of steel and to be spherically movable. Lining of white metal to be provided for lower and upper half.

PROPELLER SHAFT

1 shaft of SM-steel, forged and machined to be provided.

Shaft diameter to Classification requirements. The tail shaft to be equipped with one bearing point only, and in way of this bearing point the tail shaft to be increased by 5 mm.

A shaft alignment device to be provided at the aft peak bulkhead.

Shaft bearing temperature sensors to be installed.

A support for mounting and dismounting of tail shaft, inside of stern tube, near the after peak bulkhead, a guide bearing is to be provided.

COUPLING

The intermediate shaft to be connected to the propeller shaft and to the main engine by fixed flanges.

The coupling flanges to be connected by cylindrical bolts.

3162 STERN TUBE

Stern tube to be designed to Builders' standard, to be constructed of steel, of length as short as possible, to be welded to the stern frame.

STERN TUBE BUSH

One bush to be provided.
Material: Grey cast iron, lined with bearing metal.
The bush to be provided with an outside steel liner and positioned and casted to the stern tube by epoxy.

STERN TUBE SEALINGS

Material of the forward casing:	grey cast iron
Material of the aft casing:	grey cast iron
Material of sealing aft:	1 x Perbunan
	2 x Viton
Material of sealing forward:	2 x Perbunan

The aft shaft liner to be ceramic lined.

STERN TUBE LUBRICATION

Stern tube to have lubrication with oil from the stern tube oil high tank. The stern tube oil high tank to be replenished from the lubricating oil storage tank by means of a gear pump.

3164 PROPELLER

1 fixed pitch propeller to be provided. The propeller to be 5-bladed with hub and blades from aluminium copper nickel alloy. Propeller diameter abt. 6,600 mm.

Connection of propeller to propeller shaft to be by means of hydraulic joint.

3191 ENGINE CONTROL ROOM (ECR)

The insulated engine control room will be an integral part of the modular system and will be air conditioned (cooled) and contains the main switchboard.

The desk for operating of the main propulsion system is to be fitted within the engine control room.

320 GENERATOR DRIVES

3201 AUXILIARY DIESEL ENGINES FOR GENERATORS

3 Diesel Engines	**(Type: MAK 6 M 20)**
Design:	Trunk piston type, 4-stroke diesel engine and generator are mounted on a common base plate, resilient mounting of sets, flexible pipe connections.
No. of cylinders:	6
Continuous output:	1020 kW at 900 1/min each in accordance with ISO 3046/1 at following ambient conditions: 45° C air temperature 38° C cooling water inlet supercharger intercooler
Generator output:	970 kW
Bore:	200 mm
Stroke:	300 mm
Fuel:	IF 700 (heavy fuel of 700 cST/50° C)
Fuel consumption:	186,0 g/kWh at full load in accordance with ISO 3046.
Tolerance:	5%
Lub. oil consumption:	Lub oil consumption 0,6 g/kWh + 0,3 g/kWh
Supercharging:	1 turbocharger, 1 intercooler
Starting:	by compressed air
Cooling:	The diesel engines are incorporated in the centralised cooling water system.
Equipment:	speed governor, lub. oil pumps, lub. oil cooler, lub. oil filter, fresh water pump, cylinder cooler, prelub. oil pump, silencer

3204 DIESEL ENGINE FOR EMERGENCY GENERATOR

1 Diesel Engine

Design:	Trunk piston type, 4-stroke diesel engine and generator are mounted on a common base plate, resilient mounting of sets, flexible pipe connections.
Location:	outside engine room
No. of cylinders:	6
Continuous output:	161 kW at 1,800 1/min
Required output:	150 kW 1,800 1/min
Generator output:	162,5 kVA (130 kW)
Mean piston speed:	7,26 m/s
Bore:	121 mm
Stroke:	152 mm
Fuel:	Gas oil
Fuel consumption:	229 g/kWh
Supercharging:	1 turbocharger
Starting:	electrically
Cooling:	air cooled
Mode of operation.	The unit to be started automatically on power failure of the ship's mains. A second starting device will be provided. Starting device in accordance with IACS.

The data mentioned above depends on maker's standard.

The set will be delivered and installed as a Module.

3286 PIPING EXHAUST GAS AUX. DIESEL ENGINES

Material:	steel
Diameter:	according to recommendations of engine maker
Wall thickness:	up to DN 500 4 mm
Compensator:	stainless steel
Installation:	elastically mounted
Drainage:	at lowest point.

317 AUXILIARIES FOR PROPULSION PLANT

302 BOILER PLANT

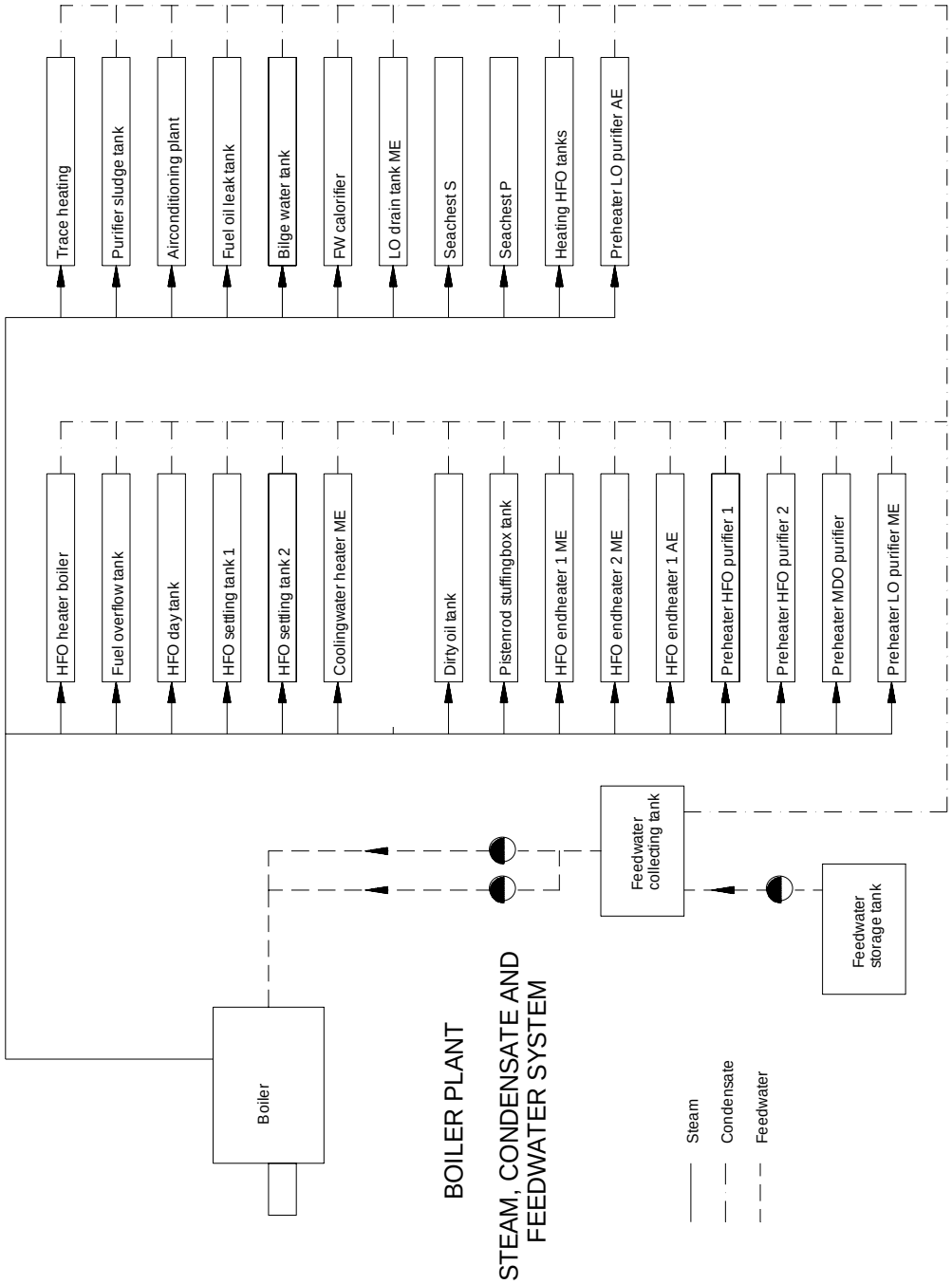
Concept

Steam for tank heating and sanitary purposes as well as general service will be generated by a combined exhaust gas heated/oil fired boiler.

Over produced steam by the exhaust gas part is led to the overproduction condenser. In case of pressure drop of the exhaust gas part down to abt. 8.0 bar, the oil fired part will come automatically in operation. Otherwise, the oil fired part will switch-off automatically, when ship starts sea going.

Condensate to be led to the condensate collecting tank.

For guidance only



3021 COMBINED EXHAUST GAS/OIL FIRED BOILER

(COMPOSITE BOILER)

Exhaust gas quantity at 90 % of main diesel engine output:	
Exhaust gas temperature entrance:	
Exhaust gas temperature outlet:	
Steam output exhaust gas part:	abt. 1.600 kg/h
Steam output oil fired part:	abt. 1.800 kg/h
Normal working pressure:	8 bar
Max. permissible working pressure:	10 bar
Feed water temperature:	90° C.

Construction details:

The boiler to be of smoke-tube type in welded construction.

The insulation to consist of rockwool, 75 mm thick and covered with galvanised sheets.

3192 LOCAL CONTROL STATION

A boiler control cubicle with all necessary monitoring devices for the entire boiler plant is to be installed in the vicinity of the boiler.

3026 BURNER

Construction:	Rotary type
Control:	Full automatically
Fuel:	HFO 600 cST/50°

3172 DUMPING CONDENSER

1 Condenser

Construction:	Plate type

3172 PUMPS

2 Feedwater pumps (1 pump as stand-by)

Capacity:	4,2 m³/h
Head:	13,0 bar
Drive:	Electric motor
Construction:	Non-self-priming, centrifugal, horizontal, seal ring
Material:	Pump housing: phosphate resistant cast iron
	Running parts: Stainless steel

1 Feedwater transfer pump

Capacity:	5 m³/h
Head:	2 bar
Drive:	Electric motor
Construction:	Non-self-priming, centrifugal, horizontal, seal ring
Material:	Pump housing: phosphate resistant cast iron Running parts: Stainless steel

3182 BOILER WATER TREATMENT SYSTEM

One metering pump for hydrazine dosage pot.

One test equipment for feed water analysis with all accessories, disposed in a cupboard.

4021 SALINOMETER

One electric salinometer system for the boiler plant is to be installed and to consist of

1 salt measuring transmitter at condensate collecting tank.

3263 PIPING FOR STEAM

Pipe:	Steel St. 37-2 DIN 2458/1626 with manufacturer's certificate
Valves and fittings	
Body:	GGG - 40 - 01
Inner parts:	Stainless steel
Mode of joint:	Flange DIN 2576 PN 10

3265 PIPING FOR CONDENSATE AND FEED WATER

Pipe:	Steel St 37-2 DIN 2458/1826 with manufacturer’s certificate
Valves and fittings	GG-20 - 01
Inner parts	Stainless steel
Mode of joint	Flange DIN 2576 PN 10

3271 PIPING FOR TANK HEATING

Heating coils of welded construction without flange connections are to be provided inside fuel tanks, sludge oil tank, lub. oil settl. tank and drain. tank.
The termination of each heating coil system to be provided with a test cock outside the tank, in order to permit taking samples. Steam traps to be provided in the exhaust steam collecting lines of the various heating sections.

Steaming Out

For inspection: tanks to be provided with steaming out connections.
In case of steaming out steam hoses will be connected. Steam hoses to be delivered by Builder.
No. of steam hoses: 7
Length: 5 m each

3286 PIPING COMPOSITE BOILER

Material:	Steel
Diameter:	according to recommendation boiler maker
Wall thickness:	up to DN 400 4 mm
Installation:	Fixed mounted

3173 COOLING WATER SYSTEM

Concept

The centralised cooling water system consists of three subsystems, the

- seawater system,
- high temperature fresh water system (HT-system) main engine
- low temperature fresh water system (LT-system).

The general heat exchange is achieved by three seawater pumps and two LT-plate coolers.

The design is based on:

- main diesel engine at max. continuous rating
- three aux. diesel engines at max continuous rating in operation
- air conditioning refrigerating plant, air conditioning refrigerating plant ECR and dumping condenser in operation.

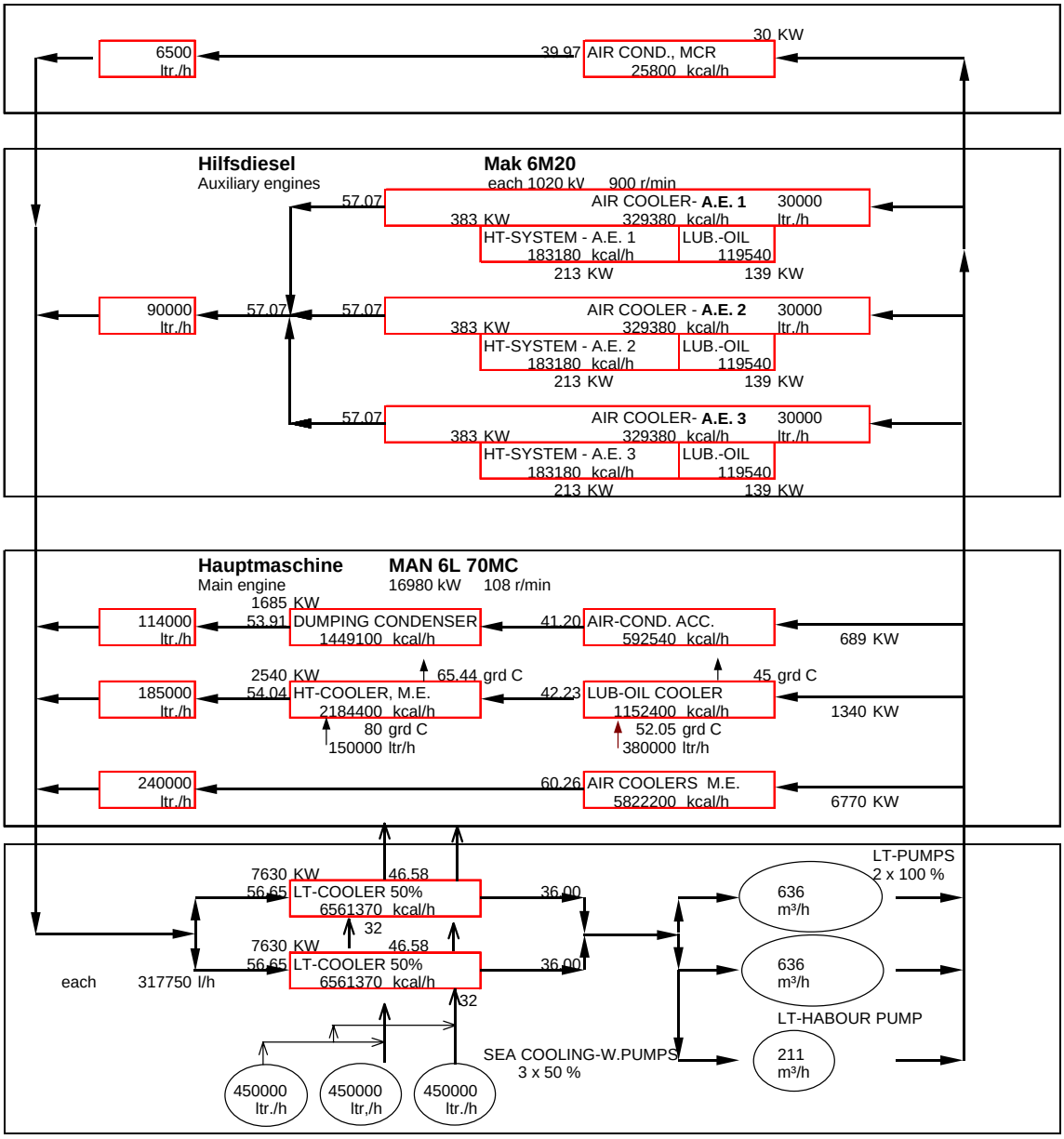
The high temperature circuit main engine consists of:

- 2 fresh cooling water pumps
- 1 cooler of plate type, designed for 100 % capacity, incorporated in low temperature circuit.

The low temperature circuit consists of:

- 2 central coolers plate type of 50 % capacity each
- 3 sea cooling water pumps of 50 % capacity each
- 2 fresh cooling water pumps for sea service
- 1 fresh cooling water pump for harbour service.

For guidance only
Centralized Cooling Water System



3282 SEA CHESTS

Outside the engine room,

one sea chest under floor port
one sea chest over floor starboard,

each suitable for simultaneous operation of

2 sea cooling water pumps for main engine,
2 ballast pumps.

The sea chests will be integral parts of the ship's structure and to be welded directly to shell plating. Sea chests to have zinc protection.

Each sea chest to be equipped with a blow out valve. The blow out valves are to be connected to the compressed air system.

The hinged gratings for the sea chests are to be made of steel, to be galvanised and to be fastened by screws of sea water resistant material.

Bores to be provided in shell within each frame space of sea chests in way of lower and upper part for draining resp. venting.

3282 CROSSOVER

A transverse pipe will connect the sea chests.

3282 SEA VALVES

Shut off used as sea valves are rubber lined.

3173 SEA WATER FILTERS

Care to be taken that no sea water can enter the sea water circulating system in engine room without having been filtered.

Material of filter casings:	acc. to makers standard
Material of strainer inserts:	acc. to makers standard

3282 OVERBOARD DISCHARGE VALVES

Overboard discharge valves are basically to be arranged as follows:

a) Below the ballast line,

b) Not in way of accommodation ladders and life-boats.

c) Aft of the sea chests, in order to prevent contaminated sea water from being drawn in when the vessel is on headway course.

All overboard discharge valves are rubber lined, as to standard of subcontractors.

The overboard discharge valves to be secured to Builders' standards.

3282 VENT AND DRAIN ARRANGEMENTS

Where necessary, vents capable of being shut off are to be provided at the highest points of the sea water circulating lines and drain plugs capable of being shut off to be provided in the lowest points.

3173 COOLER

1 plate type cooler HT-System main engine

Heat quantity:	abt. 2540 kW
Materials:	Frame: steel, plates: titanium
Quantity HT-Water:	150 m³/h
Temperature HT-Water entrance / outlet:	80° C / 65° C
Quantity LT-Water:	185 m³/h

2 plate type coolers LT-System

Arranged:	in parallel
Heat quantity:	each abt. 7630 kW
Plate material:	Titanium
Support material:	Steel
Quantity LT-Water:	each 320 m³/h
Temperature LT-Water entrance / outlet:	56,7° C / 36° C
Quantity seawater:	each 450 m³/h
Temperature seawater: entrance / outlet	32° C / 46,6° C

3173 PUMPS

3 main sea water pumps

Capacity:	450 m³/h each	
Head:	1.6 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	Non-self priming, centrifugal, vertical, mechanical seal	
Material:	pump housing:	bronze
	impeller:	bronze
	shaft:	stainless steel

1 evaporator pump

Capacity:	56 m³/h	
Head:	5 bar	
Drive:	Electric motor	
Speed:	3510 1/min	
Construction:	Non-self priming, centrifugal, vertical, mechanical seal	
Material:	pump housing:	bronze
	impeller:	bronze
	shaft:	stainless steel

2 main diesel engine HT-pumps

Capacity:	150 m³/h each	
Head:	3.3 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	Non-self priming, centrifugal, vertical, mechanical seal	
Material:	pump housing:	cast iron
	impeller:	bronze
	shaft:	stainless steel

1 each fresh cooling water pump, attached to aux. diesel engines

1 preheating pump main diesel engine and aux. engines

Capacity:	20 m³/h	
Head:	1 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	Non-self priming, centrifugal, vertical, mechanical seal	
Material:	pump housing:	cast iron
	impeller:	bronze
	shaft:	stainless steel

2 LT circuit fresh water pumps (1 pump as stand-by)

Capacity:	640 m³/h	
Head:	2.8 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	Non-self priming, centrifugal, vertical, mechanical seal	
Material:	pump housing:	grey cast iron
	impeller:	bronze
	shaft:	stainless steel

1 LT harbour fresh water pump

Capacity:	210 m³/h	
Head:	2.0 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	Non-self priming, centrifugal, vertical, mechanical seal	
Material:	pump housing:	grey cast iron
	impeller:	bronze
	shaft:	stainless steel

3281 PIPING FRESH COOLING WATER

Pipe DN 25	St. 35 DIN 2458/1626
Valves and fittings:	valves RG-5, DIN 86501
Mode of joint:	cone bushing
Pipe DN 32 - DN 100:	St. 35 DIN 2448/1629
Valves and fittings:	valves GG-02, DIN 86251
Mode of joint:	Flange DIN 2576 PN 10
Pipe DN > 100:	St. 37-2 DIN 2458/1626
Valves and fittings:	butterfly valve
Body:	GG-25
Inner parts:	GG-25, shaft Niro
Mode of joint:	Flange DIN 2576 PN10

VENT AND DRAIN ARRANGEMENT

Where necessary, vents capable of being shut off are to be provided at the highest points of the fresh water circulating lines and drain plugs capable of being shut off to be provided in the lowest points.

ANTI-CORROSIVE OIL ADDITIVE

Anti-corrosive oil to be added to the fresh cooling water from the anti-corrosive oil mixing tank.

TEMPERATURE REGULATING VALVES

One each electrically operated regulating valve to be arranged in high temperature and in low temperature circuit.

3282 PIPING SEA COOLING WATER

Pipe DN 25	CuNi10Fe
Valves and fittings:	valves RG-5
Mode of joint:	cone bushing
Pipe DN 32 - DN 100:	CuNi10Fe
Valves and fittings:	valves RG-5, butterfly valves
Mode of joint:	Coupling, pipe crimped
Critical areas:	steel, rubber covered
Pipe DN > 100:	CuNi10Fe
Valves and fittings:	butterfly valve
Body:	GG-25 rubber lining
Inner parts:	G-CuSn10Zn, shaft Niro
Mode of joint:	Coupling, pipe crimped
Crossover:	St. 37-2, rubber lined
Valves and fittings:	butterfly valve
Body (at sea chests):	GGG-40 rubber lined
Body (within piping):	GGL-25 rubber lined
Inner parts:	G-CuSn10Zn, shaft Niro
Mode of joint:	Flange DIN 2576 PN10

3174 FUEL SYSTEM

Concept

The heavy fuel system will be suitable for running with heavy fuel up to IF 600 (6,000 Redw. sec. I/100° F).

Heavy fuel will be stored in:

- 1 service tank,
- 2 settling tanks,
- 4 deep tanks and
- 1 double bottom tank
- 1 storage tank (engine room).

The H.F. transfer pumps suck from either central bunker or deep tanks and discharges to one of the two settling tanks.

ME and AE service:
From service tank the heavy fuel is pumped via flow meter and automatic filter to mixing pipe.

From mixing pipe via booster pumps, final preheaters, viscosity regulating unit, strainer to main diesel engine, fuel return to mixing pipe.

Final preheaters will be controlled by a viscosity regulating unit. The final preheaters will be steam heated.

1 Viscosity regulating unit with alarm for ME.
1 Viscosity regulating unit with alarm for AE.

Diesel fuel is drawn from daily service tank via flow meter to all diesel engines and boiler.

The filling station is situated on deck, separate links for heavy fuel and diesel fuel.

Filling of all deep and storage tanks simultaneously. Combined air- and overflow system with common alarm for overflow.

Fuel oil tanks will be provided with a remote tank-level measuring system with indication in engine control room (ECR) and ship's office.
Each bunker tank to be equipped with a high level alarm.

Heating coils in heavy fuel storage tanks, settling tanks and daily service tank.

Fuel treatment will be effected by 2 heavy fuel separators, 1 diesel fuel separator and filters.

The separators take suction from the heavy fuel settling tank and deliver the H.F. to the daily service tank. There is an overflow pipe connection from daily service tank to H.F. settling tanks. The capacity of the separator feed pumps is chosen slightly larger than the maximum diesel engine consumption.

Consequently, with continuous separation the daily service tank is always full and slight amount flows back to the settling tank. This is the normal procedure of separation according to the latest technology.

Two running modes are possible:

– 1 separator as purifier, 1 steam heated preheater in operation,
  1 separator and 1 preheater as spare.

– 2 separators working as purifiers in parallel with abt. 50 % of the nominal flow rate (the flow rate depends on the heavy fuel density and viscosity), 2 steam heated preheaters in operation.

Thermometers to be provided for:

heavy fuel oil bunker
heavy fuel oil service tank
heavy fuel oil settling tanks
heavy fuel oil mixing tank
heavy fuel oil end preheater, inlet and outlet.

The quick closing device of the draw off valve at the heavy fuel oil settling tank and heavy fuel oil service tank is to be pneumatically operated from a place outside the engine room. Several valves to be released simultaneously.

A valve with self-closing device to be provided in bottom of heavy fuel oil settling tanks and heavy fuel oil service tanks for drainage

Suitable drain plugs at lower level to be provided as well as steaming out/air blowing connections for efficient draining regarding the pour point.

Heavy fuel lines from final preheater to main diesel engine, aux. engines and back to mixing tube as well as H.F. lines situated in short pipe duct will be equipped with a heating device, consisting of copper pipes installed adjacent the lines.

Steam traps to be provided on necessary places of the heating pipes.

The filling line to be connected to the fuel oil transfer line.

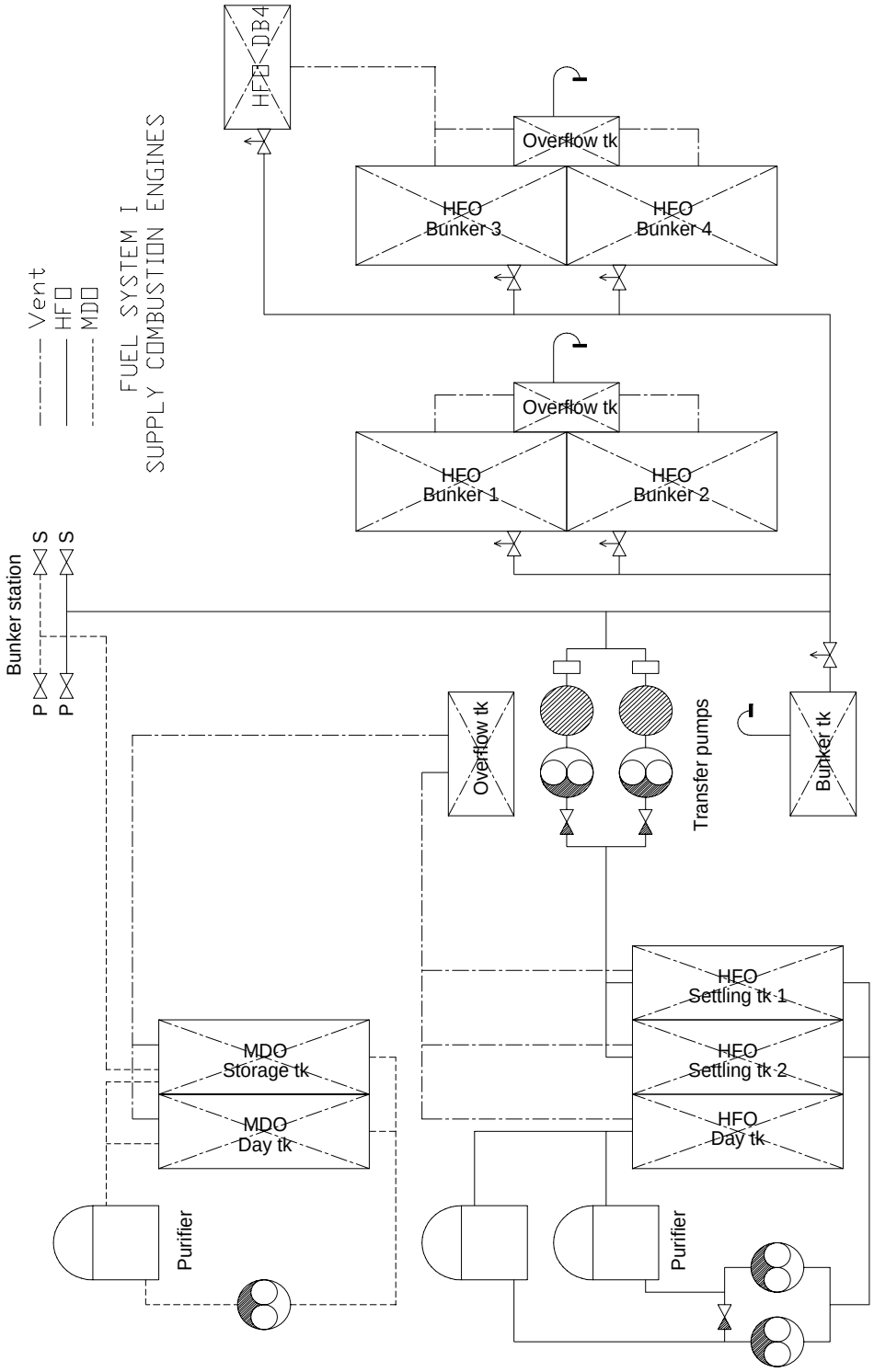
A dirty oil discharge line to be provided to permit discharge of dirty oil from sludge oil tank. The dirty oil discharge line to be served by the sludge oil pump. Discharge to be provided to main deck. Discharge connection on main deck to be blanked off by blank flange.

The separator sludge to be led into the sludge oil tank.

For discharge of dirty oil into barrels on deck, one hose of 2 m length with standard dimensions of flanges for discharge connections at ISO/DIS 7608-1983 MARPOL fitted at one end will be stowed in store room.

The various heavy fuel oil tanks are to be vented in accordance with Classification requirements.

For guidance only



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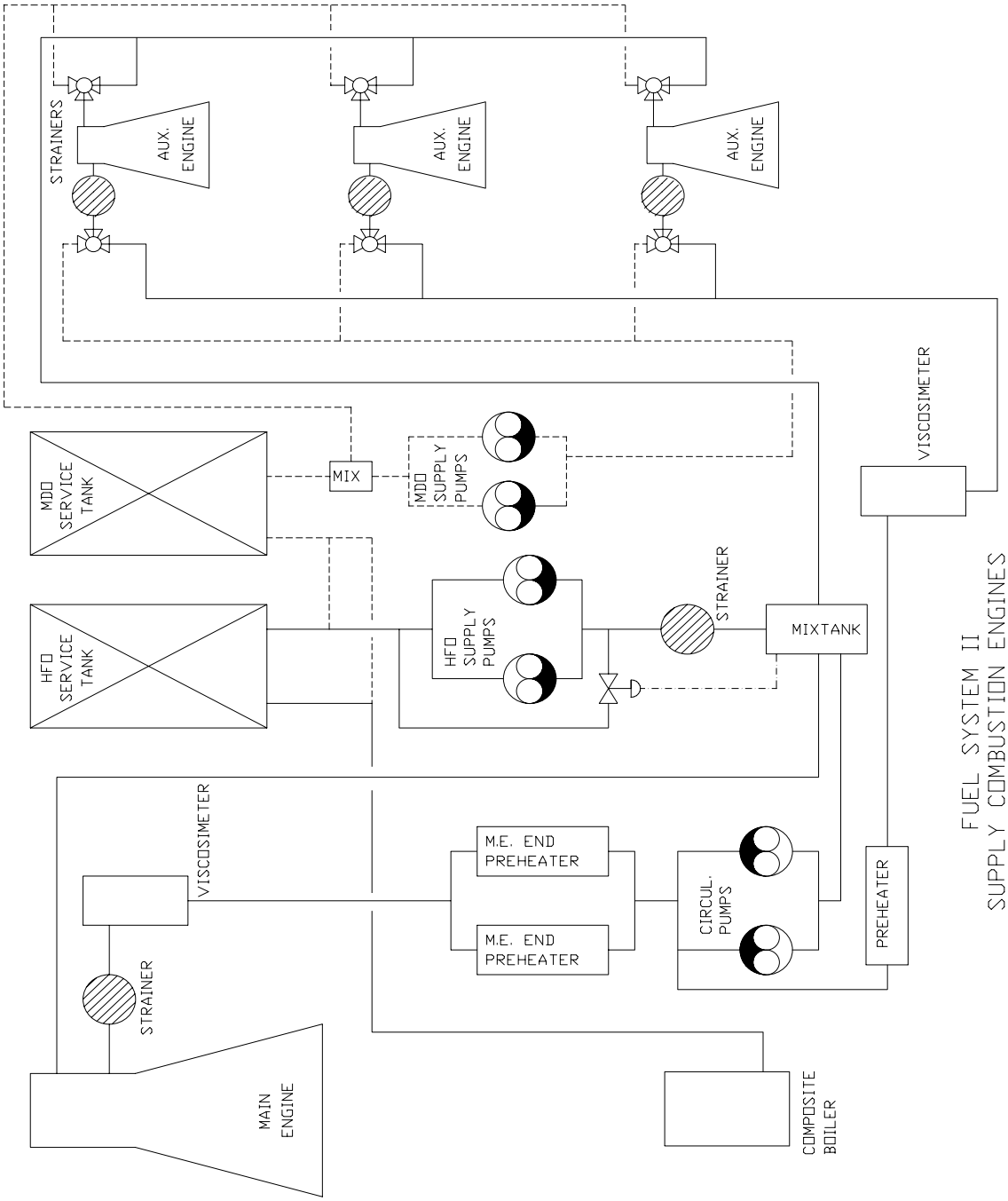


3175 SEPARATORS

2 Heavy fuel separators

Type:	
Design:	self-cleaning type with automatic control
Capacity:	abt. 3930 l/h each of purifying heavy fuel type IF 600
Equipment:	attached pump, switch box for automatic control

1 Diesel fuel separator

Type:	
Design:	self-cleaning type
Capacity:	abt. 800 l/h
Equipment:	attached pump, switch box for automatic control

3175 HEAT EXCHANGER

2 Preheaters for heavy fuel separators

Construction:	plate-type
Heated:	by steam
Temperature range:	55° C - 98° C

1 Preheater for diesel fuel separator

Construction:	plate-type
Heated:	by steam
Temperature range:	5° C - 55° C

2 Final heaters for main engine

Construction:	tube-type
Heated:	by steam
Temperature range:	125° C - 150° C

1 Final heater for aux. diesel engines

Construction:	tube type
Heated:	by steam
Temperature range:	125-150° C

3175 VISCOSITY CONTROL DEVICE

1 Viscosity regulator for main engine
1 Viscosity regulator for aux. diesel engines

3175 PUMPS

2 heavy fuel transfer pumps

Capacity:	39,2 m³/h	
Head:	4 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	Gear type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

2 fuel booster pumps for main and aux. engines (1 pump as stand-by)

Capacity:	8,2 m³/h	
Head:	5,5 bar	
Drive:	Electric motor	
Speed:	3420 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

2 fuel circulating pumps for main and aux. engines (1 pump as stand-by)

Capacity:	11,4 m³/h	
Head:	10 bar	
Drive:	Electric motor	
Speed:	3420 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

2 fuel circulating pumps for aux. engine for MDO service

Capacity:	1,9 m³/h	
Head:	4 bar	
Drive:	Electric motor	
Speed:	3420 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

2 fuel pumps for boiler (1 pump as stand-by)

Capacity:	500 ltr./min.	
Head:	4 bar	
Drive:	Electric motor	
Speed:	1740 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

1 diesel fuel pump for incinerator plant

Capacity:	0,2 m3/h
Head:	6 bar
Drive:	Electric motor
Speed:	1750 1/min
Construction:	Gear type, with safety valve
Material:	pump housing: cast iron running parts: steel

3175 Filter

1 Heavy fuel oil filter

Type:	Automatic back-scouring type
Location:	In discharge line of heavy fuel oil supply pumps

1 Heavy fuel oil indicator filter

Type:	Double filter, mesh size 40 µ
Location:	In discharge line of heavy fuel oil booster pumps

3283 PIPING FUEL SYSTEM

Pipe:	St. 37-2 DIN 2458/1626
Valves and fittings:	Valves GG-20, gate valves GG-Niro, safety valves GGG-Niro
Mode of joint:	Flange DIN 86030 PN16

3176 LUBRICATION OIL SYSTEM

Concept

The main diesel engine is supplied by 2 electric motor driven lub. oil pumps (1 pump as stand-by), taking suction from main lub. oil sump tank and discharging via cooler and automatic filter to the main diesel engine. The auxiliary diesel engines are equipped with individual lub. oil systems, pump and cooler are attached.

The stern tube is fed by lub. oil from a local gravity head tank.

The lubricating oil take over-lines are to be installed separate from each other and to extend to upper deck where they are to have flanged sockets with blank flanges with engraved designation of the type of oil.

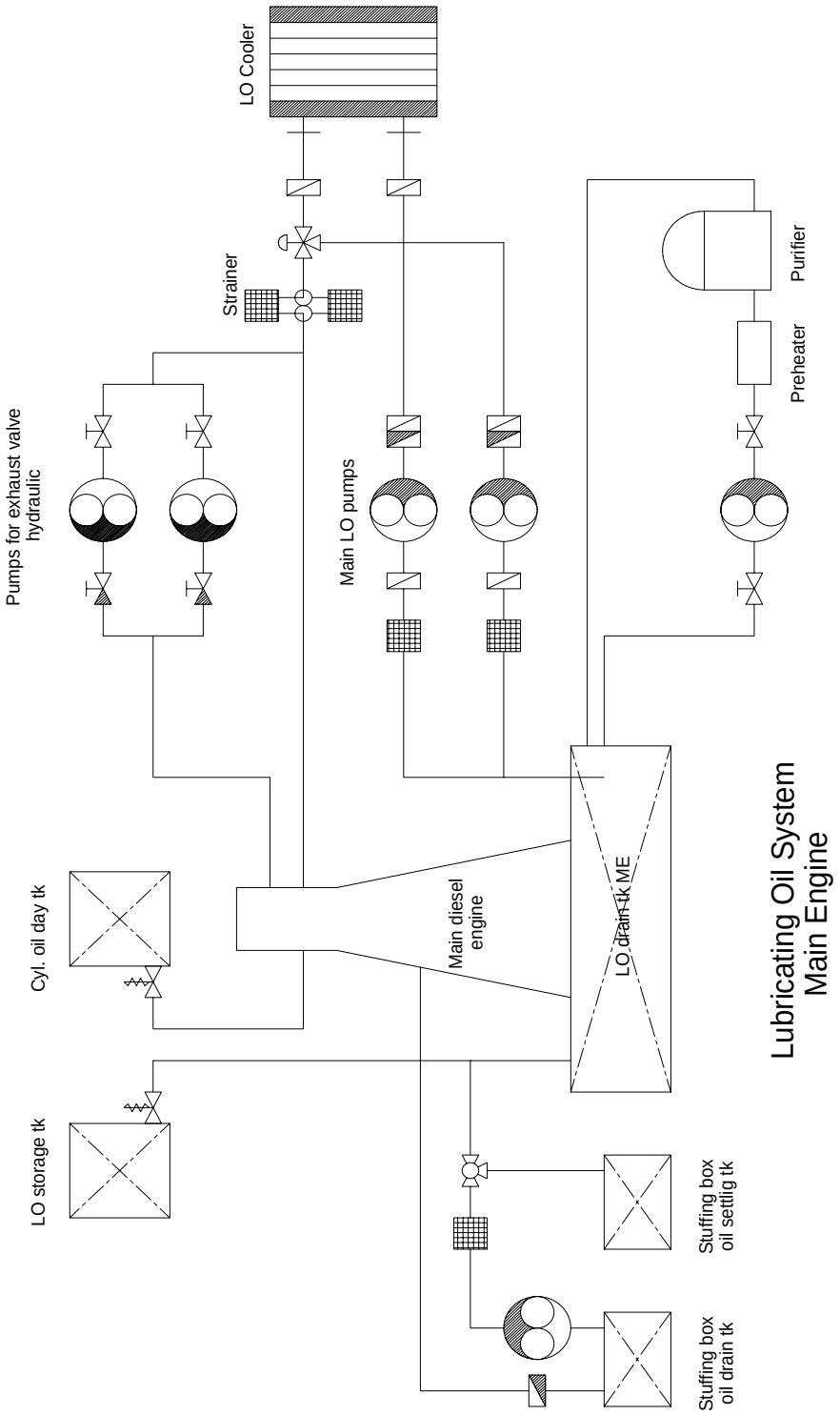
The lubricating oil take-over lines to have no filters.

Electrically operated regulating valve to be provided for temperature regulating of main engine lubricating oil.

For discharge used oil from the lubricating oil drain tanks, the dirt oil discharge line also to be used which is to be served by the sludge oil pump.

The various lubricating oil tanks are to be ventilated in accordance with Classification requirements.

For guidance only



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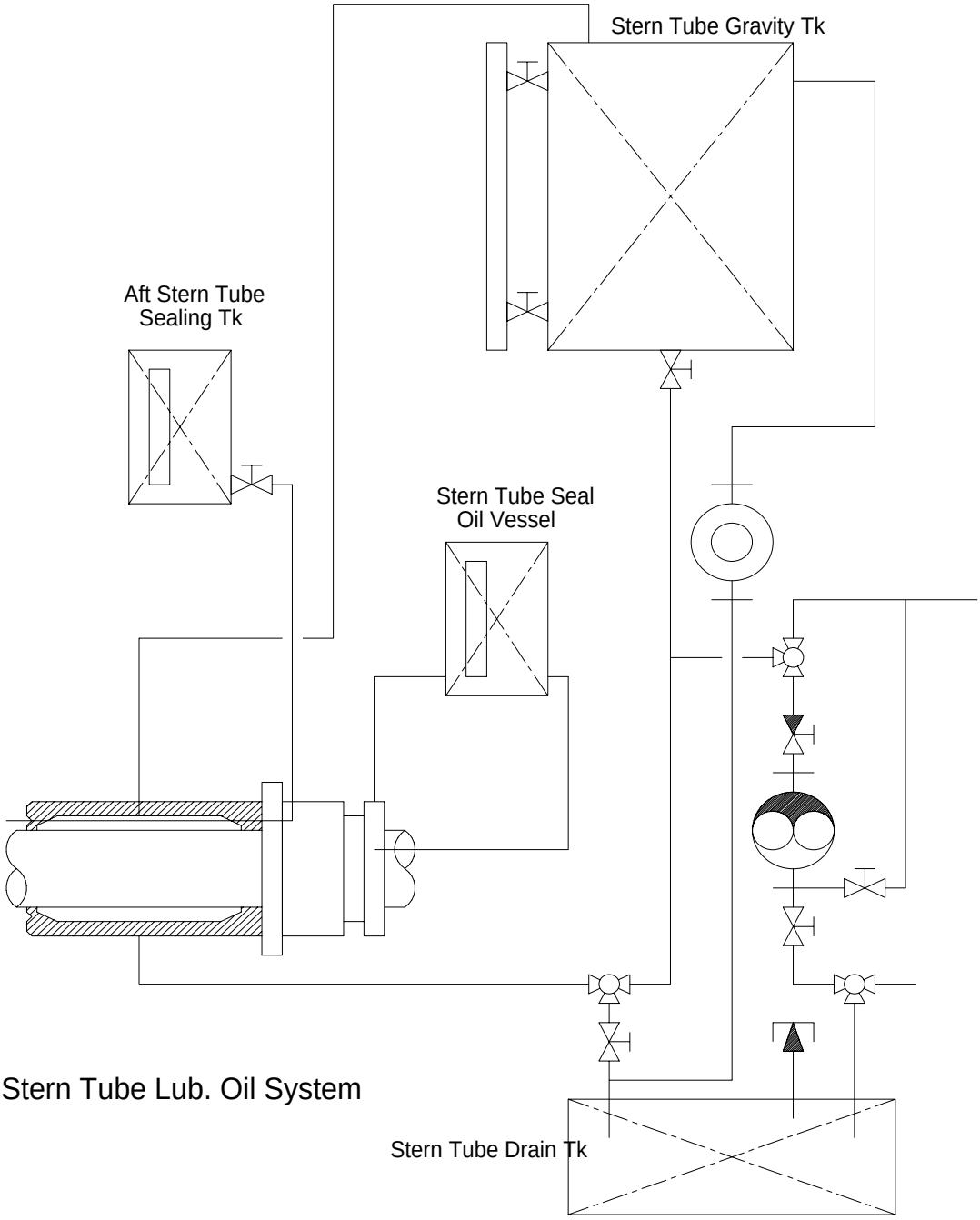


Stern Tube Lub. Oil System

3176 SEPARATOR

1 Lub. oil separator ME

Type:	
Design:	self-cleaning type with automatic control
Capacity:	abt. 3,200 l/h each of purifying lub. oil with additives
Equipment:	preheater, steam heated, switch box for automatic control
Reserve:	one HFO-purifier

1 Lub. oil separator AE

Type:	
Design:	self-cleaning type with automatic control
Capacity:	abt. 800 l/h each of purifying lub. oil with additives
Equipment:	preheater, steam heated, switch box for automatic control

HEAT EXCHANGER

1 Oil cooler for main diesel engine (plate / type)

Material:	Plate: Titanium Support: Steel
Quantity lub. oil:	490 m³/h
Temperature lub. oil entrance / outlet:	54,4° C. / 48° C.
Quantity fresh water:	185 m³/h
Temperature fresh water: entrance / outlet:	36° C. / 42,3° C.

1 Preheater for lub. oil separator

Construction:	plate-type
Heated:	by steam
Temperature range:	45° C - 95° C

PUMPS

2 Lub oil pumps for main diesel engine (1 pump as stand-by)

Capacity:	380 m³/h	
Head:	5,5 bar	
Drive:	Electric motor	
Speed:	1,750 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

2 camshaft lub. oil booster pumps (1 pump as stand-by)

Capacity:	11,7 m³/h	
Head:	10,5 bar	
Drive:	Electric motor	
Speed:	1,750 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

1 Lub oil transfer pump - stern tube

Capacity:	3 m³/h	
Head:	2 bar	
Drive:	Electric motor	
Speed:	1,750 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

1 Cylinder oil transfer pump

Capacity:	3 m³/h	
Head:	3.0 bar	
Drive:	Electric motor	
Speed:	1,750 1/min	
Construction:	Screw type, with safety valve	
Material:	pump housing:	cast iron
	running parts:	steel

1 Lubricating oil discharge filter for main engine

Type:	Automatic back-scouring filter with magnet inserts without by-pass
Location:	In common discharge line of lubricating oil pumps

2 Lubricating suction filters for main lubricating oil pumps

Type:	Single filter
Location:	In suction line of each lubricating oil pump

Lubricating oil filters for auxiliary diesel engines are attached.

3285 PIPING LUB. OIL

Pipe:	St. 37-2 DIN 2458/1626
Valves and fittings:	
Body:	GG-25
Inner parts:	Niro (20 Cn 13)
Mode of joint:	Flange DIN 2576

PIPING HYDRAULIC OIL

Pipe:	Precision tube St. 35-4 DIN 2391
Valves and fittings:	
Body:	Steel
Inner parts:	Niro
Mode of joint:	ERMETO screw joint

3177 COMPRESSED AIR SYSTEM

Concept

The compressed air system is provided:

- for starting of main and auxiliary diesel engines, 30 bar
- to supply the remote control system main diesel engine, 7 bar
- to supply the control system purifiers, 2 bar
- to supply working air system, 7 bar.

The compressed air system is fed by 3 starting air compressors and 1 working air compressor.

The air pressure in the main starting air receivers is to be maintained at 30 bar over pressure. On drop of pressure to 22 bar, the first compressor to start automatically and to replenish the receivers. At further pressure drop the second main compressor to start automatically at 18 - 20 bar over pressure.

Each compressor in operation to remain running until the pressure of 30 bar in receivers is obtained.

Each of these compressors to have a pilot light installed in ECR desk. In addition, the compressors to have failure alarm each.

The control air to be taken from the working air vessel and shall effectively be cleaned from oil, dust and dried from humidity by a separate automatic air dryer with sufficient capacity for the control valves. Connection between starting air main and working air main is provided via reducing valve.

The unit of working air compressor with receiver to operate fully automatically.

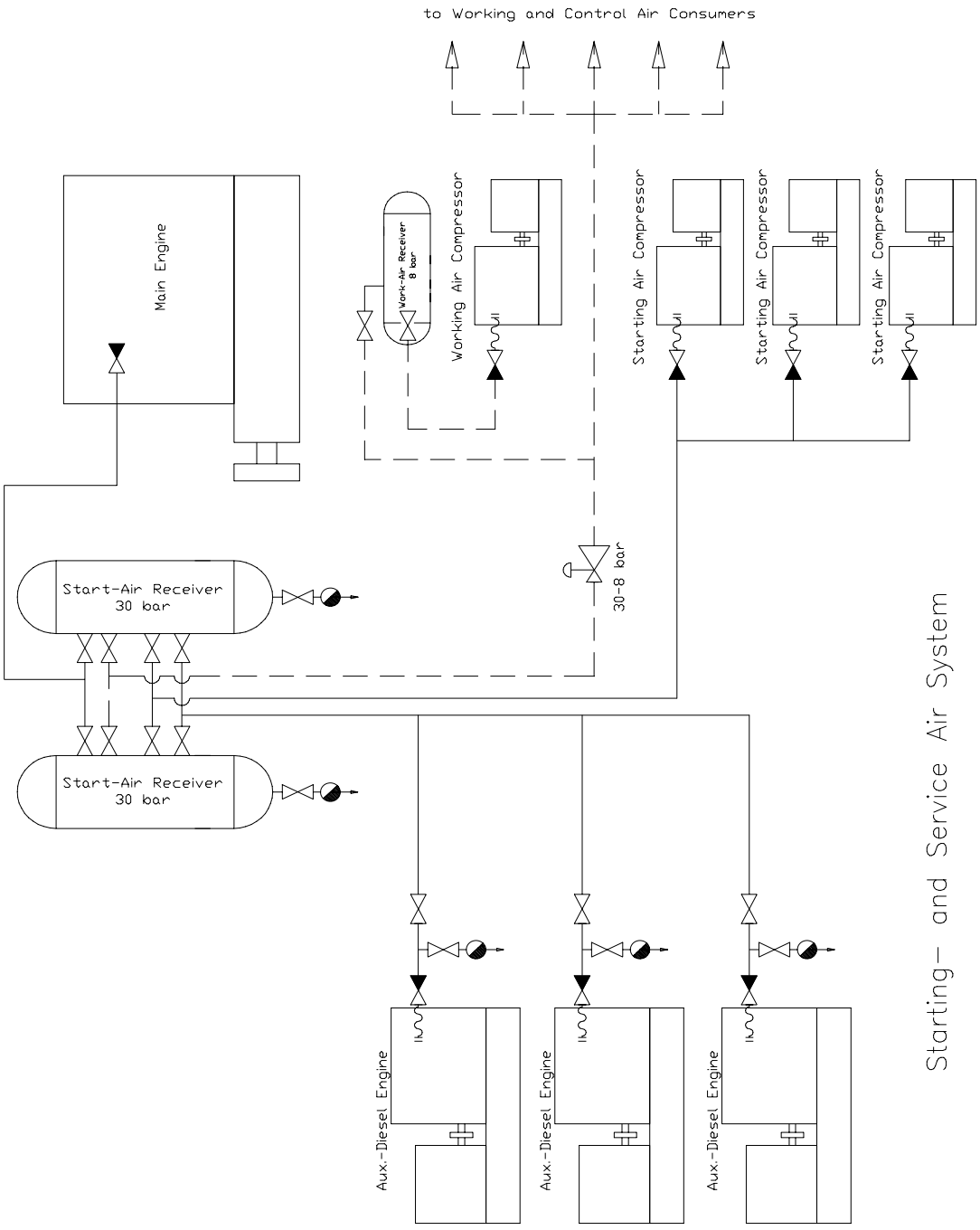
Further control air consumers as required by the respective manufacturers.

Pressure reducing for the several systems to be effected by spring loaded reducing valves.

Hose connections for compressed air operated tools are to be provided in engine room, CO_2-room, in workshop and on deck. Main line for compressed air tools on deck to be 32 mm nominal diameter and to be of galvanised steel.

The outlet line of each compressor system is to be equipped with an oil water separator.

For guidance only



COMPRESSORS

3 Starting air compressor

Type:	Piston type
Air intake capacity:	145 m³/h
Pressure:	30 bar
Drive:	Electric motor
Speed:	1785 1/min
Construction:	vertical design, single acting, two stage, air cooled, electrically mounted.

1 Working air compressor

Type:	Screw type
Air intake capacity:	150 m³/h
Pressure:	10 bar
Drive:	Electric motor
Speed:	3500 1/min
Construction:	vertical design, single acting, two stage, air cooled, electrically mounted, air bottle included.

AIR BOTTLES

2 Starting air bottles

Content:	7000 l each
Pressure	30 bar

1 Working air bottle

Content:	1000 l
Pressure	10 bar

1 Air dryer

3287 PIPING COMPRESSED AIR SYSTEM

Air pressure from 10 to 30 bar

Pipe DN 25	St. 35.4 DIN 2391 with test
Valves and fittings:	valves steel/Niro
Mode of joint:	screw joint

Pipe DN > 25:	St. 35.4 DIN 2391 with test
Valves and fittings:	GS-C25 or C22N
Mode of joint:	welded neck flange

Air pressure up to 10 bar

Pipe DN 25	St. 35.4 DIN 2391
Valves and fittings:	steel DIN 86552
Mode of joint:	screw joint

Pipe DN > 25:	St. 35 DIN 2458/1626
Valves and fittings:	GG-01
Mode of joint:	welded neck flange

Table Module Starboard
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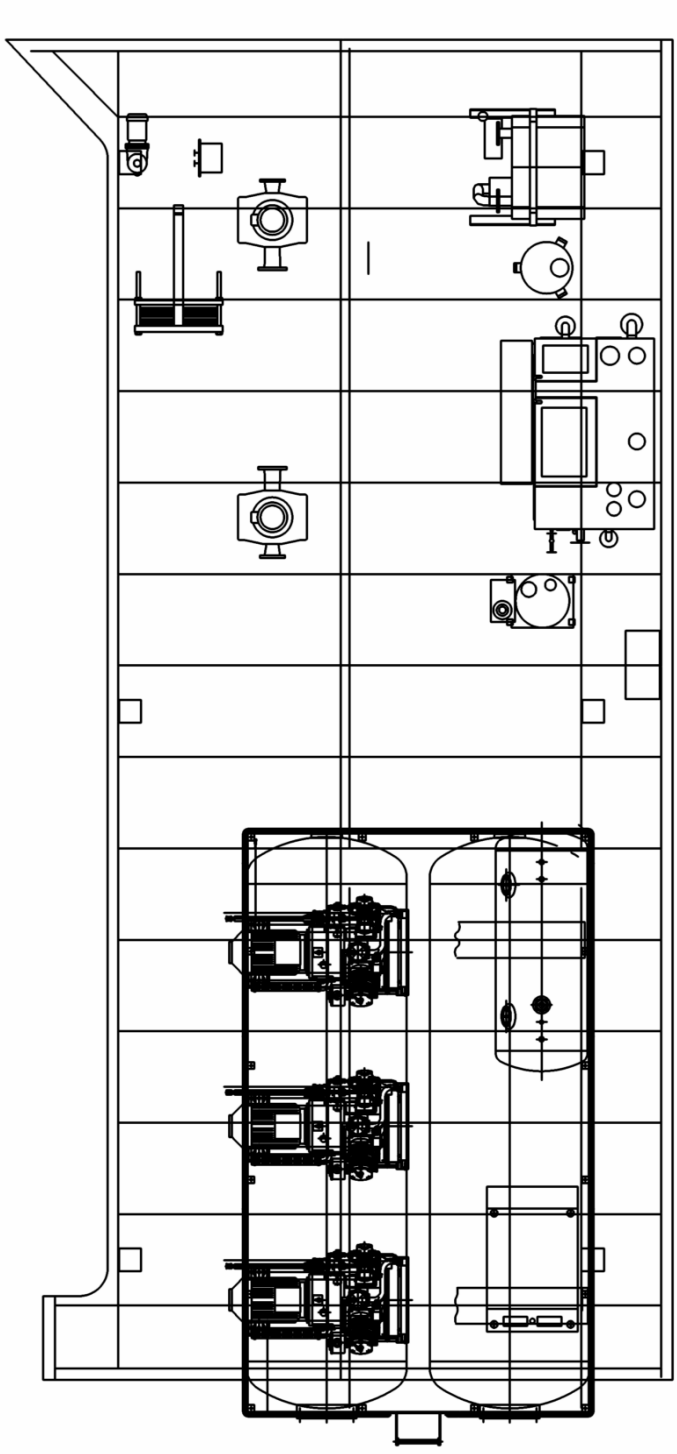

325 AUXILIARIES FOR SHIP'S SERVICE

3251 BILGE SYSTEM

Concept

The main bilge line to have branches with remotely controlled valves to the various cargo holds. The service unit for the remotely controlled valves of bilge and ballast system to be located in a suitable place in engine room.

The operating desk to be arranged in the Cargo Office.

The drain wells in engine room are to be emptied by a bilge pump particularly provided for that purpose. This pump to be connected to the bilge water separator.

The pump draws from bilge wells via bilge water separator and discharges overboard. A monitory device is provided in discharge line. In case of to high oil contamination pump will be stopped and discharge led back to the aft bilge well.

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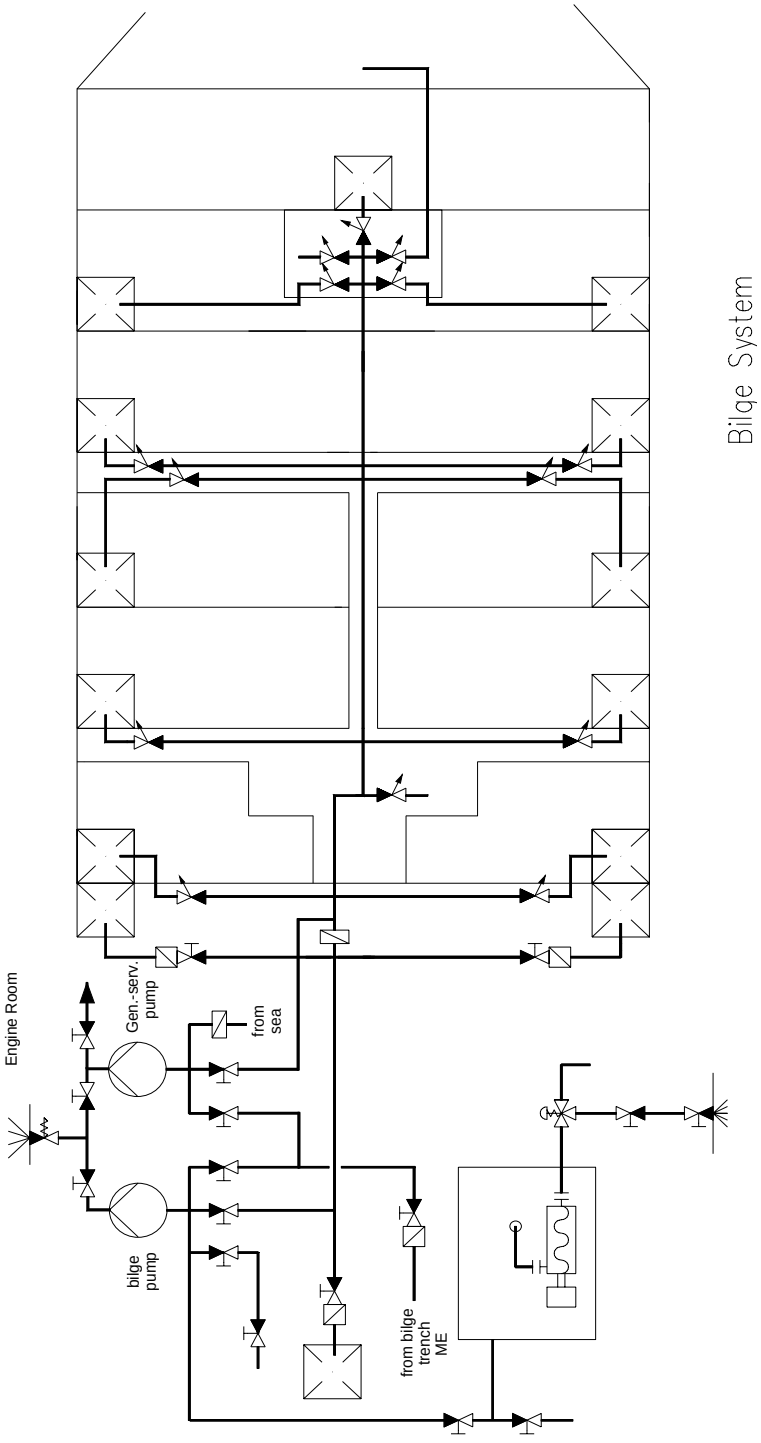

3251 BALLAST SYSTEM

Concept

The various ballast tanks to be connected to the main lines via branch lines.

Shut off in way of pipe tunnels, between main lines and branch lines, are to be remotely operated butterfly valves.

Butterfly valves to be fitted with "open-closed" indication.

The power unit for the hydraulic remotely operated butterfly valves to be installed in a suitable place in engine room.

The bilge valves in way of pipe tunnels to be remote controlled.

The operating desk for these valves to be installed in the Cargo Office.

The side tank no. 6 P and S will serve as heeling tanks.

Compensating of heel to be effected by separate heeling pump and hydraulically operated valves.

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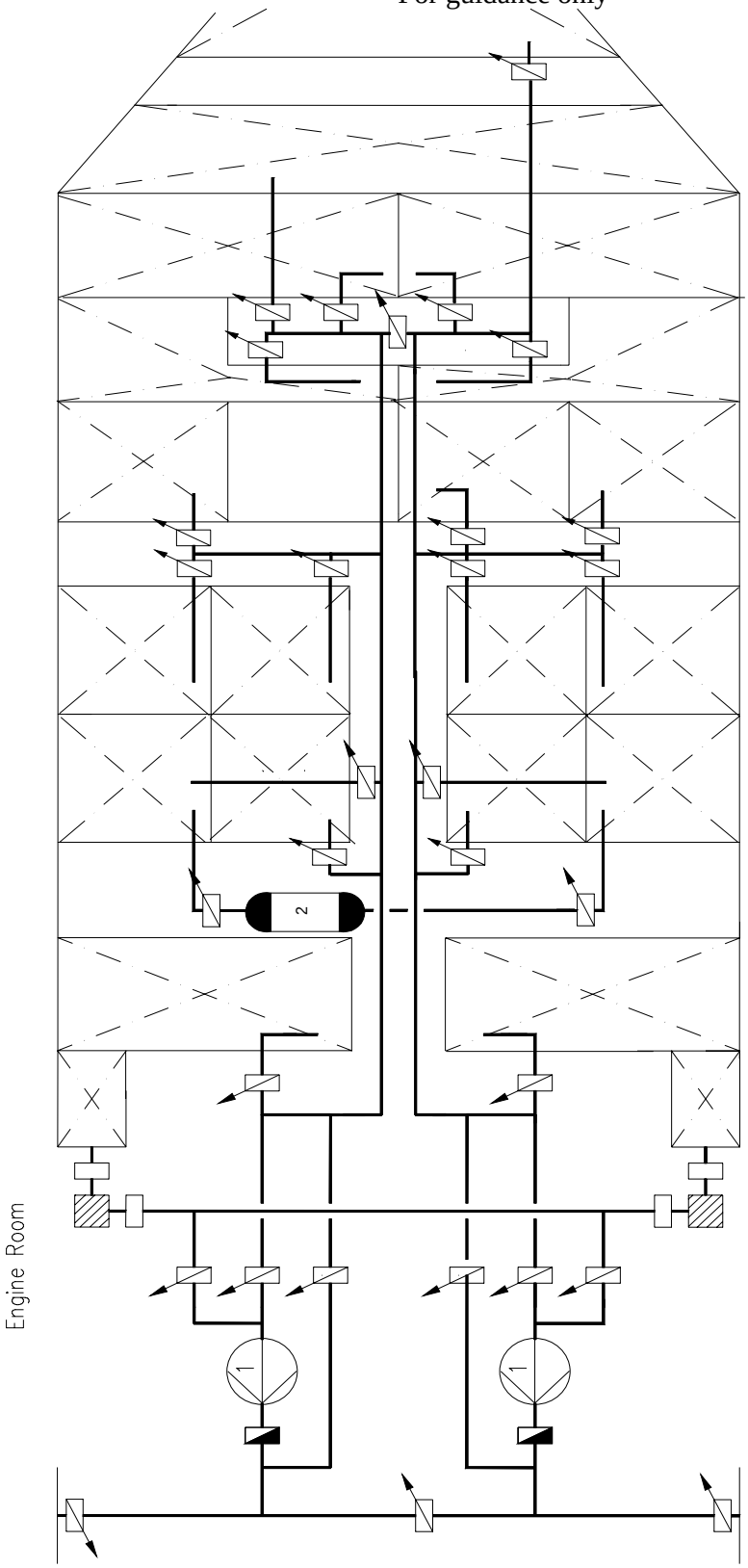

2702 FIRE MAIN AND DECK WASH SYSTEM

Concept

The fire pumps to draw from sea and to discharge into the fire main serving the engine room, deck house and deck.

In engine room, branches to be provided with hose valves.

Fire wash main line to be installed below main deck in passage way with branch lines to open deck. Piping to be extended to foreship and aftship.

Branch lines to be led in way of deck house aft:

to the various fire hydrants arranged
in way of accommodation and on open superstructure decks.

Branch lines to be led forward in the vessel:

to hawse pipes, for flushing of chain cables,
and to ejectors fitted in forebody.

On main deck, 2 international shore connections are to be provided. Number and arrangement of fire hydrants and top valves to be laid down in safety plan in accordance with rules and regulations.

At the lowest points of piping drain screws to be arranged.

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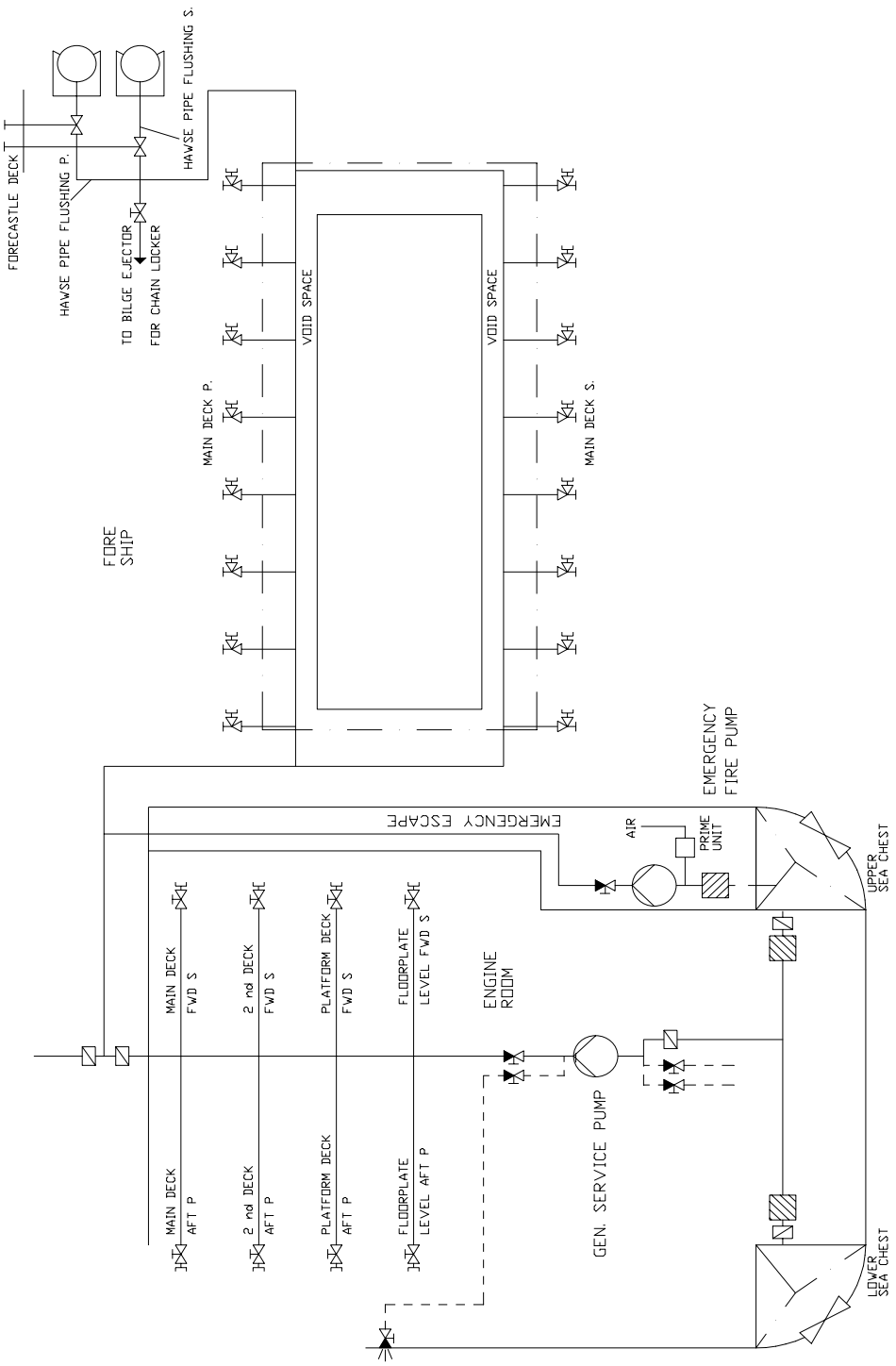


FIRE EXTINGUISHING SYSTEM

3251 PUMPS

2 Ballast pumps (one as stand-by for sea cooling system)

Capacity:	450 m³/h each	
Head:	1,6 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	non-self priming, centrifugal, vertical, mechanical seal ring	
Material:	pump housing:	bronze
	impeller:	bronze
	shaft:	stainless steel

1 Bilge pump

Capacity:	188 m³/h	
Head:	2 bar	
Drive:	Electric motor	
Speed:	1,750 1/min	
Construction:	non-self priming, centrifugal, vertical, mechanical seal ring	
Material:	pump housing	bronze
	impeller	bronze
	shaft	stainless steel

1 Bilge pump for engine room

Capacity:	5 m³/h	
Head:	3 bar	
Drive:	Electric motor	
Speed:	abt. 400 1/min	
Construction:	gearworm-type	
Evacuation:	self-priming	
Material:	housing:	cast iron
	rotating parts:	stainless steel
	stator:	Perbunan

The pump to be provided with dry-running protection device.

1 General service pump

Capacity:	90/188 m³/h each	
Head:	7/2 bar	
Drive:	Electric motor	
Speed:	1750 1/min	
Construction:	non-self priming, centrifugal, vertical	
Material:	pump housing:	bronze
	impeller:	bronze
	shaft:	stainless steel

1 Bilge ejector in chain locker

Capacity:	abt. 5 m³/h
Drive:	by fire, resp. deck washing pump

1 Bilge water separator

Capacity:	5 t/h
Heating:	steam/electrical
Oil drainage:	automatically controlled
Purity	max. 15 ppm.

The bilge water separator to be arranged in the discharge line of bilge pump for engine room bilges.

A monitoring unit for the bilge water separator is to be provided with 15 ppm alarm and automatic changing over.

1 Emergency fire extinguishing pump

Capacity:	90 m³/h	
Head:	7 bar	
Drive:	Electric motor	
Speed:	1,750 1/min	
Construction:	non-self-priming, centrifugal, horizontal	
Material:	pump housing:	bronze
	impeller:	bronze
	shaft:	stainless steel

1 Vacuum unit

The vacuum unit serves as common suction device for ballast pumps, bilge pump and general service pump.

It consists of:	2 water ring pumps, driven electrically
	1 vacuum receiver.

3291 PIPING

BILGE LINES

Pipes	St. 37-2 galvanised DIN 2458/1626
Valves and fittings	stop valves, non-return valves
Body	cast iron
Inner parts	bronze
Mode of joint	flanges, DIN 2576 PN 10

BALLAST LINES

Pipes:	St. 37-2, galvanised, DIN 2458
Valves and fittings:	butterfly valves
Body:	GGL, rubber lined
Inner parts:	Bronze, shaft Niro
Mode of joint:	Couplings, flanges, DIN 2576 PN 10

FIRE MAIN LINES

Pipes:	St. 37-2 galvanised DIN 2458/1626
Valves and fittings:	
Body stop valve:	cast iron
Inner parts stop valve:	bronze
Drain plugs:	brass
Fire hydrants:	red brass, instantaneous coupling type
Mode of joint:	couplings, flanges, DIN 2576 PN 10

2704 FLUSHING OF CHAIN CABLES

Hawse pipes to be fitted with 3 nozzles each. 1 valve for each hawse pipe to be operated from forecastle deck.

2671 CO_2-FIRE EXTINGUISHING SYSTEM FOR CARGO HOLDS AND ENGINE ROOM

Concept

A CO_2-system to be installed as fixed fire extinguishing system for suitable cargo holds and engine room. The system to be laid out as a "total flooding system" for engine room (quick-opening valves for group discharge).

For cargo holds a smoke detecting system to be installed. The above mentioned CO_2-pipe system will be used. Smoke detector cabinet in CO_2-room with audible and visual alarm in wheelhouse.

For engine room a fire detecting system to be installed.

Sufficient number of CO_2-bottles to be installed in the CO_2-room arranged on main deck. Access and transport of CO_2-bottles to the CO_2-room via door from open deck. CO_2-room is fitted with weighting device.

The room to have adequate mechanical ventilation (exhaust air). Fire insulation in places where required by regulatory bodies, thermal insulation to Builders' standard at exposed deckheads outer walls, and which are exposed to engine room etc., insulation to be covered by steel plates, galvanised.
CO_2-piping to cargo holds to be installed under main deck.
CO_2-discharges to be arranged in cargo holds and in way of engine room to enable effective distribution of extinguishing gas.

Layout and arrangement of the system, such as

- fitting out of bottles,
- releasing,
- piping,
- valves, discharges etc.,

according to regulatory requirements.

Emergency diesel room is connected to CO_2-system too.

to be provided for scavenging air duct of main engine.

The CO_2-cylinders necessary to be installed in engine room.

Release to be local.

318 FRESHWATER PLANT

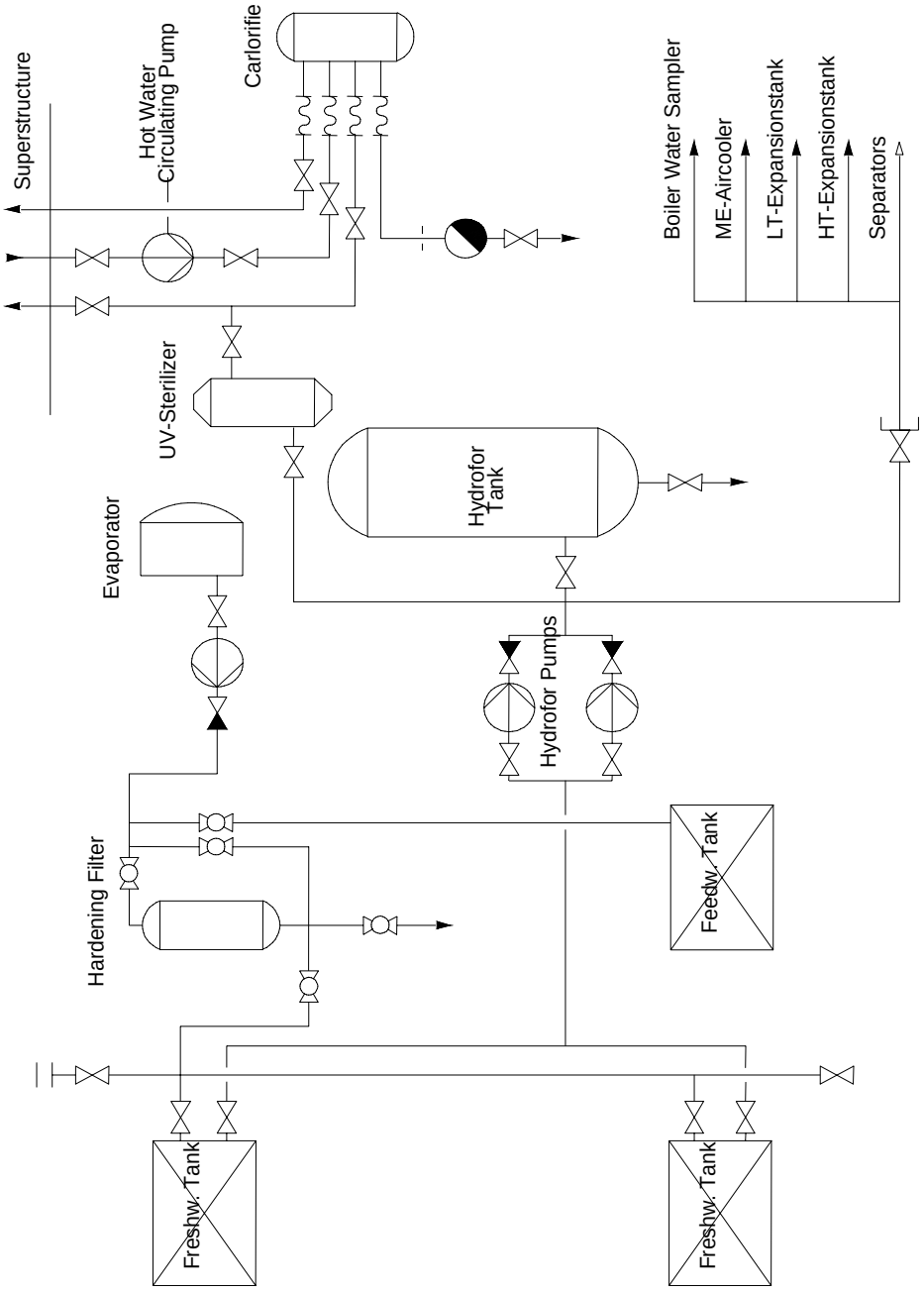
Concept

Two freshwater sanitary hydrofor pumps take suction from either storage tank port or starboard and discharge to sanitary hydrofor tank.

Beyond that, a freshwater generator is provided. Heating ist effected by cylinder cooling water of main diesel engine.

Hot sanitary water will be generated by heat of the calorifier.

For guidance only



Sanitary System Engine Room

3181 FRESHWATER GENERATOR

1 Freshwater generator

Process:	one stage	
Capacity:	20 t/day	
Heating medium:	Main engine cooling water	
Cooling medium:	Sea water	
Material:	Shell:	steel
	Tubes or plates:	stainless steel

Accessories:

1 chemical dosing system
1 Air ejector (or vacuum pump)
1 Brine pump (or brine ejector)
1 Distillate pump
1 Distillate quantity meter
1 Salinity indicator system with alarm
1 Ejector water pump

In case of too high salinity, the distillate will be drained automatically back to fresh water generator.

Ejector pump to have a sea suction valve. Ejector pump and distillate pump to have an interlock.

3183 DRINKING WATER TREATMENT SYSTEM

One drinking water hardening filter with accessories including one charge and one spare chart to be provided.

One UV-plant complete with accessories for the drinking water make up system to be provided.

Capacity: 9 m^3/h

3254 FRESH WATER HYDROFOR TANK

Number:	1
Capacity:	1500 litres
Material:	steel, galvanised inside and outside
Accessories:	Flow switch
	gauge
	safety valve
	pressure switch

The pressure switch to start and stop the hydrofor pump depending upon the pressure in the tank.

HOT WATER HYDROFOR TANK

Number:	1
Capacity:	650 litres
Material:	steel, galvanised inside and outside
Heating:	steam, additionally an electric heating is to be provided

The tank to be filled automatically from fresh water hydrofor tank.

3254 PUMPS

2 hydrofor pumps

Capacity	6,6 m³/h	
Head	5 bar	
Drive	Electric motor	
Speed	1800 1/min	
Material	pump housing	bronze
	impeller	bronze
	shaft	stainless steel

2 hot water circulating pump (1 as spare, not installed)

Capacity	1 m³/h	
Head	0.3 bar	
Drive	electric motor	
Speed	3500 1/min	
Material	pump housing	cast iron
	impeller	bronze
	shaft	stainless steel

2711 PIPING COLD FRESH WATER SYSTEM

Cold fresh water to be supplied from a hydrofor tank system installed in engine room, feeding:

- all wash basins, hand wash basins, washing troughs etc.
- all showers, bath tub in hospital,
- sinks in galley, pantries and various rooms
- various taps in galley, pantries and laundry,
- washing machines,
- hot water boilers etc.,
- various taps outside on open decks in way of deckhouse.

Piping above main deck:	PVC pressure pipes, not insulated
Piping below main deck:	Steel galvanised
Valves and fittings:	Valves > DN 50 GG-02, DIN 86251
	Valves DN 16 - DN 40 G-Cu Zn33 Pb, DIN 3512
	Valves < DN 12 Rg-S, DIN 86501
Mode of joint:	PVC pipes with adhered connection, steel pipes screw couplings, flanges

2712 PIPING HOT FRESH WATER SYSTEM

Hot fresh water to be supplied from fresh water hydrofor tank system via a hot water hydrofor tank installed in engine room, serving:

- all wash basins, hand wash basins, washing troughs etc.,
- all showers, bath tub in hospital bath room,
- sinks in galley and various rooms.

Inside each accommodation deck the hot fresh water piping system to be installed as a ring system (supply and back flow).

Piping:	Copper (WICU-pipes) DIN 1754,
	pre insulated pipes > DN 25
Valves and fittings:	Valves > DN 50 GG-02, DIN 86251
	Valves DN 16 - DN 40 G-Cu Zn33 Pb, DIN 3512
	Valves < DN 12 Rg-S, DIN 86501
Mode of joint:	soldering connection

All branch lines from main rising pipes for cold fresh water, hot fresh water supply and hot fresh water back flow to get stop valves, at every deck level to port and starboard side for easy isolation.

Stop valves on each accommodation deck, arranged such as to be accessible at every time.

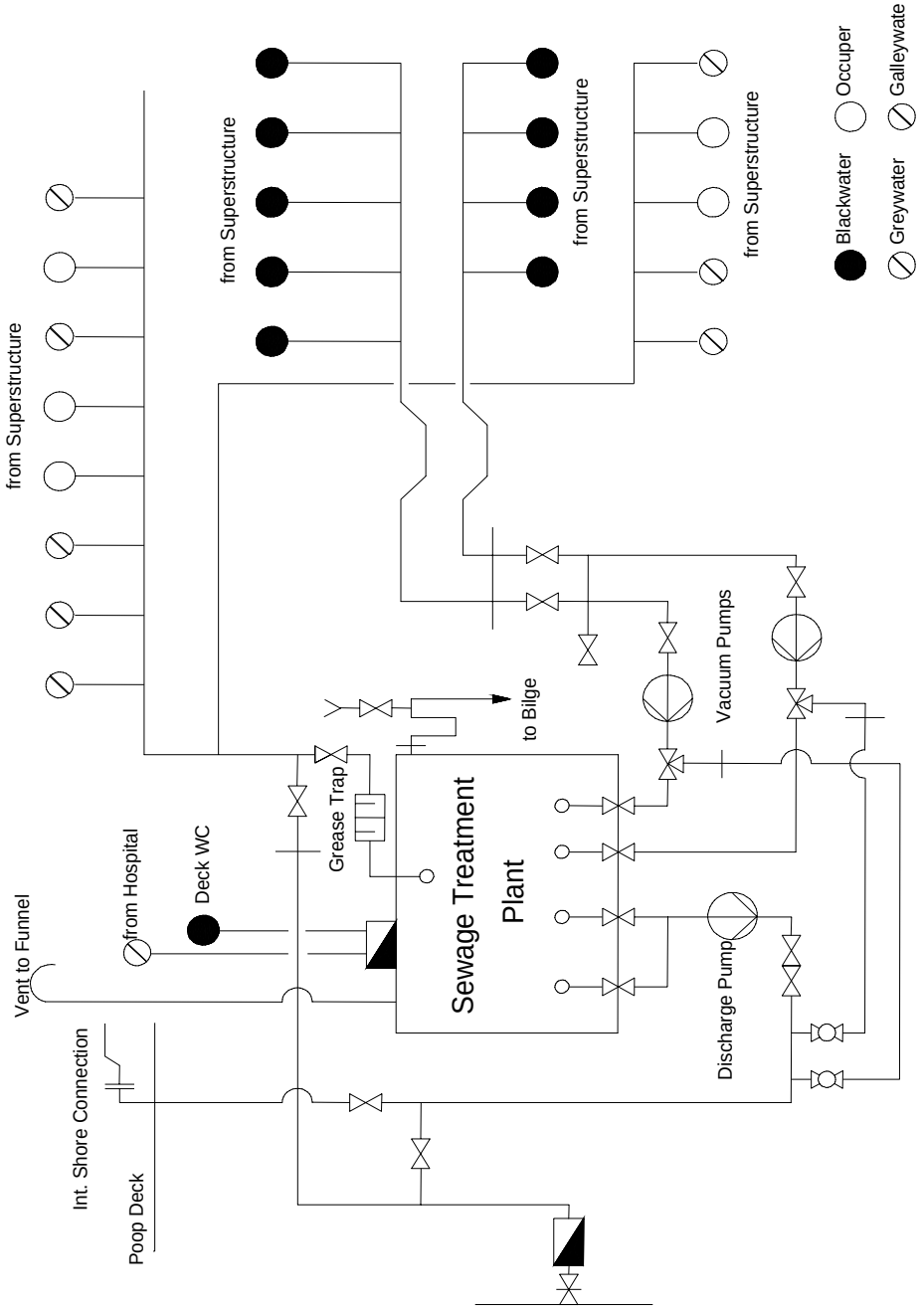
3257 SEWAGE PLANT

A fully automatic biologic sewage disposal sterilising system of adequate capacity for max. 40 persons is to be installed in a suitable place in engine room. The system to be of makers' approved design.

The sewage plant to be provided with a vacuum device in order to maintain the vacuum necessary for the sanitary system.

Possibility for discharge of sewage directly overboard to be provided.

For guidance only



Sewage Treatment System

2694 PIPING SEWAGE PLANT

Drain piping from all sanitary rooms floor scuppers etc. in accommodation to be provided in two separate systems:

a) WC-soil piping (vacuum-WC plant)
b) Sanitary drain piping (from sanitary drains, showers, bath tubs, sinks in galley, floor scuppers etc.)

Both piping systems to be collected in separate headers which to be led into the sewage collecting tank installed in engine room. Bypass-piping with storm valves for direct overboard discharge are provided.

All hospital grey water to be led independent to other systems direct to the sewage tank, no overboard discharge.

Outlet and drain pipes are fitted with air pipe vents at end lines (rising lines).

Deck sleeves for plastic type pipes to be Builders' standard.

Where necessary, cleaning plugs to be fitted in way of drain pipes and soil pipes.

Piping black water:	LORO-VAC/galvanised steel
Piping grey water:	LORO-X/galvanised steel
Valves and fittings:	LORO sockets with seal element valves GG-02
	Gate valves GG/RG DIN 86703
	Non-return flaps GS DIN/HNA
Body storm valves:	cast steel
Inner parts storm valves.	bronze
Mode of joint:	up to DN50 screw fittings, above DN50 flange

3259 INCINERATOR PLANT

1 Incinerator

The Incinerator plant to be capable of burning sludge oil and burnable waste.

Capacity: max. abt. 50 kg/h solid waste of abt. 2,000 – 2,500 kcal/kg caloric value
or max. abt. 45 kg sludge oil of abt. 6,000 kcal/kg caloric value

The incinerator plant to be started with marine diesel oil.

If the plant has reached the working temperature, the plant to be changed over burning sludge oil etc.

269 PIPING HULL

2693 DRAINAGE OF VARIOUS DECKS AND CARGO HOLDS

DRAINAGE OF MAIN DECK

For drainage of exposed main deck drain holes to be cut-in into the extended sheer strake plate on port and starboard side. Rubber plugs to be supplied for closing.

No scuppers to be provided in this area.
No drainage to be provided in way of lifeboat, accommodation ladder and pilot ladder.

DRAINAGE OF SUPERSTRUCTURE DECKS

All exposed decks in way of superstructure as well as forecastle deck and funnel top to be drained through scupper pipes to Builders' standard. Drainage through scupper pipes NW 65 (except NW 50 for stair landings). Scupper pipes terminate immediately above the respective exposed deck below.
Number of scupper pipes on the respective decks according to actual requirements.

DRAINAGE OF DECK STORES

Deck stores as well as rooms for ship's service arranged on main deck, such as switch cubicles, auxiliary engine rooms etc. to get drain plugs fitted into outer walls.
Drainage onto open deck.

DRAINAGE OF CARGO HOLDS

Cargo holds to be drained via drain wells arranged in each cargo hold P&S in double bottom. Drain wells single-compartment type and connected to vessel's bilge system.

DRAINAGE OF ROOMS FORWARD

Chain lockers, boatswains stores and forward rope stores to be drained via one each ejector, drive from fire main.
Outlet: direct overboard, discharge opening above deep load line.

DRAINAGE OF WATER BALLAST TANKS

All water ballast tanks incl. aft peak and fore peak are connected to the ship's ballast system.

DRAINAGE OF ROOMS IN ACCOMMODATIONS

For drainage of wet spaces in way of accommodation floor scuppers to Builders' standard to be provided in

galley
dry and cold provisions store rooms
lobby of provisions cold store rooms
WC-rooms, wash rooms, laundry, and
steering gear compartment.
Entrance space to accommodation on main deck.

One scupper to be provided and to be installed at aft end of rooms, as far as possible. In larger rooms such as galley and provisions rooms etc. scuppers to be provided in sufficient number and to be arranged as necessary.

Scuppers to Builders' standard with plastic filters in cast steel casings. Scuppers in provisions store rooms to be fitted with gas trap and brine lock, scuppers in way of accommodation to have odour seals.

DRAINAGE OF SANITARY ROOMS

All showers, wash basins, sinks etc. to have drains to Builders' standard.

Pipe: St. 37-2 galvanised DIN 2458/1626

369 VENT AND SOUNDING PIPES

3691 VENT PIPES

Ballast, fuel, lub. oil and fresh water tanks as well as cofferdams and empty cells are provided with vent pipes according to the requirements of the Classification society. Oil and fresh water tanks vent pipe hoods will be provided with protective screens. Vent pipes on main deck to be arranged such as to fulfil leakage stability requirements.

Material for water tank vent pipes: steel galv.
Material for oil tank vent pipes: steel black

3692 SOUNDING PIPES

Sounding pipes to be provided for:

heavy fuel oil bunker,
heavy fuel oil tanks in double bottom,
void spaces and chain lockers,
ballast tanks.

Furthermore, tanks in engine room to be fitted with sounding equipment as required by the Classification society.

Sounding pipes for oil tanks to be black steel pipes 2½" = ND 65.
Fittings and screws to be painted and black, respectively.

Sounding pipes for other compartments to be steel pipes galvanised, 1½" = ND 40.

Wall thickness of all piping to Classification requirements.

Sounding pipes installed to be protected by walls and bulkheads.

Striking plates to be fitted under sounding pipes.

Sounding pipes in bulwarks, open rails and between hatchway coamings are to terminate above deck and to have screw caps, in unobstructed decks to terminate flush with deck and to have screw plugs.

Screw cap:	bronze
Screw plug:	casing steel, screw cap stainless steel

Pipe sockets and screw caps are connected together, so that they cannot be lost.

331 TANKS

The tanks to be of steel or of plastic construction for small portable tanks. Larger tanks to have manholes, smaller tanks to have hand holes, if necessary.

All tanks to be pressure tested with water up to the highest pressure possible to occur, in accordance with Classification requirements.

TANKS IN ENGINE ROOM

1	Diesel Oil Side Bunker
1	Diesel Oil Daily Service Tank
1	Heavy Fuel Oil Settling Tank I
1	Heavy Fuel Oil Settling Tank II
1	Heavy Fuel Oil Daily Service Tank
1	Heavy Fuel Oil Storage Tank
1	Fuel Overflow Tank Engine Room
1	Fuel Line Leak Tank
1	Sludge Oil Tank/Dirty Oil Tank
1	Lubricating Oil Storage Tank
1	Lubricating Oil Drain Tank for Main Engine
1	Cylinder Oil Storage Tank
1	Cylinder Oil Service Tank
1	High Tank for Stern Tube Lubrication
1	HD Oil Storage Tank

3288 TANK GAUGING SYSTEMS

METHODS

The following three methods to be applied for measurement to ascertain the contents of the respective tanks:

a) Level measurement by means of sounding
b) Level measurement by means of sight glass or instruments locally
c) Level measurement by means of remote indication.

Remote indication for fuel oil bunkers settling and day tanks as well as ballast tanks to be arranged in vicinity of control panel for bilge and ballast valves.

332 ENGINE ROOM FACILITIES

MACHINERY WORKSHOP

1 work bench with two parallel vices 135 mm width of jaws.
Lower part of work bench to be of steel plate, with drawers and lockers. Table top to be of wooden planks
1 board for stowing and securing tools.

Lockers and racks of steel plate for stowage of tools, in number and of construction to Builders' standard.

1 fuel nozzle test stand.

One each pipe line for oxygen and acetylene to be permanently installed between cylinder room in deck in way of accommodation and machine workshop, complete with reducing station in cylinder room and extraction station in machinery workshop. Cylinder room to be devided for oxygen and acetylene.

MACHINERY STORE

The machine store to be equipped with lockers and racks of steel plate in number and of construction to Builders' standard.

ELECTRICIAN'S WORKSHOP

1 work bench with a parallel vice 135 mm width of jaws. Lower part of work bench to be of steel plate, with drawers and lockers. Table top to be of wooden planks.
1 board for stowing and securing tools.

Lockers and racks of steel plate for stowage of tools in number and of construction as to Builders' standard.

For test panel, see the Electric Specification.

ELECTRIC STORE

The electric store to be equipped with lockers and racks of steel plate in number and of construction to Builders' standard.

3322 LIFTING GEAR

Transportation and handling of spare parts is of an approved design.

Hoist suitable for suspension in underflange trolleys or lifting eyes are to be stored in store room.

ABOVE MAIN PROPULSION ENGINE

Type:	travelling crane
Number:	1
Lifting capacity:	5,000 kg
Lifting height:	to centre of crank shaft
Travelling gear of crane:	electrically driven
Travelling gear of trolley:	electrically driven
Hoisting gear:	electrically driven
	two lifting speeds
	normal speed abt. 6.0 m/min
	slow speed abt. 1.5 m/min

Rails for the transport of engine parts to be designed according to weight of main engine (piston, cylinder liner, cylinder head).
Max. weight: 5 t.
Eventually a wheel dolly to be provided instead of rails.

ABOVE AUXILIARY DIESEL ENGINES

One girder for under flange trolleys are to be arranged above each auxiliary engine (lifting capacity 500 kg).

ABOVE SHAFTING

For propeller shaft and intermediate shaft handling purposes, suitable chain hoist blocks and arrangements for putting aside the shafts are to be provided to local requirements and Builders' experience.

OTHER LIFTING GEAR

Lifting eyes to be fitted over larger machinery and apparatus.

HANDLING FACILITIES

For handling machinery parts between workshop and engine room a track to be provided for a lifting capacity of 5000 kg.

Similarly, a track to extend above separators to the cleaning table.

Either track to be fitted with underflange trolley.

Possibilities to be provided for the transport of loaded pallets (1.2 m x 1.2 m) from deck to engine room.

3323 MACHINE TOOLS

LATHE

1 lead-screw and feed-screw lathe with direct electric motor driven, 250 mm centre height, 1,500 mm turning length, with following accessories:

1 three-jaw chuck 260 mm, with turning jaws and chuck spanner
1 fastening disc for three-jaw chuck,
1 universal face plate 400 mm, with gripping jaws and chuck spanner
1 steady rest
1 dead centre for the tubular shaft
1 dead centre for the sliding poppet
1 live centre for the sliding poppet
1 each lathe carrier, clear diameter 30, 50, 80, 110 and 160 mm
2 tool holders with bits.

DRILLING MACHINE

1 upright drilling machine with direct electric motor drive, bore capacity up to 30 mm, with following accessories:
1 vice, breadth of jaws 140 mm
4 clamping devices with headed bolds and stepped type supports

GRINDING MACHINE

1 wheel stand for two grinding wheels, with direct electric motor drive, grinding wheels 200 mm diameter.
1 valve grinding machine for main engine exhaust valves.

Larger machine tools are to be equipped with lamp.

WELDING EQUIPMENT

1 complete gas welding equipment, without pressure reducer and without gauges
1 bottle oxygen
2 bottles acetylene
1 pressure reducing valve for oxygen
1 pressure reducing valve for acetylene
20 metres hose for oxygen, both ends bound in ready
20 metres hose for acetylene, both ends bound in ready
4 suitable spare hose clips
4 welding goggles
2 gas igniter with flint
1 portable welding rectifier (see electric spec. page 4/61).

NAME PLATES

All machinery and apparatus to be fitted with engraved name plates, indicating the service and capacity. All fittings to have name plates of brass.
Language: english/italian

OTHER EQUIPMENT

A tank sounding board to be fitted in a suitable place in engine room.

345 FLOORING, STAIRS

3451 FLOORING

SUPPORTING FRAMES FOR FLOORING

Flooring to consist normally of patterned steel plates 5 mm thick.

The supporting frames to consist of sectional steel fastened to the intermediate frames of modules.

Grids and patterned steel plates to be bolted to supporting frames.

3452 LANDINGS, GALLERIES, WALKWAYS, LADDERS

Landings, galleries and walkways are basically to be laid with patterned steel plates of 5 mm thickness or light passing grating. Derivation from this provision grids to be used in critical places to Builders' experience, in order to avoid stagnation of air. Rotating parts of engines, located under grids to be protected by dirt collecting plates.

Landings, galleries and walkways are to have rails and stanchions with hand rails and one rod fitted at the exposed sides (Rails and stanchion according to DIN 83205, page 1.).

Ladders (according to DIN 83206, page 1) with welded steps of patterned steel plate with flanges are to be used in engine room and to have dirt collecting plates fitted under, where necessary.

All free extending ladders are to have hand rails at either side. Ladders arranged directly adjacent to walls are to have hand rails at the exposed side and to have hand rails fitted to the wall.

373 INVENTORY AND TOOLS

Lifting Equipment

1	Planetary hoist, 9,000 mm lifting height, 7,500 kg lifting capacity
1	Planetary hoist, 5,000 mm lifting height, 3,000 kg lifting capacity
1	Planetary hoist, 5,000 mm lifting height, 1,000 kg lifting capacity
2	Pulleys, 3,000 mm lifting height, 1,500 kg lifting capacity
1	Car jack, 350 mm lifting height, 1,500 kg lifting capacity
1	Hydraulic jack with hand pump, 5,000 kg lifting capacity
4	Beam grabs
2	Manila ropes, double trace, 1,500 mm length, 430 kg
2	Manila ropes, double trace, 2,500 mm length, 630 kg
2	Steel ropes, single trace, with thimbles, 600 mm length, 1,650 kg
2	Steel ropes, single trace, without thimbles, 1,000 mm length, 1,650 kg
2	Steel ropes, double trace, with thimbles and ring, 600 mm length, 1,650 kg
2	Steel ropes, single trace, with thimbles and hooks, 800 mm length, 1,650 kg
1	Double chain with hooks and ring for barrels
4	each shackles, DIN 82101, size A 0.4, A 0.63, A 1, A 1.6, A 2 and A 2.5.
4	Roller cars, 10,000 kg portative force, each complete with pallet and guide rod
2	Crowbars, 1,000 mm length, with edge and peak
2	Hand spikes to raise and lift off machinery parts
4	each steel quoins, 100, 120 and 150 mm length
4	each timber quoins, 600, 720 and 900 mm length

Eye bolts 4 of each measurement M 10 to M 24

Measuring Instruments

4	Inch rules, timber, 2,000 mm length
1	Sound band, rustproof, measure length 30,000 mm
2	Sounding sticks, articulated, metrically graduated, 1,500 mm length
2	Outside calipers, 300, 200 mm length each
2	Inside calipers, 300, 200 mm length each
1	Feeler gauge, 20 blades, 100 mm length
1	Slide gauge with knife peaks, rustproof, measure length 300 mm
1	Dial gauge with holder, min scale 0.01 m, scale range 10 mm
1	Surface gauge, bar height 290 mm, spindle height 250 mm
1	Square 300 mm
1	Marking scriber, length 200 mm
1	Depth gauge, rustproof, measure depth 300 mm
1	Strap-micrometer with feeler screw, measure range 0 - 50 mm
1	Hand tachometer 10,000 RPM
1	Stop watch
1	Double test gauge with control socket pipe
1	Salinometer of white copper, with gauge glass
1	Thermo-aerometer, gamma 0.83 - 0.9
1	Gauge glass, 100 ccm, for aerometer
1	Gauge glass, 100 ccm, with graduation, 1 ccm for each index
1	Frame for proof glasses with 6 proof glasses
1	Spring balancer, 50 kg
2	Thermometer with holder (Alcohol), 50° C
2	Bar thermometer alcohol, 100° C
1	Bar thermometer mercury, 500° C
1	Tape measure, 100 feet
4	Paint scrapers, large 1,023 mm, small 260 mm (each two)

Tracing Tools

1 Crack plate, 500 x 500 mm
1 Pair of many-sides prism, 150 mm length each
1 Surface gauge, 400 mm height
1 Steel tape measure, 1,000 mm length
1 Steel rule, 1,000 mm length
1 Flat-square, 250 x 160 mm
1 Try-square, 250 x 160 mm
2 Marking scribers
2 Centre punch
1 Sweep with adjusting link, 300 mm length
1 Magnifying glass
1 Package of white chalk
1 Package of yellow chalk to mark

Locksmith's Tools

1 Portable work bench, 1,000 x 500 mm, with parallel vice, width of jaws 150 mm, with pipe gripping device
2 Pair of copper vice-grips, 150 mm
2 Pair of lead vice-grips, 150 mm
2 Filing vices, 160 mm, with key
2 Screw clamps, 120 mm span width, 250 mm span length
1 Hand hammer, 200 grams, with handle
1 Hand hammer, 1,000 grams, with handle
1 Ball hammer, 500 grams, with handle
1 Rubber hammer, 70 mm diameter, with handle
2 Boiler scaling hammers, 500 grams, with handle
1 Copper hammer, 3,000 grams, with handle
1 Flat chisel, 150 mm length
1 Flat chisel, 300 mm length
1 Cross-cutting chisel, 200 mm length
1 Cowmouth chisel, 180 mm length
1 Bar chisel, 1,000 mm length
1 each drift punch, 3.5 and 8.0 diameter

1 each angle drift pin, 12, 20 and 24 mm diameter
1 each hollow punch, 10, 12, 18, 20, 24 and 30 mm diameter
1 set of punching numbers, 8 mm height
1 set of punching letters, 8 mm height
1 Cutting pliers, 220 mm
1 Combination pliers, 180 mm
1 Flat pliers, 160 mm
1 Pin tongs, 160 mm
1 Side nippers, 160 mm
1 Gas pliers (pliers for water pumps), 240 mm
2 Gas pliers, 50 mm
1 Flat scraper, 300 mm, with handle
1 Triangular scraper, 300 mm, with handle
1 Spoon scraper, 300 mm, with handle
1 Spiral scraper, 300 mm, with handle
1 Flat smooth file, 350 mm, with handle
1 Flat bastard file, 350 mm, with handle
1 Half-round smooth file, 300 mm, with handle
1 Half-round bastard file, 300 mm, with handle
1 Round smooth file, 250 mm, with handle
1 Round bastard file, 250 mm, with handle
1 Square smooth file, 200 mm, with handle
1 Square bastard file, 200 mm, with handle
1 Three-square smooth file, 200 mm, with handle
1 Three-square bastard file, 200 mm, with handle
1 Knife edge file, 200 mm, with handle
1 set of warding files, with handle
3 each spare file handles of each size supplied
1 File brush
2 Wire brushes
1 Hacksaw with saw web
6 Spare saw webs

1 Electric hand drilling machine, drilling capacity up to 20 mm,
with Morse taper, complete with machine column and scroll chuck,
chucking capacity up to 15 mm

1 each twist-drill with cylindrical tang, 2 to 15 mm diameter, in steps of 0.5 mm, total 27 pieces, complete with steel box

1 each twist-drill with tapered tang, 15.5 to 32 mm diameter, in steps of 0.5 mm, total 34 pieces, complete with steel box

1 each twist-drill with cylindrical tang for tape holes

2.5 mm for M 3	3.3 mm for M 4
4.2 mm for M 5	5.0 mm for M 6
6.7 mm for M 8	8.4 mm for M 10
10.0 mm for M 12	13.75 mm for M 16

1 each twist-drill with tapered tang for tape holes

17.25 mm for M 20	20.75 mm for M 24

1 each taper drill, DIN 335, 16 and 20 mm diameter
1 each centre drill, 3.15 and 6.3 mm diameter
1 each hand reamer, 8 to 20 mm diameter, in steps of 1 mm, total 13 pieces, complete with steel box
1 Adjustable tap wrench for hand reamer
1 Box with taps and dies for threads M 3, M 4, M 5, M 6, M 8, M 10, M 12, M 16, M 20, and M 24, consisting of taps with tap wrenches and dies with die stocks
1 Ratchet die stock for pipe thread ¼ to 1 ½ ″
1 Grind stone, 100 x 50 x 27 mm, coarse and fine
1 Screw driver, 125 x 6 mm
1 Screw driver, 150 x 8 mm
1 Screw driver, 200 x 10 mm
6 Different packing sticks
5 Different packing drawers
1 Packing knife
8 Different brushes, including 2 angle brushes
1 Pair of scissors for paper
1 Circular shears
4 Eye protectors
1 each extractor with two arms, spread 80, 160 and 250 mm

1 each double ended open wrench, DIN 3110

6 x 7	8 x 9	10 x 11	12 x 13	14 x 15	16 x 17
18 x 19	20 x 22	21 x 23	24 x 27	25 x 28	30 x 32

1 each double ended dodecagonal ring spanner (either ends set off) with unequal spanner widths (according to DIN 838).

6 x 7	8 x 9	10 x 11	12 x 13	14 x 15	16 x 17
18 x 19	20 x 22	21 x 23	24 x 27	25 x 28	30 x 32

Smith's Tools

1 Anvil, 80 kg, with anvil block
1 Anvil horn
1 Anvil chisel
1 Cold chisel with handle
1 Sledge hammer, 5,000 grams, with handle

Special Tools

1 Dodecagon slugging ring wrench for the coupling bolts of the line shafts
1 Single ended wrench of steel plate for the coupling bolts of the line shafts
1 Wrench for deck screw caps

All Special Tools have to bear a mark stating their purpose uf use.

Oil Containers

2 Oil cans with handle and spout, 10 litres
2 Oil cans with handle and spout, 5 litres
2 Oil cans with pump and jet pipe, 0.5 litre
2 Oil measures with funnel-shaped riser, 1 litre
1 Funnel with straight drain, with sieve and riser border, 200 mm ∅
1 Funnel with angle drain with sieve and riser border, 200 mm ∅
1 Stool for oil barrels
1 Drain cock for oil barrels
2 Drip pans, 750 x 350 x 50 mm, with anti-rolling frame for oil feeders
2 drip and cleaning pans to fit the largest filter insert

Material Containers

1 Container for spare fillings to the fire fighting gears

1 Container of suitable size for piston rings

All containers according to Builders' standard.

Lamps

2 Safety hand lamps, gas and water tight, complete with storage battery

1 Safety lamp

1 Head lamp with 1 set of flashlight cells as spare

1 Inter-room lamp, 10 mm diameter, 1,000 mm length with 1 set of flashlight cells as spare

1 Inter-room lamp, 30 mm diameter, 1,000 mm length complete with 10 m cable and plug key.

Cleaning Utensils

1 Cleaning table with water drainage, arranged near the separators

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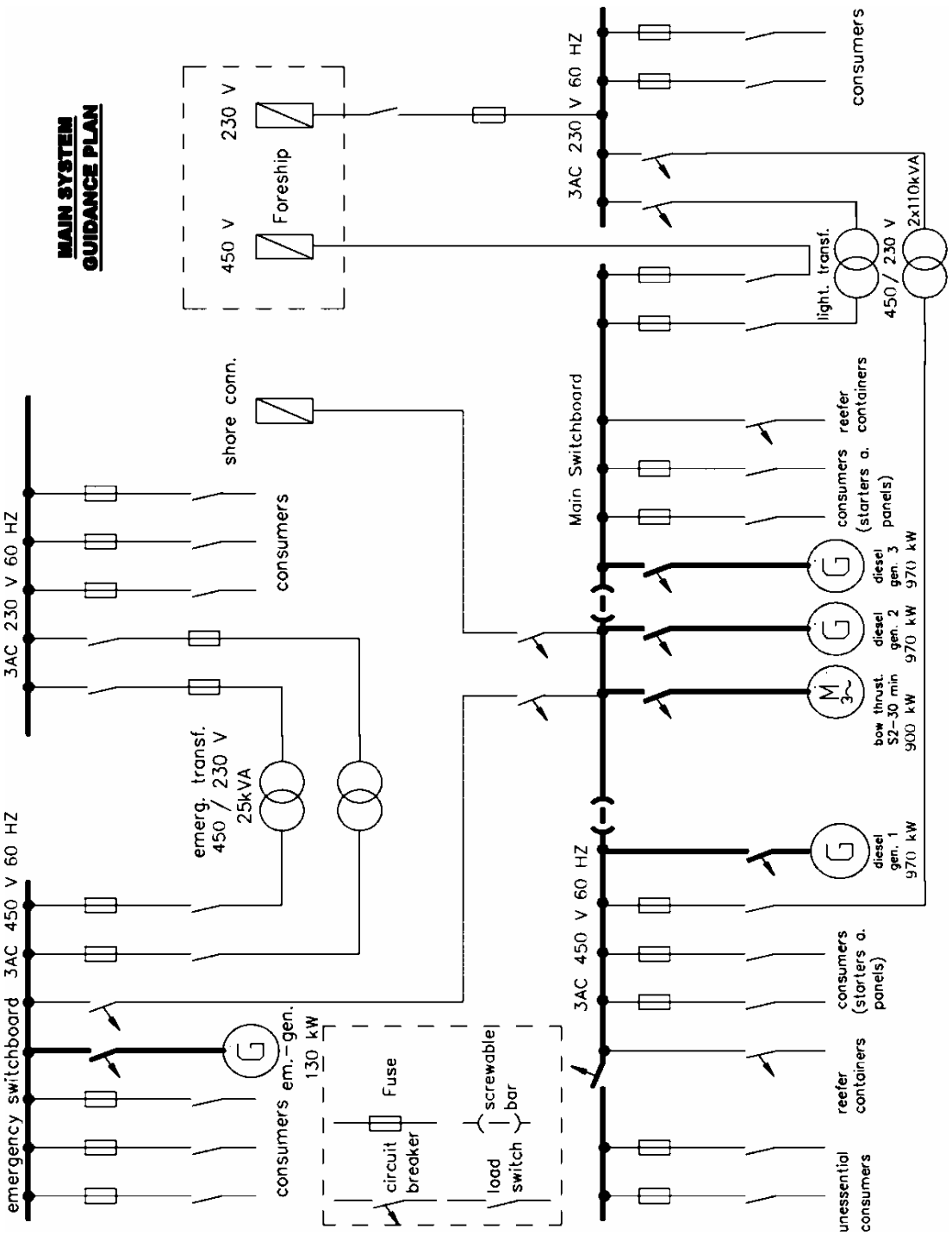
4 ELECTRIC PLANT


MAIN SYSTEM
GUIDANCE PLAN
emergency switchboard
3AC 450 V 60 HZ
3AC 230 V 60 HZ
emerg. transf.
450 / 230 V
25kVA
consumers em.-gen.
130 kW
circuit breaker
Fuse
load switch
screwable bar
shore conn.
consumers
450 V
230 V
Foreship
Main Switchboard
3AC 450 V 60 HZ
3AC 230 V 60 HZ
diesel gen. 1
970 kW
bow thrust.
S2-30 min
900 kW
diesel gen. 2
970 kW
diesel gen. 3
970 kW
consumers (starters a. panels)
reefer containers
consumers (starters a. panels)
reefer containers
unessential consumers
light. transf.
450 / 230 V
2x110kVA
consumers

ELECTRIC PLANT GENERALLY

The electric system to be laid-out so that one diesel generator will be capable of covering the power demand necessary during normal "at sea" operation in the tropic without reefer containers.

For "at sea" operation in the tropic with 80 FEU reefer containers (80 pcs. x 11,0 kW x sim. factor 0.50 = 440 kW) the parallel operation of two diesel generators will be capable to cover the power demand.

Manoeuvring load (without reefer containers, but with transverse thruster) to be covered by two or three diesel-driven generators. For the design of the current generating system see Electric Load Balance attached.

The following shipboard main voltages are to be provided:

Power consumers and large domestic equipment:	A.C.	3 x 450 V, 60 Hz
Smaller power units and domestic equipment:	A.C.	230 V, 60 Hz
Lighting and emergency lighting system and plug socket connections:	A.C.	230 V, 60 Hz
Automation and communicating systems etc.	D.C.	24 V, AC 230 V

For the design of the electrical system see Main System Guidance Plan attached.

The cable system to be installed as a three and two wire system, communicating and automation systems all-polar.

The generator neutral point is not to be earthed.

The electric equipment supplied and the workmanship to be in accordance with Builders' practice and at least to Classification requirements and also in compliance with IEC recommendations.

ELECTRIC LOAD BALANCE (for guidance only)

		16980 kW	108 1/min
Prime mover:			
Ship mains:	3 phase	450 V	60 Hz
	2 phase	230 V	60 Hz
Generator plant:			
3 diesel generators (DG)	970 kW each	1213 kVA	900 1/min
1 emergency diesel generator	130 kW	163 kVA	1,800 1/min

Grade of automation:

Blackout - startautomatic

1. Sea service
   hot zone, no reefer containers, no cargo hold fans
   required: 750 kW
   in service / load: 1 x DG / 77 % 970 kW

2. Sea service
   hot zone, no reefer containers, cargo hold fans in operation
   required: 800 kW
   in service / load: 1 x DG / 82 % 970 kW

3. Sea service
   hot zone, 80 FEU reefer container, 11,0 kW each (sim. factor 0,5)
   cargo hold fans in operation
   required: (800 + 440) 1240 kW
   in service / load: 2 x DG / 64 % 1940 kW

4. Estuary
   no reefer containers, no transverse thruster
   required: 850 kW
   in service / load: 1 x DG / 88 % 1940 kW
   or 2 x DG / 44%

5. Estuary
   No reefer containers, but transverse thruster (900 kW)
   in service (850 + 900)
   required: 1750 kW
   in service / load: 3 x DG / 60 % 2910 kW
   or 2 x DG / 90 % 1940 kW

6. Estuary
   Transverse thruster, cargo hold fans and 80 FEU reefer containers, 11,0 kW each (sim. factor 0.5) in operation. (1750 + 440)
   required: 2190 kW
   in service /load: 3 x DG / 75 % 2910 kW

TYPE OF CABLES

All cables to be installed (except special cables) to be fire retardant (to IEC 60 332-3) and halogen-free (to IEC 60754-1) with type approval of classification society.

Following types will be used:

- MPRX / MPRXCX or similar
  for power-/control systems
- FMKHC or similar for communicating-/telephone-/ automations systems
- NHXMH- J or similar
  for lighting systems in accommodation area.

Special cables to be installed as per requirements for HF systems, navigational aids and bus systems.

Arrangements of cable ways and installation of cables to be in accordance with Builders' standard.

Mechanically endangered cables to be protected by corresponding arrangements such as pipes and so on.

420 CURRENT GENERATING SYSTEM

4201 DIESEL GENERATORS

Three electric three-phase current constant voltage type synchronous generators to be installed, brushless type.

The generators to be coupled directly to the diesel engines.

For diesel engines, see the Machinery Specification.

Capacity:	970 kW (1213 kVA) power factor 0.8 450 V three phase current
Frequency:	60 Hz
Speed:	900 l/min
Design:	IM B 20, roller bearing
Enclosure:	IP 23, terminal box IP 44
Insulation:	Insulation for tropical conditions, insulation class F
Radio interference suppression:	"N" to VDE 0875

The generators to have self-excitation and load dependent exciter control and to be suitable for continuous parallel operation with each other. Exciter equipment to be built-up on generator.

Anti-condensate heating to be provided to heat the generators when not running and to protect them from humidity, operating voltage 230 V.

The generators to be installed in the fore and aft direction and to have self ventilation. Air intakes to be equipped with filters to prevent penetration of oil mist and dust.

For control of winding temperatures, generators to be equipped with PT 100-sensors which are to release alarm in case of overheating. Sensors to be fitted one (and one sensor as spare) in each phase of the stator.

4202 GEAR-DRIVEN GENERATOR

Not provided

4203 EMERGENCY GENERATOR

One electric three-phase current constant voltage synchronous generator to be installed, brushless type.

Capacity:	130 kW (163 kVA) power factor 0.8
Voltage:	450 V three-phase current
Frequency:	60 Hz
Speed:	1,800 l/min
Enclosure:	IP 23, terminal box IP44
Insulation:	insulation for tropical condition, insulation class F
Design:	acc. to standard of engine maker
Radio interference suppression:	"N" to VDE 0875

Anti-condensate heating to be provided to heat the generator when not running and to protect them from humidity, operating voltage 230 V.

The emergency diesel engine to be electrically started by means of a battery.
The main busbar voltage to be monitored (3-phase) by the emergency diesel engine monitoring device.
On failure of the ship's mains the transfer line contactor in the emergency switch-board to be opened and the emergency diesel engine to be started.
After attaining of the emerg. generator voltage and opening of the transfer line contactor, the emerg. generator circuit breaker is automatically connected to the emerg. switchboard busbar.
This will ensure, that the consumers connected to the emerg. switchboard are fed during black-out of the main switchboard.
When the main switchboard is fed again by the diesel generator(s) the emerg. generator circuit breaker is opened and after an adjustable time the transfer line contactor in the emerg. switchboard will be switched on.
The emergency-diesel engine to be stopped delayed automatically.
The emergency generator not to be intended for parrallel operation with the main diesel generators

4205 TRANSFORMERS

Transformers installed to have natural air cooling, enclosure IP 23 with insulation class F for tropical conditions. Connection DELTA-DELTA No. 0 for parallel operation.

Two three-phase current transformers 450 V/230V + 5 % to be installed for the 230 V alternating current power supply of the lighting, small consumers, electric heating etc. The transformers to be fed from the main switchboard.
1 transformer as spare.
Transformer capacity 110 kVA power output each.

Two three-phase current transformers 450V/230V + 5 % to be installed for the 230 V alternating current power supply of the emergency lighting and the emergency consumers. The transformers to be fed from the emergency switchboard.
1 transformer as spare.
Transformer capacity 25 kVA power output each.

4206 BATTERIES

Batteries of suitable capacity to be supplied as necessary, for systems such as, for instance, emergency diesel starting, automation system, wireless communication system etc..

The batteries to be connected to charging devices fed by the ship's mains.

Lead batteries maintenance free and closed type are to be installed.

The charging devices to be provided for normal charging and continuous charging of the batteries.

Battery maintenance kit to be provided.

Charging of diesel engine starting battery of life boat by solar panel on the boat.

421 SWITCH GEAR

4211 MAIN SWITCHBOARD

The main switchboard to be located free-standing and to consist of a substantial profile iron frame with front, sides and top of sheet metal plate covers, rearside open.

The sheet metal plate surface to be preserved with a durable varnish paint. The colour shade to be RAL 6018.
The main switchboard to be installed in the engine control room inside the modular system.
Insulated hand rails to be fitted at the switchboard front and at the rear side of the switchboard, special rubber matting before front and at rear side of switchboard.

The main switchboard to be subdivided into individual panels, such as generator panels, panels for essential consumers, non-essential consumers, 230V consumers.

Measuring instruments for the generator panels to be installed in the upper part of the switchboard panels and to be as far as possible of one standardised size.

The generator panels to be equipped with:

1 automatic circuit breaker
1 generator protection / diesel control unit
1 ammeter with selector switch
1 voltmeter with selector switch
1 frequency meter
1 power meter
1 hour meter
1 switch for space heater with lamp

For emergency synchronizing to be installed one each lamp synchronoscop, speed setting switch, ACB control push buttons with lamps and all necessary control elements for each generator.

Each generator to have a draw out type and motor driven automatic circuit breaker, short circuit release and under-voltage release as well as an overload and reverse power relay which is to cut-out respectively the generator circuit breaker and the circuit breaker for the non-essentials consumers stage by stage.

The busbar of the non-essential consumers to be connected to the busbar of the essential consumers by means of an automatic circuit breaker.

Ammeter to be provided for outgoing distributing circuits of essential consumers connected directly to the main switchboard.

A power meter to be installed for measuring the load of the emergency/harbour generator.

Those circuit breakers having a switching capacity below the possible short circuit current are to be provided with additional back-up fuses.

In order to be able to test the insulation condition of the mains against earth insulation test instruments with alarm to be provided for each voltage system installed isolated.

4212 EMERGENCY SWITCHBOARD

The emergency switchboard to be located in the vicinity of the emergency generator and to be of a design corresponding to that of the main switchboard, but totally closed. Under normal operation conditions, the emergency switchboard to be fed from the main switchboard via a transfer line and a transfer line contactor in the emergency switchboard. On failure of ship's mains starting impulses to be transmitted to the emergency diesel start-automatic and the emergency generator to take over the feeding of the consumers connected to emergency switchboard.

At return of the ship's mains voltage, the emergency set will stop automatically. In case of emergency the emergency generator to feed only the emergency switchboard.

The following consumers to be connected to the emergency switchboard (preliminary distribution)

- Steering gear pump 1,
- Emergency fire pump,
- Wireless communication system,
- Navigation systems,
- Automation systems,
- Emergency lighting transformers,
- 1 engine room fan (reversible),
- 1 emergency diesel generator room fan,
- 1 rescue boat davit
- 1 whistle,
- 1 starting air compressor.

Other consumer as required by rules.

4213 DISTRIBUTION PANELS

Panels for the distribution of power and lighting to be installed as required. The distribution panels to be of the built-on or built-in type, according to Builders' standard and their location.

3 distribution panels to be connected in maximum to one feed line.
Most of the motor-starters are incorporated in the power distribution panels.

4214 TEST PANEL

A test panel will be installed in the electrician's workshop and to be equipped with test facilities, outlets and instruments.

Feeder cable

- 3 x 450 V, 60 Hz,
- 3 x 230 V, 60 Hz,

Leakage-protective switch and emergency switch to be provided.

4215 NAVIGATION LIGHTS PANEL

The navigation lights to be connected to a separate panel intended solely for this purpose and to be fed directly from the emergency switchboard via a separate feeder.

By means of a change-over switch, feeding of the navigation lights panel to be possible also from the main switchboard.

Each navigation light to be equipped with an automatic indication device to indicate failure of the lamp.

All navigation lights to be fed by 230 V A.C.
For number of navigation lights see Outfitting Specification.

4216 EMERGENCY STOP PANEL

One emergency stop panel to be arranged very close to engine room entrance. In case of fire cut-out of ventilators for engine room, fuel pumps etc. and fuel tank valves in engine room by remote controlling, according to Classification society.
For the **bunkering station** on port- and starboardside emergency push-buttons to be arranged for oil transfer pumps and sludge oil pump.

4217 SHORE CONNECTION

A shore connection box IP 23 to be provided for power supply from shore, to be installed in emergency diesel room.

The shore connection to be laid out for 400 Amp., three-phase current. The connection box to be equipped as follows:

- 1 main switch
- Fuses
- 1 rotary field indicator

The shore connection to be so interlocked that parallel operation with the ship's generators will not be possible.

414 AUTOMATION

The automation system to comply with the particular requirements by Germanischer Lloyd for periodically unattended machinery space of 24 hours.

For the design of the automation system see Automation Monitoring Diagram attached.

4141 PROPULSION PLANT REMOTE CONTROL

A diesel engine remote control system to be provided for remote control of the main engine by the combined telegraph and manoeuvring lever from the bridge, bridge wings and engine control room.
By moving this lever the system will automatically start, stop and control the speed set of the main engine.
Start, stop and reversing to be done electro/pneumatically by pneumatic valve cabinet.
A separate safety system to be provided to protect the engine from damage, with shut down, slow down and emergency stop functions as a standard.

Manual control is possible from engine side manoevring console.

See also Machinery Specification.

4142 MANOEUVRE PRINTER

A manoeuvre printing system to be installed to record the orders given and manoeuvres actually carried out. The printer is fitted on the bridge desk technic.

The system to record the orders as well as the respective main engine speed, simultaneously printing day and time.

4143 "BLACK-OUT" STARTAUTOMATIC AUXILIARY DIESEL ENGINES

The diesel generator sets to be arranged to a black-out start-automatic system.

After a black-out at the ships mains or in case of a failure at a running diesel generator set, this system will automatically start the selected stand-by diesel generator set and connect the generator after arrival of the nominal voltage to the dead ship mains.

In case of starting of the stand-by diesel generator set without success the order for starting to be transmitted to the next diesel generator set.

The running diesel generator set to be monitored for failure.

Synchronising, parallel switching and load sharing of diesel generators is to be made automatically.

4144 CENTRAL MONITORING AND ENGINEER'S ALARM SYSTEM

The alarm plant is monitoring the main engine with associated auxiliary machines, the generating plant and the steering gear machinery.

The system to be laid out with decentralised peripherals and redundant bus system for abt. 280 alarm channels whereof abt. 70 sensors are analogous type transmitter.

The exhaust gas temperatures of the main engine to be monitored for deviation from temperature average values.

The equipment will receive analogue and/or binary signals, process them, display measuring values and alert in the event of malfunctions. All signals will be evaluated and processed by substations - arranged in the ship as necessary. The substations are coupled to the central computer unit via a bus system.

Binary signals will be monitored according to the closed-circuit principle.

Measuring values and alarms will be visualised alphanumerically on one display screen (19") in ECR and one display screen (17") in Chief Eng.'s Office. Selection will be from a keyboard. Group alarm panel on nav. bridge to be provided.

Print-out of malfunctions and measuring values will be on a **log printer** (arranged in ECR).

In engine room light beacons to be provided for machinery alarm, telephone, telegraph call, fire, CO^2 alarm and general alarm. In addition to the hooters red and yellow flashing lights to be installed.

During **unmanned engine room operating**, visual and audible alarm to be released on navigating bridge, in the cabin of the engineer on duty, in Officer's mess and duty mess in addition to the engine room alarm specified before.

The standby selector tableau for the engineer's alarm system with the pre-selection of the competence (nav. bridge/ECR) and the switch for selection the engineer on duty to be installed in engine control room.

In addition one alarm push button to be arranged in ECR for calling the engineers by means of this alarm.

Abt. 25 measuring points to be continuously indicated by analogous indicating instruments in the ECR control desk.

For monitoring of the shaft bearing temperature sensors to be provided.

SYSTEM DESCRIPTION

1. Basic configuration

The Automation Unit (AG) in the Engine Control Room (ECR) processes data from the station (ECR) and the sub-stations (UST). UST data are input via a redundant bus system.

2. Bus-system

The redundant bus system comprises two physically separate bus cables for bus 1 and bus 2, which are monitored cyclically to guarantee their availability.

The automation unit monitors the status of both bus lines and, if a fault develops, switches from the defective bus to the back-up bus without interruption and without restricting data throughput.

3. Monitoring and operation

Colour monitors and keyboards with a trackball/mouse are provided for the watch duty stations.
The following information can be called up on the monitors using the keyboard:

Display:

- of all incoming alarms with acknowledgement via message graphics
- of all confirmed or unconfirmed alarms (alarm list)
- Overview of alarm messages in the sub-stations
- Overview of all engine and operating data, including the set limit values
- Exhaust gas temperature monitoring of the main engine in the form of a bar chart combined with numerical values
- Password-controlled parameter adjustment by authorised personnel only
- Simple setting of local time

A part of sub-stations are equipped with an Operator Panel (OP).

The OP offers the facility for calling up all important information relating to the entire system via keyboard and text display, for example alarm status of waiting alarms, engine data and other operating data.

Further system redundancy is provided with these additional local displays, which are available without restriction, even in the event of PC/monitor failure.

4. Fault alarm recording

The system fault alarm printer records and prints out details of the start and end dates and times of all incoming alarms.

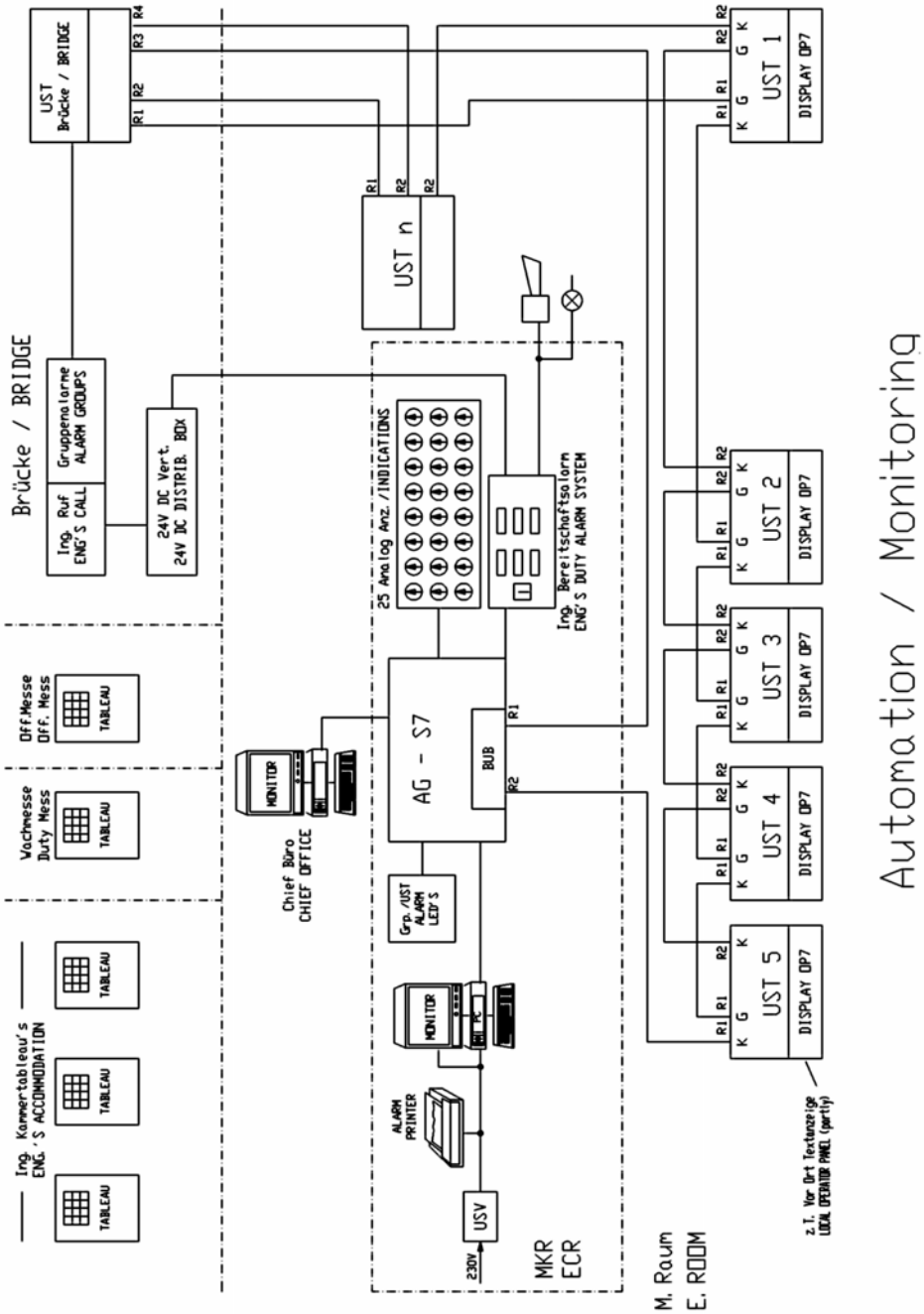
All current analog measured values can also be called up and printed out manually.

5. Power supply

The monitoring system voltage supply is provided from the on-board, battery-backed 24 V automation power supply system.

The 230 V supply for the PC, printer and monitor is maintained even in the event of mains failure by an integrated UPS system, this guaranteeing reliable system operation at all times.

For guidance only



4145 AUTOMATIC COOLING WATER CIRCUIT CONTROL

Electronic type cooling circulation control to be installed for

- Main engine jacket cooling (high temperature circuit),
- Low temperature fresh water circulating system,
- Main engine lub oil.

See also Machinery Specification.

4146 STAND-BY PUMPS

The electric driven motors of the following operating pumps are to have automatic stand-by control.

- 3 sea water cooling pumps,
- 2 fresh water pumps high temperature cooling circuit,
- 2 fresh water pumps low temperature cooling circuit,
- 2 main lub. oil pumps main engine,
- 2 heavy fuel oil booster pumps, for main-/aux. engine
- 2 fuel oil circulation pumps main engine,
- 2 camshaft lub. oil pumps
- 2 feed water pumps for composite boiler,
- 2 fuel oil pumps for composite boiler,
- 2 MDO supply pumps aux. engine.

On failure of the operating pump or power failure, the automatic to start the driving motor of the stand-by pump, pre-selected by means of a selector switch.

When the stand-by pump starts automatically, alarm will be given to the monitoring system described before.

The stand-by pump motors to start in sequence to prevent overload of generator after black-out.

Start/stop/stand-by selection switch to be arranged in engine control room console. In addition local manual start/stop device for the driving motors to be installed in the local starter board.

4147 LOADING COMPUTER

The loading computer to be delivered by Owner and to be installed in cargo office by Builder.

PC-SYSTEM

For connection of 5 personal computers a cable network (cat 5 type) with central connection box (HUB) and socket outlets in following rooms will be installed:

- bridge
- captain’s cabin
- chief eng. cabin
- ship’s office
- engine control room

Personal computers to be delivered by Owner.

4121 MIP CYL. PRESSURE MONITORING SYSTEM FOR M.E. AND AUX. ENG.

The system works with a microprocessor controlled **portable** instrument for recording of combustion pressure cycles. After measuring on the engine the peak pressure values respectively the pressure graphs are shown on the LC-display.

After completion of recording there are 3 evalution options available:

- print out of the test series on a standard PC-printer (not yard supply)
- evaluation of the test series on the LC-display
- data transfer to a standard PC-system (not yard supply) with proper software

The system to consist of:

- 1 portable processing unit with LC-display
- 1 pressure transducer with adapter and cable
- 4 pick-ups for rpm-measuring (fixed installed) – 1 for M.E. and 3 for A. E.
- 1 software for installation on a standard-PC
- 1 set cables for PC/printer, battery and charger

4122 ENGINE CONTROL DESK

The desk to be installed in engine control room in such position to ensure that it is easily accessible.

The desk to include the following:

- Main engine remote control panel with manoeuvring handle
- Main engine governor panel
- Main engine safety panel
- Engineer call system
- Temperature regulators
- Remote indication instruments
- Operator station for central monitoring system
- Telephones
- Stand-by pump control
- Viscosity regulators for main -/aux. engines

417 ELECTRIC MOTORS AND SWITCHING GEARS

4171 ELECTRIC MOTORS

The prime movers for the auxiliaries to be electric three-phase current asynchronous motors suitable for direct starting. In exceptional cases, if necessary from a technical point of view, starting to be effected via star delta control or auto transformer.

All electric motors to have self ventilation and to be supplied with special type insulation suitable also for operation in tropical climate. Insulation class F.

The electric motors to be supplied of different types of mounting arrangements, all according to the purpose for which the motors are intended, degrees of protection

- On open weather deck IP 56
- All other motors IP 54.

Where the electric motors of standard design are parts of complete systems and have to be made coincident with the relative system or form part of the design, deviations from the above are permitted. All other motors to be delivered in a size as required by the consumer driven by the respective motor.
Anti-condensate heating to be provided for electric motors; listed up:

- steering gear
- deck machinery (winches)
- emergency fire pump
- heeling pump
- HFO transfer pumps foreship
- bow thruster

4172 PROTECTIVE MOTOR SWITCHES

The protective motor switches intended for installation shall meet the special conditions encountered on board seagoing ships.

They are intended to serve for switching and for protection of the electric three-phase current motors.

For protection of the consumers from overload, a temperature compensated thermal over-current switch (bimetallic release) to be installed in each phase.

In particular cases (e.g. heavy starting) protection from overload may, however, also be provided by thermistor motor protective device.

Motor switches to be equipped with ammeters (for consumers ≥ 5 kW) and hour-meters for all essential consumers.

4173 ELECTRIC PREHEATER AUX. DIESEL ENGINES

Not to be provided, steam heated, see also Machinery Specification 3175

419 LIGHTING

The lighting and the illumination intensity to comply with the requirements applied for this ship.

The lighting system to be fed by a separate 230 V 60 Hz - mains.

The lighting voltage to be taken from the three-phase current mains via transformers.

The distribution panels to be provided with automatic cut-outs and with spare connections.

Wiring diagrams to be fitted in the distribution panels.

The luminaries to be equipped with fluorescent lamps - if practicable.

Engine room to be illuminated by watertight fluorescent type lamps (1 x 18 W, 1 x 36 W or 2 x 36 W), in addition flood lights (Halogen lamps) to be installed in upper part of engine room. Engine room lighting to be switched at the automatic cut-outs in the distribution panels. Illumination of pipe duct to be done by wtd. incandescent lamps with macrolon type or similar plastic domes.

Fluorescent lamps to be provided also for lighting in engine service rooms, passageway in way of accommodation, cabins and public rooms. The colour of the fluorescent lamp lighting in accommodation area (incl. offices and passageways) to be light colour no. 31 (warm white). The fluorescent lamps to be compensated. Incandescent lamps to be provided in remainder of rooms.

The general lighting in accommodation is principally installed as a direct lighting of simple form and design to Classification requirements.

Arrangement of lights and plug sockets in cabins and public rooms to be in accordance with standard of accommodation.

Toilets and bathrooms to be illuminated by the mirror lights. Lights in toilets and bathrooms to be switched at the door.

A mirror light to be installed over each mirror. Mirror lights over wash basins are to be provided with razor sockets with protective transformer.

Wall lights, remainder mirror lights and table lights to be switched at the light.

Built-on ceiling lights with fluorescent lamps 4 x 18 W or 2 x 18 W to be installed in cabins. Ceiling lights with 2 x 18 W or 1 x 36 W fluorescent lamps to be installed in passageways in accommodation area.

The ceiling lamps in the passageway in accommodation area to be switched at the automatic cut-outs in the respective distribution panels.

Illumination of the open weather deck in way of the superstructure to be done by wtd. fluorescent lights equipped with 1 x 36 W lamp.

The emergency lighting to be provided in accordance with the requirements of the International Convention for the Safety of Life at Sea, fed from emergency switchboard.

A sufficient number of plug sockets to be installed, plug socket voltage to be 230 V AC 60 Hz.

For illumination of weather deck flood lights (no aluminium casing) to be installed as follows, to be switched from navigating bridge.

At fore mast
- 1 flood light 1,000 W (Halogen) for illumination of fore castle,
- 2 flood lights 400 W (NAV) for illumination of forward part of weather deck.

At fore end of bridge
- 2 flood lights 400 W (NAV) for illumination of aft part of weather deck in front of superstructure.

The weather deck area beside of hatchway covers to be equipped with a passageway lighting (wtd. fluorescent lights at hatchway coamings).

For container lashing abt. 12 portable 500 W flood lights (Halogen) with 10 m rubber insulated cable and HNA plug contact to be supplied. This lighting to be fed by plug sockets (abt. 9 each port and starboard).

Cargo holds to be illuminated by abt. 18 flood lights 400 W (NAV).

The stairs and ladders inside cargo holds to be lighted by fluorescent lights.

(NAV lamps means high pressure sodium vapour lamps).

Navigation lights, signal lights (Christmas tree) and NUC lights etc. to be provided as necessary in accordance with the rules and regulations applicable to this vessel, see also Outfitting Specification, group no. 2602.

Also to be installed
- 2 funnel flood lights
- life boat flood light, fed from emergency switchboard
- 2 flood lights for illumination of the accommodation ladders
- red flashing light (Japan light)
- Suez stop light (red).

425 AUXILIARIES FOR SHIP'S SERVICE

4254 WINCHES FOR ACCOMMODATION LADDERS

Winches for accommodation ladders to be of the electrically driven type, as laid down in Outfitting Specification.

4331 PROVISION PLANT

A provision cold store room (locked-in) alarm system to be provided and connected to the bridge alarm system, to consist of

- 1 watertight illuminated push-button in each cold store room.

4332 PLUG SOCKETS FOR REEFER CONTAINERS

80 power plug sockets on deck will be provided for connection of self-contained type reefer containers.
Each socket to be laid out for connection of 40’ reefer containers (11,0 kW, 450 V, 60 Hz three phase current).

Plug sockets to be fed directly from ship's mains via reefer distribution panels. Spare connection in the distribution panels not to be provided. Plug sockets to be of the CEE 17-type with a nominal current of 32 Amp. and to have locking devices, earthing contact position 3 h, non metallic flange with screw cap.
Group sockets to be provided with watertight stainless steel housing and built-in circuit breaker. They are to be located on deck between hatches or at longitudinal hatch coamings.

Reefer Container Monitoring System

A Power Cable Transmission System (PCT) according to ISO standard 10368 High Data Rate and Low Data Rate to be supplied for remote monitoring and control of 80 reefer containers.

The signals from each reefer container will be transmitted via existing power cables to monitoring modules installed in the power distribution panels.

The decentral monitoring modules will prozess and transfer the data via a communication network to the main computer system installed in cargo officer office.

The system to consist of:

- 1 Main cabinet with integrated 230 V AC UPS
- 1 PC-computer incl. keyboard, trackball
- 1 colour monitor 17"
- 1 printer DIN A4
- Connection to the load calculator for transfer of the container locations and necessary data
- 1 contact to the bridge alarm system
- Software package

4472 DECK CRANES

Not provided.

PROVISION HANDLING GEAR

An electrically driven rail hoist to be installed, see Outfitting Specification.

452 PROVISION LIFT

An electrically operated provision lift to be installed.

4551 COMBINED WINDLASSES AND MOORING WINCHES

Two combined windlasses and self-tensioning mooring winches to be installed on forecastle, electrically driven by three-phase current asynchronous motors of the triple-pole changing type.

One each double control column to be placed on deck P&S, equipped with master switch, emergency stop switch, pull indicator, control switches and signalling lamps.

The contactor cubicles to be arranged below deck, containing all the contactors and switching elements of the control equipment.

The cubicle to be of the IP 54 type of enclosure. The cubicles and motors to be equipped with anti-condensate heating.

4561 MOORING WINCHES

4 self-tensioning mooring winches to be installed, electrically driven by three-phase current asynchronous motors of the triple-pole changing type.

On each double control column and one each single control column to be placed P&S for the 3 winches on aft deck, equipped with master switch, emergency stop switch, pull indicator, control switch and signalling lamps. The winch on the forecastle to be controlled from one each single control column (P&S).

The contactor cubicles to be arranged below deck, containing all the contactors and switching elements of the control equipment.

The cubicles to be of the IP 54 type of enclosure. The cubicles and motors to be equipped with anti-condensate heating.

4571 STEERING GEAR

An electro hydraulic steering gear with 2 pump units to be installed,
see Outfitting Specification.

Pump motors to be fed through 2 separately installed cables. Feeding to be provided from main switchboard for pump 2 and from emergency switchboard for pump 1.

The steering gear pump motors to be capable of being controlled from steering gear compartment and from navigating bridge. The pump motors to be equipped with anti-condensate heating.
The pump units to be capable of being operated individually and also in parallel.

A steering gear alarm system to be provided in accordance with regulations as part of the central monitoring and bridge alarm system.

The steering gear to be electrically controlled from the steering control (desk-technic on the bridge) or from auto pilot (micro-processor-controlled) in the desk-nautic on the bridge or from non-follow-up control of bridge wing consoles. The steering to be laid out as non-follow-up/follow-up control. In addition an override-non-follow-up control to be installed in the desk „nautic“ on bridge.

One course memory device to be provided for the desk „technic“ on the bridge.

4572 BOW THRUSTER

One electrically driven bow thruster with a controllable pitch propeller to be installed, see Outfitting Specification.

The bow thruster to be driven by a 450 V, 60 Hz, three-phase squirrel-cage motor, IP 23 and anti-condensate heating, power output 900 kW S 2-30 min, starting by auto transformer (reduced voltage starting). Starting current max. 1.3 x I_N.
The bow thruster to be controlled from the bridge desk - nautic and bridge wings port and starboard, each control panel to be equipped with an ammeter, pitch indicator etc.

The automatic circuit breaker in the main switch board to be switched in the ECR only.

The bow thruster motor is provided with 2 sets (each 3 pcs) thermistor sensor elements. The 1st set gives a warning for overload on bridge (yellow lamp and buzzer), the 2nd if activated will stop the motor.

4581 LIFE-BOAT WINCH AND RESCUE BOAT WINCH

For life-boat winch and rescue boat winch, see Outfitting Specification.

All a.m. winches to be of the electrically driven type.

460 NAVIGATIONAL AIDS AND SIGNALLING EQUIPMENT

The electric devices on navigating bridge to be installed mostly in the nautic console and technic console as well as in the consoles of the bridge wings.

4601 COMPASS

GYRO

The gyro system consists of:

1 master gyro for installation in bridge technic console with telescope-type foundation (for gyro pilot see section 457.1),
2 bearing repeaters on pedestals for installation in wings of navigating bridge, complete with 1 each standard type bearing diopter,
1 repeater for bridge technic console,
1 repeater for bridge nautic console,
1 repeater for steering gear room,
1 each connection for gyro pilot, radar and satellite communicating system.

MAGNETIC COMPASS

The magnet compass to be installed on top of wheelhouse, with deflection of vision to helmsman and sensor for transmission to gyro pilot.

4602 SPEEDOMETER

The system consists of:

1 measuring sensor (with sea valve) for installation in fore ship area,
1 speed indicator with distance counter on navigating bridge (nautic console) with adjustable illumination,
1 each connection for radar.

4603 ECHO SOUNDER

The system consists of:

1 transducer in fore ship area,
1 graphical type indicator with LC-display and alarm on navigating bridge (nautic console),
1 printer

Smallest indicating range: abt. 0 - 10 m,
max. indicating range: abt. 0 - 2000 m.

4608 ANEMOMETER

A portable anemometer will be provided.

4604 WHISTLE

One electric whistle to be installed at the fore mast.
The whistle to be controlled from navigating bridge by means of push button keys, whereof one key in wheelhouse (nautic console) and one each key in wing consoles of navigating bridge port and starboard.

An automatic whistle control to be installed for automatic signalling on navigating bridge (technic console).

Morse signalling / manoeuvring lamp to be installed to flash simultaneously when an audible signal is given by the whistle, or when operated by Morse-keys.

4605 SEARCHLIGHTS

SUEZ CANAL SEARCHLIGHT

One 230 V A.C. plug socket for Suez Canal searchlight to be provided in fore ship.

The Suez Canal searchlight to be Owner’s supply.

DAYLIGHT SIGNALLING SEARCHLIGHT

One daylight signalling searchlight (20 W, 24 V, Halogen) will be supplied together with 5 m junction cable, with sighting telescope, including 24 V battery and charger.

SEARCHLIGHTS FOR BRIDGE WINGS

Two searchlights (650 W, 230 V, Halogen) to be installed, one each port and starboard.

4606 WINDOW WIPERS, CLEAR VIEW SCREENS AND HEATED WINDOWS

Electrical connection to be provided for

- window wipers
- clear view screens
- electrically heated windows.

4607 HEELING CONTROL

A heeling control system with manual/automatic control of anti-heeling pump and valves to be supplied.
The system to consist of 1 measuring unit (inclinometer) for controlling of pump and valves. The plant is part of the bilge/ballast system and to be operated from the PC installed in Cargo Officer Office or engine control room.

4609 BRIDGE ALARM SYSTEM

The following alarms to be installed:

Hospital call (in addition lamp & buzzer in alleyway 1. superstructure deck)
Provision cold store room call (locked-in alarm)
Combined windlasses and mooring winch, bow failure
Mooring winches, stern failure
Heeling alarm- / failure alarm
Autopilot OFF-COURSE alarm
Autopilot failure alarms
Steering gear failure alarms
Watch alarm / failure alarm
General alarm system failure
Fire detecting system failure
Fire detecting system cargo holds alarm- /failure alarm
Gyro compass system failure
Log failure alarm
Position light fail alarm
Battery for wireless communication system failure
Central monitoring alarm system failure.
Telephone system failure
Steering gear service tank level
Reefer container monitoring alarm- /failure alarm

Alarm panels for this system to be installed in Officers cabins, Offic. mess and Captain Office. The Officer on duty can be selected on the alarm panel on bridge.
The watch alarm system with its acknowledge push buttons on bridge and wings is part of the a.m. plant.

461 INTERIOR COMMUNICATION SYSTEMS

4611 ENGINE ORDER TELEGRAPH SYSTEM

The system is part of the main engine remote control system, see 4141.
On bridge and in engine control room handle type transmitter/receiver to be installed, at emergency controll position on main engine push-button type is used.

4612 SHAFT REVOLUTION INDICATOR

The system consists of:

1 electronic rpm-transmitter fitted on main engine

1 revolution indication receiver on navigating bridge, (nautic console), with adjustable illumination,

2 watertight revolution indication receivers on bridge wings port and starboard (wing consoles), with adjustable illumination,

1 revolution indication receiver in ECR desk

1 revolution indication receiver on emergency control position main engine

1 revolution indication receiver on front of navigating bridge with adjustable illumination.

The complete plant is part of the main engine remote control system.

4613 CPP PITCH INDICATOR

not provided

4614 RUDDER ANGLE INDICATOR

The system consists of

1 watertight transmitter, driven by the rudder stock,

1 indication receiver on navigating bridge, ceiling mounted, capable of being read from three different positions, with adjustable illumination,

1 indication receiver on nav. bridge (nautic console), with adjustable illumination,

1 indication receiver in ECR desk,

1 each watertight indication receiver on bridge wings port and starboard (wing consoles), with adjustable illumination.

Receiver with coloured sections and lettered for 35° hard over to both port and starboard.

4616 AUTOMATIC TELEPHONE AND PUBLIC ADDRESS SYSTEM

The system to be fed from 230 V main and emergency supply with automatic change over switching and consists of :

1	electronic exchange for abt. 60 extensions with abt. 5 internal communication sets and 2 priorities (bridge and ECR)	
1	SAT-COM and shore connection	
2	amplifiers, abt. 240 W each, for the PA and General alarm system	
4	built-in type telephones (with loudspeaker for loudspeaker system)	wheelhouse and ECR desk
abt.38	wall-type resp. table-type telephones (with loudspeaker)	cabins, bedrooms, offices mess rooms, galley etc.
4	wt. telephones (with built-on loudspeaker and head set)	em.control position main engine, steering gear room, bow thruster room, emergency gen. room
1	wt. telephone (with built-on loudspeaker), portable, with 5 m cable, plug and 2 sockets	bunker station
3	wt. telephones (with built-on loudspeaker)	engine workshop, electric workshop, foreship (with additional “Hand”-telephone)
1	microphone station for loudspeaker system	wheelhouse (nautic console)
abt.30	ceiling built-in type loudspeaker	alleyways, mess rooms, offices, in way of accommodation, ECR
abt.4	built-on type loudspeaker	Alleyway, change room, dry provision store
2	wt. Loudspeaker	Laundry, waste room
1	wt. microphone station with separate loudspeaker	life-boat station

4617 GENERAL ALARM

One GA switch unit to be installed in bridge nautic console with automatic signal transmitter for the sirens and lamps distributed in the ship for the crew alarm system.
Manual alarm push button to be arranged at life-boat station.
In accommodation, workshops, engine control room general alarm will be transmitted via telephone and loudspeaker (PA) system.

4618 CLOCKS

One clock to be installed in the bridge desk-nautic, 24 V D C.

For nautical clocks and battery-driven clocks see Outfitting Specification.

4619 TALK-BACK SYSTEM GALLEY

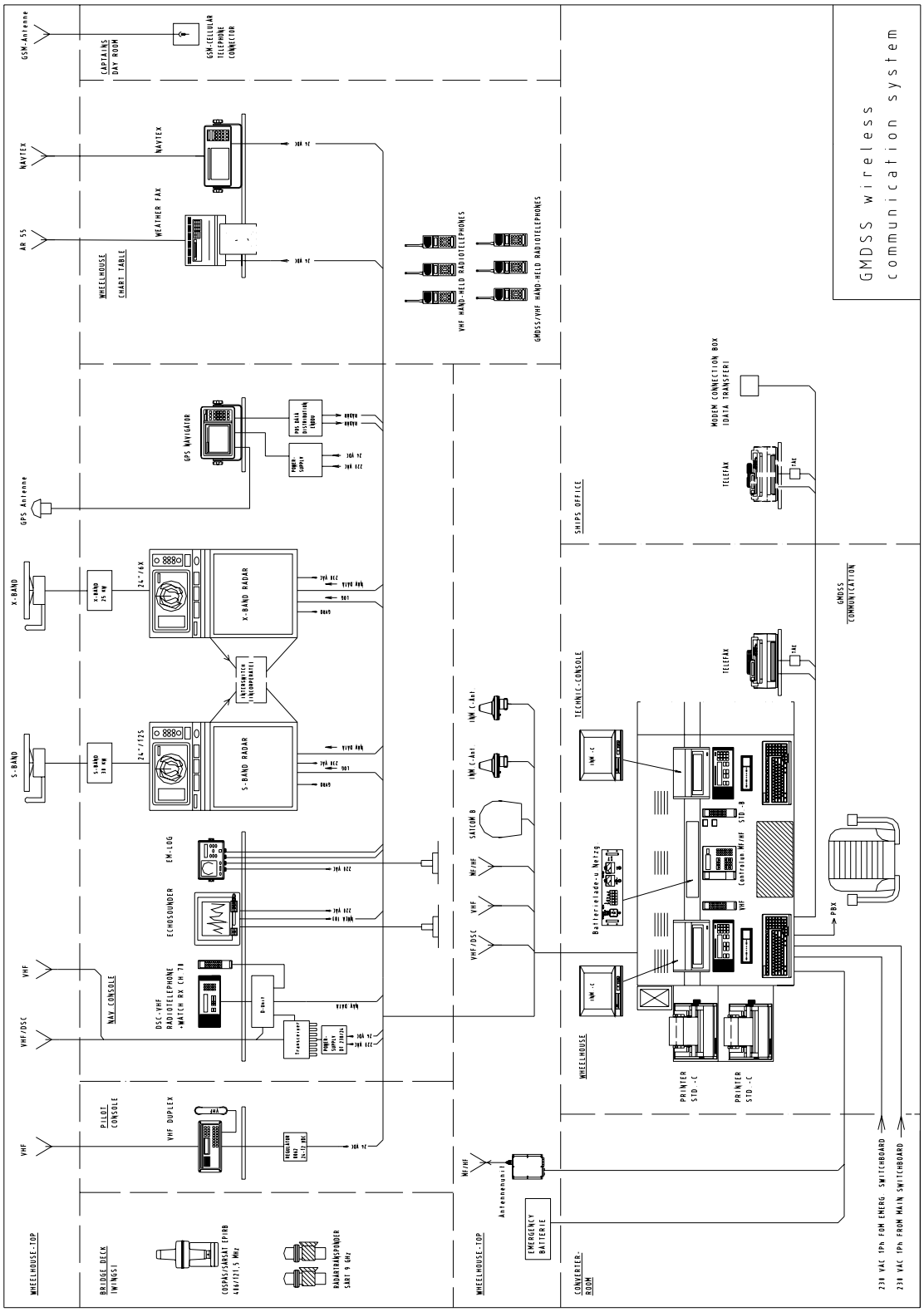
A talk-back system to be installed with substations in galley and main deck provision store area.

462 WIRELESS COMMUNICATION SYSTEM, RADAR PLANT

Concept

All navigation and wireless communication equipment will be installed in accordance with SOLAS regulations, ITU conventions and the Global Maritime Distress and Safety System (GMDSS) respectively, for operation area A1, A2, A3. Operating of the system without radio officer.

For the design of the GMDSS WIRELESS COMMUNICATION SYSTEM / RADAR PLANT see System Configuration Plan attached.



For guidance only

4621 WIRELESS COMMUNICATION SYSTEM

The wireless communication system to be installed in wheelhouse, to consist of

- 1 SSB MF/HF radio telephone, 250 W PEP, for telephony- and telex-operation, automatic tuning time 0.5 sec. (100 kHz – 30 MHz).
- 1 MF/HF DSC watch receiver with scanner and controller with 4-line display and 2 decoder/encoder to control the SSB MF/HF receiver in addition for DSC calling
- 1 MF watch receiver for 2182 kHz
- 1 Power Supply
- 1 Battery charger
- 1 Battery 24 V, 180 Ah
- 1 Antenna system
- 1 DSC Telexfilter
- 2 VHF/DSC radio telephones semiduplex with built-in DSC controller and receiver Ch 70
- 1 VHF/DSC radio telephone duplex
- 3 VHF portable radio telephones for on-board operation with battery and charger
- 3 VHF portable radio telephones wt. acc. GMDSS rules for life-boat operation, with lithium battery and charger
- 1 COSPAS/SARSAT EPIRB incl. float-free bracket (406 / 121.5 MHz)
- 2 Radar transponder SART 9 GHz
- 1 NAVTEX receiver, 518 kHz, with built-in printer
- 1 Weather chart recorder, autom. operation, with built-in receiver and memory
- 2 Global position system (GPS) satellite navigators, 6-channel parallel system

- 1 AIS Automatic Identification System
- 1 VDR Voyage Data Recorder

The data mentioned above depends on maker's standard.

4622 SATELLITE COMMUNICATION SYSTEM

The system to consist of:

1 INMARSAT B system - Class 2 (installed in wheelhouse)
incl. separate ID for telephone and fax-operation and connection box for data transfer prepared, consisting of

- above deck equipment ADE (antenna with radome)
- below deck equipment MCU
- 1 handset/control unit with LC-display
- 1 distress alarm-box
- telefax "SATFAX" (with connection box in wheelhouse and Captain Office)
- PBX connection
- 1 data-transfer connection box
- 1 power supply unit 230 V AC
- 1 printer for data PRN 9000 (serial)

2 INMARSAT SATCOM STD-C/EGC system (installed in wheelhouse)
for telex- and data-communication, consisting of

- transceiver with GPS receiver PCB incl. distribution to MF/HF-DSC, 2x VHF-DSC
- antenna
- message terminal GMDSS-Computer with LC-display and floppy disk drive, keyboard and printer
- operation from 230 V AC and 24 V DC with automatic change over

4623 RADAR PLANT

2 Radar Systems, consisting of:

System 1

Type:	ARPA-S-band
Aerial:	12 feet
Wave length:	10 cm (s-band)
Output transmitting:	30 kW
Display unit:	24 inch display diagonal radar, screen 16 inch diameter, raster scan type, high resolution screen, video mapping
Range:	3/8 - 96 nautical miles
Installation:	display unit on pedestal, integrated electronic interswitch,

System 2

Type:	ARPA-X-band
Aerial:	6 feet
Wave length:	3 cm (X-band)
Output transmitting:	25 kW
Display unit:	24 inch display diagonal radar, screen 16 inch diameter, raster scan type, high resolution screen, video mapping
Range:	3/8 - 96 nautical miles
Installation:	display unit on pedestal, integrated electronic interswitch,

4624 SHIP'S BROADCASTING, TV-AERIAL

A central broadcasting and television aerial system for AM, FM and TV reception with extensions in each cabin and day rooms to be supplied and to consist of:

1 amplifier-unit including switch-off relay controlled by the radio station and one video-module for feeding the system by a video recorder.

2 fixed installation receiving aerials (1 x 360° aerial, 1 x whip aerial) for long wave, medium wave, short wave, ultra short wave and VHF/UHF-TV reception.

abt. 30 aerial sockets, double type for radio and TV

abt. 30 connection cables for broadcasting receiving sets and TV sets.

Video recorder as well as all other receiving sets are Owners' supply.

465 ELECTRIC HEATING

abt 15 electric heaters (abt. 500-1,500 W) to be provided in accommodation, em. generator room and bow thruster room etc.

1 heating flange (abt. 12 kW) in the hot water boiler (see Machinery Specification).

467 FIRE DETECTING AND CO_2 ALARM SYSTEMS

4671 FIRE DETECTING SYSTEM FOR ENGINE ROOMS/ACCOMMODATION

An automatic smoke/fire detecting system to be installed in engine rooms and passageways and stairways in accommodation to detect any fire already when originating.

The system to be of the self monitoring type and to consist of:

1 detector central unit for abt. 14 conventional loops, installed on navigating bridge, wall mounting type, with necessary lights and switches, incorporated charger and 24 V battery.

abt. 27 smoke detectors and 5 manually operated fire alarm push buttons for engine room area incl. 1 timer for switching off smoke detectors in workshop during welding.

abt. 24 smoke detectors and 19 manually operated fire alarm push buttons for accommodation area.

2 fixed temperature heat detectors in galley, and converter room.

The fire detecting system to be connected to the central monitoring and engineer's alarm system and to the bridge alarm system. Alarm buzzers and lamps to be arranged in all engineer and officer cabins.
The alarm system to be fed from emergency switchboard.

4672 CO_2 ALARM SYSTEM

The CO_2 system for engine room and emergency generator room to be equipped with an alarm system, which automatically releases alarm before rooms to be floded.

This alarm to sound quite differently than the other alarms installed.

The alarm system to consist of Limit switches at CO_2 valves, resp. at the door of the valve station and audible alarm devices. Automatic fan stop to be installed too.

For CO_2-fire extinguishing system see Machinery Specification.

4721 CATHODIC PROTECTION

An impressed current system will be installed to protect the ship against electrolytic-galvanic corrosion. See Outfitting Specification 2724 for the description of the system.

4722 SHAFT EARTHING

Earthing of tail shaft to be provided by an earthing slip-ring, with brush holders and brushes.

Brush for connecting of measuring instrument (mV-meter) to be supplied.
Measuring instrument to be integrated in the panel of the cathodic protection system.

4732 ELECTRIC INVENTORY AND TOOLS

Electric measuring instruments and tools to be supplied according to classification requirements.

TOOLS

1 portable electric drilling machine (1 - 10 mm)
1 drill stand for this drilling machine with one small vice
1 leather bag
containing the following tools:

1 SOUDAGAS soldering lamp	
3 cartridges for the soldering lamp	
1 tin of TINOL (soldering compound)	
1 tin of soldering paste	250 grams
1 hand hammer	200 grams
1 voltage tester, unipolar	100-500 V
1 pair of combination pliers, VDE-insulated	180 mm
1 pair of long nose telephone pliers, VDE-insulated	160 mm
1 pair of long reach round nose pliers, VDE-insulated	160 mm
1 pair of long reach flat nose pliers, VDE-insulated	160 mm
1 pair of side cutting pliers, VDE-insulated	160 mm
1 pair of cable stripping pliers, VDE-insulated	160 mm
1 varnish strippers	
1 set screw driver, insulated, of 3, 4, 6, & 8 mm	
1 short stubby screw driver, insulated	
1 set screw driver for Phillips screws, insulated, size o, 1, 2 & 3	
1 cable knife	
1 pair of electricians scissors	
1 dust brush	
2 pair of pincers (pointed & bent legs)	
1 pocket type of vernier calipers, in case	
1 acid siphon for accumulators	
2 electric soldering irons, 80 W & 200 W, 230 V	
0.5 kg of soldering wire	
0.5 kg of soldering tin	

1 set VDE-insulating body protection, consisting of
- 1 insulation cover sheet
- 1 pair of electrician's finger gloves
- 1 electrician's safety face mask

MEASURING TOOLS

1 megger tester
1 multimeter
1 tongue type current meter, 0 - 1,000 A
2 pair of measuring cords
bags for instruments.

SUNDRY ITEMS

10-litre KANTEX balloon with distilled water.

LAMPS, EXTENSION CABLES & PORTABLE TRANSFORMERS

2 portable lamps, each one with 15 m of cable and HNA plug (230 V)
2 portable lamps, each one with 15 m of cable and earthed plug (230 V)
1 tubular lamp with 15 m of cable (24 V)
1 portable lamp with 15 m of cable (24 V)
2 cable extensions, 15 m each, with HNA plug and coupler (230 V)
2 cable extensions, 15 m each, with earthed plug and coupler (230 V)
1 portable isolating transformer with 1 socket outlet, 230/230 V A.C., 2 kVA
1 portable isolating transformer, 230/24 V A.C., 150 VA, with socket outlet, junction line & plug

1 portable welding rectifier (welding current max. 300 A) with 10 m primary cable

Accessories:

1 set standard welding equipment

1 welding cable 20 m with connectors

1 welding cable 30 m with connectors

3 plug sockets 440 V, 32A, 60 Hz, three-phase current, to be provided for the welding unit, installed in fore ship, engine workshop and welding place (Plug sockets similar to plug sockets for reefer container).

SPECIAL TOOLS

Special tools for normal maintenance and normal overhauling for electric equipment to be provided in accordance with manufacturer's supplying standard - if necessary.

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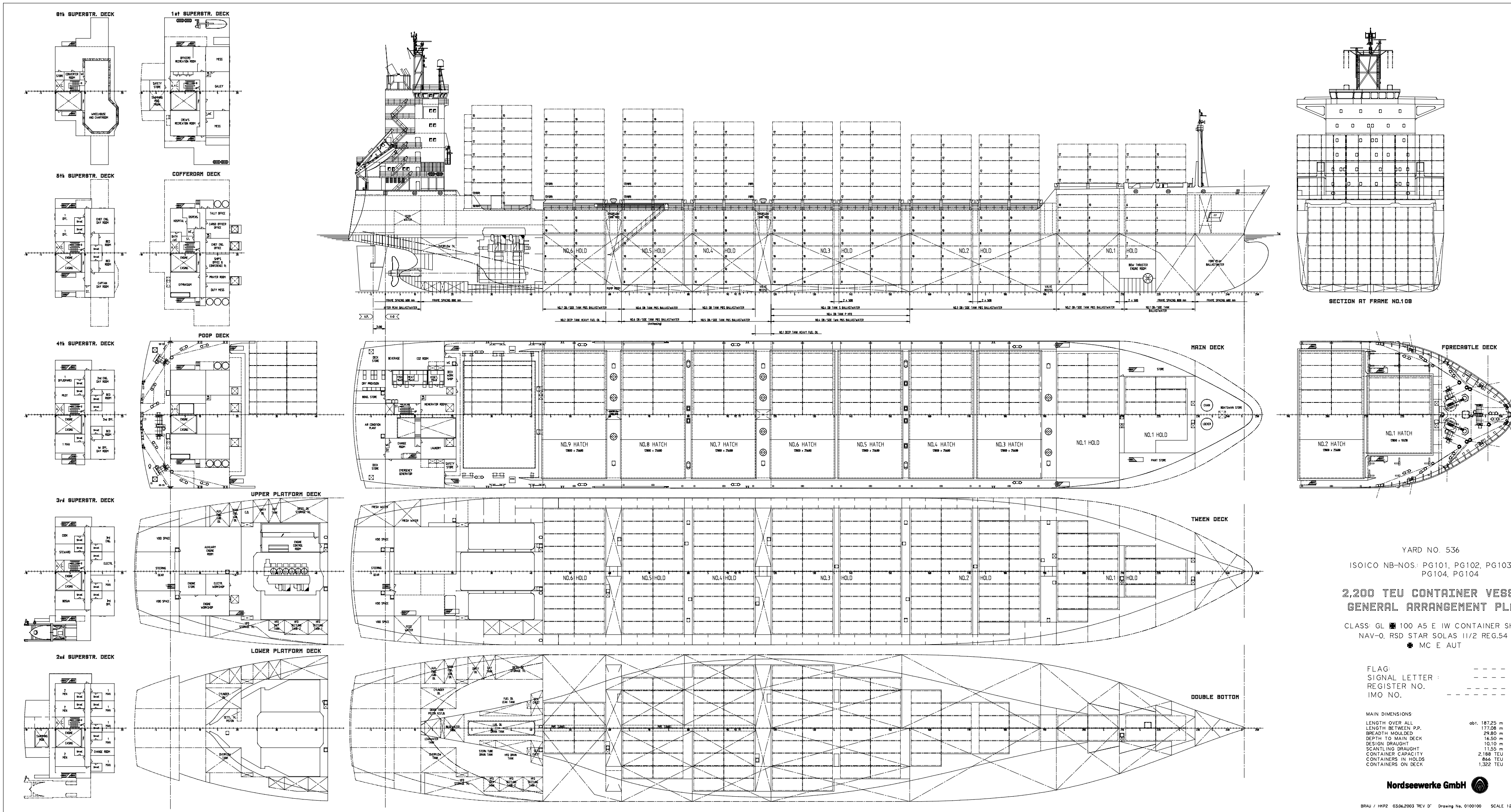

YARD NO. 536

ISOICO NB-NOS.: PG101, PG102, PG103, PG104, PG104

2,200 TEU CONTAINER VESSEL
GENERAL ARRANGEMENT PLAN

CLASS: GL ✠ 100 A5 E IW CONTAINER SHIP
NAV-O, RSD STAR SOLAS II/2 REG.54
✠ MC E AUT

FLAG:	- - - -
SIGNAL LETTER :	- - - -
REGISTER NO.	- - - - -
IMO NO.	- - - - - - -

MAIN DIMENSIONS:

LENGTH OVER ALL	abt. 187.25 m
LENGTH BETWEEN P.P.	177.08 m
BREADTH MOULDED	29.80 m
DEPTH TO MAIN DECK	16.50 m
DESIGN DRAUGHT	10.10 m
SCANTLING DRAUGHT	11.55 m
CONTAINER CAPACITY	2,188 TEU
CONTAINERS IN HOLDS	866 TEU
CONTAINERS ON DECK	1,322 TEU

Nordseewerke GmbH

BRAU / HKP2 03.06.2003 "REV D" Drawing No. 0100100 SCALE 1:200