

Unit 1

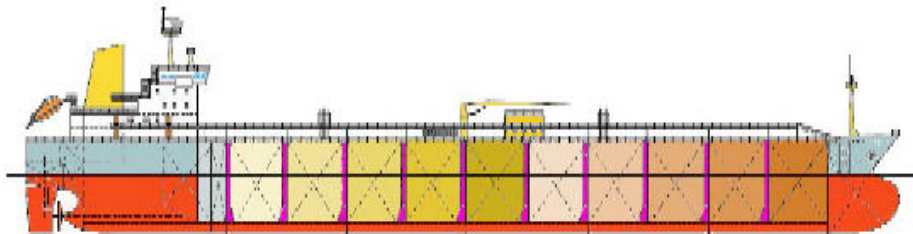
SHIPS AND SHIP TERMS SHIP DESIGN AND CONSTRUCTION (general introduction)

Basic terms

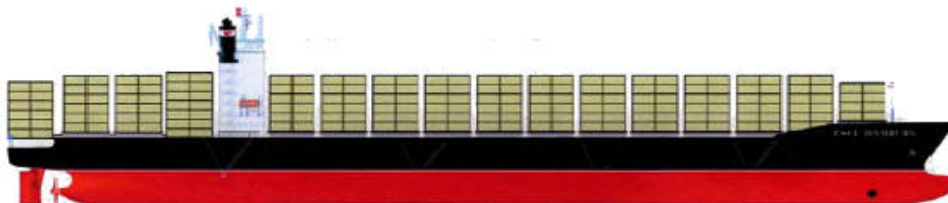
<i>hull</i> <i>superstructure</i> <i>machinery</i> <i>stern</i> <i>bow</i> <i>amidships</i> <i>beam</i>	<i>deck</i> <i>engine room</i> <i>propeller shaft</i> <i>bow thruster</i> <i>rudder</i> <i>bulbous bow</i> <i>hold</i>
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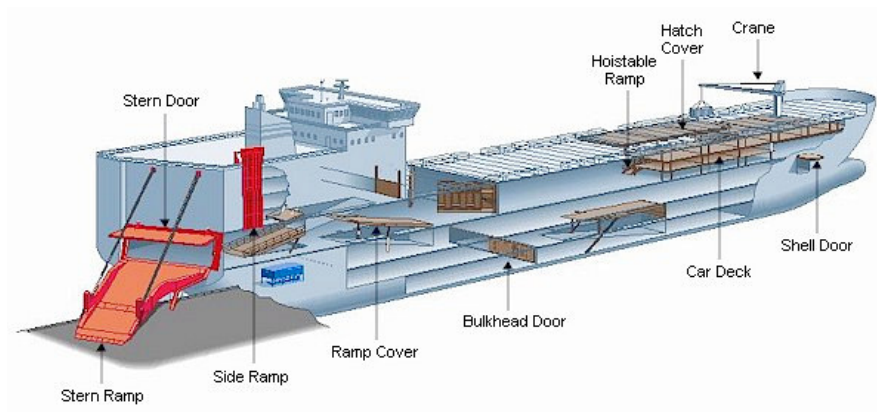
1 A multi-purpose vessel



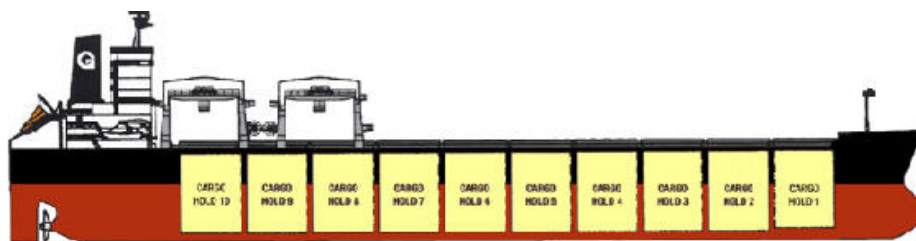
2 An oil tanker



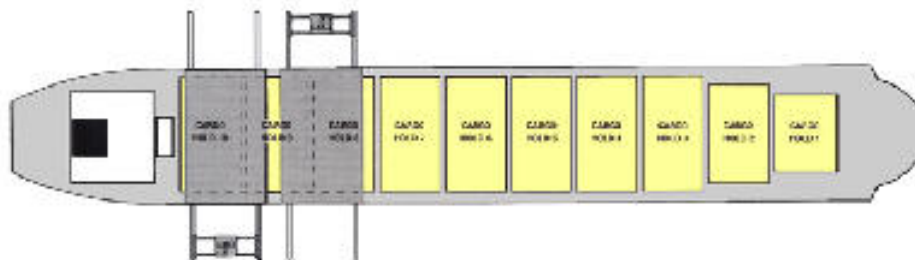
3 A container vessel



4 A roll-on/roll-off ship



5 bulk carrier - elevation / profile



6 A bulkcarrier – upper/main deck plan

Ships are large, complex vehicles which must be self-sustaining in their environment for long periods with a high degree of reliability. A ship is the product of three main areas of skill, those of the **naval architect**, the **navigating officer** (deck officer) and the **marine engineer** (engineering officer).

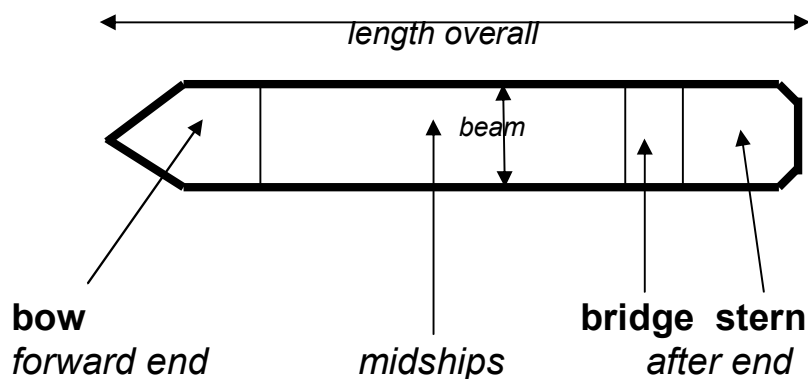
The naval architect is concerned with the hull, its construction, form, habitability and ability to endure its environment. The navigating officer is responsible for safe navigation of the ship, and its cargo operations. The marine engineer is responsible for the various systems which propel and operate the ship. More specifically, this means the machinery required for propulsion, steering, anchoring and ship securing, cargo handling, air conditioning, power generation and its distribution.

There are two main parts of a ship: the hull and the machinery. The **hull** is the actual shell of the ship including her **superstructure**,

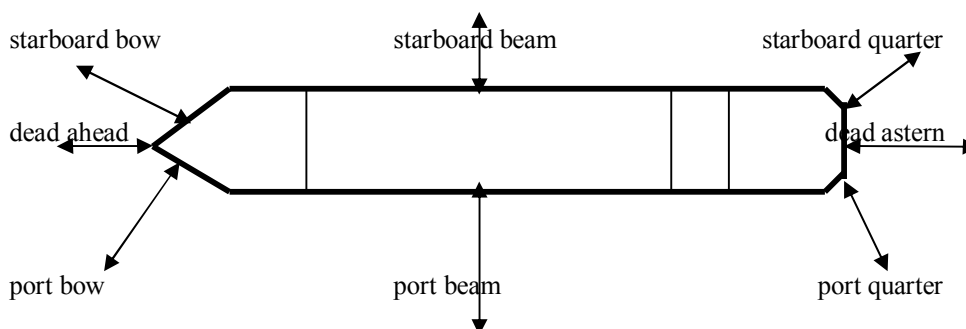
The **machinery** includes not only the main engines required to drive her but also the auxiliary machinery (boilers, generators, etc.) used for manoeuvring purposes, steering, mooring, cargo handling and for various other services, e.g. the electrical installations, winches and refrigerating plant.

The rear portion of the ship is called the after end or **stern**. When moving stern first, the vessel is said to be moving astern. The front portion of the ship is called the fore end, whilst the extreme forward end is called the **bow**. When moving bow first, the vessel is said to be moving ahead. Fore and aft are generally used for directional purposes. The area between the forward and aft portions of the vessel is called **amidships**.

The maximum breadth of the vessel, which is found in the amidships body, is known as the **beam**.



Many modern cargo and passenger liners have a transverse **propulsion unit** or **bow thruster** in the bows. Its purpose is to give greater manoeuvrability in confined waters, e.g. ports, and so reduce or eliminate the need for tugs.

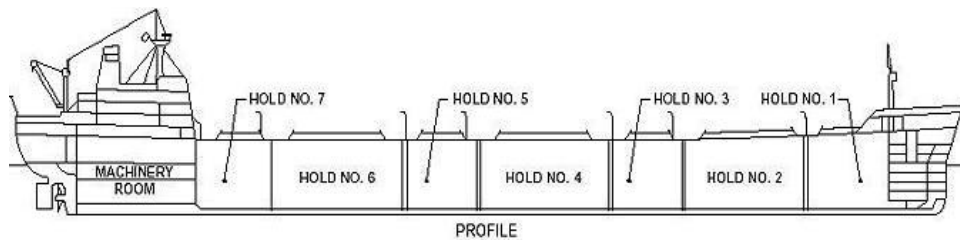


The **rudder**, which enables the vessel to maintain her course, is situated right aft.

The **bulbous bow** can improve passenger and crew comfort, as it can reduce pitching in heavy seas and has been provided in tankers, bulk carriers, and modern cargo liners to increase speed when in ballast.

The modern tendency is to have large unobstructed **holds** with mechanically

operated **hatch covers**, both for the speedy handling of cargo, and to reduce turn-round time to a minimum.



7 General arrangements plan – a bulk carrier

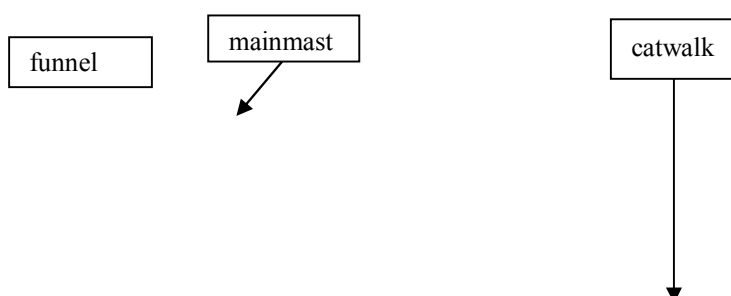
A ship's actual design and number of **decks** depend on the trade in which the ship will ply. A tramp, carrying shipments of coal or ore, will be a **single deck vessel** with large unobstructed hatches to facilitate loading and discharge. A cargo liner carrying a variety of cargo in relatively small consignments would have **'tween decks** to facilitate stowage. If such a vessel also conveyed wood and other commodities of high stowage factor, a **shelter deck** would be provided.

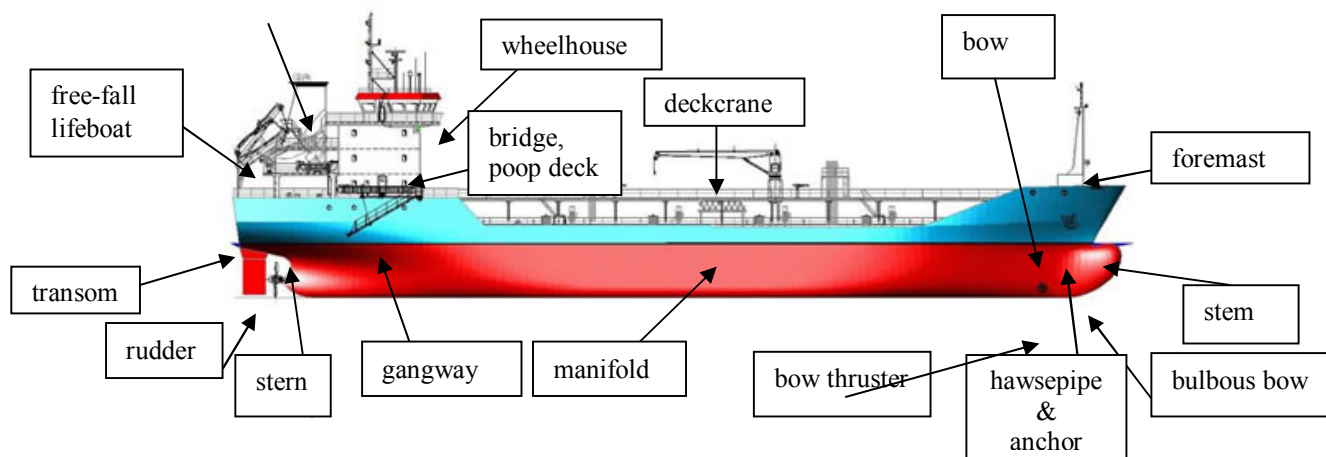
Additionally, container ships are equipped with specially designed holds with **cells** or **slots** to facilitate speedy container handling using shore-based lifting gear.

Machinery

Three principal types of machinery installation are to be found at sea today. Their individual characteristics change with technological advances and improvements and economic factors such as the change in oil prices. The three layouts involve the ship's propulsion machinery using direct-coupled slow-speed **diesel engines** (the main engine), medium-speed diesels with a **gearbox**, and the **steam turbine** with a gearbox drive to the propeller.

A **propeller**, in order to operate efficiently, must rotate at a relatively low speed. Thus, regardless of the rotational speed of the **prime mover**, the **propeller shaft** must rotate at about 80 to 100 **rev/min**. The slow-speed diesel engine rotates at this low speed and the **crankshaft** is thus directly coupled to the propeller shafting. The medium-speed diesel engine operates in the range 250—750 rev/min and cannot therefore be directly coupled to the propeller shaft. A gearbox is used to provide a low-speed drive for the propeller shaft. The **steam turbine** rotates at a very high speed, in the order of 6000 rev/min. Again, a gearbox must be used to provide a low-speed drive for the propeller shaft.





A. Comprehension & vocabulary

A.1 Find the parts of the reading text which provide answers to the following questions:

1. What do the two main parts of the ship include?
2. What are the two extreme ends of a ship called?
3. Define the location and function of the following ship parts: **bow, stern, funnel, mainmast, stem, sternpost, shipboard crane, double bottom, engine room, rudder, bulbous bow, bow thruster, hatchcover, free-fall lifeboat, forecastle, poop deck, bridge, wheelhouse, forepeak, afterpeak**
4. Which types of machinery are housed in the engine room?
5. Where are the anchors and windlasses placed?

A.2 Complete the following sentences:

1. The hull includes both _____.
2. The ship's machinery includes _____.
3. When moving bow first, the ship _____ and she _____ when she moves stern first.
4. The midship portion of the ship is situated between _____.
5. The beam is _____.
6. The rudder is designed to _____.
7. The bow thruster gives the ship _____.
8. Modern ship holds are equipped with mechanically operated hatch covers to _____.
9. The use of the bulbous bow is to _____.

A.3 Which ship terms are defined below?

1. _____ : the body of the ship.
2. _____ : the large hinged plate at the stern of the ship which controls the ships direction.
3. _____ : space inside the ship for carrying the cargo.
4. _____ : a part of the ship which drives the ship through the water.
5. _____ : an opening in the deck through which the cargo is lowered

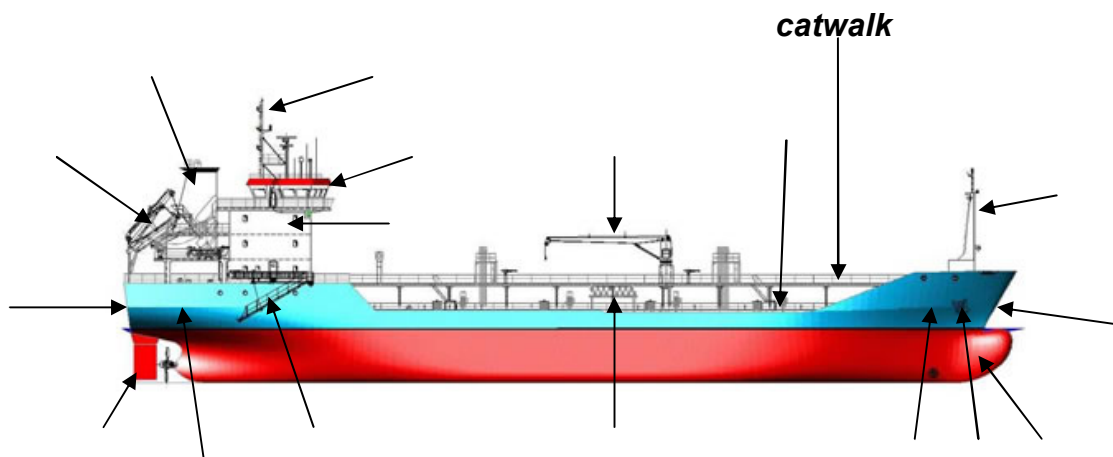
into and lifted from the hold.

6. _____ : the measurement of the ship's largest width.
7. _____ : fore and after end of the ship's hull.

A.4 Complete the following text with the corresponding ship terms:

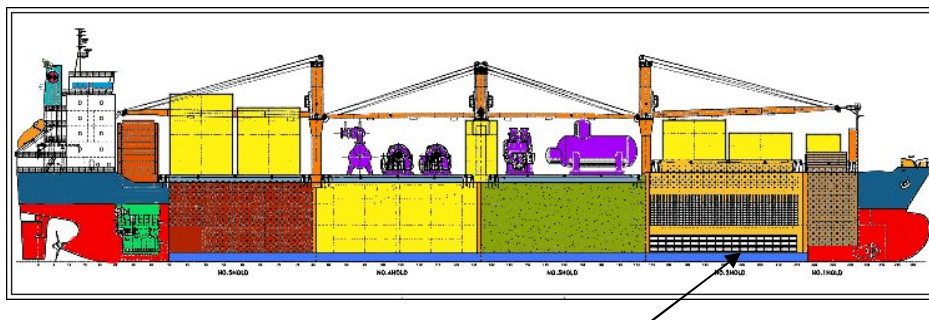
The forward end of the ship is called the 1. _____ the after end is the 2. _____ , and halfway between the two is 3. _____. The 4. _____ of the ship is the distance from the port to the starboard side of the ship. The 5. _____ or body of the ship includes the outer skin or shell and all members and parts which hold the ship together, divide it into 6. _____ and give it strength and rigidity.

A.5 – Write down the labels indicating the parts of the ship of the ship following the arrows from the bow to the stern:

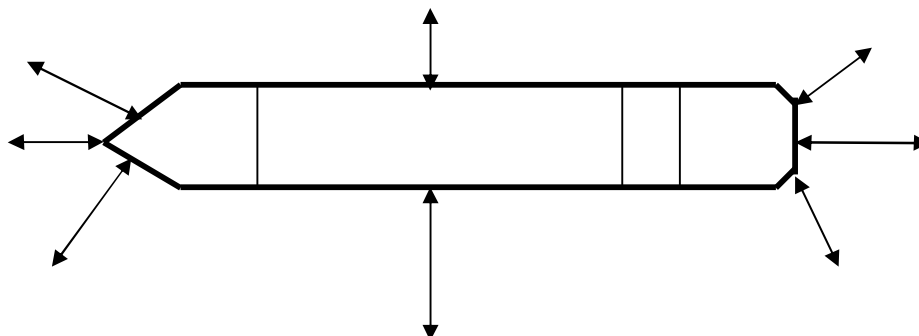


A.6 Indicate the parts of the ship below by drawing an arrow to the relevant position:

bow, stern, funnel, mainmast, stem, sternpost, shipboard crane, double bottom, engine room, rudder, bulbous bow, bow thruster, hold No. 3, hatchcover, free-fall lifeboat, forecastle, poop deck, poop deck No. 3, bridge, wheelhouse, forepeak, afterpeak



A.7 Write down the terms relating to the arrows showing points of orientation on board an around the ship



B. Grammar

B.1 Supply the right form of the verb in brackets:

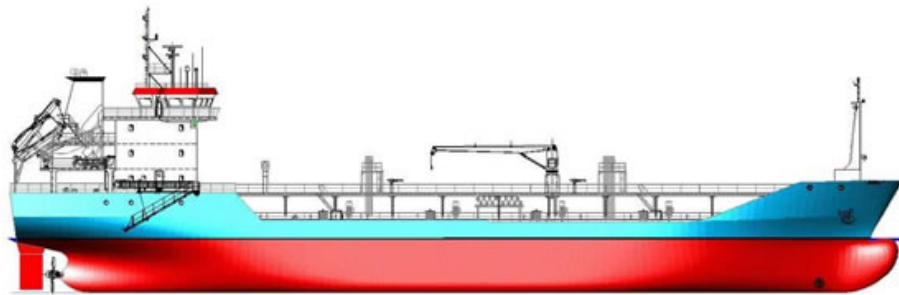
Description of a ship

The «Polar Star» *(be)* _____ a ship *(belong)* _____ to a class called multi-purpose ships. She *(be)* _____ of 15,000 dwt (9,000 gross and 6,000 net tons). Her overall length is 130 m, beam 16 m, draught 9 m. Her five cargo holds *(arrange)* _____ so that holds Nos. 1 to 4 *(be)* _____ forward of the bridge superstructure and No. 5 is abaft it. Each hold *(serve)* _____ by two 20 ton derricks, mounted in pairs. The hull *(be)* _____ of a single 'tween deck type with raised forecastle and a bridge superstructure of medium height. The ship *(fit)* _____ with a stern anchor and warping winch for *(manoeuvre)* _____ in confined waters. With a single diesel engine and a controllable pitch propeller the «Polar Star» *(run)* _____ at her economical service speed of 16 knots, her fuel consumption *(be)* _____ around 20 tons per day.

B.2 Fill in the missing member of the word pair:

adjective	noun
long _____	width _____
_____	breadth _____
high _____	depth _____
strong _____	_____

Description of a ship - main particulars



GENERAL INFORMATION	
SHIP TYPE	TANKER FOR CHEMICALS IMO II & OIL PRODUCTS
DESIGN CRITERIA	Ice-strengthened, single decked, single screw motor ship with double bottom and double skin with coated cargo tanks. No steel structure facing into the cargo tanks. The hull form is designed for minimum resistance, overall design provides an environmentally friendly, cost-effective, reliable and flexible unit. One deep-well pump for each tank and complete segregation for each cargo tank, one vapour return line.
DESIGNER	DELTA MARINE ENGINEERING AND COMPUTER TRADE Co.
PROJECT NO	DLT-114
PROJECT NAME	TBN DESAN-21 (3500 DWT OIL/CHEMICAL TANKER)
OWNER	DESAN SHIPBUILDING Co. / TURKEY
SHIPYARD	DESAN SHIPYARD / ISTANBUL
HULL NUMBER	21
CLASSIFICATION SOCIETY	B.V
CLASS ID	11834Q
CLASS NOTATION	BV, I + HULL, + MACHINERY, OIL TANKER, CHEMICAL TANKER, IMO II, ESP, UNRESTRICTED NAVIGATION, + AUT-UMS, CLEAN SHIP, ICE CLASS IC, VCS, IG, INWATERSURVEY, MONSHAFT
STATUS	UNDER CONSTRUCTION
KEEL DATE	2007
SHIP GENERAL	
MAIN DIMENSIONS	
LENGTH OVERALL	92.86 m
LENGTH BETWEEN PERPENDICULARS	86.65 m
BREADTH (MOULDED)	14.10 m

DEPTH (MOULDED)	7.20 m
DRAUGHT (DESIGN)	5.70 m

SPEED, CONSUMPTION & CRUISING RANGE

DESIGN SPEED	13.0 knots, 85% MCR
CONSUMPTION	7.5 ton/day, 85% MCR
CRUISING RANGE	7200 nm

HULL

HULL MATERIALS

The vessel to be constructed throughout of steel-plates and sections of approved shipbuilding quality, tested and approved by the Classification Society. In general, continuous and scallop welding to be adapted. Intermittent welds may be adopted where allowed by the Classification Society.

EQUIPMENT FOR CARGO

CARGO SPACE DEFINITION

TYPE OF CARGO SPACES

Epoxy coated cargo tanks integrated in the structure separated by longitudinal and transverse corrugated bulkheads and integrated slop tank at fore of cargo space.

NUMBER OF CARGO COMPARTMENT

10 Cargo Tanks + 1 Integrated Slop Tank

MAX CARGO DENSITY

1.54 t/m³

DECK CRANES FOR CARGO

GURDESAN, Cargo Hose Crane, SWL 5t, 12 m / Provision Crane, SWL 2t, 7 m

CARGO SYSTEM

Cargo system is designed so that 11 different substances can be loaded/ unloaded at the same time. Also a unique substance can be loaded / unloaded to /from all tanks by means of the two common line located aft and fore of cargo manifold. Cargo discharge system of the ship is capable of discharging six (6) tanks at the same time in full capacity.

CARGO DISCHARGE CAPACITY

Cargo discharge system of the ship is capable of discharging six (6) tanks at the same time in full capacity.

CARGO PUMPS

FRAMO, hydraulically driven pumps, 10 x 200 m³/h.

CARGO PIPES & FITTINGS

Cargo pipes are class II type mild steel pipe. The connections to be of butt welded if possible. The pipelines to be of through cargo tank inside. The pipelines to be arranged with sufficient expansion possibilities.

CARGO SYSTEM VALVES

DANFOSS, Remote Operated Hydraulic Valves.

SEPARATE STRIPPING SYSTEM

There are two kinds of stripping procedures applying for this vessel. Cargo tanks 6P&S, 5P&S, 4P&S which are located aft of the manifold and cargo tanks 3P&S, 2P&S, SLOP which are at fore of the manifold. Stripping is done by using compressed air or nitrogen when substances can not face to contact the air ie oxygen. DN 25 x Sch 10s stainless steel seamless 316L 1.4404 for stripping pipes are used in stripping system.

FREEZING, REFRIGERATING & HEATING SYSTEM FOR CARGO

Stainless steel heating coils.

INERT GAS SYSTEM

Nitrogen system is designed so that to fill 95% ullage volume of all cargo tanks and slop tank at the same time.

Nitrogen main pipes are connected to each tank cargo access hatch by means of the flexible hoses. System contain 10 pieces 50 lt, 200 bar nitrogen tube, control cabinet (include reducer, safety, non return valves.), flexible hoses. The cargo tank inlet pressure of nitrogen gas is 0.13 bar. Nitrogen tubes control cabinet and flexible hoses will be keep in Nitrogen room located main deck above the pump room .System is also used for stripping and purging purpose as well.

CARGO VENTILATION SYSTEM

PV valves setting pressure is 2000 mmWG for pressure, -350 mmWG for vacuum. The lines between PV valves and tanks are so arranged as to permit their self draining to the tanks. Pipe connections are to be full penetration butt welded type.

TANK CLEANING SYSTEM

Each cargo tank to be fitted with two tank cleaning hatches for tank portable tank cleaning machines. Tank cleaning hatches also to be used for ventilation gas freeing fans. Tank cleaning pump to be centrifugal, electric driven capacity 40 m³/h, 10 bar.

SHIP EQUIPMENT

MANOEUVRING MACHINERY AND EQUIPMENT

RUDDER

GURDESAN, Flap type

SIDE THRUSTER

JASTRAM, 200 kW

STEERING GEAR

DATA

ANCHOR, MOORING AND TOWING EQUIPMENT

GURDESAN, Windlass & Mooring Winch / Mooring Winch.

EQUIPMENT FOR CREW AND PASSENGER

LIFE SAVING EQUIPMENT

GEPA, Freefall

CREW CABINS

13 single berth and 2 double berth (suit) cabins.

SEWAGE TREATMENT PLANT

JOWA

MACHINERY MAIN COMPONENTS

MAIN ENGINE

MaK 6M25, 1x 1800 kW

PROPULSION SYSTEM

BERG, CP Propeller, 3500 mm

BOILER / STEAM GENERATOR

S-MAN

AUXILIARY DIESEL GENERATOR

VOLVO PENTA, 3 x 300 kW, 1500 rpm, 50 Hz

EMERGENCY DIESEL GENERATOR

VOLVO PENTA

SHAFT GENERATOR

AvK, 1 x 4560 kW

SYSTEM FOR MACHINERY MAIN COMPONENTS

COOLING SYSTEM

BLOKSMA, Box Cooler

SHIP COMMON SYSTEMS

ELECTRICAL SYSTEM

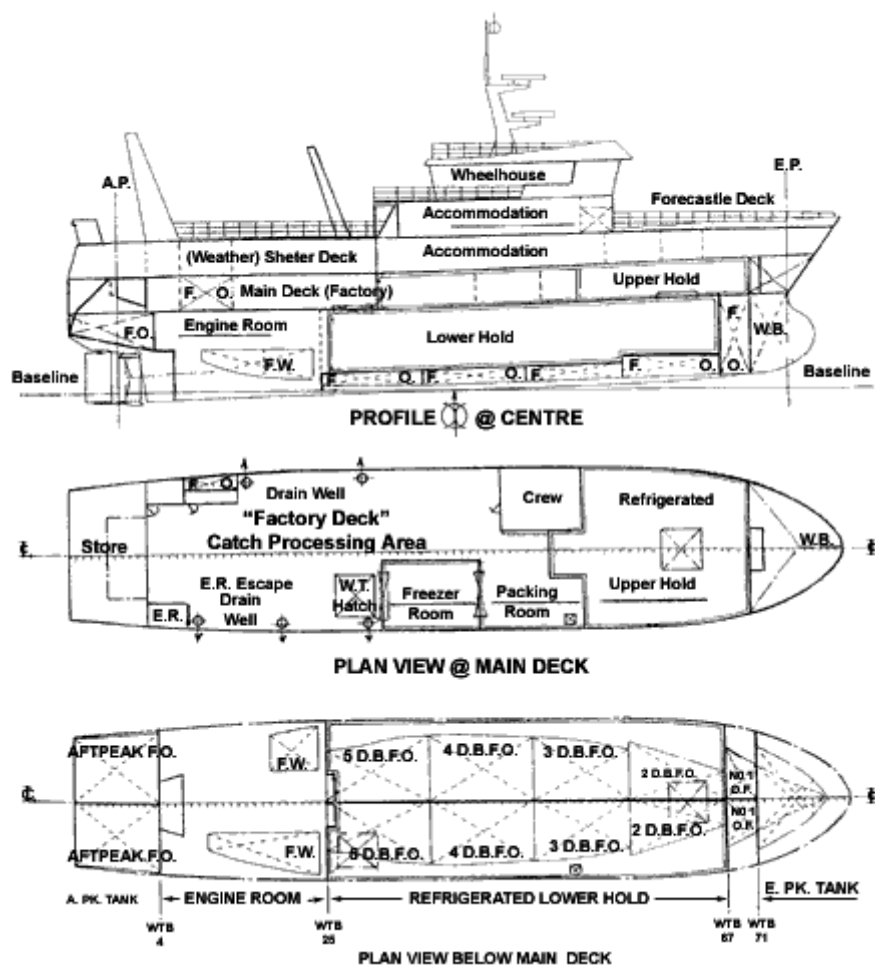
BETESAN, Electric Contractor

ALARM SYSTEM

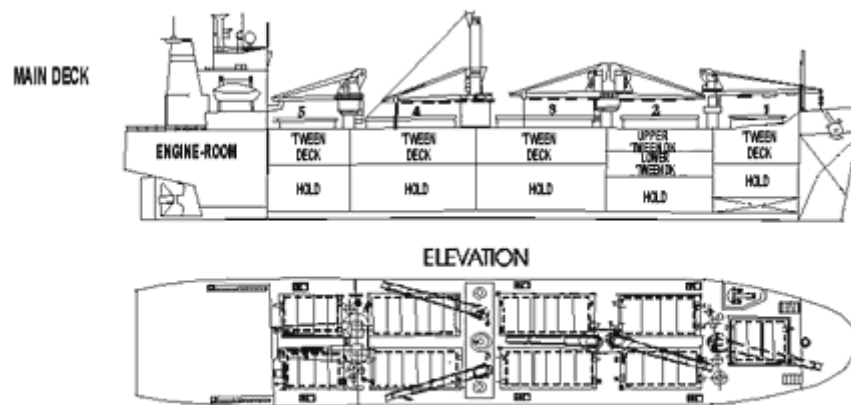
POLIMAR, CO2 System / Foam System

LOADING INSTRUMENT

DELTA MARINE, DeltaLoad



8 Factory ship



9 Classical freighter / cargo liner - general arrangement plan