

LAMPIRAN

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Unit 1

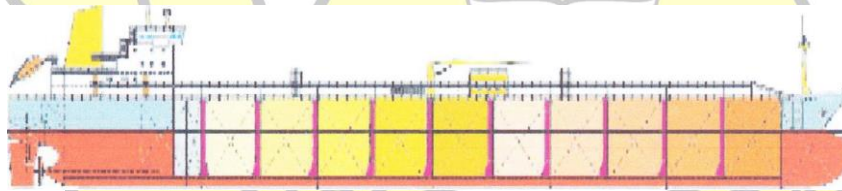
SHIPS AND SHIPS TERMS
SHIP DESIGN AND CONSTRUCTION
(general introduction)

Basic terms

hull superstructure machinery stern bow amidships beam	deck engine room propeller shaft bow thruster rudder bulbous bow hold
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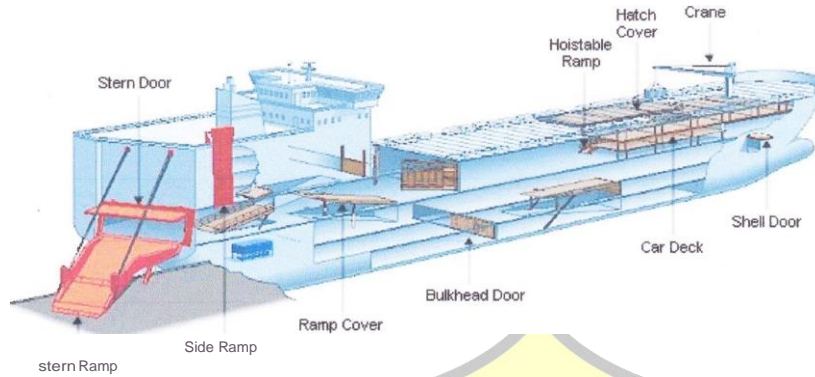
1 A multi-purpose vess31



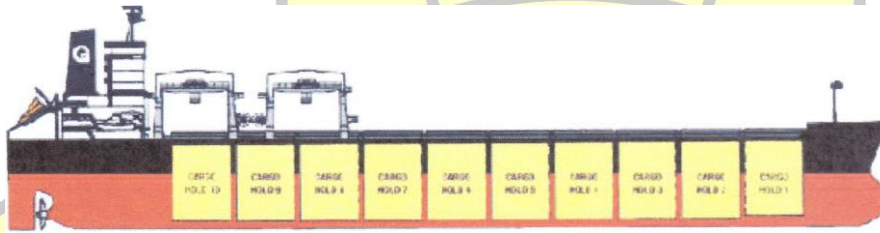
2 An oil tanka-



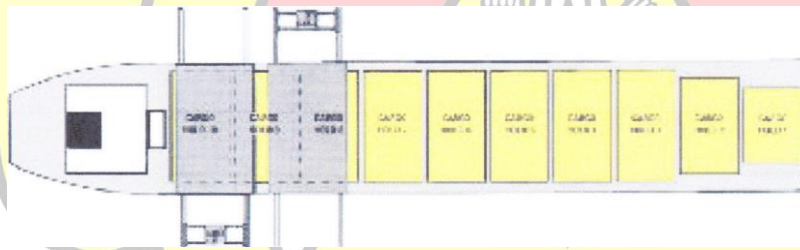
3 A container vess31



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.

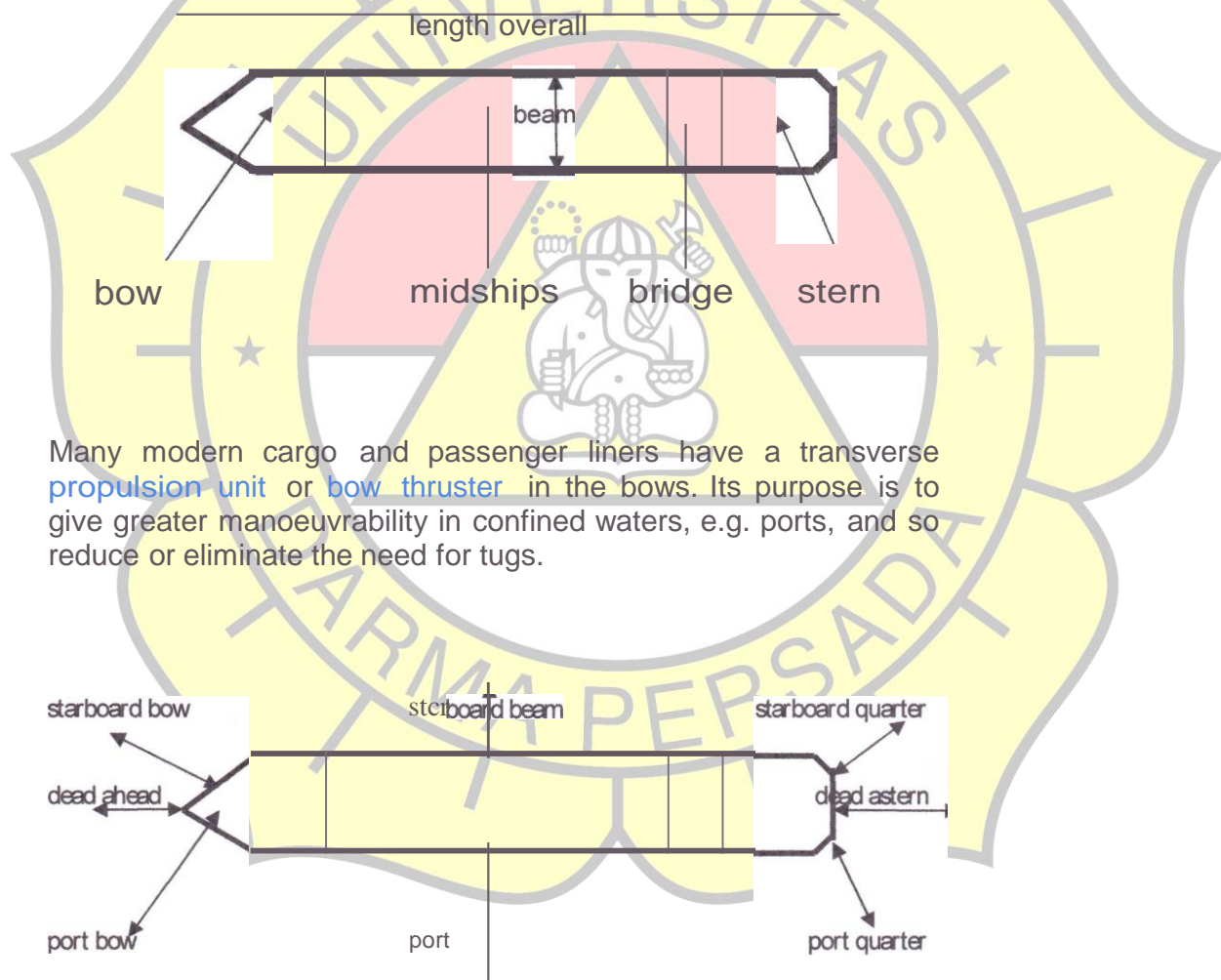
There are two main parts of a ship: the hull and the machinery.

The **hull** is the actual shell of the ship including the

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**.



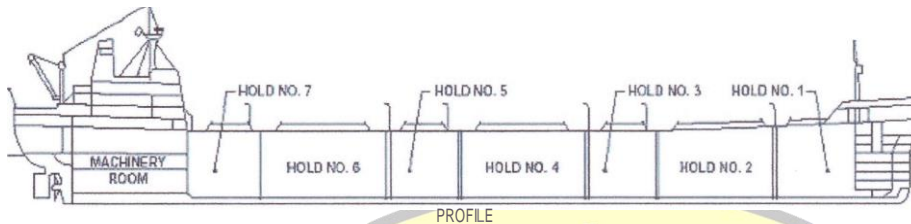
Many modern cargo and passenger liners have a transverse **propulsion unit** or **bow thruster** in the bows. Its purpose is to give greater manoeuvrability in confined waters, e.g. ports, and so reduce or eliminate the need for tugs.

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 many 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?

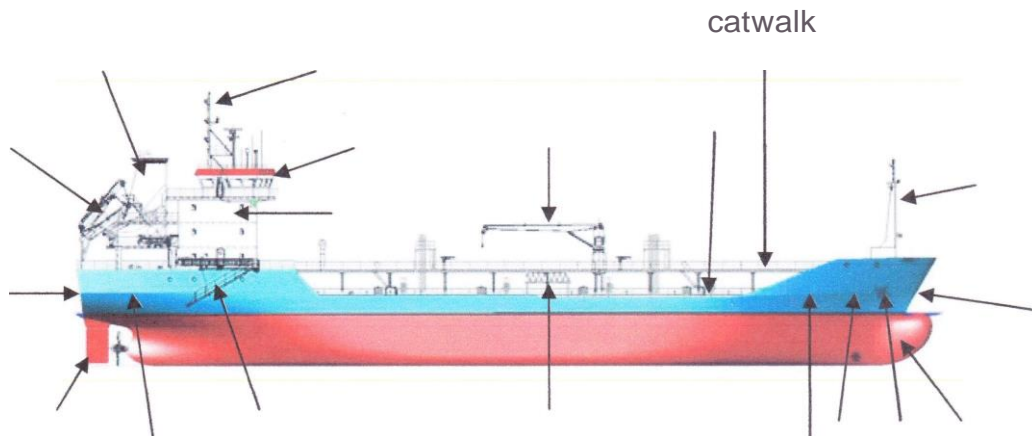
1. _____ : the body of the ship.
2. _____ : the large hinged plate at the stern of the ship which controls the ship's direction.
3. _____ : space inside the ship for carrying the cargo.
4. _____ : a part of the ship which drives the ship through the water.
5. _____ : an opening in the deck through which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

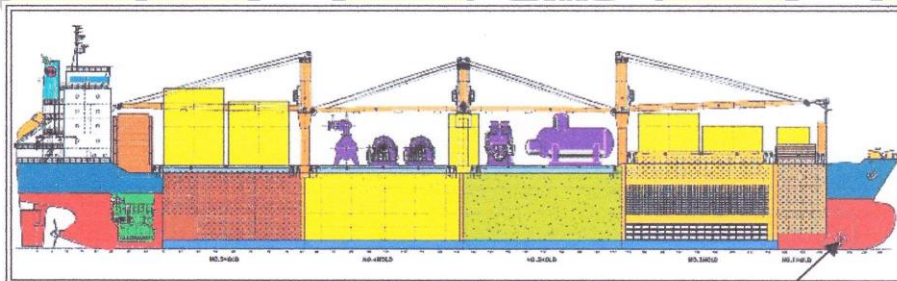
shell and all members and parts which hold the ship together, divide it into 6. _____ and give it strength and rigidity.

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



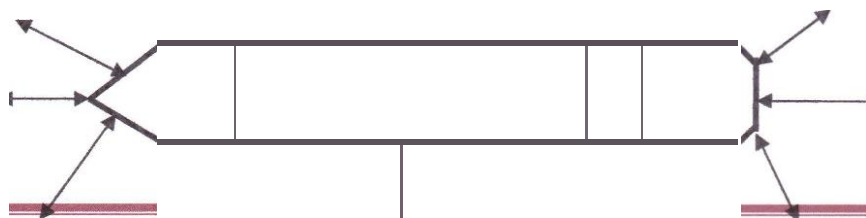
A.6 Indicate the parts of the ship below by drawing an arrow to the relevant position:

- 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, brdge, wheelhouse, forepeak, afterpeak



bow thruster

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



B. Grammar

8.1 Supply the right form of the verb in brackets:

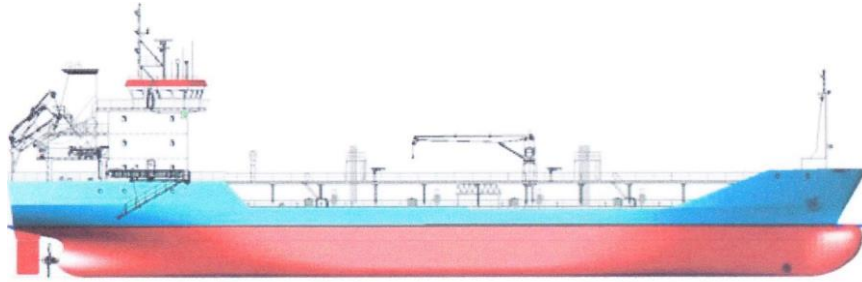
Description of a ship

The «Polar Star» (be) 1. _____ a ship (belong) 2. _____ to a class called multi-purpose ships. She (be) 3. _____ 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) 4. _____ so that holds Nos. 1 to 4 (be) 5. _____ forward of the bridge superstructure and No. 5 is abaft it. Each hold (serve) 6. _____ by two 20 ton derricks, mounted in pairs. The hull (be) 7. _____ of a single 'tween deck type with raised forecastle and a bridge superstructure of medium height. The ship (fit) 8. _____ with a stern anchor and warping winch for (manoeuvre) 9. _____ in confined waters. With a single diesel engine and a controllable pitch propeller the «Polar Star» (run) 10. _____ at her economical service speed of 16 knots, her fuel consumption (be) 11. _____ around 20 tons per day.

8.2 Complete the list filling in the missing words:

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

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 OIUCHEMICAL TANKER)
OWNER	DESAN SHIPBUILDING Co. / TURKEY
SHIPYARD	DESAN SHIPYARD /ISTANBUL
HULL NUMBER	21
CLASSIFICATION SOCIETY	B.V
CLASSID	118340
CLASS NOTATION	BV, I+ HULL,+ MACHINERY, OIL TANKER, CHEMICAL TANKER, IMO II, ESP, UNRESTRICTED NAVIGATION, + AUT-UMS, CLEAN SHIP, ICE CLASSIC, 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)	7.20m
DRAUGHT (DESIGN)	5.70m

SPEED, CONSUMPTION & CRUISING RANGE

DESIGN SPEED	13.0 knots, 85% MCR
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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

1.54t/m³

DECKCRANESFORCARGO

GURDESAN, Cargo Hose Crane, SWL 5t, 12m / 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 200m³/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. ON 25 x Sch 10s stainless steel seamless 316L 1.4404 for stripping pipes are used in stripping system.

FREEZING, REFRIGERATING & HEATING SYSTEM FOR CARGO

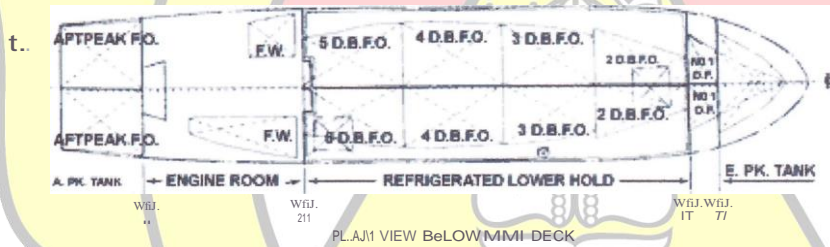
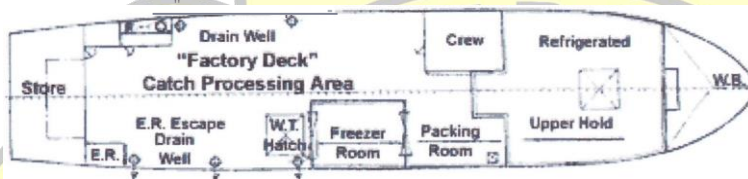
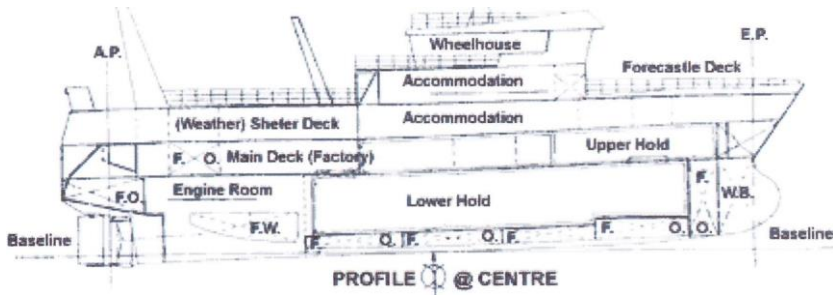
Stainless steel heating coils.

INERT GAS SYSTEM

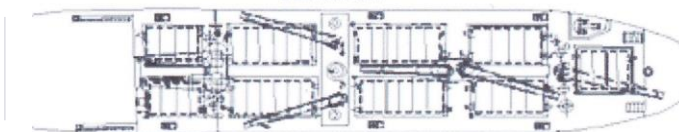
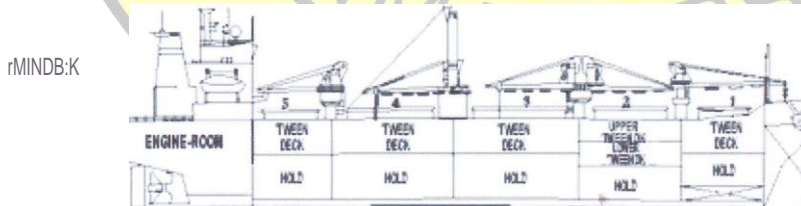
Nitrogen system is designed so that to fill 95% ullage volume of all cargo tanks and slop tank at the same time. Nitrogen main pipes are connected to each tank cargo access hatch by means of the flexible hoses. System contain 10 pieces 50 lt, 200 bar nitrogen tube, control cabinet (include reducer, safety, 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.



8 Factory ship



PLAN MAIN DECK

9 Classical fraghta- / cargo line-- ga1a-al arrangement plan



6 7 0 9
 4127,4617 5107 5597 Fore end: A min. shobasic engine
 A max. shows en91ne with built on tuning wheel
 ForPIO. Seecorrespondt,,g..Spacerequ!r meqr.

1880 MAN B&W ana ABB turbochai Jels The reqwred sptice to tile engme room
 c .ing :.,,il!!luultop Ut!KI: g

2382 2!100!2G37 MAN B&W turbodmryt.-f o,,,&n rons :JCCCUJ!rrglo "TutuOC..llt!r-E..!1

2036 2173 2371 2508 ABB turbochm!J Chnicc" nt ncmrn:l MCR

!Th!> ciic:t nrP fr!m rr(lnk-.hnl.r:Pntr>lmP tn!
 !Jwer edge of deck beam. when uc:mq

4500 1) Manual crane
 lisViA &AVNiJ Bd A loeJtUb(!ra rtb
 o-ww ouc J cran

I	4825	Vertical lift of piston, piston rod passes between cylinder cover studs
G	4725	Tilted lift of piston, piston rod passes between cylinder cover studs
H	1990	See "Gallery outline"
I	3520	See "Engine outline"

101:: !1013! i!CCh 100 h 2!i0 b 250 tMN B&W turbochargt:f lormen;-ron iKCCording to "luft<XJ1dr9er

.Q.I_L1 Q!jOj 1004 !1004}1200j1200 ABB turbocharger jc.ho1cc" at norranal MCR

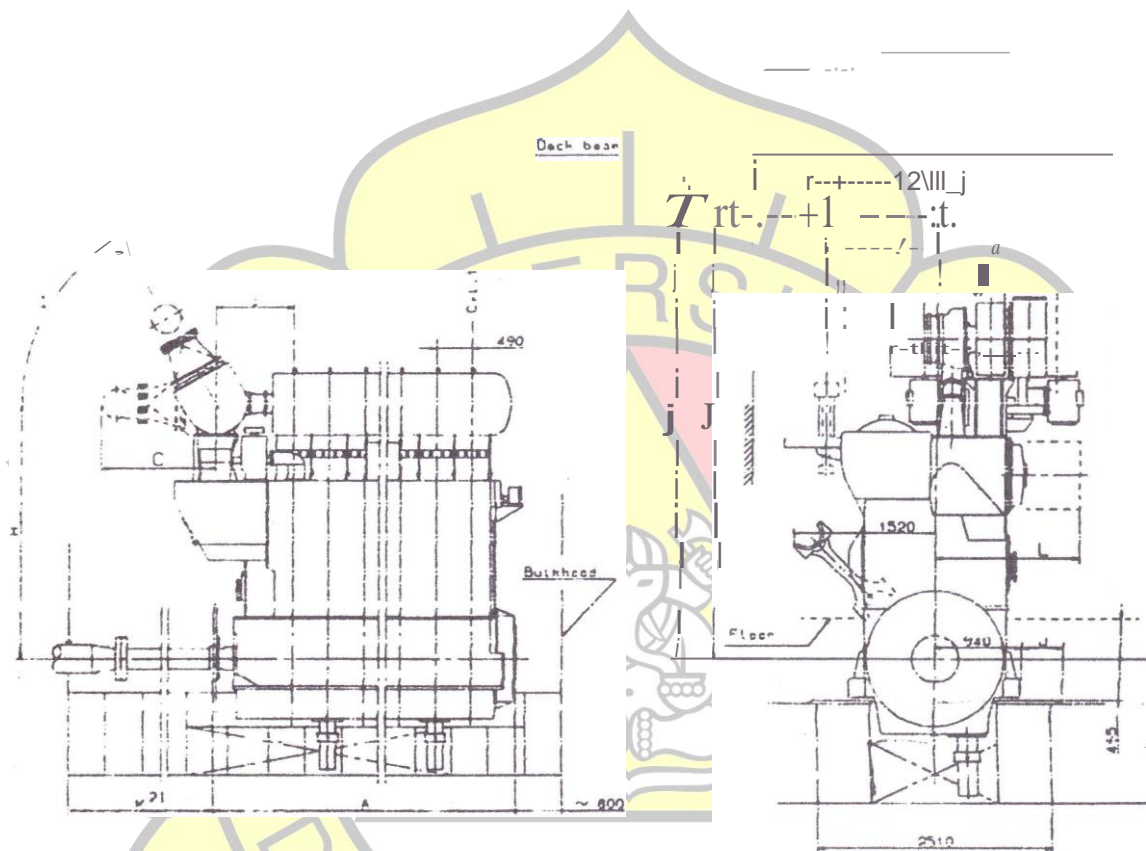
r.n t&r... ol of t,olding dOW!! bolts
 liu90T1690!1690 Ne:e c.rtry pttctfor CIVt!Vsul (r .llf COOP.I

194 !The drmp.nsoncover rAqwrxl cap:"CU ,lrId huok lmvell'ng Vlnrll't tor
 7 72 t,rbcCh."lrgcr NA34/S

42tL. L
 IMiX . iL* (e;ire:) :,,; j tA- "l' :,,; J ; rJi u:-et,

30 . 45 . 60 . 75 . 90° r;::;,-S:-; g ;::;m n;l :c<lroom ab i g :J





- 1) Minimum 4675 mm for turbocharger NA34/S
- 2) K must be equal to or larger than the propeller shaft, if the propeller shaft is to be drawn into the engine room

Norma minimum centreline distance for twin engine installation: 3450/2800 mm (2800 mm for common galley for starboard and port design engines)

The dimensions are given in mm and are for guidance only. If the dimensions cannot be fulfilled, please contact MAN B&W Diesel A/S or our local representative.

S26MC
 Bore: 260 mm
 Stroke: 980 mm

Power
1GrJL'

Lt L2
 Speed

Power and speed

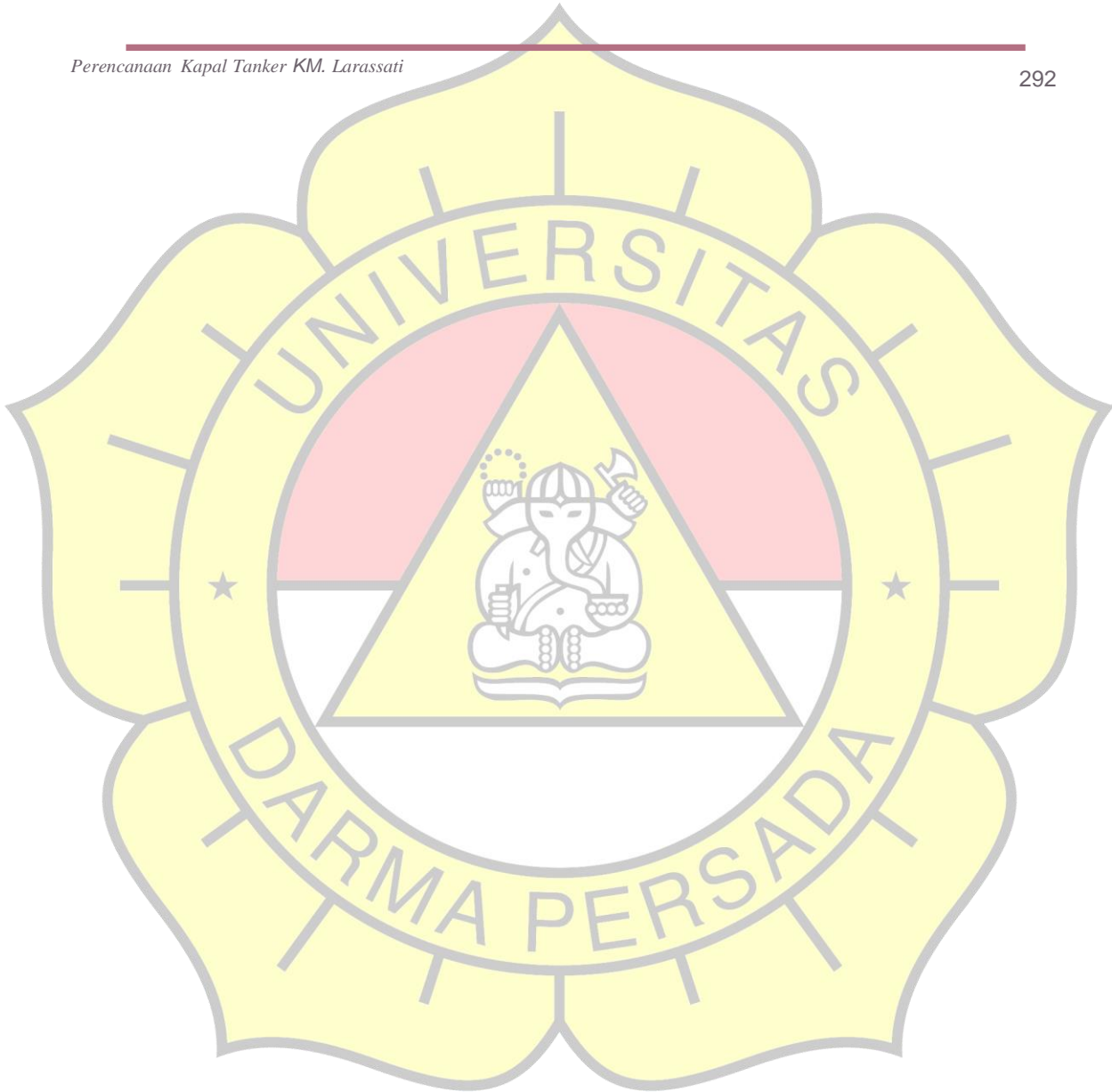
Layout point	RPM	Mean effective pressure (bar)	Power (kW / RHP)									
			4	5	6	7	8	9	10	11	12	
I	250	18.5	1600 2180	2000 2725	2400 3270	2800 3815	3200 4360	3600 4905	4000 5450	4400 5995	4800 6540	
L2	250	14.8	1280 1740	1600 2175	1920 2610	2240 3045	2560 3480	2880 3915	3200 4350	3520 4785	3840 5220	
L1	212	18.5	1360 1860	1700 2315	2040 2720	2380 3255	2720 3720	3060 4185	3400 4650	3740 5150	4080 5580	
LA	212	14.8	1100 1480	1375 1850	1650 2220	1925 2590	2200 2960	2475 3330	2750 3700	3025 4070	3300 4440	

Fuel and lubricating oil consumption

Layout point	At load (%)	Specific fuel consumption (g/kWh)	Lubricating oil consumption (g/BHP-h)
Lt	100%	179 132	130
L2	100%	174 128	127

Approximate
 Kg/cyL 24 t.uur.;
 1.5
 1.1-1.6 g/kWh

13	179 132	177 130	0.8-1.2 g/BHP
14	174 128	173 127	



Section 9

Framing System

A. Transverse Framing

1. General

1.1 Frame spacing

Forward of the collision bulkhead and aft of the after peak bulkhead, the frame spacing shall in general not exceed 600 mm.

1.2 Definitions

- k material factor according to Section 2, B.2.
- l_o unsupported span [m] according to Section 3, C., see also Fig. 9.1
- 2,0m
- l_{ku} length of lower/upper bracket connection of main frames within the length l_o [m], see Fig. 9.1

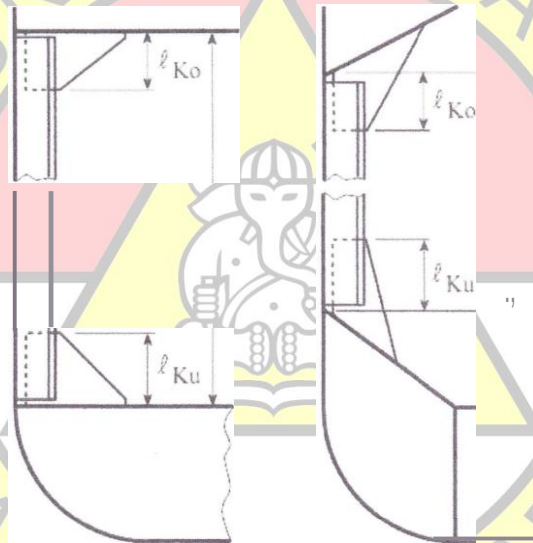


Fig. 9.1 - Unsupported span of transverse frames

- m , $0,204 \leq [4 - C \leq m]$, where $C = I$
- e spacing of web frames [m]
- P P_s or P_e as the case may be
- P_s load on ship's sides [kN/m^2] according to Section 4, B.2.1
- P_e load on bow structures [kN/m^2] according to Section 4, B.2.2 or stem structures according to Section 4, B.2.3 as the case may be
- p_1 'tween deck load [kN/m^2] according to Section.4, C.I.
- p_1, p_2 pressure [kN/m^2] according to Section 4, D.I.
- H_u depth up to the lowest deck [m]
- c_r factor for curved frames

$$c_{nnin} = 1,0 - 2 \frac{\Delta}{i}$$

s max. height of curve.

2. Main frames

2.1 Scantlings

2.1.1 The section modulus W_R and shear area A_R of the main frames including end attachments are not to be less than:

$$W_R = n \cdot c \cdot a \cdot e^2 \cdot p \cdot k \quad [cm^3]$$

upper end shear area :

$$A_{Ro} = (1 - 0,817 \cdot m_a) 0,04 \cdot a \cdot l \cdot p \cdot k \quad [cm^2]$$

lower end shear area :

$$A_{Ru} = (1 - 0,817 \cdot m_a) 0,07 \cdot a \cdot f \cdot p \cdot k \quad [cm^2]$$

$$n = \begin{cases} 0,9 - 0,0035 \cdot L & \text{for } L < 100m \\ 0,55 & \text{for } L \geq 100m \end{cases}$$

$$c = \begin{cases} 1,0 - \left(\frac{t_{Ku}}{f} + 0,4 \cdot \frac{t_{Ko}}{f} \right) & \\ 0,6 & \end{cases}$$

Within the lower bracket connection the section modulus is not to be less than the value obtained for $c = 1,0$.

2.1.2 In ships with more than 3 decks the main frames are to extend at least to the deck above the lowest deck.

2.1.3 The scantlings of the main frames are not to be less than those of the 'tween deck frames above.

2.1.4 Where the scantlings of the main frames are determined by strength calculations, the following permissible stresses are to be observed:

bending stress: $\sigma_b = \frac{100}{k} \quad [N/mm^2]$

shear stress: $\tau = \frac{100}{k} \quad [N/mm^2]$

equivalent stress: $\sigma_{av} = \frac{180}{k} \quad [N/mm^2]$

2.1.5 Forces due to lashing arrangements acting on frames are to be considered when determining the scantlings of the frames (see also Section 21, H)

2.1.6 For main frames in holds of bulk carriers see also Section 23, B.5.2.

2.2 Frames in tanks

The section modulus W and shear area A of frames in tanks or in hold spaces for ballast water are not to be less than the greater of the following values :

$$W_1 = n \cdot c \cdot a \cdot e^2 \cdot P_1 \cdot cr \cdot k$$

W_2 according to Section 12, B.3.1, and

$$A_1 = (1 - 0,817 \cdot m_a) 0,05 \cdot a \cdot e \cdot p_1 \cdot k$$

$$A_2 = (1 - 0,817 \cdot m_a) 0,04 \cdot a \cdot e \cdot p_2 \cdot k$$

n and c see 2.1.1