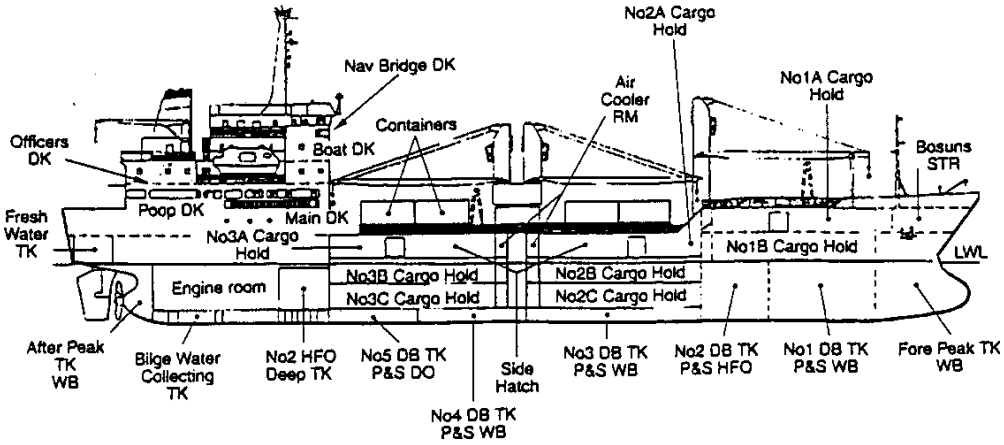
Unit 3
SHIPS AND SHIP TERMS

SHIP'S DECKS, SPACES AND EQUIPMENT

Basic terms

cargo gear	***anchor gear***
derrick	***crew accommodation***
lifting capacity	***draught waterline***
mast	***freeboard***
nautical equipment	***life-saving apparatus***
ship's systems	***machinery***
ship's crane	***mooring gear***
shore crane	***samson post***
winch	***manifold valve***

Ship's decks and spaces



1 Ship's spaces - reefer ship

A ship might reasonably be divided into **three distinct areas**: the cargo-carrying holds or tanks, the accommodation and the machinery space. Depending upon the type each ship will assume varying proportions and functions. An oil tanker, for instance, will have the cargo-carrying region divided into tanks by two longitudinal bulkheads and several transverse bulkheads. There will be considerable quantities of cargo piping both above and below decks.

The **general cargo ship** will have various **cargo holds** which are usually the full width of the vessel and formed by transverse bulkheads along the ship's length. Cargo handling equipment will be arranged on deck and there will be large hatch openings closed with steel hatch covers. The accommodation areas in each of these ship types will be sufficient to meet the requirements for the ship's crew,

provide a navigating bridge area and a communications centre. The machinery space size will be decided by the particular machinery installed and the auxiliary equipment necessary.

A **passenger ship**, however, would have a large accommodation area, since this might be considered the 'cargo space'. Machinery space requirements will probably be larger because of air conditioning equipment, stabilisers and other passenger related equipment.

Modern dry cargo ship designs maximize **hold space**. A typical mid-size ship may have five or six holds; three or four forward of the machinery space and superstructure, and one or two aft. The machinery spaces and superstructure are usually located about three quarters aft. Older designs typically have three holds forward of the superstructure and two aft. Holds aft of the accommodation and machinery spaces improve the trim of the vessel when partially loaded, and provide the ship with sufficient draft aft for stability and propeller immersion.

Small freighters often have **machinery and accommodation spaces** aft of all cargo holds. Deadweight of modern general cargo liners ranges from 9,000 to 25,000 tons; speeds range from 17 to 22 knots. Tramps are typically smaller and slower, with speeds ranging from 12 to 18 knots.

The **speed-to-length ratio** is generally 0.87 or less as higher ratios are usually not economical. Laden drafts are as deep as channels to the intended terminal ports allow, typically in the 26- to 29-foot range. **Hull depth** is selected to provide the desired draft and satisfy statutory freeboard requirements. Depth of the double bottom is kept low to maximize cargo space.

One or more **'tween decks** may be fitted to facilitate flexibility in cargo loading and unloading, cargo segregation, and to improve stability. There may be watertight doors in the bulkheads on the 'tween decks levels. Denser cargoes are carried in the lower holds with high stowage factor products normally stowed in the 'tween decks. Refrigerated spaces may be built into the 'tween decks.

Tramps are designed to carry a wide variety of commodities while liners may be designed for a specific trade. Ship designs for a specific trade strive for "full and down" operation; the ship's freeboard is down to her loadline with cargo cubic fully occupied.

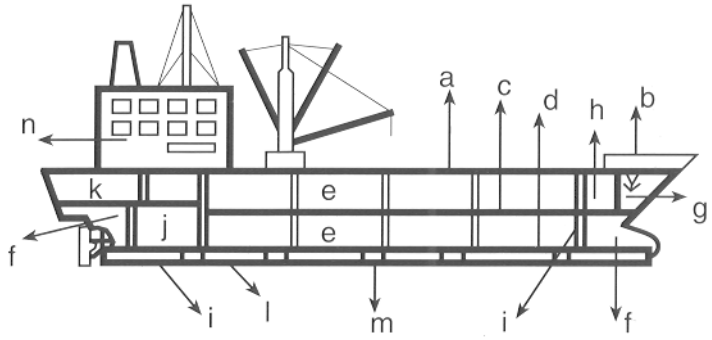
For a given trade, **hold spaces** are usually designed so that the ratio of bale cubic to deadweight is 10 to 15 percent greater than the overall stowage factor of the goods carried to allow for more rapid cargo handling and broken stowage – the spaces between and around cargo units, including dunnage, and spaces not available for cargo stowage because of physical obstructions or ventilation and access requirements.

Holds are sized and provided with cargo gear to limit the amount of cargo cubic per stevedore gang to about 60,000 cubic feet; holds in the midbody are therefore usually shorter than those nearer the ends of the ship. The conflict between the desire to shorten holds and the length required by cargo gear and hatches

sometimes dictates the assignment of midships spaces to machinery or to fuel, cargo, or ballast deep tanks rather than holds.

Hatches are as large as possible without compromising hull strength (the main or second deck is normally the strength deck) to reduce the requirement for horizontal movement of cargo within the holds. Hatches served by two sets of cargo gear generally measure 20 by 30 feet or larger. Hatches on older ships are generally smaller than those on newer ships. Hatches are surrounded by coamings to reduce the risk of flooding in heavy seas. Covers are usually constructed of steel (or wood on older vessels). The main deck plating between hatches is not effective in providing longitudinal strength, and is sized to carry fairly light local loads. The deck plating outboard the hatches is therefore much heavier, often exceeding five-eighths inch in thickness.

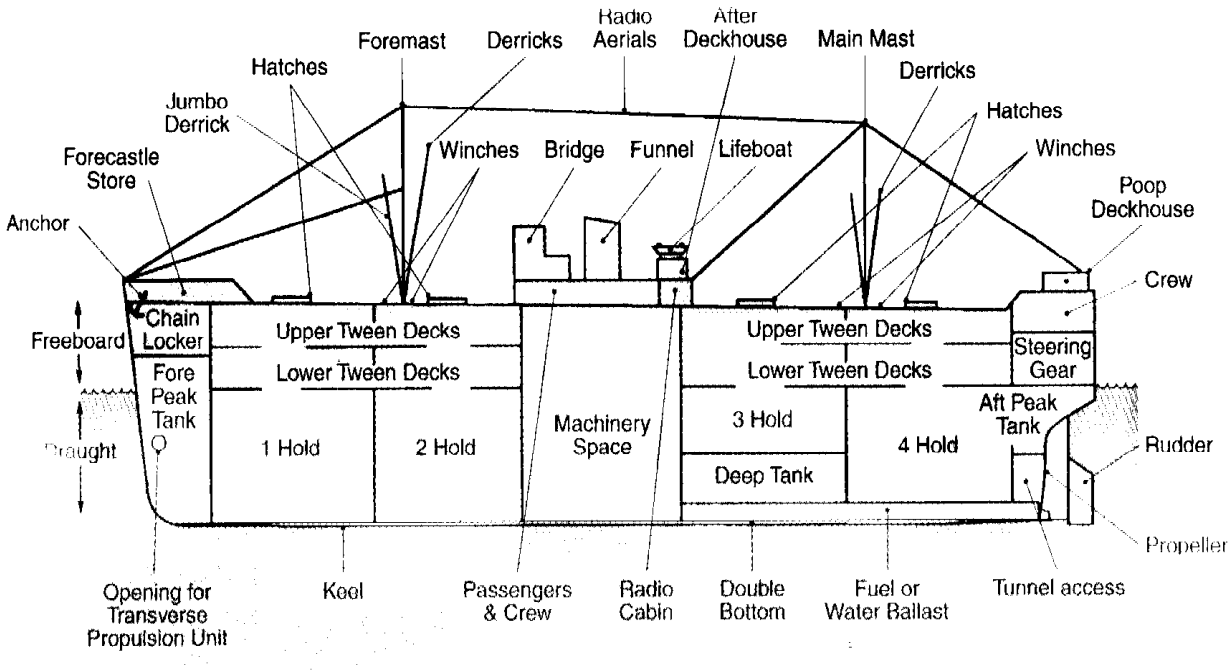
Cargo gear is designed for speed and flexibility for handling breakbulk, palletized, or container cargo. Various combinations of derricks, winches, and deck cranes are used for the handling of cargo. Cranes are fitted on many vessels to reduce manpower requirements. Some ships have special heavy-lift derricks that may serve one or more holds. Booms are rigged for either yard and stay (burton) or swinging-boom operation.



Longitudinal section with spaces and separations

Source: P. van Kluijven (2005) IMLP

a. *upper deck or main deck*
b. *forecastle*
c. *tweendeck*
d. *tanktop*
e. *upper hold and lower hold*
f. *peak tank*
g. *chain locker*
h. *bosun's locker*
i. *collision bulkheads*
j. *engine room*
k. *steering machinery*
l. *double bottom*
m. *cofferdams*
n. *superstructure*



2 Decks and spaces on a classical cargo liner

Ship's systems

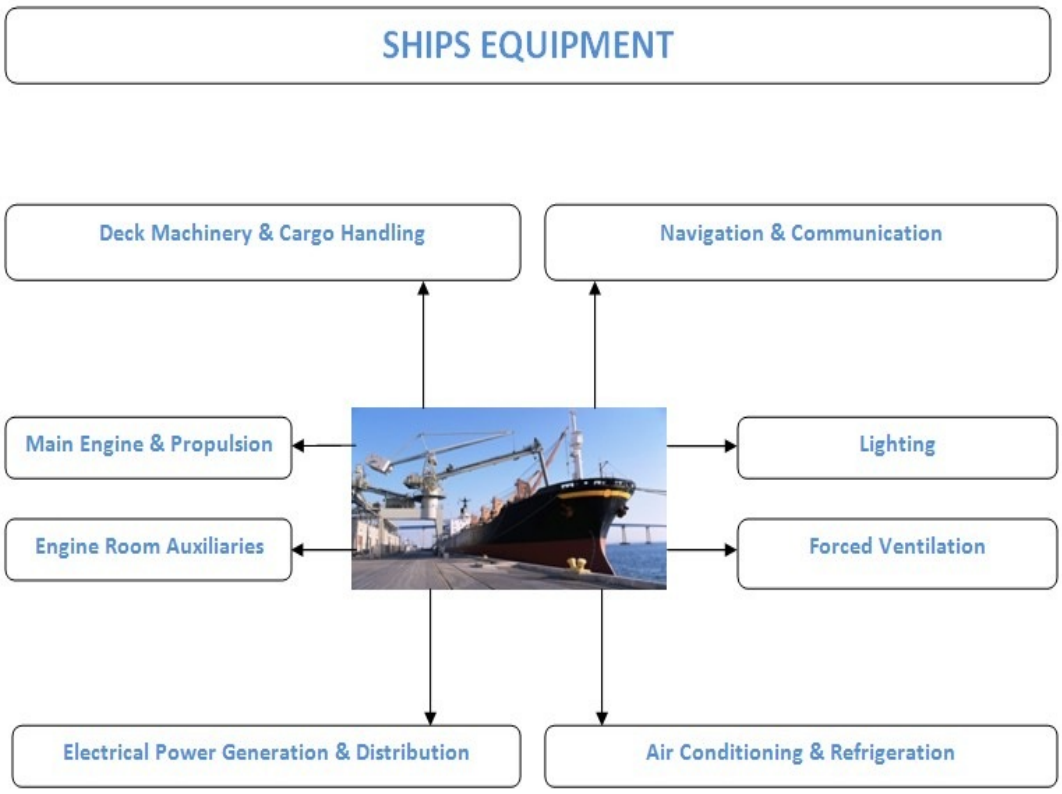
The **ballast pumping system** comprises a 500 m³/hr centrifugal **pump** and two main centrifugal self-priming pumps, each of which has a capacity of 1,000 m^/hr **De-ballasting**, excluding **stripping**, can be undertaken in eight hours. The **bilge system** in all the holds, except Hold 1, incorporates two centrifugal, self-primping pumps rated at 200 m^/hr, and a single piston type bilge pump of 10 m³/hr. The centrifugal pumps discharge bilge water directly overboard, while the piston unit discharges into a **settling tank**. For Hold 1, there is a single centrifugal pump with a 100 m³/hr capacity and a bilge water **settling tank**. The pump extracts water from the hold's bilge wells and pumps it either overboard or to the settling tank. Emergency **drainage** of Hold 1 is also possible using the engine room bilge pumps.

The central **coolers**, the main engine cylinder cooling fresh water cooler, and the main engine lub oil cooler are all plate type, and were manufactured by Alfa Lavals, Sweden. All the steam **heaters** on the *Lara Rickmers* class are of the shell and tube type.

Kværner of Norway provided the solid/oil **waste incinerator** unit, which has an approximate burning capacity for **solid waste** of 50 kg/hr for **sludge oil**.

The engine room is arranged with a **control and monitoring system**, that meets LR class requirements for a periodically **unmanned engine room**. Stein & Sohn of Germany supplied the **main engine control system**, as well as its Camos

2000 engine room **alarm** and monitoring system. **Auxiliary equipment** in the engine room includes centrifugal type sea water, fresh water, ballast and bilge pumps, all driven by electric motors. These are capable of operating in regular conditions in both **suction** and **discharge** mode without overloading.



The **handling of cargo** is carried out either by the ship's own **cargo gear** or by **shore cranes**.

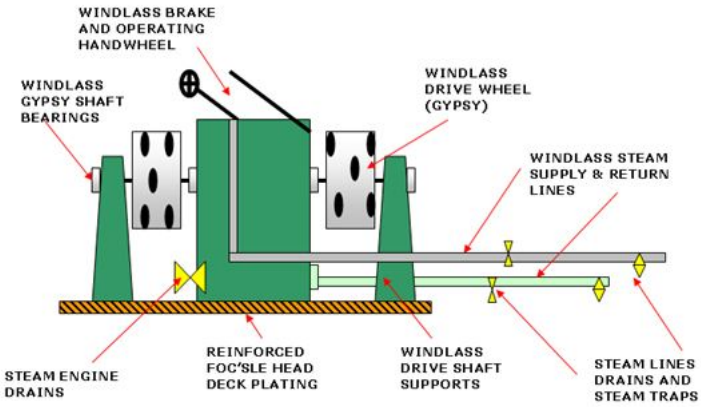
The **derricks** are the ship's cranes, and their **lifting capacity** can vary from 3 tonnes to 50 tonnes or more. If heavy items such as locomotives or boilers are carried, jumbo derricks capable of lifting up to 200 tonnes are provided. They are operated by the ship's **winches**. Derricks are necessary when cargo is loaded or discharged into barges and are also used on the ship's quayside, where they can work in conjunction with shore cranes. The derricks are supported by masts or **samson posts**.

The **bridge** of a vessel is the navigating centre of the ship where her course is determined. It is generally situated aft. In recent years the tendency to have machinery aft has caused the navigating bridge to be similarly located, particularly on cargo ships and tankers. Included on the navigating bridge is the **helm**, and also a large amount of **nautical equipment**, including radar sets, a gyro compass, a radio direction finder, etc. The bridge is in direct communication with all parts of the vessel.

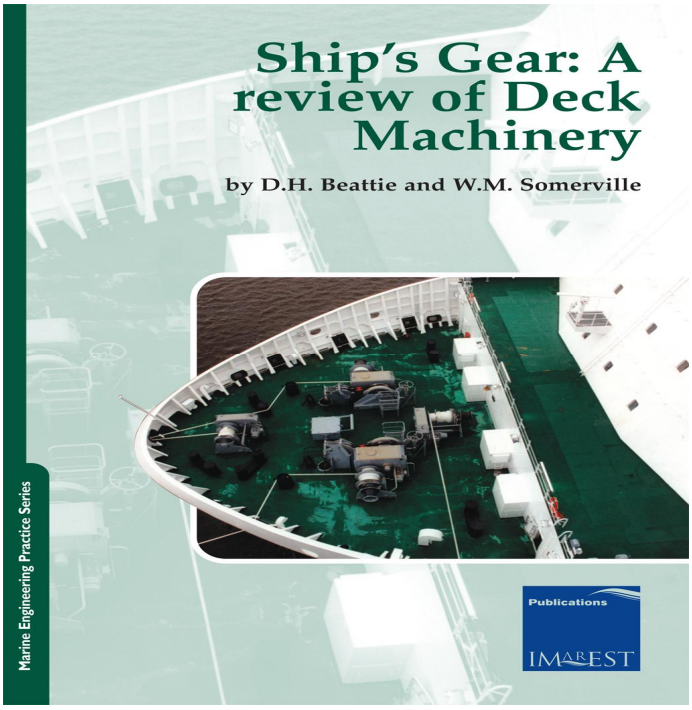
Crew accommodation on modem cargo ships and tankers is situated aft in close proximity to the machinery. Standards of accommodation are high, and are controlled by various IMO and ILO **statutory regulations**.

There are various statutory provisions concerning the quantity and type of **life-saving apparatus** carried on a vessel. Broadly speaking, it is determined by the type of the vessel, crew establishment and passenger certificate (authorized

number of passengers permitted to be carried). The life-saving apparatus includes lifeboats, inflatable rubber liferafts, lifebuoys and individual lifejackets.

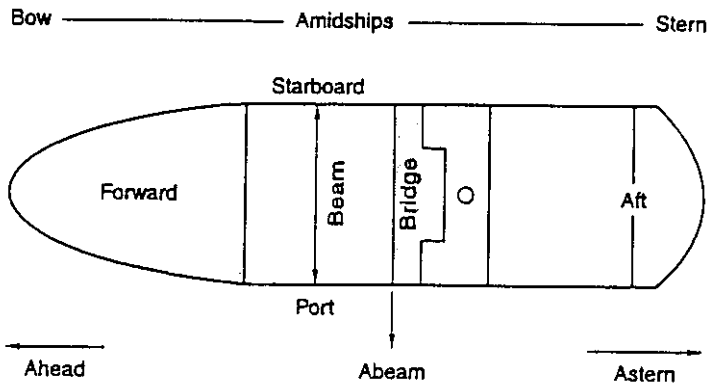


Drawn by Willie Scott 2010



The **draught** (or draft) of a vessel is the vertical distance from the keel to the waterline. The maximum permitted draught varies according to the zones, seasonal periods and waters in which the ship plies. **Freeboard** is the distance measured amidships from the water line to the main deck of a vessel. This is normally the uppermost continuous deck in a ship with one or more decks. However, in a **shelter**

deck vessel it would be the next deck below.



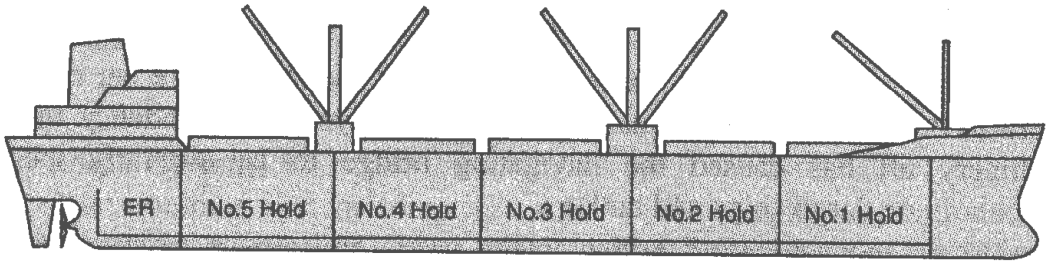
Orientation on board and around the ship

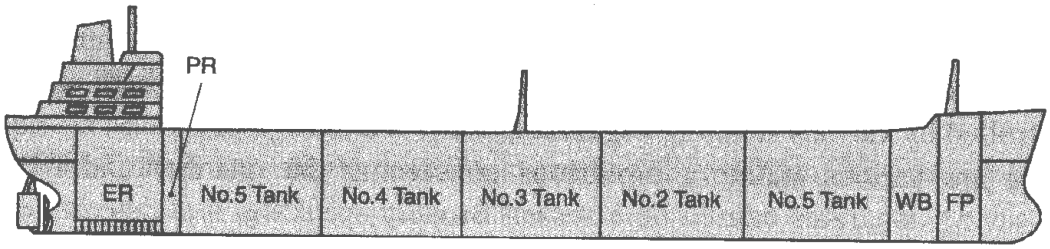
A. Comprehension & vocabulary

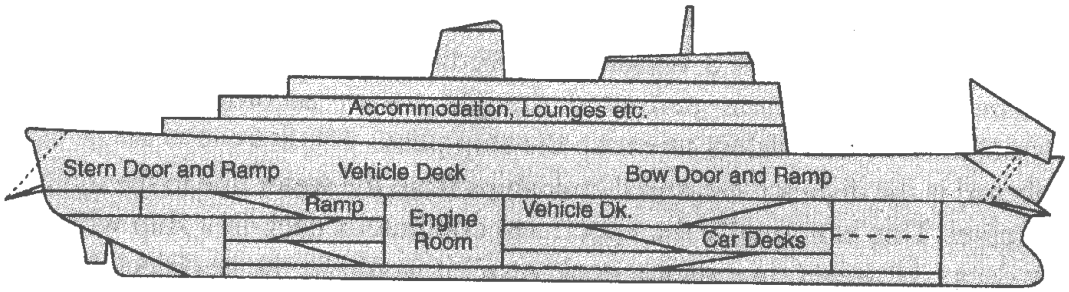
A.1 Answer the following questions:

1. What is the cargo handled with?
2. What is the usual capacity of the ship's derricks and cranes?
3. Which type of cargo is carried by jumbo derricks?
4. What is the function of the bridge?
5. Where is the bridge situated?
6. What equipment does the bridge accommodate?
7. Where is the crew accommodation situated?
8. What does the ship's safety equipment depend on?
9. What does life-saving apparatus include?
10. What is the draught of a ship?
11. What is the freeboard of a ship?

A.2 Write down the main elements of the ship's construction under the following headlines (see the relative drawings):





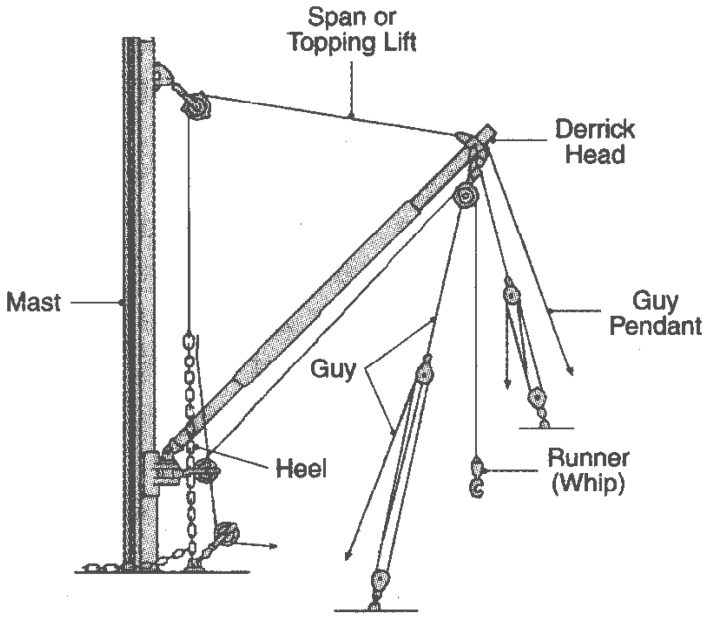


ship's hull	superstructure	cargo gear

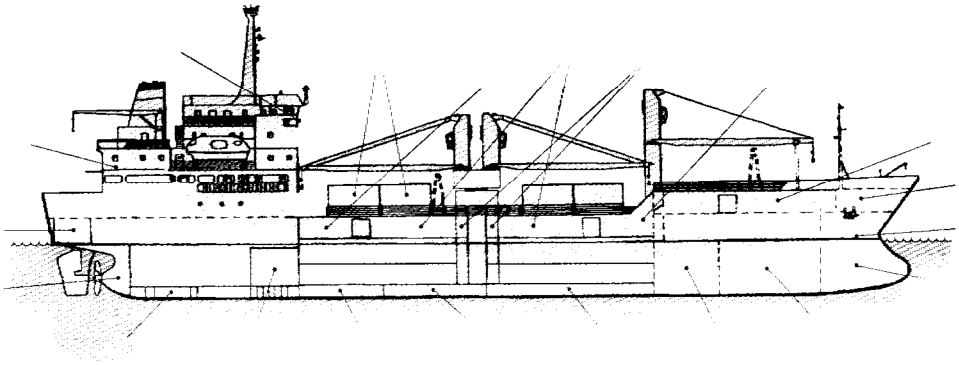
A.3 Have a look at the sketches above (ship's derrick) and fill in the following missing words: ***tackles • runner • mast • derrick head • topping lift • guy pendants***

The ship's derrick

A derrick is a strong boom pivoted on the 1. _____ at the lower end. It is fitted with stays and 2. _____ to swing it to port and starboard. The derrick boom is lifted by the 3. _____ or span fixed at the
4. _____ and passing through a block on the top of the mast. A whip or
5. _____ is used to lift and lower the cargo. The guy pendants are operated by 6. _____ .



A.5 Insert the missing labels in the layout drawing of the ship ***(see also Basic terms for help):***

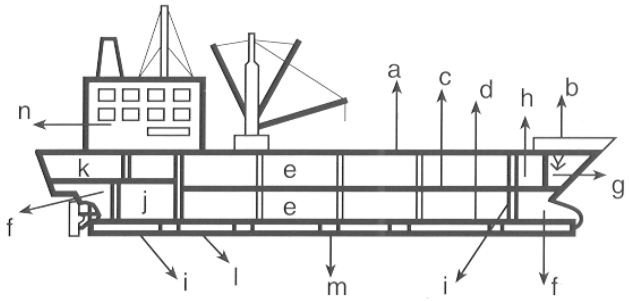


A.6 Re-write the abbreviations referring to the terms deck ***and*** *tank* ***from the drawings of the ship on p. 1, and give their full forms:***

EXAMPLE
main dk = main deck
wb tk = water ballast tank

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

A.7-a Assign the labels to the letters below:



Longitudinal section with spaces and separations

bosun's locker *chain locker,* *cofferdams* *collision bulkheads* *engine room* *forecastle* *peak tank* *steering machinery* *superstructure* *tanktop* *The double bottom* *tweendeck* *upper deck, or main deck* *upper hold and lower hold*	

A.7-b Give Croatian (or your own language) equivalents for the labels above.

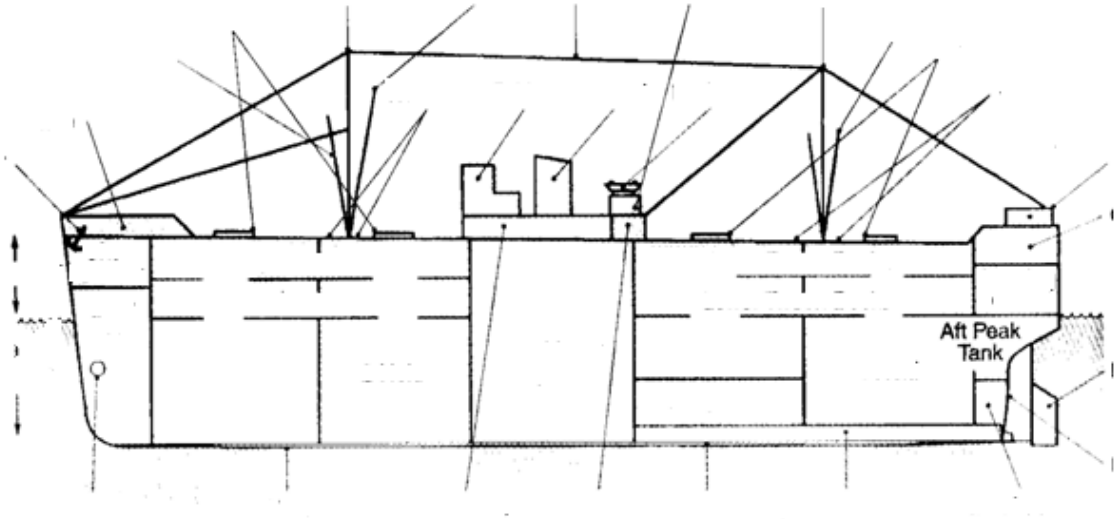
• *bosun's locker* • *chain locker,* • *cofferdams* • *collision bulkheads* • *engine room* • *forecastle* • *peak tank* • *steering machinery* • *superstructure* • *tanktop* • *double bottom* • *tweendeck* • *upper deck,*	• ..... • ..... • ..... • ..... • ..... • ..... • ..... • ..... • ..... • ..... • ..... • ..... • .....

A.4 Say which term from the basic terminology is described below:

• Samson post • derrick • life-saving apparatus • cargo gear
•freeboard • bridge • accommodation • draught • NAVAIDS • ballast •freeboard

1. _____ : height between the water level and the upper deck.
2. _____ : boom or spar used for hoisting or lowering loads.
3. _____ : depth in water at which a ship floats.
4. _____ : distance from the top deck to the water.
5. _____ : ship's own equipment for loading and discharging.
6. _____ : instruments used for the ship's navigation.
7. _____ : cabins for the ship's personnel.
8. _____ : control centre of the ship.
9. _____ : king post.
10. _____ : means and equipment for the rescue and protection of seafarers, such as lifeboats, liferafts, lifejackets, etc.
11. _____ : sea-water carried in tanks for the ship's stability.

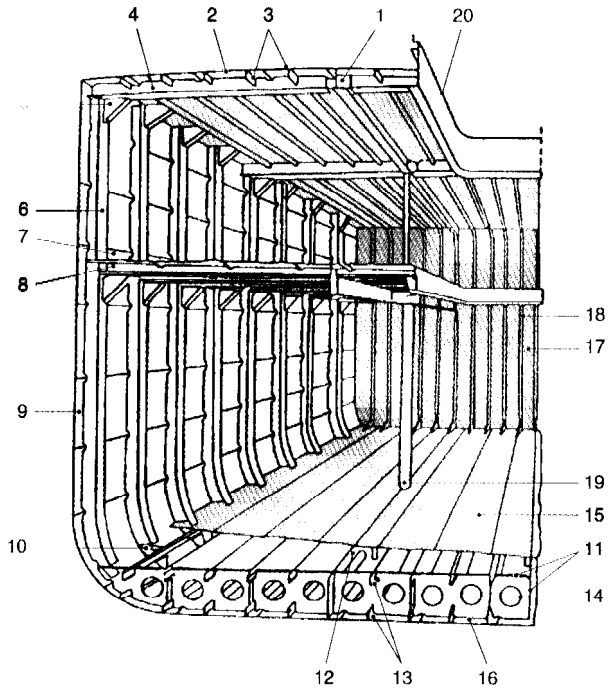
A.5 Insert the appropriate label for the relevant ship spaces, structural members and equipment



A.6 Give your language equivalents for the following ship's terms (Ship's Hold, Unit 2):

1. central stringer _____
2. deck plating _____
3. deck stringers _____
4. deck beam _____
5. knee, angle bar _____
6. frame _____
7. 'tween-deck plating _____
8. 'tween-deck beam _____
9. side plating (strakes) _____
10. margin plate _____
11. central girder _____
12. side stringer _____
13. bottom and double bottom stringers _____
14. floor _____
15. tank top, inner bottom _____
16. bottom plating (strakes) _____
17. cross bulkhead _____
18. bulkhead stiffener _____
19. hold pillar _____
20. hatch coaming _____

Design of a Ship's Hold (Cross Section)



A.8 Fill in the following missing terms (structural members of the ship):

• stem • stern post • beams • angle bars • keel • knees • brackets • stringers • floors • frames

The 1. _____ is a longitudinal structural member at the bottom of the vessel, to which floors and frames are attached. The 2. _____ is a structural member forward, rising from the keel and forming the how. The 3. _____ is a vertical member at the after end of the hull. The transverse members making up the structure of a ship are the 4. _____ on the sides, the 5. _____ supporting the decks, and the 6. _____ forming up the double bottom space. The longitudinal members holding together the bottom, side plates and the deck plating are bottom, side and deck 7. _____ . Small-sized members used for joining and reinforcing the ship's structural members are 8. _____ , *9.* _____ , and 10. _____ .

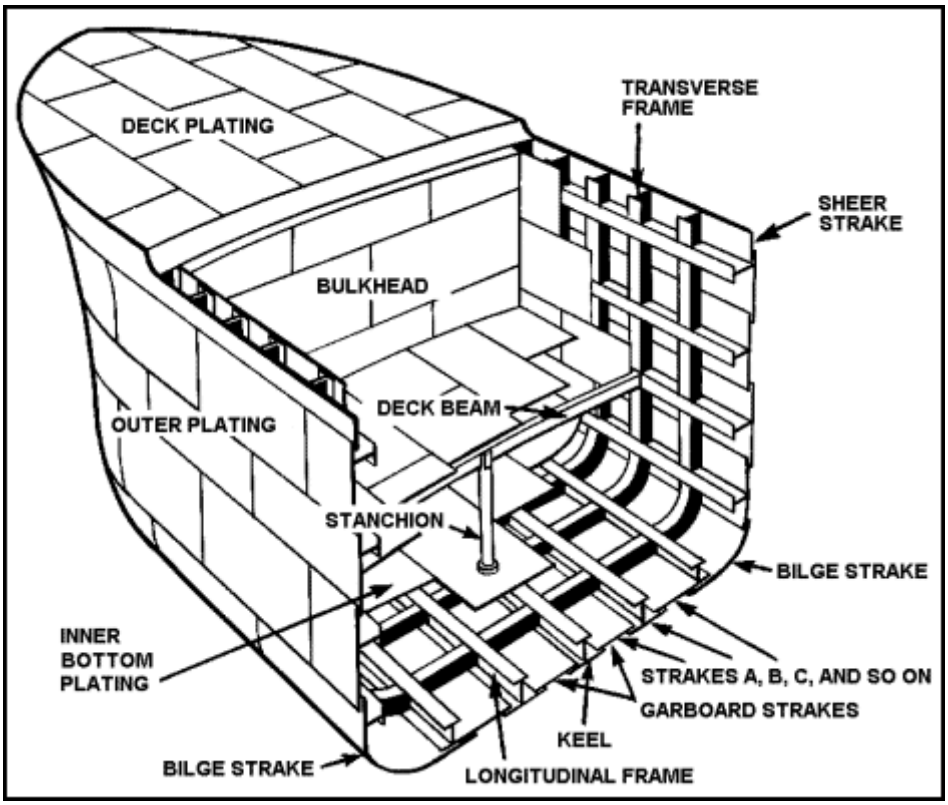
A.9 Ship Terms-Revision:

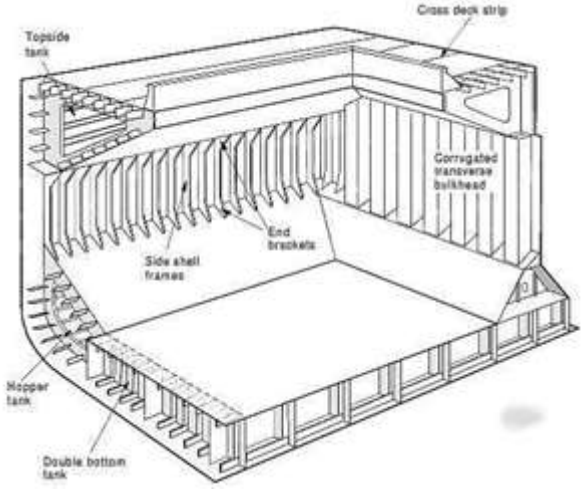
1. ***Aboard*** is the opposite to _____ .
2. In the past the _____ was usually placed amidships.
3. The openings in the deck are called _____ .
4. Through the hatches, entrance into the _____ is possible.
5. The cargo is discharged or loaded with the ship's cranes or _____ .
6. The equipment of a derrick includes standing or fixed and running
7. Derricks are supported on the _____ or king posts.
8. On board ship instead of the terms ***behind*** and ***in front of,*** _____ and _____ are used.
9. When the ship is coming to her berth or anchorage, the Chief Officer stands on the _____ .
10. The ladder leading from one deck to another is called a _____ .
11. A passage or a corridor in a ship is called the _____ .
12. The lefthand and the righthand sides of the ship are referred to as the _____ and the _____ side.
13. The _____ of the bridge project out of the bridge on either side.
14. To get from the side alleyway into the cabin or any other space inside the ship, you must step over the _____ .
15. The _____ is also a raised vertical edge of a hatchway.
16. The derricks and deck cranes are driven by _____ either electrical or hydraulic.
17. The _____ winch is used for shifting the ship alongside the same quay or pier.

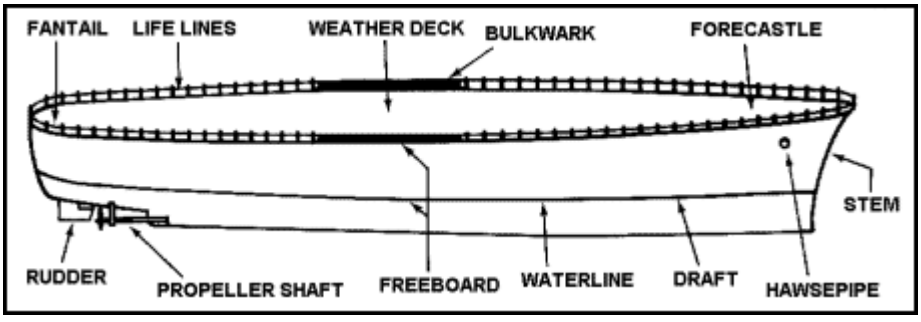
B. Grammar

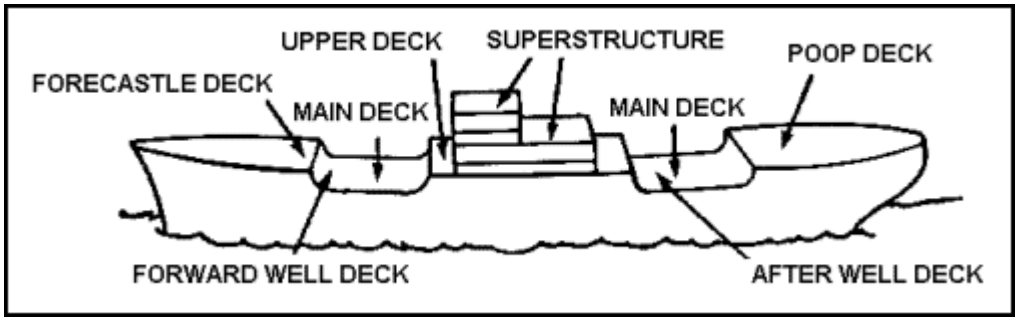
B.1 Adverbs are mainly formed by adding *-ly* to the adjective, (e.g. *strong -strongly, quick - quickly*,). Find such adverbs in the reading text and state whether they refer to a verb, an adjective or to the whole sentence (the first example has been worked out for you):

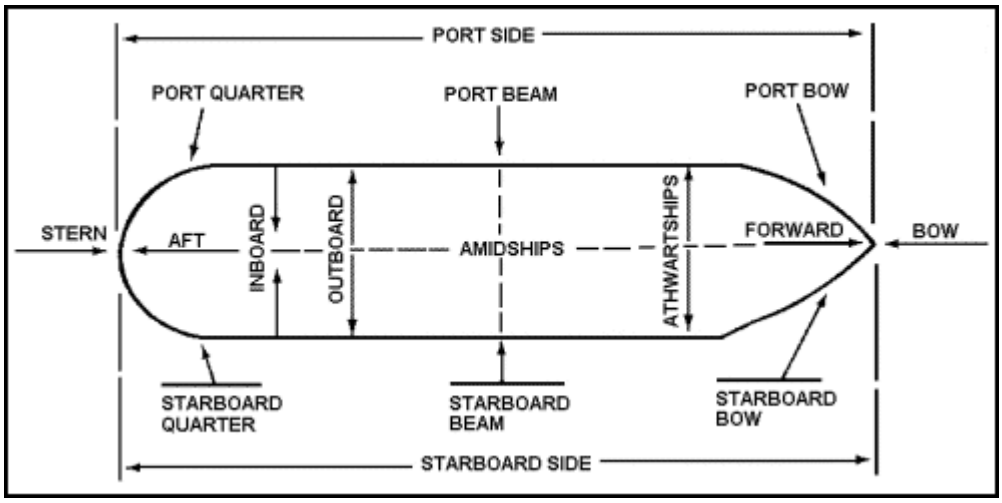
1. commonly	referring to the verb carry
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____

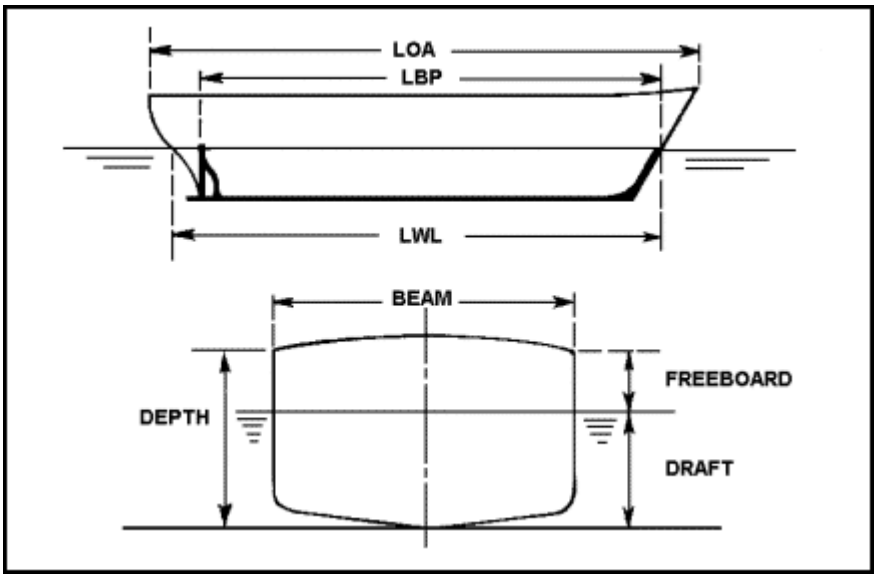

DECK PLATING
TRANSVERSE FRAME
SHEER STRAKE
BULKHEAD
DECK BEAM
OUTER PLATING
STANCHION
BILGE STRAKE
INNER BOTTOM PLATING
STRAKES A, B, C, AND SO ON
GARBOARD STRAKES
KEEL
BILGE STRAKE
LONGITUDINAL FRAME

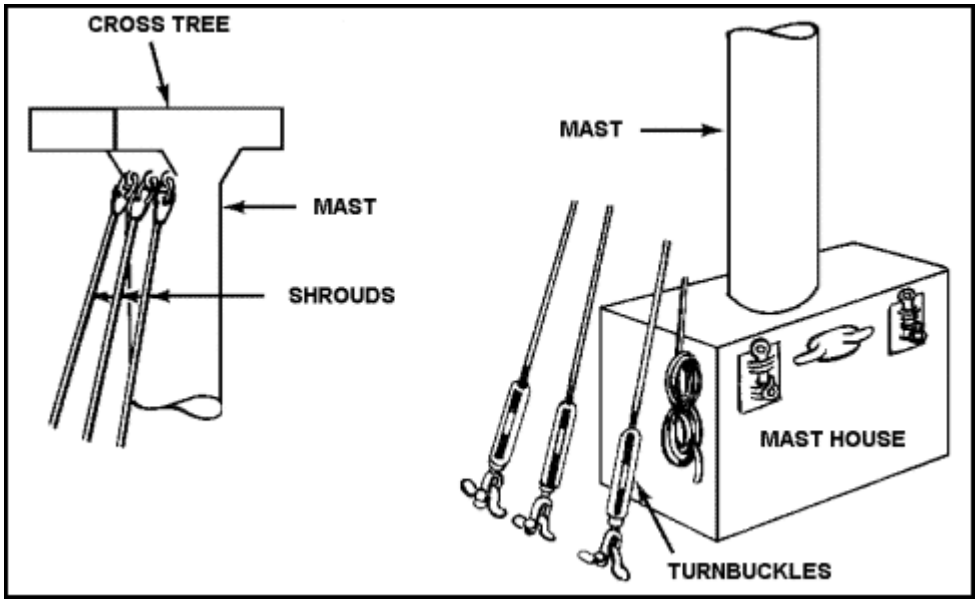

Cross deck strip
Topside tank
Corrugated transverse bulkhead
End brackets
Side shell frames
Hopper tank
Double bottom tank

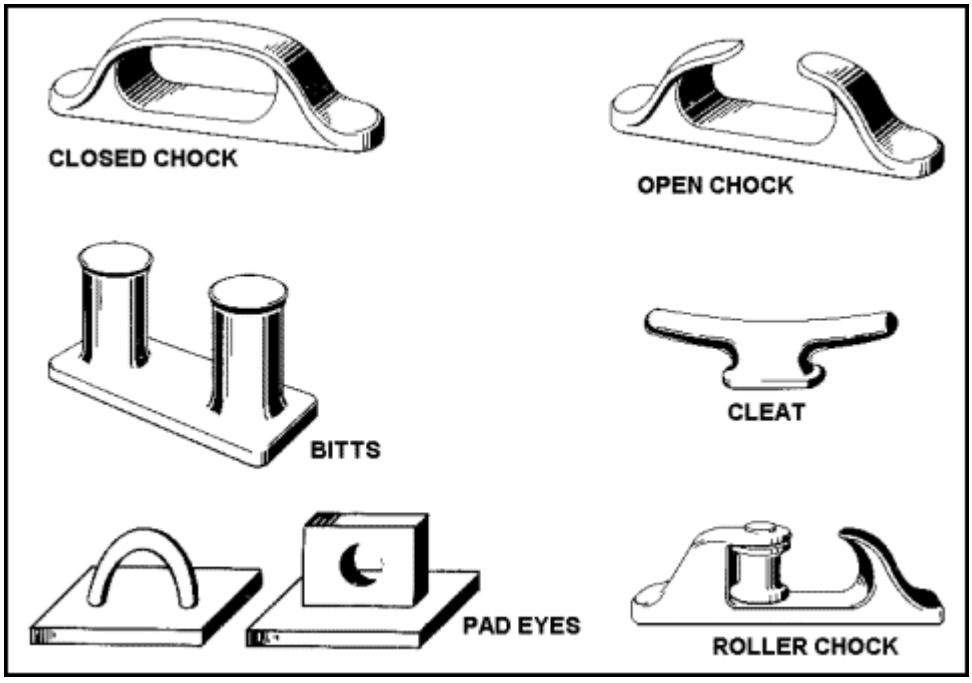

FANTAIL
LIFE LINES
WEATHER DECK
BULKWARK
FORECASTLE
STEM
RUDDER
PROPELLER SHAFT
FREEBOARD
WATERLINE
DRAFT
HAWSEPIPE

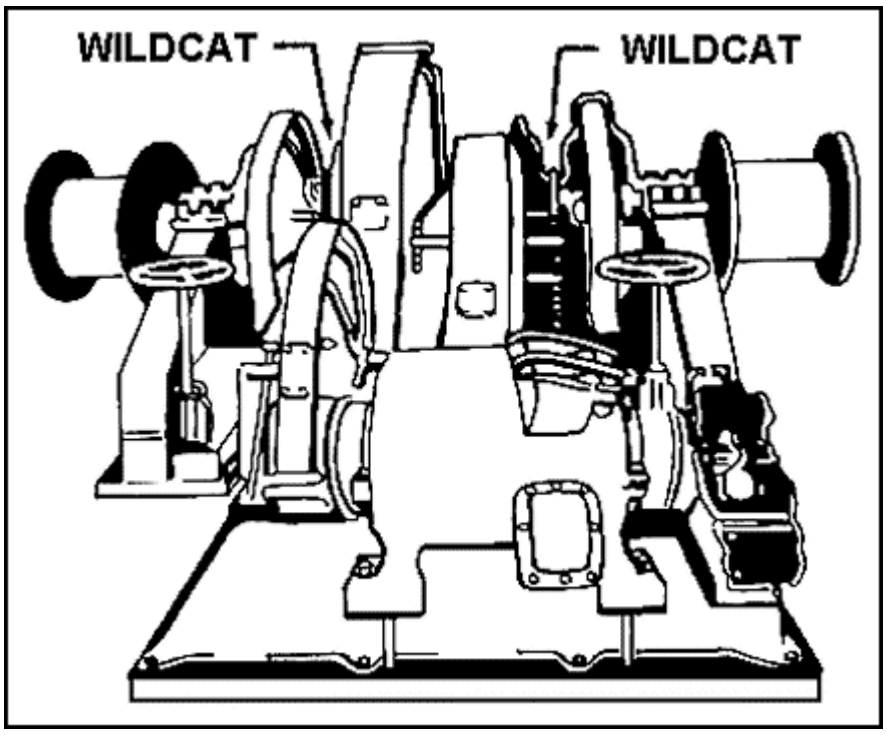

UPPER DECK
SUPERSTRUCTURE
POOP DECK
FORECASTLE DECK
MAIN DECK
MAIN DECK
FORWARD WELL DECK
AFTER WELL DECK

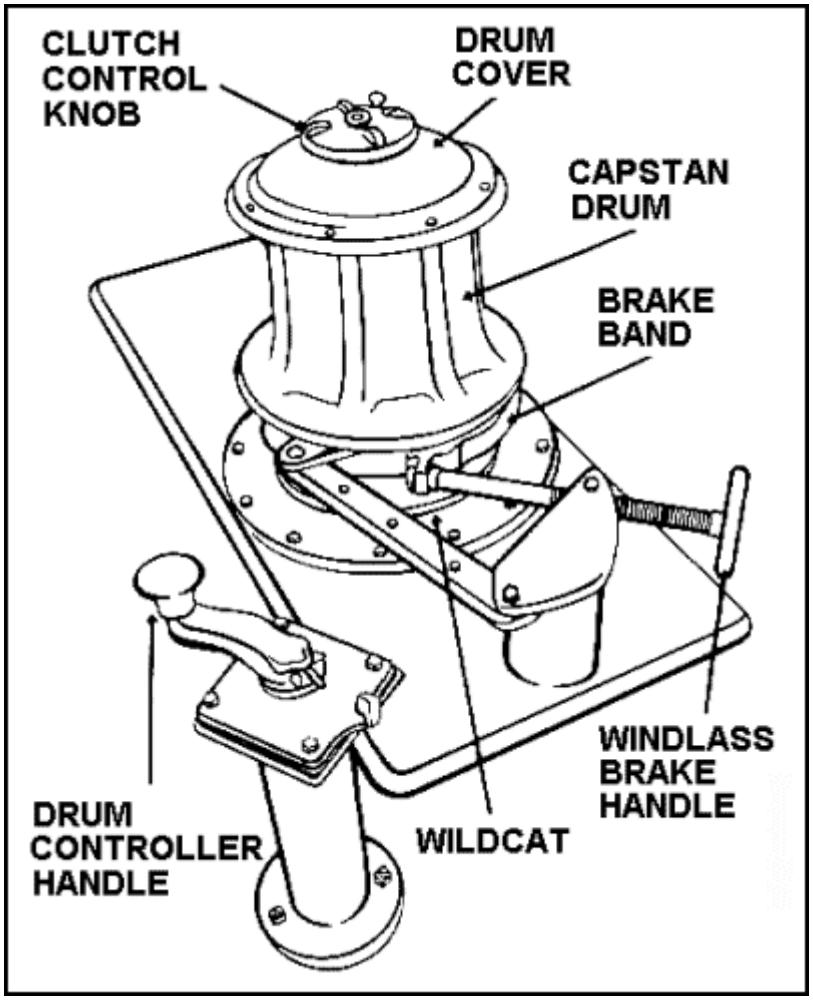

PORT SIDE
PORT QUARTER
PORT BEAM
PORT BOW
STERN
AFT
INBOARD
OUTBOARD
AMIDSHIPS
ATHWARTSHIPS
FORWARD
BOW
STARBOARD QUARTER
STARBOARD BEAM
STARBOARD BOW
STARBOARD SIDE

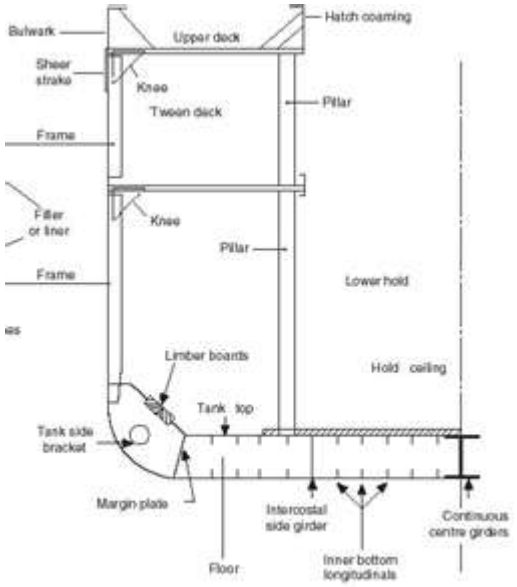

LOA
LBP
LWL
BEAM
FREEBOARD
DEPTH
DRAFT

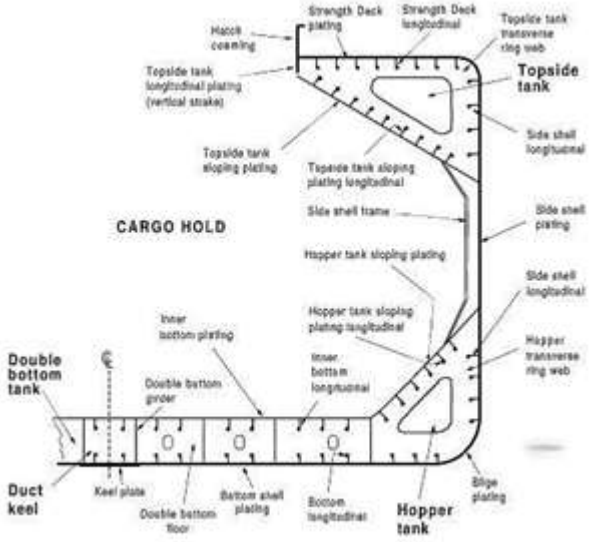

CROSS TREE
MAST
SHROUDS
MAST
MAST HOUSE
TURNBUCKLES

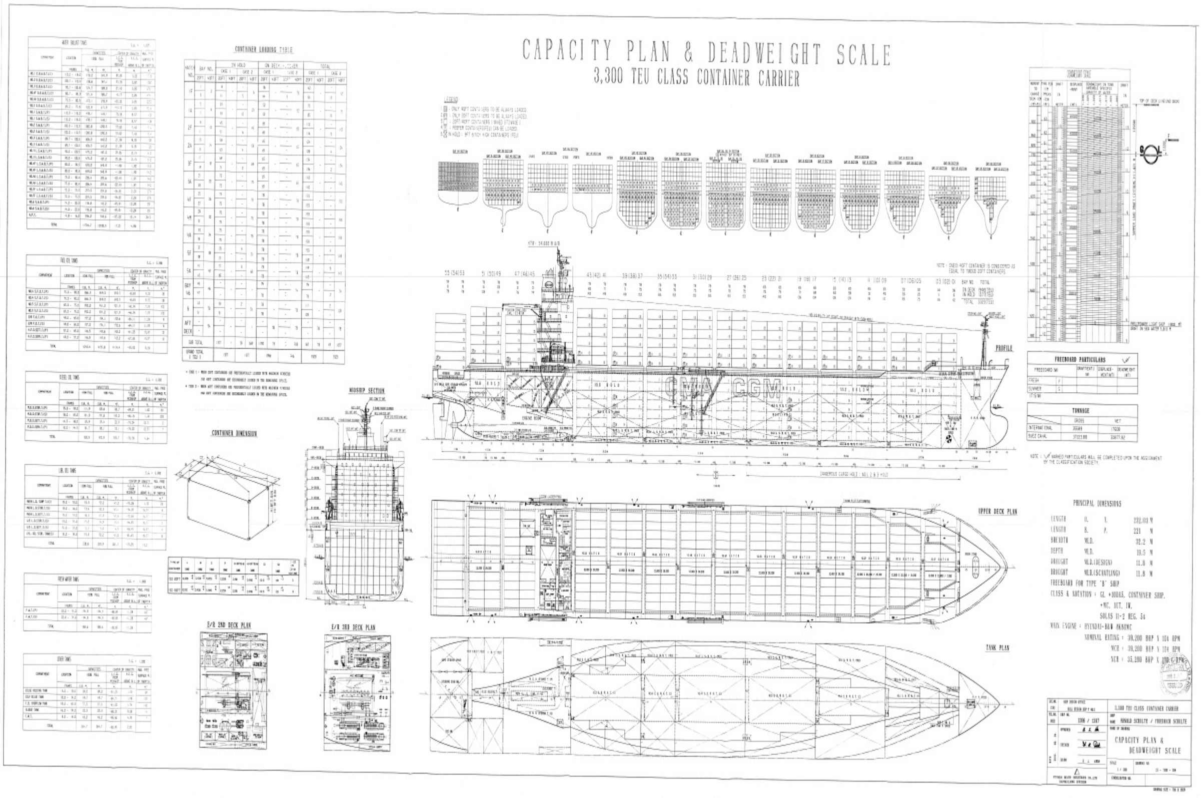

CLOSED CHOCK
OPEN CHOCK
BITTS
CLEAT
PAD EYES
ROLLER CHOCK


WILDCAT
WILDCAT


CLUTCH CONTROL KNOB
DRUM COVER
CAPSTAN DRUM
BRAKE BAND
WINDLASS BRAKE HANDLE
DRUM CONTROLLER HANDLE
WILDCAT


Bulwark
Upper deck
Hatch coaming
Sheer strake
Knee
Tween deck
Pillar
Frame
Filler or liner
Knee
Pillar
Frame
Lower hold
Limber boards
Hold ceiling
Tank top
Tank side bracket
Margin plate
Intercostal side girder
Continuous centre girders
Floor
Inner bottom longitudinals


Strength Deck plating
Strength Deck longitudinal
Topside tank transverse ring web
Hatch coaming
Topside tank longitudinal plating (vertical strake)
Topside tank
Side shell longitudinal
Topside tank sloping plating
Topside tank sloping plating longitudinal
Side shell frame
Side shell plating
CARGO HOLD
Hopper tank sloping plating
Side shell longitudinal
Inner bottom plating
Hopper tank sloping plating longitudinal
Hopper transverse ring web
Double bottom tank
Double bottom girder
Inner bottom longitudinal
Duct keel
Keel plate
Double bottom floor
Bottom shell plating
Bottom longitudinal
Hopper tank
Bilge plating



CAPACITY PLAN & DEADWEIGHT SCALE
3,300 TEU CLASS CONTAINER CARRIER
CONTAINER LOADING TABLE
CONTAINER DIMENSION
MIDSHIP SECTION
PROFILE
UPPER DECK PLAN
TANK PLAN
TONNAGE
GROSS
NET
INTERNATIONAL
SUEZ CANAL
NOTE : MARKED PARTICULARS WILL BE COMPLETED UPON THE ASSIGNMENT BY THE CLASSIFICATION SOCIETY.
PRINCIPAL DIMENSIONS
LENGTH O. A. 232.00 M
LENGTH B. P. 221 M
BREADTH MLD. 32.2 M
DEPTH MLD. 19.5 M
DRAUGHT MLD.(DESIGN) 11.8 M
DRAUGHT MLD.(SCANTLING) 11.8 M
FREEBOARD FOR TYPE 'B' SHIP
CLASS & NOTATION : GL +100A5, CONTAINER SHIP, +MC, AUT, IW, SOLAS II-2 REG. 54
MAIN ENGINE : HYUNDAI-B&W 8K80MC
NOMINAL RATING : 39,200 BHP X 104 RPM
MCR : 39,200 BHP X 104 RPM
3,300 TEU CLASS CONTAINER CARRIER
ARNOLD SCHULTE / FRIEDRICH SCHULTE
CAPACITY PLAN & DEADWEIGHT SCALE