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(MARINE DEPARTMENT)

Ship and Ship Routines.
MRT 232.2
Course Outline: 14/09/22.

- Shipboard Organization
- Compliance with SOLAS', dry docking, enclose space.
- Anchor work & Cables.
- Rope and Wire works
- The Ship (General knowledge) and Maritime administration
- Communication and Marine Survey.

The Captain Or master is not listed as a member Of the deck department. He is the representative Of the Ship Owner in the Vessel.

* Third Officer is also known as the Safety Officer
* Second Officer is also known as the Charting Officer.
* Mayday -> as a distress Call (Signal) in international radio-telephone communications

A bulkhead is to a Vessel as a wall to a room.

D/G = Diesel Generator. rpm = revolution per minute
M/E = Main Engine
T/C = Turbo Charger

Duties Of the Master, Officers and Crew of a Ship.

A Ship's Crew can generally be divided into four main categories namely:

- The deck department
- The engineering department
- The Stewards department
- Others

Modern Ship's Complement

Captain/Master

The Captain Or master is the Ship's highest responsible Officer, acting On behalf Of the Ship's Owner. Whether the Captain is a member Of the deck department Or not is a matter Of some Controversy, and generally depends On the Opinion Of an individual Captain. When a Ship has a Third Mate, the Captain does not Stand Watch.

Deck department

Chief Officer/Chief mate: The Chief Officer (often called the chief mate in the United States) is the head of the deck department on a merchant vessel, second in command after the ship's master. The chief mate's primary responsibilities are the vessel's cargo operations, its stability, and supervising the deck crew.

The mate is responsible for the safety and security of the ship, as well as the welfare of the crew on board. The chief mate typically stands the 4-8 navigation watch.

Additional duties include maintenance of the ship's hull, cargo gears, accommodations, the life saving appliances and the fire-fighting appliances. The chief mate also trains the crew and cadets on various aspects like safety, firefighting, search and rescue and various other contingencies.

Second Officer/Second mate: The Second Officer (or Second mate) of a merchant vessel is usually in charge of navigation and is the next licensed position above third officer and below chief officer as third in command. The second mate typically stands the 12-4 navigation watch.

That is, the second mate will stand watch from 1200 to 1600 at noon and again from 0000 to 0400 in the nights. The second mate is typically the Navigation Officer aboard a ship. The navigation officer is responsible for maintaining the charts and navigational equipment on the bridge.

The duties also usually entail developing the voyage plans under the direction of the ship's master.

Third Officer/third mate: Of a merchant vessel is primarily charged with the safety of the ship and crew. The third mate is the next licensed position onboard the vessel, being fourth-in-command after the captain, first/chief mate and second mate. The third mate tends to take the 0800 to 1200 watch.

Boatswain: A boatswain, often (at least since 1868) phonetically spelled and pronounced bosun, is in charge of the unlicensed deck crew and is sometimes also third or fourth mate.

Able Seaman: In the modern merchant marine, an able seaman (AB) is a member of the deck department and must possess a merchant mariner's document.

An AB will work in a ship's deck department as either a watch stander, a day worker, or a combination of their roles.

At Sea an AB watch stander's duties include standing watch as helmsman and lookout. A helmsman is required to maintain a steady course, properly execute all rudder orders and communicate utilizing navigational terms relating to heading and steering.

While the ship is not underway, a watch stander may be called upon to stand security-related watches, such as a gangway watch or anchor watch.

Ordinary Seaman:→ In the United States merchant marine an Ordinary Seaman or OS is an entry-level position in a ship's deck department. An OS performs a variety of duties concerned with the operation and upkeep of deck department areas and equipment. Upkeep duties include sealing, buffing and painting decks and superstructure, as well as sweeping and washing the deck.

An OS may splice wire and rope, break out, rig, overhaul, stow cargo handling gear, stationary rigging, and running gear. Additionally, the OS secures cargo, as well as launches and recovers boats.

The OS may rig and operate hydrographic and other specialty winches, handle and stow oceanographic explosives, and stage and stow beach support equipment.

Engineering department.

Chief engineer:→ On a merchant vessel is the official title of someone qualified to oversee the engine department. The qualification for this position is colloquially called a "chief's ticket".

The chief Engineer commonly referred to as "The chief" "cheng", or just "chief" is responsible for all operations and maintenance that have to do with all engineering equipment throughout the ship.

Second Engineer/First Assistant Engineer:→ is the officer responsible for supervising the daily maintenance and operation of the engine department. He or she reports directly to the chief engineer.

On a merchant vessel, depending on term change, "The first"

Or "The Second" is the marine Engineer Second in Command of the engine department after the Ship's Chief Engineer. The person holding this position is typically the busiest engineer aboard the ship, due to the Supervisory role this engineer plays and the Operational duties performed.

Operational duties include responsibility for the refrigeration Systems, main engines (Steam/gas turbine, diesel), and any Other equipment not assigned to the Second assistant engineer/third engineer Or the third assistant engineer/fourth engineer(s). If the engine room requires round the clock attendance and Other junior engineers can cover the three watch rotations, this Officer is usually a "day worker" from 0630-1830.

Third Engineer/Second Assistant Engineer :→ The third engineer or Second assistant engineer is junior to the Second Engineer/ first Assistant Engineer in the engine department and is usually in charge of boilers, fuel, auxiliary engines, Condensate, and feed Systems.

This engineer is the third highest marine engineer in rank. Depending on Usage, "The Second" Or "The Third" is also typically in charge of fueling or bunkering, if the Officer holds a valid Person In Charge (PIC) endorsement for fuel transfer Operations.

Fourth Engineer/Third Assistant Engineer :→ is the most junior marine engineer of the ship, he or she is usually responsible for electrical, Sewage treatment, lube oil, bilge, and Oily Water Separation Systems.

Depending on Usage, this person is called "The Third", "The fourth" Or "Pourth". (If Sailing with Filipino Crew), and usually Stands a watch.

Moreover, the fourth Engineer may assist the third mate in maintaining Proper Operation of the lifeboats.

Engineering Cadet :→ An Unqualified, Unlicensed trainee engineer Officer. Normally reports to the Second engineer. Their role as trainee is to Observe and learn, while helping out where possible. As they have no 'ticket' a Cadet can not hold a watch, but will likely assist One of the qualified engineers with their watch.

Typical duties are limited to preparing the tea and coffee at breaks for the engineering team. The Engine Cadets epaulette is purple, as with the Other engineers, however has only one gold horizontal Strip (UK System).

Steward department.

Chief Steward :→ directs, instructs, and assigns personnel performing such functions as preparing and serving meals; cleaning and maintaining Officer's quarters and Steward department areas; and receiving, issuing, and inventorying stores.

The chief Steward also plans menus, compiles supply, overtime, and cost control records. The Steward make requisition or purchase stores and equipment.

Additional duties may include baking bread, rolls, cakes, pies and pastries. A chief Steward's duties may overlap with those of the Steward's Assistant, the chief cook, and other Steward's Department Crew members.

Chief Cook :→ is a Senior Unlicensed Crew member working in the Steward's department of a Ship. He directs and participates in the preparation and serving of meals; determines timing and sequence of operations required to meet serving times. He inspects galley and equipment for cleanliness and proper storage and preparation of food.

Procedure for Handing Over and Taking Over a Watch

Engineers and deck Officers on Ships perform their duties in rotational Shifts, each having fixed and equal number of hours. This work shift is known as a 'Watch', and needs to be carried out in an efficient manner to ensure the Safety of life and property at Sea.

The normal Watch keeping Schedule and responsible Watch keeping engineers in a fully manned engine room is:

0800 – 1200 → 4/E; 2000 – 2400 → 4/E

1200 – 1600 → 3/E 2400 – 0400 → 3/E

1600 – 2000 → 2/E 0400 – 0800 → 2/E

An engineer Onboard a Ship can master the Watch keeping procedures in a number of days, however, he needs to

take Extra Care while handling Over to the next engineer Officer so as to ensure that the Ship runs Safely and Smooth

For the engineers, handing Over of watch is done according to the instructions provided by the Chief engineer's Standing Orders and the company's instructional manual.

In practical terms, it is impossible for any relieving engineer Officer to check all the valves, pipelines, machinery and controllers in the engine room while taking Over the watch.

It is therefore incumbent on the relieved Officer to pass the right information to the incoming relieving engineer, so that there are no surprises during the watch and he can concentrate on his watch and perform more demanding and important jobs.

Things to inform the relieving/incoming Officer during a watch HandOver

1. Special Orders related to any Ship Operation from bridge or the company, control System or maintenance work.
2. Standing Orders from the chief engineer or the company.
3. Level of important tanks such as bilges, ballast tank, Sewage tank, reserve tank, Slop tank, fuel tank, or any other tank which require attention.
4. Condition and State of fire extinguishing equipment and Systems, in case any specific Section or fire alarm has been isolated.
5. Special mode of navigational Operation of Ship in case of emergency Situation, damage, icy or Shallow water, etc.
6. In case there is any equipment failure, details of Same should be informed to him.
7. In case there is any kind of maintenance being carried out in the engine room by other engineer Officers and Crew members, then their work location, details of job machinery Under maintenance and information of authorized person and Crew members should be provided.
8. Any potential hazard associated with the Ongoing maintenance work should also be communicated to the relieving Officer.
9. All the checks already made when the Ship leaves the port should

be noted. In case any check is pending, it should be conveyed to the relieving Officer.

10. All the checks that are made when the ship enters the port should be noted and the relieving officer informed of this should any be missing

11 Condition and important information regarding mode of Operation of main engine, boiler, and auxiliary engines should be provided.

12. In case an equipment needs to be monitored manually, details of same should be provided, along with the condition of monitoring and control equipment

13. Any form of adverse ship condition needs to be informed the relieving Officer.

14 Information on the condition and modes of all the important auxiliary machinery such as purifiers, fresh water generator, Oily water Separator, pumps, Sewage treatment plant, etc. should be provided.

15 In case any important machinery failed to receive attention during the watch, the relieving Officer should be told and asked to take care of the same.

16 The condition and modes of automatic boiler controls and details of other equipment related to the Operation of the Steam boiler should be provided.

* The engineer Officer should ensure that all the important parameters regarding main and auxiliary machines are suitably recorded in the engine room log book.

Taking Over a Watch.

For an engineer taking over a watch, he should do the following.

1. Get ready with proper PPE 20 mins before the watch. Then go Outside the accommodation to see the main engine and Auxiliary Engines exhaust gas colour from the funnel.
2. Then come down to the engine room in time, take a good round to feel for any abnormality in sound, smell etc., check for any leak, contamination, level pressures and temperatures of all running machineries.

3. After coming back to the control room check the control panel for any abnormal alarms or parameters.
4. Check the main electrical switchboard for running diesel generator (D/G) load, volts and amp and stand-by mode of other idle D/G. Also check the megger readings and lamp indications for earth faults in 440 volts or 230 volts feeder panel.
5. Then check M/E rpm, T/C rpm and M/E load indicator and ask about chief engineer and bridge instruction for M/E rpm.
6. Before taking over watch, ensure that the log book is checked and that all important parameters regarding main and auxiliary machines has been recorded and updated in the engine room log book by the outgoing watch keeping engineer and signed.

Duties of a Watch Keeping Engineer During an Engine room Watch

1. Check and maintain the main engine or propulsion systems functioning and all units exhaust temperature, piston cooling lubricating oil temperature, jacket cooling water (JCW) outlet temperature, lube oil inlet pressure and temperature, air cooler temperature, fuel temperature and pressure.
2. Auxiliary engine system functioning and all units exhaust temperature, piston cooling lubricating oil temperature, jacket cooling water outlet temperature, lube oil inlet pressure and temperature, air cooler temperature, fuel temperature and pressure to be checked and maintained.
3. Steering system functioning, and tank oil level to be checked.
6. Boiler pressure and water level to be checked. Also check the hot well water level.
7. Accommodation A/C and provision refrigeration plants to be checked and provision room temperature to be checked too.
8. Exhaust gas economizer/Exhaust gas boiler inlet and outlet temperature to be checked.
9. Bilge level in all bilge wells and bilge holding tanks to be checked.
10. Sludge tanks and Bilge Separator oil tanks level to be checked.

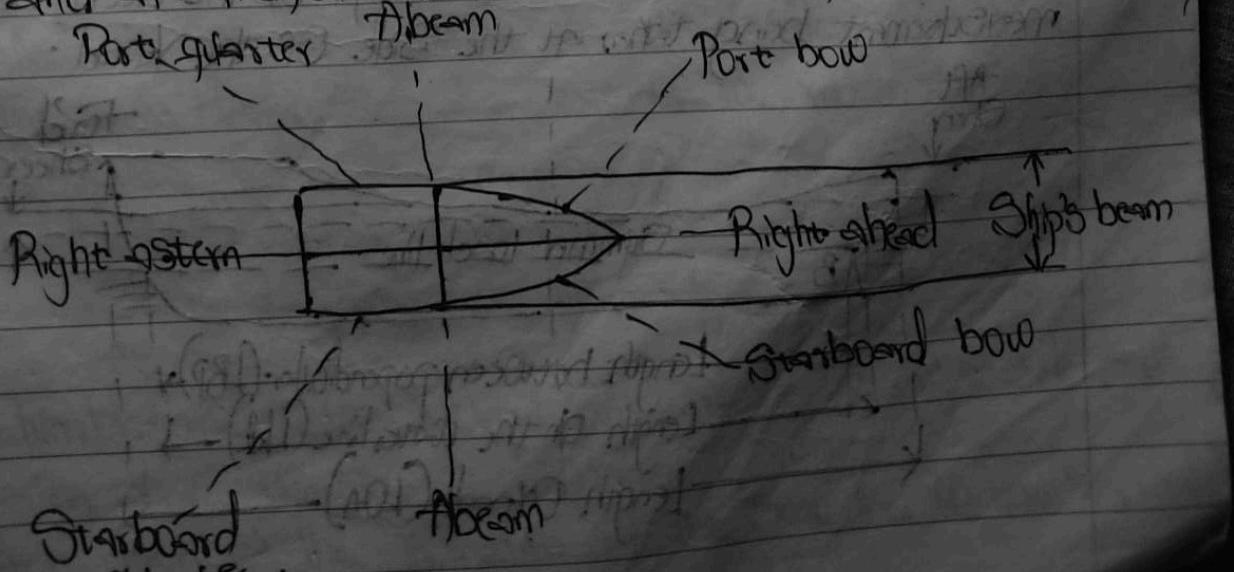
11. Waste oil, Service tank level and temperature, and incinerator furnace temperature to be monitored, if the incinerator runs.
12. Sewage treatment plants to be checked for proper functioning.
13. Check if Safety related items such as fire alarms, fire extinguishing system, etc are functioning properly.
14. Purifier fuel temperature, pressure and gear oil level to be checked.
15. Air compressor oil level to be checked.
16. Drain fuel oil Setting and Service tanks and check the level and temperature.
17. Air bottles to be drained and pressures to be maintained.

Any change in log book parameters will help to make out difference between Condition monitoring and easily detects some faults with relevant machineries and indicate there performance. Hence,

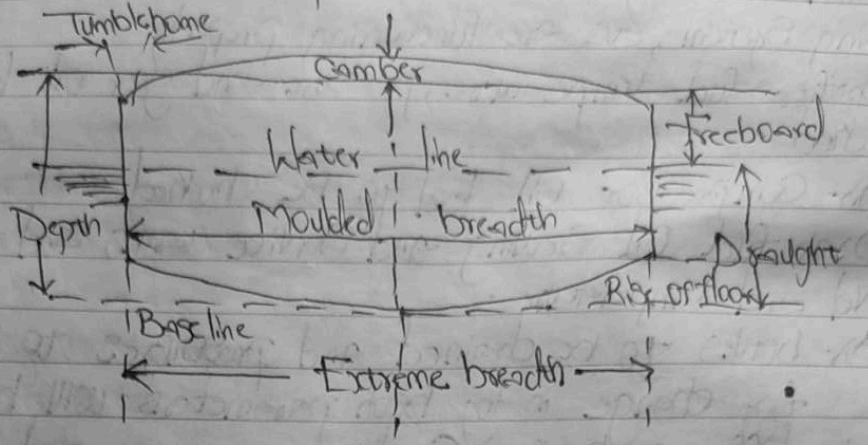
* Different level condition indicates loss, leakage, overflow, etc;
* Change in temperature and pressure will indicate deviation/abnormality, Considering the same ambient condition.
* A distillate plant small reading may indicate performance fall off.
* FO/DO flow meter increased reading may indicate loss or leakage.

The Ship:

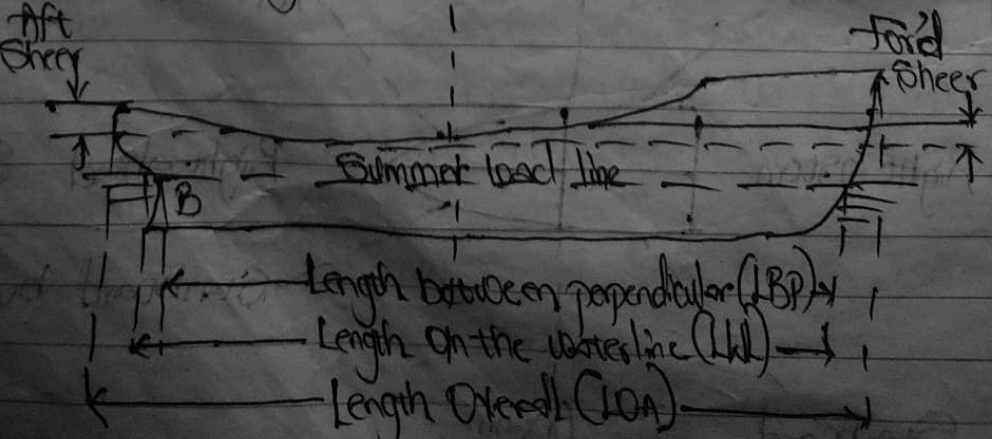
* A beam :- A bearing projected at right angles from the fore and aft line, outwards from the widest part of the ship.



* Ahead :- 'Right ahead' is the line the fore and aft line, if projected, would extend in front of the vessel. Opposite to the term 'astern', when used in relation to relative bearings. It may also be used as an engine-room order to cause the engines to turn in order to move the ship ahead.

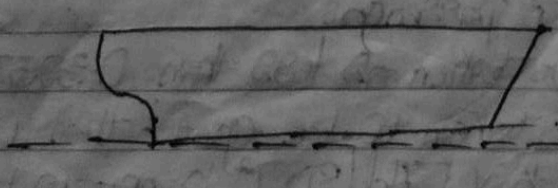


* Athwartships :- Defined as 'in a direction' from one side of the ship to the other, at right angles to the fore and aft line.
* Breadth :- The maximum beam of the vessel measured from the outside edge of the shell plating on either side of the vessel is the extreme breadth. The beam of the vessel measured amidships, between the inside edge of the shell plating on either side of the vessel, is the moulded breadth.
* Camber (or round of beam) :- the curvature of the decks in the athwartships direction. The measurement is made by comparing height of deck at the centre of the vessel to height of deck at the side of the vessel.
* Depth :- The extreme depth of the vessel is measured from the bottom side of the keel to the top of the deck beams, the measurement being taken at the side of the vessel.



- Sheer :- It the curvature of the deck in the fore and aft direction, measured as the height of the deck at various points above the height of the deck at the midships point.
- The moulded depth :- is measured from the top side of the keel to the top of the deck beams, at the side of the vessel.
- LBP :- The distance between the forward and aft perpendiculars.
- LOA :- The maximum length of the vessel measured from the extreme fore'd point of the vessel to the extreme after point.

* Flare :- the outward curvature of the shell plating in the foremost part of the vessel, providing more width to the forecastle head and at the same time helping to prevent water coming aboard.
* Fore and aft line :- An imaginary line passing from the Stern to the Stern through the centre of the vessel.
* Freeboard :- This is the vertical distance, measured at the ship's side, from the waterline to the top of the freeboard deck edge. The freeboard measurement is taken at the midships point. Deck edge is marked by a painted line 25mm x 100mm, above the plimsoll line.
* Keel Rake :- The inclination of the line of the keel to the horizontal.
* Rise of floor :- is the rise of the bottom shell plating above the base line (taken from the top edge of the keel).
* A perpendicular drawn to the waterline from a point on the Summer load line where it intersects the Stempost is called the Forward perpendicular (FP)
* A perpendicular drawn to the waterline at a point where the after side of the rudder post meets the Summer waterline is called the aft Perpendicular (AP). If a rudder post is not fitted, then it is drawn from the centre of the rudder stock.



* Tumble home :- The inward curvature of the ship's side shell plating above the Summer load line.
* Stem Rake :- The inclination of the Stem line to the Vertical.

* Ship's Beam :- The widest part of the ship in the transverse athwartships direction.
* Tonnage :- All ships constructed on or after 8 July, 1982 are measured in accordance with the 1970 1969 International Conference on Tonnage Measurement. Existing ships built prior to this date were allowed to retain their existing tonnage if the owner so desired, for a period of 12 years
* Gross Tonnage (GT) :- is defined as that measurement of the internal capacity of the ship.

$$GT = K_1 V$$

$$K_1 = 0.2 + 0.02 \log_{10} V$$

V = total volume of all enclosed spaces measured in cubic metres.

* Net tonnage (NT) :- is that measurement which is intended to indicate the working/earning capacity of the vessel.

Net tonnage for passenger ships, carrying more than 13 passengers is determined by the formula:

$$NT = K_2 V_c \left[\frac{4d}{3D}\right]^2 + K_3 \left[\frac{N_1 + N_2}{100}\right]$$

Net Tonnage for Other Vessels:

$$NT = K_2 V_c \left[\frac{4d}{3D}\right]^2$$

Where V_c = total volume of cargo spaces in m^3.
d = moulded draught amidships in 'm'
D = Moulded depth in metres amidships.

$$K_2 = 0.2 + 0.02 \log_{10} V_c.$$

$$K_3 = \frac{1.25(GT + 10,000)}{10,000}$$

N_1 = No of passengers in cabins with not more than 8 berths
N_2 = No of other passengers

NT is not to be taken as less than 0.30GT. The factor $[4d/3D]^2$ is not taken to be greater than Unity.

The expression $K_2 V_c [4d/3D]^2$ is not to be taken as less than 0.25GT.

Terms and Definitions Concerning Stability

* Bulkhead Deck :- Defined as the uppermost deck to which the watertight bulkheads are taken to.
* Centre Of Flotation :- That point in the Ship's length about which the Vessel will trim by the head/by the stern. In layman's terms the tipping centre of the Ship, which is very rarely the exact midships point.
* Coefficient Of fineness (of the water-plane area) (Cw) :- The ratio of the water plane area to the area of the rectangle having the same extreme length and breadth.
* Displacement :- is the weight of water the Vessel displaces i.e. the weight of the Vessel and all it contains. Displacement = V x ρ_{water}.
* Floodable length :- The maximum length of a compartment which can be flooded so as to bring a damaged Vessel, to float at a waterline which is tangential to the margin line.
* Lightship Displacement :- Lightship is defined as the extreme displacement of a Ship, when fully equipped and ready for Sea but without cargo, Crew, passengers, fuel, ballast water, fresh water and, consumable stores.
* Load deadweight :- is defined by the difference in tonnes between the displacement of a Ship in water of a specific gravity of 1.025 at the load waterline corresponding to the assigned ~~number~~ Summer freeboard and the lightweight of the Ship.
* Margin line :- defined by a line at least 76mm below the upper surface of the bulkhead deck, as measured at the side of the Vessel.
* Permeability :- in relation to a Compartment Space means the percentage of that space which lies below the margin line, which can be occupied by water.
* Permissible length :- Floodable length x Factor of Sub division (of the Vessel)
* Subdivision Factor :- Varies inversely with the Ships length, the number of passengers and the proportion of the Underwater Space used for passengers/Crew and machinery Space. In effect it is the factor of safety allowed in determining the maximum Space of transverse watertight bulkheads, i.e. the permissible length.

Reserve Buoyancy.

The buoyancy of the immersed portion of the vessel is that which is necessary to keep the vessel afloat. The buoyancy of all other enclosed watertight spaces above the waterline is therefore residual buoyancy, more commonly referred to as "reserve buoyancy".

It must be assumed that in the case of the conventionally designed ship, if water equal to the displacement and reserved buoyancy enters the vessel, it will sink. Sufficient reserve buoyancy is necessary in all seagoing vessels in order for the ship to rise quickly, owing to the lift effect, when navigating, especially in heavy sea conditions.

(a) Centre of buoyancy :- The centre of buoyancy (C. of B) is that point through which the resultant of all forces due to buoyancy may be considered to act. It is the geometric centre of the underwater volume of the ship.

(b) Transverse metacentre :- The transverse metacentre (M) is that point of intersection of a vertical line through the centre of buoyancy, in the upright position, with a vertical line through the new centre of buoyancy (B_1) in a slightly inclined position.

(c) Forces acting on a vessel in still water :- The force of buoyancy must be equal and opposite to the forces of gravity if no vertical movement of the body is to take place. For the body to float in the upright position, both forces must act in the same vertical plane.

Equilibrium.

A body is said to be in stable equilibrium if, when slightly disturbed and inclined from its initial position, it tends to return thereto.

A body is said to be in a state of neutral equilibrium if, when slightly disturbed from its initial position, it exhibits no tendency to return thereto or to move to another new position.

A body is said to be in unstable equilibrium if, when slightly disturbed from its initial position, it tends to move further from it.

Varieties of Ship

1. Tanker
2. Container Ship
3. Par car ferries
4. Guide Carriers
5. Dry Cargo Ship: ~~Bluk~~ Bulk Carrier
6. Chemical Carrier
7. LNG Carrier
8. Railway Ferry (RO-RO)
9. Offshore Supply Vessel
10. Tug
11. Roll-on / Roll-off Ships (RO-RO)

Longitudinal profile plan of a general cargo vessel :→ Pdf.

Plate and Construction Terms.

* 'A' frame :→ Supporting framework for the Stern tube of a twin-screw vessel used as an alternative to a Spectacle frame
* Boss plate :→ A shell plate parallel to the Stern tube at the head of the Propeller boss.
* Bulkhead :→ A Vertical partition between compartments. May be in the fore and aft line or athwartships.
* Coffin plate :→ The ~~afore~~ aftermost plate of the keel, dish (Coffin) shaped to fit the Stern frame.
* Collision Bulkhead :→ A heavy duty bulkhead in the forepart of the Vessel to withstand damage after impact from collision.
* Floor :→ A Vertical athwartships member in way of the double bottom. A floor will run from the Centre girder out of the margin plate on either side of the Vessel. Floors may be in Steel plate, Solid or framed bracket form.
* Frame :→ Internal Support member for the shell plating. Vessel may be framed transversely or longitudinally.
* A Strake is a continuous line of plates or planks running from bow to Stern that contributes to a Vessel's skin.
* Garboard Strake :→ The first Strake out from the keel.
* Gusset plate :→ Triangular plate often used for joining angle bar to a plate.
* Intercostal :→ A side girder in the fore and aft line. Steel either

side of the keel.

* Keel :> Centre line plate passing from the stem to the stern frame.
* Duct keel :> is a plated box tunneled keel allowing passage right forward. It provides additional buoyancy
* Lightening holes :> Holes cut into floors, or intercostals to reduce the weight content of the ship's build and to provide access to tank areas
* Longitudinal :> A fore and aft strength member connecting the athwartship floors
* Margin plate :> A fore and aft plate fitted at the turn of the bilge.
* Outer plate :> A shell plate of double curvature found under the transom floor, being extended from the fore side of the sternpost in the direction of the bow.
* Panting Beams :> Athwartships members in the forepart introduced to reduce the in/out tendency of the shell plating, caused by varying water pressure on the bow when the vessel is pitching
* Panting Stringers :> Internal horizontal plates secured to the shell plating and braced athwartships by the panting beams.
* Plate landings :> Refers to the shell plate, when shell plate is set in the raised and sunken method, the region where adjoining plates overlaps is known as the plate landing.
* Scantlings :> Originally applied to the size of timbers in the building of wooden ships but now used to indicate the thickness of plates, angles and flanges.
* Sheer Strake :> The continuous row of shell plates on a level with the uppermost continuous deck.
* Stealer plate :> A plate found at the extremities of the vessel in the shell or deck plating.

Main Structural members — Compensating Stress Factors affecting the vessel.

* Beam knees :> Resist racking, heavy weights and localised stress
* Beams :> Resist racking, water pressure, longitudinal torsional stresses and beam stresses due to weights.

* Bulkheads :- Resist racking stresses, water pressure, dry-docking, heavy weights, hogging and sagging, torsion stresses and shear forces.
* Decks :- Resist hogging and sagging, shearing, bending, heavy weights, and water pressure.
* Floors :- Resist water pressure, dry-docking stresses, heavy-weights, local stresses, racking, vibration and pounding.
* Frames :- Resist water pressure, panting, dry-docking and racking stresses.
* Longitudinal girders :- Resist hogging and sagging, water pressure, dry-docking and pounding stresses and localised shearing stresses. Examples: keel, keelsons, fore and aft members, intercostals.
* Pillars :- Resist stresses caused by heavy weights, racking, dry-docking and water pressure.
* Shell plating :- Steel plates of various size, which, when joined together form the sides of the ship's hull. Plates are generally of an increased thickness (increased scantlings) in and about the keel area.

Classification Societies. 21/09/22

This is an association / organization (Non-governmental) which is established to maintain technical standard and rules & regulation in the maritime sector.

Ship classification Societies is a non-governmental Organization that established and maintain technical standard for construction and Operation of Ships and Offshore Structure.

Obligation of classification Societies (Purpose)

1. ~~They ensure that~~ The major obligation of classification Societies is to ensure that floating vessels comply to IMO regulations and standard.
   - They ~~are~~ issue Certificate of Compliance
2. They avoid liabilities / disabilities (vessels that don't have the potential to be on the waterway). It empowers them to have an issurance certificate.

3. They issue international loadline Certificate in accordance with the legislation of the participating State giving effect to International Convention of loadline.
4. They Set technical rules based on research experience and research.
— The main purpose of IMO is Safety of lives at Sea.
5. They Confirm that design and calculation meet desired Standard (required rules of IMO).
6. They Survey Ships and Structures during the process of Construction and Commissioning periodically during Ship's Survey
7. They are responsible for classing O.I. platform and Other Offshore Structure and Sub-marines.
8. They Survey diesel engine, pumps, steal, machineries
9. They ensure that the labour law(act) and Safety Standard is upholded.

History of Classification Societies.

It all Started at 1756 where mariners (London) will come to Louis bush bar to drink tea
Louis was called the Underwriter (he wrote down the challenges of personnel On Sea).
Louis is the first person to start classification Societies.
Lloyd's Register — 1760 → First classification Society
Austrian Veritas → 1858
American bureau of Shipping → 1862
Korea of Shipping → 1980
Louis is Samson's Son.

Legislation in Maritime Administration.

NIMASA :- Started in 2007 and ensures that all Vessels Comply (conform) to IMO Standards. NIMASA is responsible for the Safety areas.

Every Ship Owner are expected to:
* Register your vessel
* Have the required Certificate

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Assignment

1. Explain the history of classification Society with in 5 lines.
2. Explain the history of NIMASA and its function
3. " Coastal and inland Shipping
4. What are IMO Convention Under Maritime Safety.

Answer

1. In 1756, mariners gathered at Edward Lloyd's coffee house to gossip and make deals, there was Underwriting to make good (profit) a portion of the losses if the ship didn't make it in return. It came to the realization that the Underwriters needed a way of assessing the quality of the ships that they were being asked to insure.

2. NIMASA was created on 1st August 2006 when the National Maritime Authority was merged with the Joint Maritime Labour industrial Council. Both were formerly parastatals of the federal Ministry of Transport. The Nigerian Maritime Administration and Safety Agency (NIMASA) was established primarily for the administration of maritime Safety Seafarers Standards and Security, Maritime Labour, Shipping regulation; promotion of Commercial Shipping and Cabotage activities, pollution prevention and Control in the marine Environment.

Functions

- Pursue the development of Shipping and regulatory matters relating to merchant Shipping and Seafarers.
- Administration and regulation of Shipping licenses.
- Administration, Regulation and Certification of Seafarers.
- Establishment of Maritime Training and Safety Standard.
- Regulation of Safety of Shipping as regards the Construction of Ships and navigation.

3. Shipping is the movement of Cargo or passengers across waterbodies. Coastal shipping is confined to a country. It is a type of Cabotage, where goods are transported from point A to point B along a country's coast by small Vessels.

4. International Convention for the Safety of life at Sea (SOLAS)
- International Convention for the prevention of pollution from ships MARPOL
- International convention On Standards of Training, Certification and Watchkeeping for Seafarers (STCW)
- International Convention On Loadlines (LL)
- Convention On the International Regulations for preventing collisions at Sea (COLREG)
- Convention On facilitation Of International Maritime Traffic (FAL)
- International Convention on Maritime Search and Rescue (SAR)
- International Convention for Safe Containers (CSC)
- Convention On the International Maritime Satellite Organisation (IMSOC)

Different classes of ropes, their uses and maintenance.

A rope is a length of fibers, twisted or braided together to improve strength for pulling and connecting. It has tensile strength but is too flexible to provide compressive strength (i.e it can be used for pulling, but not pushing). Rope is thicker and stronger than similarly constructed cord, line, string and twine. A rope can be made from almost every pliable material but is generally composed of vegetable fibers, Synthetic fibers, steel, iron or copper wires. The fibers are combed out and formed into continuous ribbon, spun into yarn and wound on bobbins. The yarns are made into strands which are laid into the finished rope. The lay or angle at which the strands are twisted together, is an important factor governing the performance of the rope. The higher the "angle of lay" is the harder the rope.

The types of rope are divided into the following classes.

1. Three-strand or hawser-laid rope :- this construction, sometimes called "Plain lay", is the general standard type of rope for all ordinary purposes.

2. Four-Strand or shroud lay → Provides the rope with greater bearing surface than the three strands, but its weight is greater than and its strength is less than three strand rope of the same size. A core is generally placed in the center of this rope for stability. Both three and four strand ropes are normally made "right hand".

3. Cable-laid rope (Cobler lay) → this is made by laying three-strand ropes together. It is normally made "left hand" but when required, can be made "right hand". When used in conjunction with wire rope as a towing spring. It is essential that the lay of the rope is the same as that of the wire rope.

4. Unkinkable lay :→ In this construction the twist of the yarn and the strands is the same, usually left hand, while the rope is right hand lay. This provides resistance to kinking when running through sheaves and is recommended for lifeboat falls in certain cases.

5. Eight-Strand plaited rope :→ It is made by plaiting two pairs of right hand strands with two pairs of left hand strands. This construction gives the same strength as three strand rope of the same size but is extremely flexible and is resistance to kinking. It grips well on winches and capstans, making it very suitable for mooring ropes.

6. Braided rope — It consists of a braided sheath over a braided core. It gives paler strength than three stranded or eight stranded rope and is very flexible. Does not kink and gives more grip on capstans and warping because the area of contact is greater. This construction is used for nylon ropes.

Types of ropes.

* Natural fiber ropes!

1. Manila rope — comes from abaca plant. This rope is smooth and glossy.
2. Sisal rope — is relatively cheap but is not as strong as manila. It is almost white and has a hairy surface.
3. Hemp :→ is a term reserved mainly for low tetrahydrocannabinol (THC) strains of the plant Cannabis Sativa. Scholars believe that hemp is humankind's oldest cloth and hemp-lime stone composites have been found in ancient Roman architecture.
4. Coir — is a natural fiber extracted from the husk of coconuts and used in products such as floor mats, doormats, brushes, mattre-

Seeds, etc. Technically, coir is the fibrous material found between the hard, internal shell and the outer coat of a coconut. Other uses of brown coir (made from ripe coconut) are in upholstery padding, sacking and horticulture. White coir, harvested from unripe coconuts, is used for making finer brushes, string, rope and fishing nets.

5. Cotton :- is a very soft rope made up of cottons and used for ornamental purposes.

* Synthetic fiber ropes:-

1. Polyamide (nylon) → is the strongest of the synthetic fiber ropes. It has exceptional resistance to substantial loading. It is resistant to alkalis, oils and organic solvents but is attacked by acids.
2. Polyester (Terylene) → is almost as strong as nylon and doesn't stretch as much as other man-made fibres. It resists acids, oil and organic solvents but is attacked by alkalis.
3. Polypropylene and polyethylene - ropes made from these fibers will float on water. They have a relatively low melting point. Both fibers are highly resistant to acids, alkalis and oils but may be affected by bleaching agents and some industrial solvents. Polypropylene is widely used as it has several ~~dam~~ advantages over natural fiber ropes and is less expensive than nylon and terylene and is stronger than polythene.

Basic knot tying and Splicing

Knot tying consists of the techniques and skills employed in tying a knot in rope, nylon webbing or other articles. The proper tying of a knot can be the difference between an attractive knot and a messy one, and ~~(illegible)~~ occasionally life and death. It is important to understand the often subtle differences between what works, and what doesn't. For example, many knots "spill" or pull through, particularly if they are not "backed up" usually with a single or double overhand knot to make sure the end of the rope doesn't make its way through the main knot, causing all strength to be lost.

Kinds of knots.

1. Overhand knot or thumb knot :- is one of the most fundamental knots and forms the basis of many others including the simple nose, overhand loop, angler's loop, reef knot, fisher-

man's knot and water knot. The Overhand knot is very secure, to the point of jamming badly. It should be used if the knot is intended to be permanent. It's often used to prevent the end of a rope from unraveling. It is a stopper knot that prevents from slipping through your hands.

There are a number of ways to tie the Overhand knot.

* Thumb method - Create a loop and push the working end through the loop with your thumb.
* Overhand method - Create a bight, by twisting the hand over at the wrist and sticking your hand in the hole, pinch the working end with your fingers and pull through the loop.

2. Figure of eight knot :-> The figure-eight knot is a type of knot. It is very important in both sailing and rock as a method of stopping ropes from running out of retaining devices. Unlike the Overhand knot, which will bind iron-hard under strain, often requiring the rope to be cut, the figure of eight can be easily untied after even the greatest strain.

3. Two-half hitch :-> is a type of knot, specifically a binding knot or hitch knot. It consists of an Overhand knot tied around a post, followed by a half-hitch. Equivalently, it consists of a half-turn around a post followed by a clove hitch of the running end around the standing part.

4. Clove hitch :-> Along with the bowline and the sheet bend, it is often considered one of the most important knots. A clove hitch is two successive half-hitches around an object. It is most effectively used as a crossing knot. It can be used as a binding knot, but is not particularly secure in that role. A clove hitch made around the rope's own standing part is known as either two half-hitches or buntline hitch, depending on whether the turns of the clove hitch progress away from or towards the hitched object.

5. Rolling hitch :-> is a knot used to attach a rope to a rod, pole, or other rope. A simple friction hitch, it is used for lengthwise pull along an object rather than at right angles. The rolling hitch is designed to resist lengthwise movement for only a single direction of pull. A common usage while sailing is for rigging a stopper to relax the tension on a sheet so that a jammed winch or

block can be cleared

6. Bowline :→ is an ancient and simple knot used to form a fixed loop at the end of a rope. It has the virtues of being both easy to tie and untie. The bowline is sometimes referred to as king of the knots because of its importance. It is one of the four basic maritime knots (the other three are figure-eight knot, reef knot and clove hitch). The structure of the bowline is identical to that of the sheet bend, except the bowline forms a loop in one rope and the sheet bend joins two ropes. Along with the sheet bend and the clove hitch, the bowline is often considered one of the most essential knots. Although generally considered a reliable knot, its main deficiencies are a tendency to work loose when not under load and the bight portion of the knot to capsize in certain circumstances. To address these shortcomings, a number of more secure variations of the bowline have been developed for use in safety-critical applications.

7. Figure of eight-knot tied in doubled end→ this is a useful knot to tie in smooth rope and thin line. It holds very well and is extremely easily undone even after being under a heavy load. It can be made quickly in thin slippery line to provide a loop and is used by anglers to make a non-slip loop.

8. Bowline on the bight :→ is a knot which makes a pair of fixed size loops in the middle of a rope. Its advantage is that it is reasonably easy to untie after being exposed to a strain. This knot can replace the figure-eight knot when tying into a climbing harness. However, it is critical to use a strong backup knot with plenty of tail beyond the knot.

9. Reef or Square knot :→ is an ancient and simple binding knot used to secure a rope or line around an object. Although the reef knot is often seen used for tying two ropes together, it is not recommended for this purpose due to potential instability of the knot. A reef knot is formed by tying a left-handed overhand knot and then a right-handed overhand knot, or vice versa. A common mnemonic for this procedure is "right over left, left over right", which is often appended with the rhyming suffix"... makes a knot both tidy and tight. The working

ends of the reef knot must emerge both at the top or both at the bottom, Otherwise a knot results.. Two consecutive Overhands of the same handedness will make a granny knot.

10 Single and double sheet bend :→ is a knot that joins two ropes together. Doubled, it is effective in binding lines of different diameter or rigidity securely together, although it has a tendency to work loose when not under load. This is the first and foremost the bend is use when connecting two ropes to different sizes. Always make the bight with the thicker rope and bend the thinner rope to it. If the rope is very smooth, do not rely on the single sheet bend but use a double or even triple sheet bend. It is now used frequently to attach a flag to a flag line.

11. Fisherman's knot :→ is a bend (a knot for joining two lines) with a symmetrical structure consisting of two overhand knots, each tied around the standing of the other. Other names for the fisherman's knot include: Angler's knot, English knot, halibut knot, waterman's knot. Though the fisherman's knot is associated with fishing, it can slip when tied in nylon monofilament and other slippery lines; however, if more holding power is required, the overhand knots can be made with more turns, as in the double fisherman's knot, and so on. It is compact, jamming when tightened and the working can be gripped very close to the knot. It can also be easily tied with cold, wet hands. Though these properties are well suited to fishing, there are other knots which may provide superior performance, such as the blood knot.

12. Carrick bend :→ is a knot used for joining two lines. It is particularly appropriate for very heavy rope or cable that is too large and stiff to easily be formed into other common bends. It will not jam even after carrying a significant load or being soaked with water. As with many other members of the basket weave knot family, the carrick bend's ~~aesthetic~~ aesthetically pleasing interwoven and symmetrical shape has also made it popular for decorative purposes.

13 Heaving line knot :→ When line has to be thrown to the shore or to another vessel, the end of it can be weighed by making a heaving line knot. Another use for this knot is to make a knob at the

end and the Snap can be used, say, to hang Cables or rope on the guardrail.

14. Monkey's fist is a good method of designing the throwing end of the heaving line. To make a monkey's fist. The monkey's fist can also be used effectively to thicken the end of any Control line. When made round a Cork Core, it makes a floor chess they pendant which will float.

15. Stage hitch :- formed by laying the bight of the rope. Over the Stage inside the horse then Creeping the two parts Underneath and laying them Over the Stage Outside the horse. The bight is then pulled Over the end of the Stage. After pulling the two parts. Use a bowline to make fast the end of the rope to the Standing part.

16- Boatswain's chair bowline hitch :- a Seaman can lower himself and Secure the chair in a new position using the bowline hitch. The running part is held firmly against the Standing part in One hand or secured to it by a temporary Seizing. The bight of the running part is passed through the bridge of the chair Over the man's head and so then passed behind him and his feet.

N.B There are hundred kinds of knots but the following knots discussed above are the Common Use in maritime field.

Rope Splicing

Rope Splicing in rope work is the forming of a Semi-permanent joint between two ropes or two parts of the Same rope by partly Untwisting and then interweaving their Strands. Splices are preferred to knotted ropes, Since while a knot reduces the Strength by as much as 40% or more, Some Splices Can retain up to 95% of the Strength of the line. However, Splicing Usually results in a thickening of the line and if Subsequently removed a distortion of the rope.

Samples of Splices

1 Eye Splice - formed by unlaying the end of a rope for a short distance and then after closing up the end, to form an eye of the desired Size. Lay the three Strands upon the Standing part and tuck the middle Strand through the Strand of the Standing part of the rope next to it, against the lay of the rope, then pass the Strand on the left Over the Strand Under which number 1

strand is tucked and tuck it under the next loosely, put the remaining strand through the third strand on the other side of the ropes.

2. Short Splice :- It is used to join two ropes when it is not required to pass through a block. ~~then~~ Untay the two ropes based on the required distance and clutch them together so that the strands of one rope go alternately between the strands of the other.
3. Long Splice :- A splice is used to join two ropes ends forming one rope the length of the total of the two ropes. The long splice, unlike most splice types, results in a splice that is only very slightly thicker than the rope without the splice, but sacrifices some of the strength of the short splice. It does this by replacing two of the strands on each rope end with those from the other, and cutting off some of the extra strands that result. The long splice allows the spliced rope to still fit through the same pulleys, which is necessary in some applications.
4. Side Splice :- A splice in which the end of one rope is joined to the midsection of another. For example, the cut splice (above) is composed of two side splices, with each line's end side spliced to the standing part of the other.
5. Back Splice (also called an end splice) :- A splice where the strands of the end of the rope are spliced directly back into the end without forming a loop. It is used to finish off the end of the rope to keep it from fraying. The end of the rope with the splice is about twice the ~~end~~ thickness of the rest of the rope. With nylon and other plastic materials, the back splice is often no longer used; the rope strands are simply fused together with heat to prevent fraying.
6. Cut Splice (Originally called Cunt Splice) :- A splice similar to the eye splice. It is typically used for light lines (e.g., the log-line) where a single splice would tend to come undone, the rope being frequently used. It makes a very strong knot. A cut splice is a join between two ropes, made by side splicing the ends slightly apart to make an eye in the joined rope which lies shut when the rope is taut. Its original name was bowdlerized to "cut splice".

Wire ropes.

Wire ropes used for marine purposes usually consist of six strands laid up around a central heart of fiber or about a seventh wire strand. Each strand is made up of several wires twisted around a central fiber core or around a single center wire, the number of wires of the rope depends also on the purpose for which it is required. Increasing the number of wires to the strand for the same size of rope gives greater strength and flexibility.

Wire ropes are referred to by two numbers, the first indicates the number of strands including strands which maybe used for the central heart, and the second indicates the number of wires to the strand.

Types of lay.

1. Ordinary lay :- The wires are twisted in the opposite direction to the strands.
2. Lang's lay :- The direction of twist of the wires is the same as the direction of the strands. This lay provides a greater wearing surface but should only be used when both ends of the rope and the bed are secured against rotation. It is not likely to be used for marine purposes.
3. Performed rope :- Each strand of this type of rope is performed into a helix so that it will be easier to handle and less likely to kink.
4. Spring lay :- This is a combined rope consisting of three galvanized wire strands and three fiber strands laid up around a central fiber core. The rope is cable laid, each main strand being made up of three fiber strands and three 19-wires strands over a fiber strand core. Spring lay rope is four times stronger than fiber ropes and 50% stronger than nylon. It is much easier to handle than ordinary wire rope and is very suitable for mooring ropes and for preventers for derrick rigs.

Application

1. Standing rigging :- Wire ropes used for stays, shrouds and preventers have a steel core to give extra strength flexibility is not important. British Standard publication 365 recommends 7x construction for wires up to 28mm in diameter

7X19 for 32 to 48mm, and 7X37.

0. Cargo lashing
6X12 ropes are recommended for sizes 8 to 16mm and 6X24 construction for larger sizes.

3 Cargo Handlings
6X24 construction is usually used but 6X19 ropes are also suitable for ropes to 24 mm.

4 Mooring ropes
Wire ropes 6X37 construction are recommended for general used but for powered winches, 6X36 ropes with a wire core should be used for sizes up to 40mm and 6X41 for sizes 44 to 60mm.

Handling a wire rope.

1 When uncoiling a wire rope, it is important that no kinks are allowed to form as a kink is made, no amount of strain can take it out and the rope becomes unsafe to work. If possible, a turn-table should be employed

2 If a turn-table is not available, the rope maybe rolled along the ground.

3. In no case must the rope be laid in the ground and the end taken over or kinks will result and the rope will be completely spoiled

4 The life of a wire rope depends principally upon the diameter of drums, sheaves and pulleys, and too much importance cannot be give to the size of the reeler.

5. The load should not be lifted with a jerk as the strain may become equal to three or four times the proper load and a rope may easily be broken.

6. Examine ropes frequently, a new rope is cheaper than the risk of killing or maiming employees.

7. One-Sixth of the ultimate strength of the rope should be considered a fair working load.

8. To increase the amount of work done, it is better to increase the working load than the speed of the rope. Experience has shown that the wear of the rope increases with the speed of the rope.

9. Wire rope should be greased when running or idle. Rust destroys as effectively as hardwork.
10. Great care should be taken that the grooves of drums or sheaves are perfectly smooth, ample in diameter and conform to the surface of the rope. They should also be in perfect line with the rope so that the latter may not chafe on the sides of the grooves.

Wire Splicing.

The Docks Regulations of the Factories Act requires that a thimble or eye splice should have at least three tucks with the whole strand of the rope and two with half the wires cut out of each strand. The strands must be tucked against the lay of the rope. If the splice is made with the lay, rotation will cause the tucks to draw and the splice to pull out. Wire splices should be parceled with oily canvas and served with Hasbro' line.

Splicing thimbles Under and Over Style.

Read Pdf

It will be noticed that this style of splice possesses a plaited appearance and the more strain applied to the rope, the tighter the splice will grip and there is no fear of the splice drawing, owing to the rotation of the rope.

Strength of Wire rope.

The breaking stress of flexible steel wire rope in tonnes is given, approximately, by the following formulae:

$$6 \times 12 \frac{15D^2}{500} \text{ tonnes}$$

$$6 \times 24 \frac{20D^2}{500} \text{ tonnes}$$

$$6 \times 37 \frac{21D^2}{500} \text{ tonnes.}$$

D is the diameter of the rope in millimeters.

The safe working load may be taken as one-sixth of the breaking stress.

Blocks

The word block, refers to join in a dictionary, has a multiple meaning. In marine circles, a block consists of a pulley wheel or wheels confined in a banding (frame). These blocks are portable and normally used in pairs to assist in transporting of heavy objects from one position to another or simply to change the direction in which the rope moving the object is leading.

The Sheaves (pulley wheels) may be made of wood (lignum vitae), galvanized iron, or cast iron and depends on the type of block to which the sheave is fitted.

All blocks are stamped with SWL (Safe working load) and the rope size for which they are suitable.

Parts of the block.

1. Arse :- That end of a block which does not contain a Swallow.
2. Binding :- Steel forked piece, one bend which is fitted to secure the block to a strong point, while the forks accommodated the pin (one fork may be extended to make the becket).
3. Bush :- A center piece in the sheave which revolves around the pin.
4. Cheek - A side of the shell of the block.
5. Crown - That end of the block which houses the Swallow and the part of the binding used to secure the block.
6. Pin :- Axle upon which the sheave revolves.
7. Distance Pieces :- Pieces used on the arse and Crown to keep the cheeks of the shell apart and provide free running to the sheave.
8. Saucer :- Heavy steel saucer placed immediately below the Crown of the floating block on some heavy lift purchases.
9. Score :- Groove cut in the shell or dump blocks for the purpose of holding the strop in place.
10. Sheave :- Pulley wheel around which the fall is led.
11. Shell :- A cover over the sides, top, and bottom of the sheaves.
12. Strop :- A grommet around the block that has no binding. Used to secure a block to a strong point.
13. Swallow :- The point in the shell where the fall enters or leaves the block as it passes over the sheave.
14. Swivel :- A pivot included in the binding so that the block may

then when it is secured to a strong point.

15 SWL – Safe working Load of the Block.

16 Tail :-> A fiber rope tail affixed to the binding or Strop of a Small block for the purpose of Securing the Block to a Strong point.

Diagram :-> Pdf

Types of Blocks

1 Cargo block :-> External bound metal block used on derrick with a wire rope fall as head block, heel block, topping lift block, or purchase block.

2 Clump block :-> Wood block with no binding but with the Shell Secured to the Strop. Originally, the Shell was Carved from One piece.

3 External bound block :-> A block having the forks of the binding Outside the Shell.

4 Funnel Block :-> A block constructed with a long hook on the Crown So that it may be hooked over the funnel top for the use when painting the funnel.

5 Gin block :-> Metal block with a Skeleton binding and no Shell. Normally used for working Cargo with fiber rope whips.

6 Internal Bound block :-> Wood block with the forks of the binding ~~metal~~ enclosed in the Shell.

7. Metal Block :-> Any block entirely made of metal.

8. Non-topping block :-> A block so constructed that when used as a floating block the life boat fall or Cargo purchase, the Crown will remain below the sheave and the block will not be topple when no weight is Suspended form the purchase.

9. Snatch block :-> A block where one cheek or part of one cheek is hinged and allows a fall to be placed in the Swallow without having to reeve the fall.

10. Wood block :-> Any block having a wood Shell.

Anchor work and associated gears, Mooring Winch

An anchor refers to a nautical or marine equipment intended to restrict vehicle or structural movement in the water. Anchors achieve their purpose by either using their weight to hold structures in place, clamping on to the bed of the waterbody, or using a combination of both these techniques.

In addition, anchor can also act as dragues (possible drag mechanism) for ships and other vessels during storms. They provide a restoring drag that keeps the vessel stable and prevents slamming of the bow or flooding through green water loading during choppy conditions.

Bow slamming refers to the ship violently striking the water surface due to large waves that can cause structural deformations and failure.

Green water is technical term for any water that is present on the upper decks of a vessel due to the partial flooding as a result of the natural motions of waterbodies.

How Anchor works

When an anchor penetrates the surface of the seabed, suction generates resistance, created by the bottom material plus the weight of the material above the anchor. As the boat pulls on the anchor rode, the anchor digs in deeper, creating additional resistance. In rocky bottoms anchors can't dig in, but rather snag on projections and hold precariously.

* Setting: To ensure that an anchor "sets" well, apply tension to the rope so the anchor penetrate the bottom. Do this by making fast the line and applying power in reverse. If your boat moves, reset the anchor and try again.
* Scope: is defined as a ratio of the length of an anchor rope from the bit to the anchor shackle and the depth of the water under the bow of the boat measured from deck height. Most anchoring tests and anchor manufacturers agree that a scope of 7:1 achieves the anchor's designing holding power, and more scope is better than less. In theory, 7:1 scope is great, but in a crowded anchorage most cruisers scoff at the idea of paying out more than 3:1 or 4:1; there just isn't that much space for boats to swing. When an anchor

is Securely Set you can Consider shortening Scope in a Crowded anchorage.

* Resetting :- It's fairly easy to Set an anchor when wind and Current come consistently from one direction, but if they veer, Some perform better than Others Under Varying angles of pull.

The method involved in Securing a Ship to the Seabed by means of her anchors and Cables is called Anchoring and lifting the anchor from Seabed is called Weighing anchor.

Types Of Anchors.

The bigger the Vessel, the heavier must her anchor.

1. Admiralty pattern Anchor :- Some times referred to as a fisherman's anchor. It has been for many years and have good holding pull 3 to 1/2 times its own weight depending upon the nature of Sea bottom, but it is stowed in hawse pipe due to its long stock. It is hardly Seen Onboard merchant Vessel
2. Admiralty Standard Stockless Anchor :- this is by far the most popular anchor generally use today. The Stockless anchor great advantage is its close Stowing property and easily housed in to hawse pipe when not in use. Holding pull Varies depending on the nature of the bottom but as a rule of thumb it is Considered to be three times of its own weight.
3. Admiralty Class 14 Anchor :- It looks same as a Stockless anchor and used as a bower Anchor. This anchor due to its good holding properties has become Very popular in the Shipping industry. The AC type 14 anchor developed more than twice the holding power of stockless anchor of the weight.
4. CQR Anchor :- referred as plough anchor. It is generally Used only for Small Craft because it is difficult to Stow in the hawse pipe. The holding power depend upon nature of the bottom but still have good holding power to its weight ratio. The ratio between holding pull and anchor weight increases as the Size decreases.
5. Danforth Anchor :- Generally called as Stocked close Stowing anchor, accepted as Small boat anchor to prevent the anchor from rolling when its flukes digs into the ground. It can be

Stowed into the hawse pipe. Same as Stockless anchor, the ratio between holding power and anchor weights increases as the size decreases. It fits neatly into the hawse pipe and can be secured as efficiently as Stockless anchor.

Diagram of anchor: Pdf.

Types Of Ship Anchors.

1. Bower anchor :- The ships main anchors are called the bower anchors. They are used for anchoring the ship and stowed one on each bow.
2. Sheet anchor :- It is an extra anchor carried for safety to back up main anchor in case one is lost.
3. Stream anchor :- A anchor lashed and secured as near the stern of the vessel. It is made to be used in narrow channels for preventing the stern of the vessel from swinging. But these days, it is hardly carried and used.

Chain Cable.

The long shank of stockless bower anchor fits inside the hawse pipe, whereas its arm rest snugly against the ship side. The anchor shackle on top of the anchor is connected to a long studden chain cable. The chain is made up of length of 27.5 meters each join together by lugless joining shackles of chain. A length of chain cable will always contain an odd number of links to ensure that the joining shackle will pass around the cable holder in correct plane. Joining shackle being slightly larger than common links should lie vertically round a cable holder and horizontally over the gypsy of windlass. There may be 8 or 9 shackles of bower anchor. The stud make the chain stronger and prevents the chain from kinking.

Diagram of Associated Anchor and Cable Gears :- Pdf.

Types Of Joining Shackles.

The shackles which join length of cable together may be either lugless or lugged is called 'Joining shackle'. Joining shackles are also used during towing and securing to buoy evolution.

1. Lugged joining shackle :- is a three part shackle join

together with a pin and pallet, used to join two shackles of anchor cable.

2. Lugged joining shackle :- is straight shackle made of two parts and join together with a pin and pallet.
3. Swaking to buoy shackle :- is used to secure ship to a buoy
4. Lugged anchor shackle :- is used to join onboard end of cable to anchoring.
5. Joggle shackle :- is long and slightly curved shackle used for connecting a wire rope to the cable.

Why and how a cable is marked

When anchoring, it is important to know how much cable has run out. The cable is therefore marked at each joining shackle to assist in its identification.

The shackles and joining shackles of a cable are numbered from its outer to inner end. The first joining shackle together. Every joining shackle is painted white. One link on each side of joining shackle is also painted white and marked with turns of seizing wire round STUD. The marked links which serves to indicate the join between two shackles. For example;-

* To indicate 1st joining shackle the first link on both side of joining shackles is marked with one turns of wire and painted white.
* To indicate 2nd joining shackle the second link on both sides of joining shackle is marked with two wire and painted white.
* To indicate 3rd joining shackle, the third link on both sides of joining shackle is marked with wire and painted white.

Mooring winch.

* Mooring gear

The set of fittings and mechanisms aboard a ship that are used to warp and secure the ship when it is moored at a dock, at the wall of a lock, to buoys, or alongside another vessel. A ship's mooring equipment includes mechanisms, such as winches and capstans, that are used to take in and pay out mooring lines, which are ropes or steel cables. It also includes the following fittings: bitts

and cleats, around which the mooring lines are made fast; stoppers, which temporarily hold the mooring lines, mooring chocks, rollers, and mooring pipes, which are used to change the direction of the mooring lines, manually operated or mechanized reels, on which the mooring lines are stored, and line throwers, which throw the mooring lines from the ship.

* Windlass

The windlass is a machine to lift or lower the anchor cable on the foc'sle deck. The windlass is combined with the rope drum also called warping drum. It consist of a horizontal cathartship shaft rotated by electric motor, hydraulic pressure by steam engine. On both the end. This shafts are fixed two warping drums which can be used for hearing the mooring hausers. Each anchor chain rides over a Gypsy, which is just a roller revolving freely on the shaft. Grips conforming to the shape of the link are cut on the gypsies. The links of the chain lie snuggle in these grips and are gripped by them when the chain is hove up. The rotation of the gypsy can be controlled or stopped altogether by means of friction.

Overview of anchor mooring winch.

1. Storage part of the mooring drum
2. Pulling Section of the drum (working part)
3 Brake band
4 Gear box.
5 Electro-hydraulic motor
6 Warping head
7 chain in the gypsy wheel.
8 Dog clutch.
9 Anchor
10 Hawse pipe
11 Spurling pipe
12 Chain locker
13 Chain stopper with Security device
14 Guide roller $16
15 Bollard
16 Deck.

Diagram :-> Pdf.

Anchor equipment.

Anchors can be

1 Conventional anchors
2 High holding power – HHP anchors
3 Super high holding power - SHHP
4 Pool anchor (HHP) type HG 'Pool N' anchor; Hall anchor (Conventional anchor)

Anchor equipment

1 Crown / Shackle
2 Shank
3 Flukes
4 Crown pin
5 Crown plate
6 Anchor chain with Swivel

Anchor mooring gears.

1 Warping head
2 Drum
3 Bollards
4 Eyes to Connect the Stoppers
5 Guide roller
6 Center lead
7 lead Davy
8 Head line
9 Forward Spring.

Ripping

End links

1 Gaff Socket with rolled connection
2 Cast Spelter Socket
3 Rolled Eye Socket
4 Thimble Fabrite eye
5 Spliced eye with thimble
6 Thimble Flemish eye Swaged
7 Wedge Socket (not allowed for hoisting)

Safety hook (labelling)

1. Brand or type marking
2. Chain Size (chain 7/8 of an inch)
3. Class, Grade 8 (High-grade Steel)

4 Safety pin
5 Spring

Type:

1. Bow Shackle with Safety pin
2. " " " Screw-bolt
3. D-Shackle with Safety bolt and nut
4. " " Screw-bolt

Terminology Used in anchor work.

a) A' cockbill :-> An anchor is said to be a'cockbill when it has been eased just clear of the hawsepipe and its weight is taken by the Stake Slip in readiness for letting go.
b) Anchor coming home :-> means the anchor is dragging towards the Ship as the Cable is hove in
c) Anchor Aweigh :-> The anchor is said to be aweigh immediately it is clear of the bottom'
d) Clear hawse :-> the Cables are clear of one another when a Ship is riding to two anchors.
e) foul hawse :-> If the Cables are crossed or otherwise foul of each other when she is riding to two anchors.
f) Clear or foul anchor :-> It is reported clear as soon as it is entirely sighted.
g) To come To :-> A Ship is said to come to an anchor at the moment of letting go.
h) Dragging :-> instead of holding the Ship, it drags along the bottom; this may occur in heavy weather, in a Strong Current.
i) To grow :-> A Cable is said to grow in the direction in which it leads Outside the hawsepipe
j) To hang Cable :-> to hold it temporarily with a Stopper.
k) A Hanger :-> a rope which is passed through a link of chain cable
l) long Stay :-> The cable is said to be at long Stay when it is taut and reaches out well away from the hawsepipe.
m) Short Stay :-> The Cable is said to be at Short Stay when it is taut and leads down to the anchor at a Steep angle.
n) Shortening-in Cable :-> A Ship lying at anchor is said to Shorten-in her Cable when she heaves in part of it.
o) To Snub :-> a cable is to retain it Suddenly when running

Out by applying the brake.

R) Up and down :-> When it is Vertical.

Q) To veer cable :-> To pay out or ease out cable from the combined Capstan and Cable holder.

P) Weighing anchor :-> is the Operation of hearing in Cable until the anchor is broken out of the bottom.

S) Anchor watch :-> This watch consists of an Officer on the bridge and it should always be set in bad weather.

T) Dragging an anchor :-> can be detected by taking frequent compass bearings on Shore objects or by taking Soundings.

U) Clearing a foul anchor.