

**JAI MATA DI**

**SAFETY ORAL NOTES**

**CLASS 2**

**PREPARED BY ANKUR SHARMA**

**MANET BATCH 6**

### Q-1) FRESH WATER ALLOWANCE?

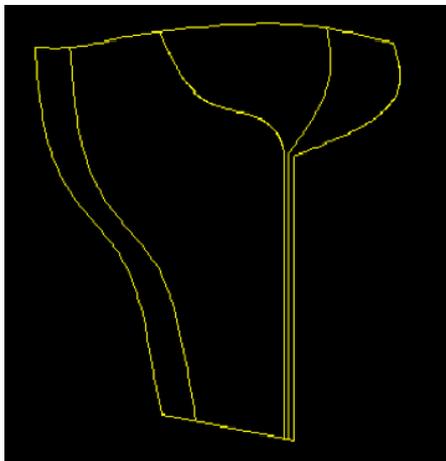
- When the vessel moves from saltwater to fresh water due to the difference in density the vessel will sink more so that summer loadline will submerge below water line.
- This additional sinkage will be just enough to achieve more underwater volume so that vessel will get exact buoyancy as the vessel floating in sea water.
- This rise /change in draft is called as Fresh water allowance FWA.
- Fresh water allowance =  $\frac{\text{Displacement (W)}}{40\text{TPC}}$
- Summer draft + FWA = Freshwater Draft
- If vessel is loading in Fresh water, she can load upto fresh water draft.
- When the vessel travels from fresh water to sea water, she will rise and her draft at salt water will be summer draft.

### Q-2) TYPES OF STERN?

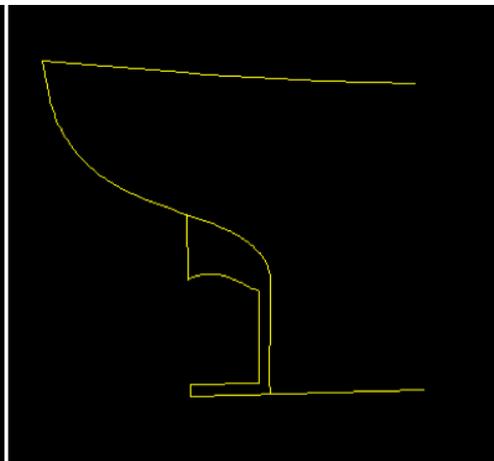
Common types of ship's stern are:

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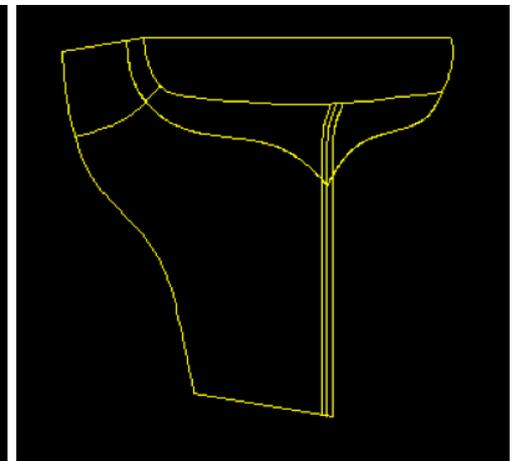
1. Elliptical:
  - Most conventional form of stern.
  - Characterised by an upwardly curved profile beginning fore of the aft perpendicular.
  - Cutaway for rudders occurs above waterline.
2. Cruiser:
  - Designed to lower the steering gear below the armor deck.
  - Characterised by an upwardly curved profile from aft perpendicular to the main deck.
  - Cutaway for rudders occurs above waterline.
  - More pleasant profile and hydro-dynamically efficient.
3. Transom:
  - Characterised by generally flat shape extending to the waterline.
  - Greater deck area and of simple construction.
  - Can be viewed as cruiser stern whose aft most portion is cut off.



ELLIPTICAL STERN



CRUISER STERN



TRANSOM STERN

### Q-3) STEERING GEAR REQUIREMENT FOR TANKER ABOVE 10000 GRT?

As per SOLAS Regulation 29,

1. *In every tanker, the chemical tanker, or gas carrier of 10,000 gross tonnages And upwards and in every other ship of 70,000 gross tonnages and upwards, The main steering gear shall comprise two or more identical power units Complying with the provisions.*
2. *Every tanker, chemical tanker, or gas carrier of 10,000 gross tonnage and up words shall, subject to para. 17, comply with the following.*
  - *The main steering gear shall be so arranged that in the event of loss of steering capability due to a single failure in any part of one Of the power actuating systems of the main steering gear, Excluding the tiller, quadrant, or components serving the same purpose, or seizure of the rudder actuators, steering capability Shall be regained in not more than 45 seconds after the loss of one Power actuating system;*

### **Main steering gear requirements as per SOLAS :**

1. **Rudder stock shall be of adequate strength and capable of steering the ship at maximum ahead speed.**
2. **Capable of putting rudder over from 35° on one side to 35° another side at its deepest draft and maximum ahead service speed and 35° on either side to 30° on another side in 28 seconds.**
3. **Operated by power and designed so as not to incur damage at maximum astern speed.**

### **Auxiliary steering gear requirement as per SOLAS:**

1. **Capable of putting the rudder 15° on one side to 15° on the other side in 60 seconds, when vessel at the deepest draft and running ahead at ½ maximum ahead service speed or 7 knots whichever is greater.**
2. **Adequate strength and capable of steering at a navigable speed.**
3. **Steering gear control from Navigation Bridge and locally.**
4. **Auxiliary steering gear controls from locally and if power operated also operable from Navigation Bridge.**
5. **Steering capability to be regained in not more than 45 seconds after the loss of one power system.**

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### **Q-4 FOLLOW UP AND NON-FOLLOW UP?**

#### Non follow up system:

When steering gear set to required position, rudder is moved & when rudder reach the required position, steering gear must be set to off position. This system uses the three solenoid valve.

#### Follow up system :

When steering gear set to required position, rudder is moved & when rudder reaches the set position, steering gear still remains at that position. This system uses the hunting gear arrangement.

#### Hunting gear :

It is a feedback mechanism of steering gear which repositions the floating lever of hydraulic pump as the tiller moves to the desire position.

### **Q-5 DIFFERENCE BETWEEN WEATHERTIGHT AND WATERTIGHT?**

A watertight door or hatch can withstand a water pressure from both sides. It helps during the major water leakage. Due to a watertight closure, the leakage won't spread and the ship will remain afloat. Its test is done by mounting it onto tank and applying pressure from inside.

A weathertight door or hatch can withstand the water pressure from one side(outside). Watertight enclosures can be found above the waterline like on deck or on wheelhouse of the ship. They can be submerged for the shorter period as would occur when hit by a standing wave. Its test is done by high pressure hose.

### **Q-6 FIRE FIGHTING EQUIPMENT NEAR BOILER AND HYPERMIST TESTING?**

- A receptacle containing at least 0.3 cubic metre of sand, saw dust impregnated with soda or other dry material suitable for quenching oil fire
- 45 lts semi portable foam type extinguisher.
- Hypermist system

#### **1. Operation test (pump running test and verification of discharge pressure)**

- Close all the valves except the water supply valve.
- Open the pump drain valve.
- Select the switch to manual position and push the start button from the pump starter panel.
- Check the pump running condition and discharge pressure in the gauge.

#### **3. Actual test (With flooding)**

- Select the switch to the manual position and follow the starting procedure as above mentioned in this blog.
- For automatic activation, protect the machinery of the relevant area. Activate both detectors. Check for alarm at control panel as well as audible and visible alarm. Mist will start coming at the relevant nozzle. Once confirm the successful

<ul style="list-style-type: none"> <li>• Push the stop button and drain the water remaining in the pump unit.</li> <li>• Put the system back to normal position.</li> </ul>	<p>activation stop the system from the local control panel. After the test put the system in normal condition.</p>
<p><b><u>2. Automatic release test (without flooding)</u></b></p> <ul style="list-style-type: none"> <li>• Close the water suction valve.</li> <li>• Disconnect the motor power cable or remove the contractor from the pump.</li> <li>• Open the airball valve.</li> <li>• Activate both detectors by UV lamp (if flam detector) and smoke container (if smoke detector).</li> <li>• Check the alarm of the main control panel, visual and audible alarm in the protected area.</li> <li>• Check the air release of the nozzle in that area.</li> <li>• Push the stop button from local control.</li> <li>• Repeat the test with other sections. After completion put the system back to normal.</li> </ul>	<p><b><u>4. Alarm and other tests</u></b></p> <ul style="list-style-type: none"> <li>• Low water level alarm test in the fresh water tank.</li> <li>• Electrical source failure alarm. We can test by removing the fuse.</li> <li>• Interlock (if applicable) push the start and check the ventilation cut off.</li> <li>• Air blow test – blow the air of pressure 7-8 bar to ensure the line and nozzles are clear.</li> <li>• Note – Drain the system and put it in a normal condition after any test.</li> </ul>

**Q-7) ALL THE CERTIFICATES AND UNDER WHICH CONVENTION?**

1. Certificate of Class
2. Certificate of Registry
3. Certificate of competency for masters, ratings and officers= *SOLAS 1974*
4. International Tonnage certificate= *Tonnage convention*
5. International Load line certificate= *Load line convention*
6. International Load line exemption certificate= *Load line convention*
7. International Oil pollution prevention certificate= *MARPOL Annex 1*
8. International Sewage pollution prevention certificate= *MARPOL Annex 4*
9. International Air pollution prevention certificate= *MARPOL Annex 6*
10. International certificate of fitness= *IBC code*
11. International Ship security certificate= *SOLAS 1974*
12. Shipboard oil pollution Emergency plan= *MARPOL Annex 1*
13. Oil record book ORB Part-1= *MARPOL Annex 1*
14. Garbage record book= *MARPOL Annex 5*
15. Garbage management plan= *MARPOL Annex 5*
16. Safety management certificate= *SOLAS 1974*
17. Document of compliance= *SOLAS 1974*
18. Damage control booklet= *SOLAS 1974*
19. Minimum safe manning certificate= *SOLAS 1974*
20. Ship safety construction certificate= *SOLAS 1974*
21. Ship safety equipment certificate= *SOLAS 1974*
22. Ship safety radio certificate= *SOLAS 1974*

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**FOR OIL TANKERS**

23. Oil record book Part 2
24. Record of ODMCS for ballast voyage
25. Ship structure Access manual
26. Enhance survey report file

**FOR CHEMICAL TANKERS**

27. International certificate of fitness for carriage of dangerous chemical in bulk.

**FOR GAS TANKERS**

28. International certificate of fitness for carriage of liquefied gases in bulk.

**Q-8) PREPARATION FOR SAFETY CONSTRUCTION SURVEY?**

- Inspect structural strength, peak and machinery bulkheads, and stern tubes.
- Inspect watertight bulkheads, decks and inner bottoms, watertight decks.
- Inspect main machinery means of maneuvering and going astern.
- Inspect ventilations systems in machinery spaces, protection against noise.
- Inspect boilers and other pressure vessel;
- Inspect electrical installations, main source of electrical power and main switchboard, lighting systems.

- Inspect emergency source of power and emergency switchboards, locations and construction of cables and general precaution against shock, fire and other hazards.
- Check remote control of propulsion machinery from bridge and steering gear.
- Check communication between engine room and bridge, engineer's alarm.
- Inspect ballast and bilge pumping and drainage arrangements.
- Check anchors, anchor handling equipments and chain cables.
- Check emergency towing arrangements.

**Q-9) WHAT WILL YOU CHECK FOR MARPOL COMPLIANCE BEFORE JOINING THE VESSEL?**

By certificates and by checking OWS 15 ppm alarm.

**Q-10) SEEMP**

- Ship Energy Efficiency Management Plan is an operational measure to improve the energy efficiency of a vessel in a cost effective manner by reducing greenhouse gas emission.
- It can be achieved by speed optimization, weather routing, hull monitoring and maintenance, efficient cargo operation.
- It is implemented on a ship in following hierarchy:  
Planning→Implementation→Monitoring→Self Evaluation and improvement
- It is applicable for all the ships above 400 GT and platform and drilling rigs engage in FG voyages.

**Q-11) LOAD LINE SURVEY? ALL TYPES OF LOAD LINE?**

- International convention on load line adopted on 5 April 1966 and entered into force on 21 July 1968.
- It applies to ships of more than 24 metre in length.
- Load line certificate certifies that vessel complies with the load line convention and it is issued by the administration.
- International load line certificate is issued for a period of less than 5 years.

This convention includes three annexes:

Annex 1 is divided into four chapters:

Chapter 1: General

Chapter 2: Conditions of assignments of freeboard

In this they calculate how much freeboard will be safe based on the number of subdivisions the ship has.

Chapter 3: Freeboard

Chapter 4: Special requirements for ships assigned timber freeboard.

Why special because timber itself is buoyant hence less freeboard is required.

Annex 2 covers zones, areas and seasonal periods.

Annex 3 contains certificates, including the International Load Line certificate.

The main purpose of load line is to ensure the watertight integrity of ships hulls below the free board deck. All assigned load lines must be marked amidships on each side of the ship, together with the deck line.

**Load line survey:**

1. Freeboard marks will be checked that it is in accordance with the Load line certificate.
2. Have any changes been done or any new equipment has been installed which affects the validity of international load line certificate or have any changes made to the hull.
3. Statutory certificates and documents are valid.
4. Stability booklet approved.
5. Loading manual approved.
6. If cargo ship is more than 100 mtrs, loading instrument is installed.
7. Language should be easily understood by the ships officers.
8. Condition of deck, should not be excessive rust.
9. Weather tight doors are in satisfactory condition.
10. Machinery space openings are weather tight.
11. Hatchways and hatch openings are weather tight.
12. If tarpaulin is used, there should be atleast 2 for each hatch and are in good condition.
13. All ventilators on deck and their coamings are in good condition.
14. Flame screens on air pipes at all fuel oil tanks are satisfactory.
15. Scuppers, overboard discharge and non-return valves are found to be in good condition.
16. Freeing ports will be checked. Shutters, hinges, pins are not corroding.
17. Pumping arrangements in steering flat and forepeak tanks are in good order.

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18. All guardrail and bulwarks should be in satisfactory condition.

**Vessel will be subject to following surveys:**

1. Initial survey: it is issued before vessel is put into service.
2. Renewal survey: at intervals exceeding not more than 5 years.
3. Annual survey: within +/- 3 months of anniversary date of load line certificate.

**Different types of load line markings are as follows:**

- TF (Tropic Freshwater) – the deepest permitted draft considering the relatively benign weather conditions in tropical waters and the fact that the vessel floats deeper in freshwater due to lower density than in saltwater.
- F (Freshwater) – the deepest permitted draft in freshwater considering that the vessel floats deeper in freshwater than in saltwater.
- T (Tropics) – deepest permitted draft in tropical waters considering the benign weather conditions in tropical waters.
- S (Summer) – deepest permitted draft during summer considering benign weather conditions.
- W (Winter) – deepest permitted draft during winter considering rougher weather conditions.
- WNA (Winter North Atlantic) – deepest draft permitted considering the rough weather conditions likely to be encountered during winter in the North Atlantic.

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**Q-12) WHAT IS SPURLING PIPE AND HAWSE PIPE?**

**Spurling pipe:**

A steel pipe or tube through which an anchor chain passes to the chain locker below the forecastle deck of a ship

**Hawse pipe:**

A pipe which guides the chain from deck level to outside the shell plating. The hawse pipe should be constructed to a size large enough to accommodate the smooth running of the chain and to provide secure stowage of the anchor, permitting it to drop freely when released without jamming or risking damage to the hull structure.

**Q-13) HOW TO TEST FIRE DETECTORS?**

- Smoke detector is checked by smoke detector spray.
- Flame detector is checked by Infrared lamps at a distance of 3 metre within 20 seconds.
- Heat detector is checked by a heat gun which have a bulb inside.

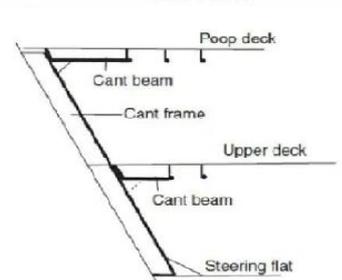
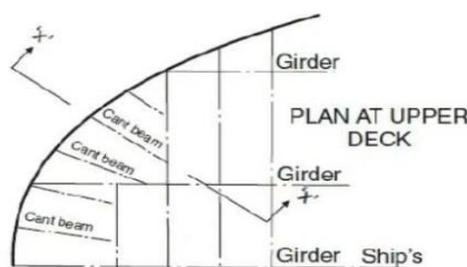
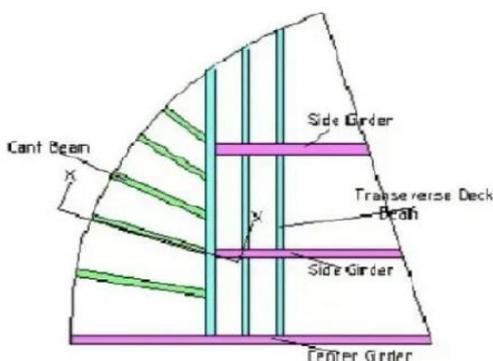
**Q-14) WHAT IS FREEBOARD DECK?**

*This is normally the uppermost continuous deck exposed to weather and sea, which has permanent means of closing all openings in the weather part thereof, and below which all openings in the sides of the ship are fitted with permanent means of watertight closing .*

*In a ship having a discontinuous freeboard deck, the lowest line of the exposed deck and the continuation of that line parallel to the upper part of the deck is taken as the freeboard deck.*

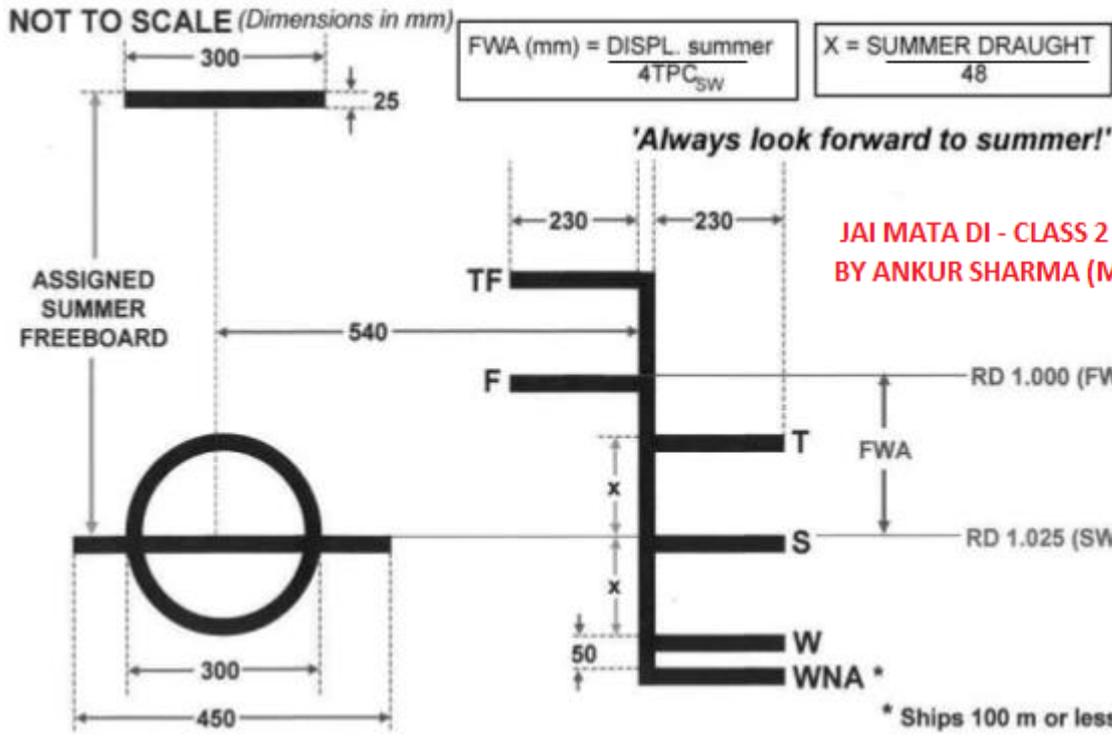
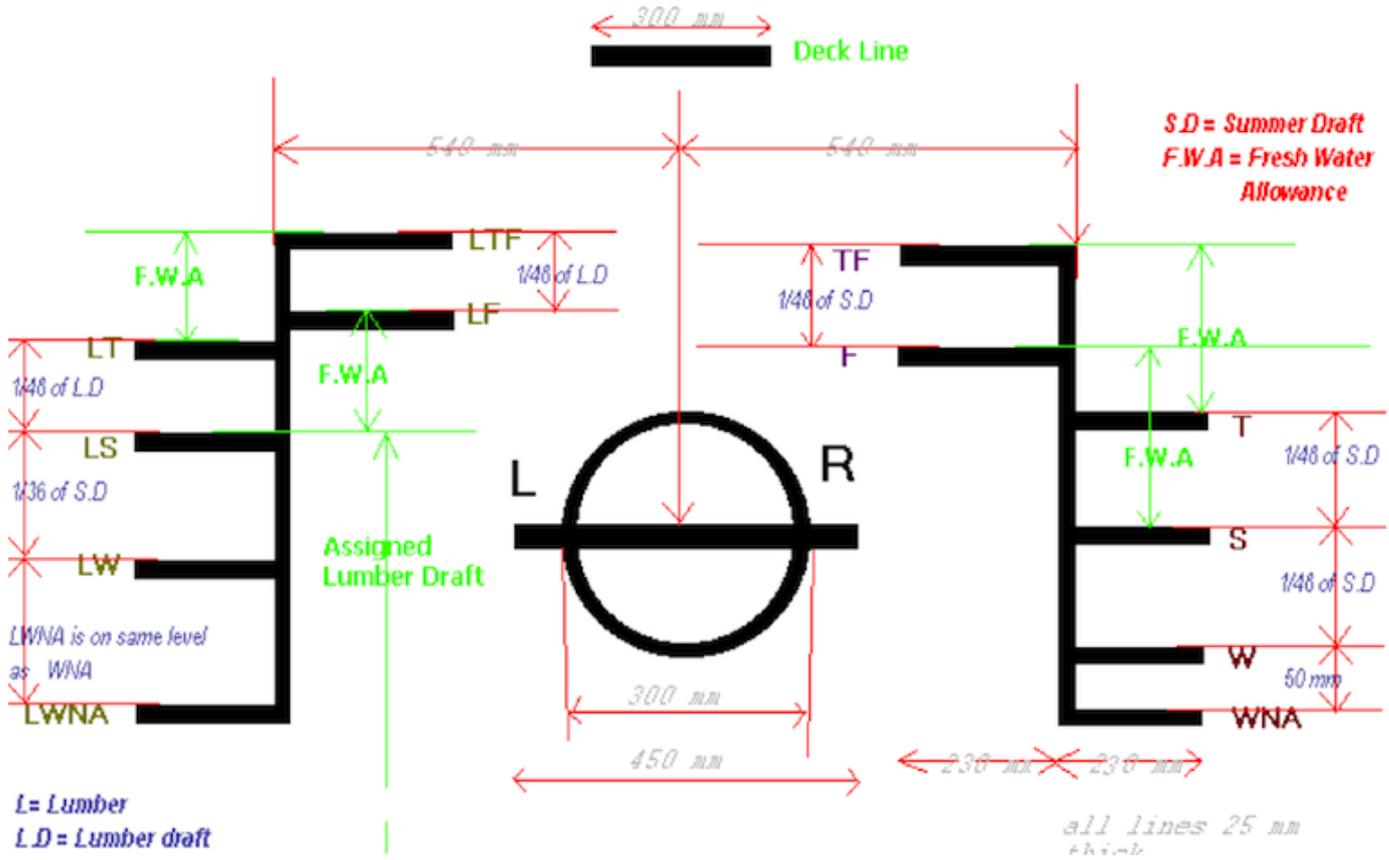
**Q-15) WHAT IS CANTED BEAM?**

One interesting feature of aft end stiffening arrangements is Cant beams. Cant beams are instrumental in providing *longitudinal as well as transverse* strength to the stern arrangement. They are radial in nature and are directly welded to the shell plating giving a kind of web frame structure. Cant beams are often coupled with cant frame providing additional strength.



**Q-16) WHAT IS PLIMSOLL MARKING?**

A commercial ship is properly loaded when the ship's waterline is equal to the Ship's plimsoll line. The Plimsoll line is a reference mark located on a ship's hull that indicates the maximum depth to which the vessel may be safely immersed when loaded with cargo.



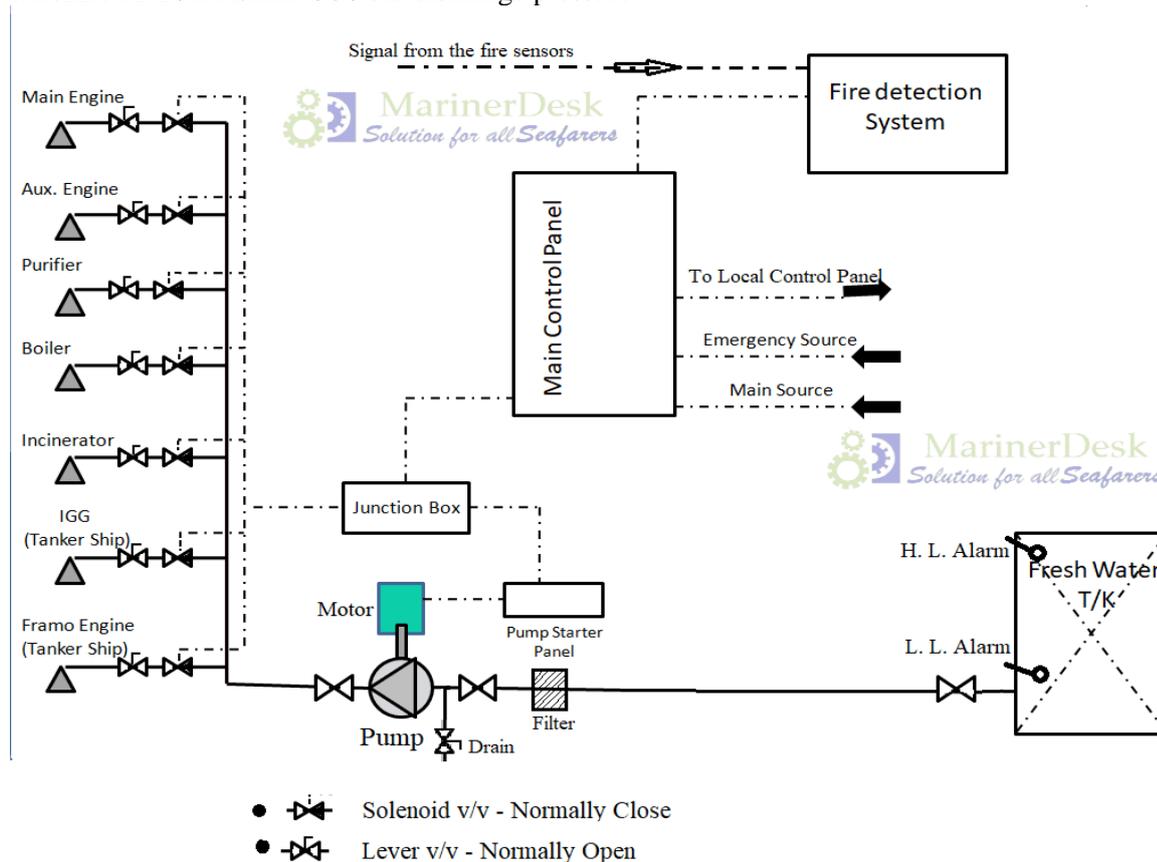
**Q-17) HYPERMIST SYSTEM WORKING?**

Mandatory in passenger ships with GT > 500 and cargo ships with GT > 2000, for fire extinguishing in machinery spaces of category A with volume > 500 m3

An electrical driven vertical centrifugal, multi-stage, inline type, the pump is fitted to pump the water from F.W. tank to nozzle. Once both detectors of any protected area get activated, they send the signal to fire detection system. From the detection system signal send to the main control panel. The main control panel gives the signal to the pump starter unit and signals to open the solenoid valve of the relevant area. When the pump gets signal, will start delivering water and

nozzle will release the mist (fog) to extinguish the fire. The fresh water is always available in that fresh water tank. To ensure this suction line of hydrophore pump is connected above the suction of the hyper mist pump.

- The capacity of the pump is 200 litres/min @ 70 bar discharge pressure.
- At nozzle 12-20 litre/min @ 50 bar discharge pressure.



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### How the micro fog (mist) get generated?

The diffuser action in nozzle breaks the liquid particles into a fine mist of size about 50 to 200  $\mu\text{m}$ . These fine particles are excellent fire extinguisher as it provides large surface area for cooling and of its characteristic.

### Characteristics of micro fog (mist)

- Cooling effect – As we know mist contains a water molecule, which gives the cooling effect.
- Smoke eliminating effect – The smoke particles being absorbed and settled by the mist (fog).
- Oxygen replacement effect – Mist get evaporated by taking latent heat. The water vapour is heavier than air, replace the oxygen.
- Shut off effect – The floating mist as fog forms a layer of water on fire.

### Starting procedure of hyper mist

The system is provided with both automatic as well as manual starting procedure.

#### 1. Automatic starting

Hyper mist system is provided with detectors as composed of minimum two detectors in each protected area. When perceiving a fire via one detector in any protected area, the pre-warning alarm will start. Activation of the other detector in the same protected area, it will automatically result in the release of the hyper mist system by opening the suction valve and start the pump. If the solenoid valve is not open, it can be opened by using override.

#### 2. Manual Starting

For the manual release push button is provided on the local control panel at each section and on the main control panel at the fire control station. When the manual release push button is pressed, the fire alarm, as well as the system, will be activated in the designated area.

### Stopping procedure of Hyper mist

Stopping of the system to be done manual only. The push button is provided at the local control panel as well as the main control panel. By pushing the stop button we can stop the system.

### **Q-18) ON YOUR SHIP, DO YOU HAVE TRANSVERSE FRAMING OR LONGITUDINAL FRAMING?**

We have longitudinal framing.

Transverse Framing: It is carried out in ships less than 120 metre in length in which stiffeners run along the breadth of the ship.

Longitudinal Framing: It is carried out in ships more than 120 metre in length in which stiffeners runs along the length of the ship.

As longer ships are subjected to high longitudinal bending stresses like hogging and sagging. So if longer ships have transverse framing, transverse stiffeners will play no role in taking up the longitudinal bending stresses and therefore leads to more chances of failures.

### **Q-19) WHAT IS DEADLIGHT?**

A strong shutter or plate fastened over a ship's porthole to keep out light and water.



### **Q-20) WHAT ARE GYPSIES AND WILDCATS?**

Chain handling wheel on windlass is termed as either Gypsies (in UK) or Wildcats (in North America).

Line handling wheel is termed as warping head.

### **Q-21) DIFFERENT TYPES OF BULKHEADS, A60 ETC AND LOCATION?**

**Types of Bulkheads:**

#### **BY POSITION**

- Transverse
- Longitudinal

#### **BY PURPOSE**

- Watertight
- Non-watertight
- Collision
- Insulation

#### **BY CONSTRUCTION**

- Plain
- Corrugated

**Types of Divisions:**

1. "A" Class
2. "B" Class
3. "C" Class

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#### **"A" Class:**

"A" class divisions are those divisions formed by bulkheads and decks which comply with the following criteria:

- They are constructed of steel or equivalent material
- They are suitably stiffened
- They are constructed as to be capable of preventing the passage of smoke and flame to the end of the *one-hour standard fire test*.
- they are insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than 140°C above the original temperature nor will the temperature at any point including any joint rise more than 180°C above the original temperature with the time listed:

class "A-60" 60 min

class "A-30" 30 min

class "A-15" 15 min

class "A-0" 0 min

#### **"B" Class:**

"B" class divisions are those divisions formed by bulkheads, decks, ceilings or linings which comply with the following criteria:

- They are constructed of approved non-combustible materials.
- they are constructed as to be capable of preventing the passage of flame to the end of the *first half hour of the standard fire test*

- they have an insulation value such that the average temperature of the unexposed side will not rise more than 140°C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225°C above the original temperature, within the time listed:

class "B-15" 15 min

class "B-0" 0 min

### **"C" Class:**

"C" class divisions are divisions constructed of approved non-combustible materials but they are not required to meet any requirements related to rise in temperature or passage of smoke and flame to the unaffected side.

### **Location:**

Class A and B panels are used adjacent to most of the enclosed spaces within the ship, for example: cargo holds, control stations, stairways, lifeboat embarkation stations, galleys, machinery spaces, tanks, public spaces and accommodation areas. Class C panels are mostly used in open decks and promenades, where requirement of fire safety is minimum.

### **Q-22) PREPARATION FOR SAFETY EQUIPMENT SURVEY?**

The Safety Equipment Certificate, ensuring a ship has the correct safety equipment.

### **What does the Cargo Ship Safety equipment Certificate cover?**

- Fire safety systems
- Life saving appliances
- Navigational equipment
- Pilot embarkation arrangements
- Nautical publications
- Lights and shapes
- Sound signals
- Distress signals

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### **Why is it required?**

SOLAS chapter 1 Part B Regulation 8 – Surveys of Life-Saving Appliances and other Equipment of Cargo Ships.

### **Which ships require the certificate?**

Cargo ships of 500 gross tons or more on international voyages.

### **What surveys are required to maintain the certificate?**

1. An initial survey before the ship is put in service;
2. A renewal survey at intervals specified by the Administration but not exceeding 5 years.
3. A periodical survey within three months before or after the second anniversary date or within three months before or after the third anniversary date of the Cargo Ship Safety Equipment Certificate.
4. An annual survey within 3 months before or after each anniversary date of the Cargo Ship Safety Equipment Certificate;

### **Preparation for Safety Equipment Survey:**

1. Inspect all the lifeboat stores and equipment. Overhaul and renew as necessary
2. Inspect the lifeboats pay particular attention to buoyancy material and check that the bottom boards and thwarts are not cracked. Repaint the ship's name and port of registry.
3. Thoroughly over haul davits, winches and blocks and grease all moving parts. If required renew falls.
4. When the boats are in water run lifeboat engines both ahead and astern.
5. Check that the inflatable liferafts have been serviced within the last 12 months
6. Inspect the survival craft portable radio equipment
7. Over haul the lifebuoys especially the self igniting lights and check that they are correctly located
8. Examine the life jackets and check they are correctly distributed
9. Check expiry dates of pyrotechnics
10. Test the emergency lighting system
11. Check fire control plans are posted and still legible
12. Test the fire/smoke detection system
13. Test and try out the fire pump including the emergency fire pump
14. Check fire hoses, nozzles and applicators are in good conditions
15. Test and overhaul the fixed fire fighting system
16. Overhaul portable and non portable fire extinguishers
17. Confirm that all remote controls are operable
18. Overhaul any applicable closing arrangement for ventilators, skylights, doors, funnel spaces and tunnels
19. Overhaul the fireman's outfit and recharge the compressed air B.A

20. Inspect the pilot ladders, pilot hoists if carried
21. Navigational equipment is also surveyed

**Q-23) WHAT ARE THE SAFETY EQUIPMENTS?**

<b>LSA</b> Lifeboats, davits and winches Inflatable boats Rescue boats Liferafts Lifejackets Immersion suits and TPAs	<b>Distress signals</b> Rockets and signals Hand held VHF's EPIRBs SARTs Signal lantern	<b>Navigational equipment</b> Echo sounder Gyro compass Magnetic compass Sound signals Shapes Navigational lights
<b>Fire fighting</b> Fire control plans Fire extinguishers Fixed fire systems IG systems Fireman's outfits Fire detection and alarm system	<b>Power</b> Emergency controls Emergency power supply	<b>Miscellaneous</b> Stability data Pilot ladder

**Q-24) TRANSOM SPACE?**

It is situated in S.G. room. Here you can find manhole door near rudder trunk. It's purpose is to inspect rudder trunk condition, lubrication etc. You can enter inside this place for carrying out inspection in port only and in calm weather or sea.

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**Q-25) TYPES OF CHEMICAL TANKERS?**

According to IBC code, there are three types of chemical tankers:

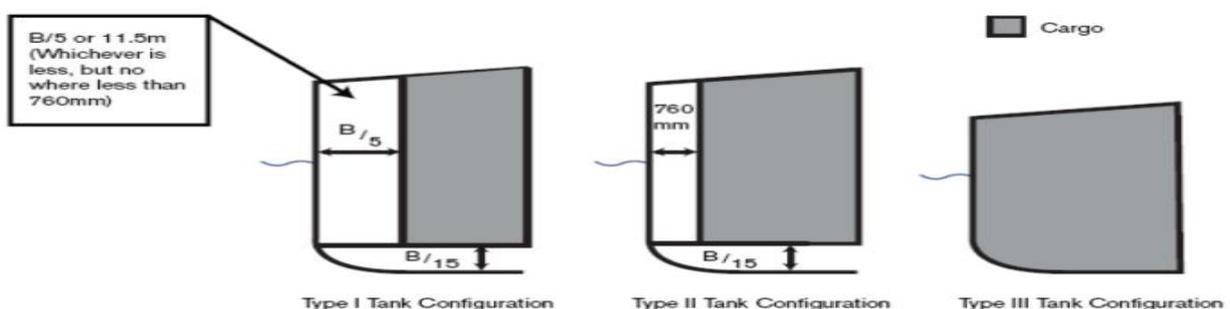
- **ST1** is a chemical tanker intended to transport most dangerous products, which require maximum preventive measures to avoid an escape of such cargo. Accordingly, a type 1 ship should survive the most severe standard of damage stability and its cargo tanks should be located at the maximum prescribed distance onboard from the shell plating.
- **ST2** is a chemical tanker intended to transport products requiring significant preventive measures.
- **ST3** is a chemical tanker intended to transport products requiring a moderate degree of containment to increase survival capability in a damaged condition.

**Tank capacity limitation:**

- ST 1 : The quantity of cargo required to be carried in ship < 1,250 m<sup>3</sup> in any one tank
- ST 2 : The quantity of cargo required to be carried in ship < 3,000 m<sup>3</sup> in any one tank
- ST 3 : There is no filling restriction for chemicals assigned to Ship Type 3 Cargo Tank

**Tank location:**

- ST 1 : from the side shell plating not less than **B/5 or 11.5m** whichever is less and from the moulded line of the bottom shell plating at centerline, not less than **B/15 or 6 m** whichever is less, and nowhere less than **760 mm** from the shell plating.
- ST 2 : from the side shell plating not less than 760 mm and from the moulded line of the bottom shell plating at the centerline, not less than **B/15 or 6m** whichever is less
- ST 3 : no requirement



## Q-26) TYPES OF RUDDER?

### 1. Spade or balanced rudder:

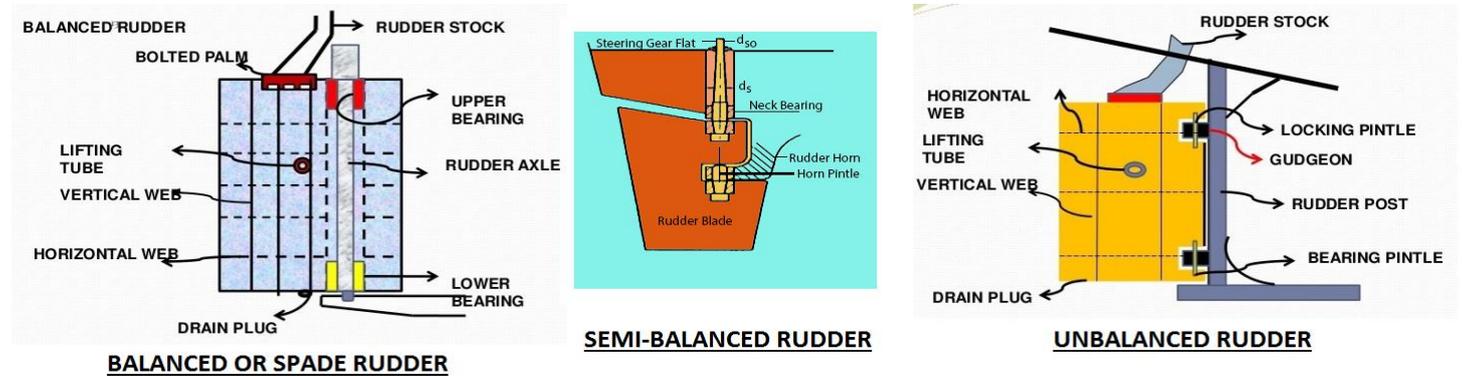
A rudder has 20-40% of the area forward of the stock, similarly there is no torque on the rudder stock at certain angles and it is called balanced. The axis of the rudder is placed near to the center of gravity, so torque required to move the rudder will be very less.

### 2. Semi-balanced rudder:

A rudder with 20% of its area forward of its stock is called semi-balanced rudder. It is often found in twin screw ships. In this at no angle, rudder is balanced.

### 3. Unbalanced rudder:

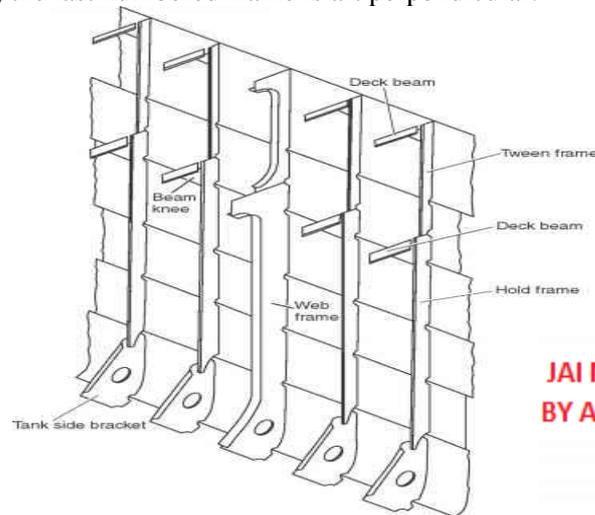
A rudder with whole of its area aft of its stock is called unbalanced. In this at no angle, rudder is balanced.



## Q-27) WEB FRAME?

Oversized members that replace a frame at certain locations on a ship. a frame of heavy scantling used in ship construction and made by riveting a wide plate to a frame and stiffening the plate by riveting two reverse frames to its inner edge.

All frame fwd of fwd perpendicular are identified by capital letter starting with 'A' & Aft of the aft perpendicular are identified with double capital letter starting with 'AA'. The frame between fwd and aft perpendicular is identified with numbers, the fwd perpendicular is identified with number zero (0). Each frame aft of the fwd perpendicular will carry the next higher consecutive number, the last numbered frame is aft perpendicular.



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## Q-28) DIFFERENCE BETWEEN LIFEBOAT AND RESCUE BOAT?

Life boat is a survival craft used for sustaining the lives of persons in distress from the time of abandoning the ship while rescue boat is to rescue a persons in distress (overboard) and to board the marshal craft (ship).

Lifeboat can be used as rescue boat if it complies all the requirements of rescue boat as follows:

1. The length L shall not be less than 3.8 m and not more than 8.5 m
2. The rescue boat shall be capable of carrying at least five seated persons and a person lying on a stretcher all wearing immersion suits and lifejackets if required.
3. Rescue boats shall be capable of manoeuvring at a speed of at least 6 knots and maintaining that speed for a period of at least 4 hours, when loaded with its full complement of persons and equipment.
4. The towing speed shall be at least 2 knots when towing the largest liferaft carried on the ship when loaded with its full complement of persons and equipment or its equivalent.
5. Rescue boat hulls may be either of rigid or inflated construction or a combination of both.
6. A Rescue boat shall be fitted with an inboard engine or outboard motor. If it is fitted with an outboard motor, the rudder and tiller may form part of the engine.

### **Q-29) REGULATION REGARDING LIFEBOUY AND TPA?**

The lifebuoys corresponding to SOLAS should be:

1. Are located in easily accessible places on both sides of the vessel, on all open decks extending to the side of the ship; at least one should be placed near the stern;
2. The lifebuoys should be fastened so that they can quickly and freely drop them onto the water.
3. Have an outer diameter of not more than 800 mm and an inner diameter of at least 400 mm;
4. Made of non-fading material and that does not absorb water.
5. Be able to maintain at least 14.5 kg of iron in fresh water for 24 hours;
6. Have a mass of at least 2.5 kg but not more than 6 kg;
7. Do not sustain burning or continue melting after full enveloping with fire for 2 seconds;
8. Be constructed to withstand a drop into the water from the height at which it is stowed above the waterline in the lightest seagoing condition, or 30 mt whichever is the greater, without impairing its operating capability.
9. Each lifebuoy must be marked with capital letters of the Latin alphabet with the name of the ship on which it is transported and the port of registration of the vessel.

The thermal protective aid corresponding to SOLAS should be:

1. It should be made up of non flammable and water proof material.
2. It should have a thermal conductance of not more than  $7800 \text{ W}/(\text{m}^2\text{K})$  and shall be so constructed that, when used to enclose a person, it shall reduce both the convective and evaporative heat loss from the wearer's body.
3. Thermal protective aid shall function properly throughout an air temperature range  $-30^\circ\text{C}$  to  $+20^\circ\text{C}$ .
4. It should be internationally ORANGE in colour, highly visible.
5. It should permit the wearer to remove it in the water in not more than 2 min, if it impairs ability to swim.
6. It covers the whole body of persons of all sizes wearing a lifejacket with the exception of the face. Hands shall also be covered unless permanently attached gloves are provided;
7. It should be capable of being unpacked and easily donned without assistance in a survival craft or rescue boat.
8. Minimum number of TPA's required: **10% of** the lifeboat / liferaft / rescue boat capacity or two, whichever is the greater.

### **Q-30) ACTION IN CASE OF OMD ALARM?**

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1. Accept the alarm from the panel.
2. Inform the bridge and chief engineer and side by side initiation of slow down of engine.
3. Press engineer's alarm to call for required manpower.
4. Check that alarm which came must not be false alarm. If it comes again after resetting then it is real.
5. Increase the lubrication of the engine by starting the standby lubrication pump.
6. Now wait for bridge to stop the engine and take the command back to engine room.
7. Indicator cock needs to be opened and close starting air valve.
8. Engage turning gear and start turning the engine to avoid piston getting stuck due to localised weld.
9. Other people can keep the extinguishers ready.
10. As a precautionary measure nobody should be standing near the crankcase relief door.
11. When the alarm will be gone, we can switch off the lube oil pump.
12. With the back of the hand, feel crankcase door. If they are cool, we can proceed further else wait for more time.
13. When it is cooled to normal temperature, open the crankcase door.
14. Two, three ventilation blowers should be kept for ventilation.
15. Now it is time to go inside for checks and before that make sure light should be flameproof, boiler suit is clean and free of any oil. Both sleeves should be rolled down and nothing should be in the pocket.
16. Check for any sign of local hot spot, or metal particles etc. and rectify the same.
17. Now again start the lube oil pump and check for the flow.

### **Q-31) SAFEMATIC ARRANGEMENT?**

Safematic system is also called automatic isolation system.

On ships it is provided in steering gear which means:

1. Connectible to all steering gear allowing emergency operation with two independent mechanical and hydraulic systems. In case of pipe burst or other defects involving oil leaking, the leakage can be isolated and steering capability is maintained with two cylinders and one pump unit.
2. The safematic arrangement detects, isolates and switches-off the defective system automatically within a few seconds. Steering gear remains operational with the remaining system.
3. The ship's manoeuvrability is restored immediately and loss of hydraulic fluid is kept to a minimum, due to the very short time required for automatically detecting, isolating and switching over.
4. All steering gears have still their hand operated stop valves for the same purpose.

### **Q-32) EGB FIRE INDICATIONS/ ACTIONS/ UPTAKE FIRE**

#### **CAUSES:**

1. Due to soot deposits on economiser coils, soot deposits are high while using high carbon content fuel
2. At manoeuvring time incomplete combustion may occur and at that time flue gas velocity is low thus unburnt fuel tend to adhere on economizer coils.
3. Air carry through exhaust gas due to excess supply of scavenge air
4. Flame is produced when air and fuel are proportionally mixed in the sufficient heating temperature.

#### **INDICATIONS:**

1. Overheating and peeling of paint at economizer body.
2. Sparks emit from the funnel.
3. Sudden increase in uptake gas temperature.
4. Flame visible in the smoke detector.

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#### **ACTIONS:**

1. Inform Bridge and C/E start standby A/E , prepare for engine slowdown.
2. Slow down main engine and stop the engine if possible.
3. Cover the turbocharger.
4. Soot blow to be carried out to blow off the soot, always keep an eye on temperature.
5. Never soot blow while economizer is on fire and temperature is above 600 degrees, it may cause hydrogen fire and melt down the coil stack of the economizer.
6. Continue running economizer water circulating pump, keep an eye the pump pressure and parameters, always ensure that the economizer tubes are never allowed to be starved of water circulation.
7. If fire fighting equipment is fitted on economizer it should be put in operation.
8. Spray water on external casing of the uptake to cool the affected area.
9. Few times starting and stopping of the main engine also helps to blow out the collected soot at the uptake, important parameter to be noted here is the pressure drop across the economizer thus indicating the amount of fouling due to the collected soot.

#### **After Fire is out:**

1. After cooling down to ambient temperature open the economizer cover .
2. Clean the inside parts of the economizer.
3. Check the tubes for any damage, if found repair it.

### **Q-33) HOW WILL YOU ENSURE ANNEX 6 COMPLIANCE?**

For SOx compliance, it can be checked by:

- checking the limits of Sulphur content of fuel in BDN and Lab analysis report.

For NOx compliance, it can be checked by

- EIAPP certificate which is issued for each engine separately by maker before the engine is fitted onboard.
- IAPP is issued for each engine after it is fitted on onboard.
- NOx technical file records can be checked.
- For incinerator, Type approval and operation of shipboard incinerator certificate can be checked.

### **Q-34) LIFERAFT SECURING ARRANGEMENT, REGULATIONS, HRU, NUMBER OF LIFERAFTS?**

Life rafts are normally located on muster station, on port and starboard side near the lifeboat.

#### **Securing arrangement:**

It is stored in a fibreglass container which is secured by a strap or rope whose end have HRU unit. Painter of liferaft is connected to the weak link and this weak link is connected by a shackle to a strong point on the frame where liferaft was located.

- Once ship started to sink, and when it will sink upto 4 meter the water pressure will activate sharpknife in H.R.U
- It will cut the securing rope around the canister or container of the raft, and now raft will float free.
- Now ship will further sink, the painter line will stretched and it will inflate the raft.
- Now due to increase in buoyancy will break the Red weak link around 2.2 KN± 0.4 and life raft will be on surface of water now.

#### **Regulations for liferaft:**

1. The lift raft should be capable of withstanding exposure for 30 days afloat in all sea conditions
2. When dropped into the water from a height of 18 metres, the life raft and all equipment in it will operate satisfactorily
3. The floating life raft should be capable of withstanding repeated jumps on it from a height of at least 4.5 metres above its floor.
4. Can be towed at 3 knots with its full equipment, compliment of persons and one anchor streaming
5. Canopy to provide insulation and protection against heat and cold by two layers of material separated by an air gap

6. Minimum carrying capacity must be at least 6 persons.
7. It shall be provided with a means to mount a survival craft radar transponder (SART) at a height of at least 1 meter above the sea level
8. It shall be capable of being inflated by one person.
9. Maximum weight of its container, as well as the equipment, should not exceed 185 kilos
10. Inflation shall be completed within a period of 1 minute at an ambient temperature of between 18 degrees to 20 degrees Celsius and within a period of 3 min at an ambient temperature of -30 degree Celsius.
11. When the liferaft is loaded with a full complement of persons and equipment, it should be capable of withstanding a lateral impact against the ship side at an impact velocity of not less than 3.5m/s and also drop into the water from a height of not less than 3 metres without damage
12. Inflation is done by CO2 with a small quantity of N2 which acts as an anti-freezing element. Also, CO2 is non-flammable and also weighs more than air hence adds buoyancy to the raft. The freezing point of CO2 is -78 degrees so it can inflate life raft at really low temperatures
13. The painter breaking strength should be:
  - 15kN for 25 people and more
  - 10 kN for 9 to 24 people
  - 7.5 kN Rest (6-9)

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**HRU:**

A hydrostatic release unit allows a liferaft to launch automatically if there isn't time for crew to launch it manually.

**How it works:**

The strong white rope is secured to the deck or liferaft cradle and attached to the liferaft lashing with a sliphook. If the ship sinks, the water pressure will (within 4 metres) activate the sharp knife which cuts the white rope and the liferaft will float free. As the ship sinks, the liferaft painter line will be stretched and the liferaft starts to inflate.

The Red Weak Link breaks and survivors can board the floating liferaft.

- Breaking strength of white rope sling: min 15kN.
- Breaking strength of red weak link: 2.2 +/- 0.4 kN.



**Number of liferafts:**

The number of lifeboats and liferafts should be enough to accommodate at least 125% of the number of passengers and crew.

**Q-35) LIFEJACKETS TO BE WEAR OR NOT IN FREEFALL LIFEBOAT?**

- The lifejackets used in totally enclosed lifeboats, except free-fall lifeboats, shall not impede entry into the lifeboat or seating, including the operation of the seat belts in the lifeboat.
- Lifejackets selected for free-fall lifeboats, and the manner in which they are carried or worn, shall not interfere with entry into the lifeboat, occupant safety or operation of the lifeboat.

**Q-36) SAFETY SYSTEM FOR GALLEY FIRE?**

Galley fire probably cause due to:

- Combustible materials such as cooking oil, fat, oily rags etc coming into contact with the hot surface of the cooking platform.
- Electric Short-circuit in some appliance in the galley. In case fuse does not trip off the high current passing through the wires would cause them to get very hot. The insulation would melt and catch fire.

Actions to be taken:

1. Shout 'Fire in the Galley'
2. Sound the alarm
3. Announce the location of fire via PA System
4. The person who detects the fire, start fighting fire all available means.
5. The use of blankets, provided as part of fire fighting equipment for the galley, for the purpose of smothering the fire.
6. If the cause is an electric fire, the action should be
  - Switch off power supply to the equipment, or if required to the entire galley.
  - Use an appropriate extinguisher either a CO2 or a Dry Chemical Powder.
7. If it is liquid on fire, oil or cooking fat- a foam extinguisher should be used.
8. If oily rags are on fire, any extinguisher or water would use.
9. If fire cannot be tackled within the five minutes then

- Evacuate all person from galley.
- Shut off exhaust blower of the galley.
- Seal off all source of inlet of air - portholes, entrance door etc.
- Use a water spray through a portholes or an entrance door.
- Some of vessel's provided with fixed CO2 for Galley also, use as per Master instruction.
- Effect boundary cooling if necessary.

10. Appropriate entries must be made in the ship's logbook.

11. The master would make appropriate entry in the official logbook.

### **Q-37) WHAT IS CONDITION OF ASSIGNMENT?**

If the conditions listed below for the reasons for freeboard requirements are to be achieved which are:-

1. To ensure that ship cannot be loaded beyond her strength.
2. To provide her with adequate reserve buoyancy
3. To keep the decks high enough from the water to enable the crew to navigate and handle her in all weather.

- It is important to that all openings in the freeboard deck should be properly protected and closed and that provision should be made to allow the ship to free quickly of water which may come in upon the decks.
- To ensure that this done, the ship is required to comply with certain "Conditions of Assignment".

These are conditions which must be met before freeboards are assigned to a ship and a LOAD LINE CERTIFICATE issued, which enables the load lines and mark to be graved in and painted on the side of the ship.

- The conditions are concerned with water tight integrity of the hull and state requirements for the strength, height of coamings, closing arrangements of items such as super-structure and bulkheads, hatchways, machinery space openings, openings in freeboard & superstructure decks ventilators, air pipes, cargo ports, freeing ports, side scuttles, scuppers, inlet and discharges.
- Also means provided for protection of crew.

### **Q-38) WHAT IS PSC AND WHICH ALL CONVENTIONS GOVERN PSC INSPECTION?**

Ships trade internationally and have to call at various ports all over the world. Many ships may not call at any of their home ports for a considerable period and it is possible that during a certain period of time ship's certificates may not have been renewed or maintenance in general has suffered due to various reasons. Therefore, it is imperative that ships must be inspected at various ports to ensure compliance with rule requirements as regards safety, maintenance, manning, etc. This control is termed as Port State Control.

Ship can be detained under CODE NUMBER 07106

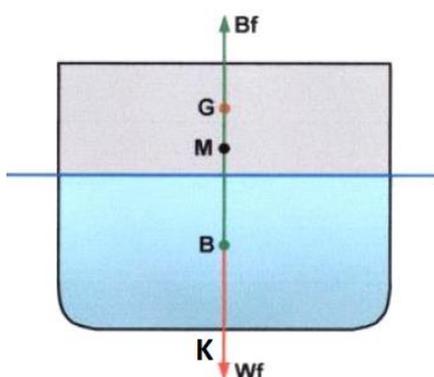
PSC has been governed by following IMO instruments:-

- Reg. 19 - Chapter 1 of SOLAS Convention 1974 as amended.
- International Convention of Load Line 1966 & its Protocol.
- International Convention for Prevention of Marine Pollution from ships (MARPOL) 73/78.
- International Convention of STCW 1978 as amended.
- International Regulations for preventing Collisions at sea (COLREG) 1972.
- International Labour organization (ILO) convention No. 147.

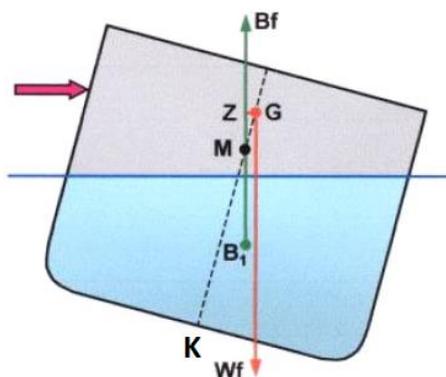
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### **Q-39) WHAT IS ANGLE OF LOLL AND HOW TO CORRECT?**

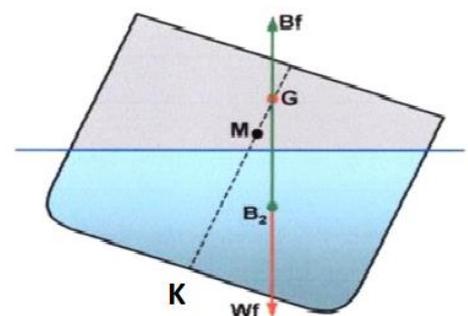
Angle of loll is the state of a ship that is unstable when upright (i.e. has a negative metacentric height) and therefore takes on an angle of heel to either port or starboard.



**FIGURE:1**



**FIGURE:2**



**FIGURE:3**

Consider a ship with an initial negative metacentric height (FIGURE:1) and any external force applied to the vessel will cause it to start heeling.

Consider the lines of action of  $B_f$  and  $W_f$  in FIGURE 2, they are acting in such a way to cause the ship to heel further over.  $GZ$  is a capsizing lever.

As the vessel continues to heel FIGURE 3, centre of Buoyancy will move outward as the underwater volume of the ship changes shape. At a stage, when centre of buoyancy comes in vertical line with  $G$ ,  $GZ$  becomes zero and capsizing lever will disappear and ship will come to rest at an angle of loll. If the centre of gravity were very high, the ship will capsize.

### How to correct Angle of Loll

An angle of loll can be corrected only by lowering the centre of gravity, not by moving loads transversely. This can be done by moving weight downwards, adding water ballast in double bottom tanks or removing weight above the ship vertical centre of gravity.

### Q-40) WHAT IS DEADWEIGHT, LIGHTWEIGHT, DISPLACEMENT, GRT, NRT? VALUES OF LAST SHIP?

#### **Lightweight:**

It is the weight of the ship when completely empty. It is a mass of a ship with all of its structures, including all steels, decks, cargo gears and machinery. It does not include fuel oil, lube oil, cargo, ballast water, fresh water, stores, crew and effects. As per SOLAS “Lightweight is the displacement of the ship in tonnes without cargo, fuel oil, lube oil, ballast water, fresh water, stores, crew and effects.

#### **Deadweight:**

It is a measure of how much mass or weight, a ship is carrying or can safely carry. The sum of all weights includes fuel oil, lube oil, cargo, ballast water, fresh water, stores, crew and effects. It does not include the weight of the ship nor the machinery.

As per SOLAS, “Deadweight is the difference in tones between the displacement of a ship in water of a specific gravity of 1.025 at the load waterline corresponding to the assigned summer freeboard and the lightweight of the ship.”

#### **Displacement:**

It is the weight of the volume of water that a ship displaces or the weight of the water that a ship pushes aside when she is floating.

$$\text{DISPLACEMENT} = \text{LIGHTWEIGHT} + \text{DEADWEIGHT}$$

#### **Gross Tonnage:**

It is a measure of a ship’s overall internal enclosed volume/spaces from keel to funnel including cargo space.

Gross Tonnage = Earning space + Non earning space

#### **Net Tonnage:**

It is a total volume of the ship’s cargo spaces.

NT= Earning spaces

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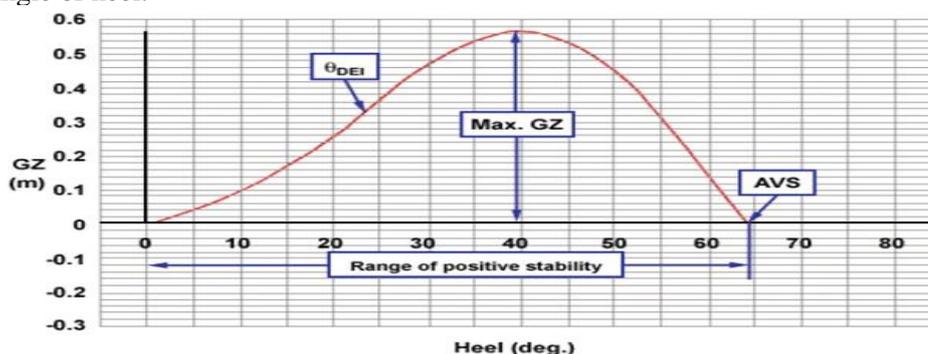
Note: Tonnes is related to weight whereas Tonnage is related to volume.

#### **Last Ship Details:**

- Gross Tonnage: **29708**
- Summer DWT: **49990 tonnes**
- Length Overall x Breadth Extreme: **183.31 x 32.2 m**

### Q-41) STATIC STABILITY CURVE OR GZ CURVE?

$GZ$  is known as the righting arm. The curve of static stability or  $GZ$  curve for a ship is obtained by plotting the righting lever against the angle of heel.



$$\text{Righting Moment (t-m)} = \text{GZ (m)} * \text{Displacement (t)}$$

As the ship progressively heels, the righting lever GZ increases to some maximum value and then decreases until at some angle of heel, it becomes negative i.e. It becomes a capsizing lever.

- Following information is provided by the curve:-
- **Range of stability:** - the range over which the ship has positive righting lever i.e 0-64 degree.
- **Angle of vanishing stability** :- is the angle of heel at which the righting lever returns to zero, or the angle at which the sign of the righting levers changes from positive to negative i.e 64 degree.
- **Maximum GZ:-** is obtained by plotting a tangent to the highest point of the curve i.e 0.57 mtrs which occurs at about 39 degree.
- **Initial gm:-** can be found by drawing a tangent to the curve through the origin and then erecting a perpendicular through the angle of heel of 57.3 degree. The 2 lines are allowed to intersect and the value of gz is noted which is the initial gm.
- **Point of inflection/contra flexure:-** The curve where the curve trend changes from increasing steepness to decreasing steepness. It is the angle at which the deck edge immersion takes place is approximately 23 degree.
- **NOW THE QUESTION ARISES IS THAT WHY WE TAKE INITAL GM AT 57.3 DEGREE. WELL THE ANSWER IS THAT 57.3 DEGREE = 180/PIE=180/3.14=57.3 DEGREE**

#### Q-42) Difference between crude carrier and product carrier? Mention structural differences.

Following definitions of crude oil Tanker and Product carrier have been given in the MARPOL 73/78:

"Crude Oil Tanker" means an oil tanker engaged in the trade of carrying crude oil

"Product Carrier" means an oil tanker engaged in the trade of carrying oil other than crude oil

#### Structural Difference

- Larger the ship, the heavier will be the structural members (i.e. increased scantlings)
- Apart from the above, a major structural difference between a crude oil tanker and product carrier is that the crude oil tanker has a small number of large size cargo tanks whilst the product carrier has a large number of small tanks. This is because for most of the time the crude oil transported is of a single kind coming out of an oil well and hence does not need much of a segregation. As opposed to this the product carrier has to carry a number of different products coming out of the same refinery that must be segregated.
- If you compare two identical size of ships, the product carrier is inherently stronger because of many transverse longitudinal bulkheads installed for sub-division of the cargo area. The large size cargo tanks in crude oil carrier need additional strengthening by means of thicker bulkheads, deeper longitudinal and transverse girders, closely spaced frames and stiffeners.

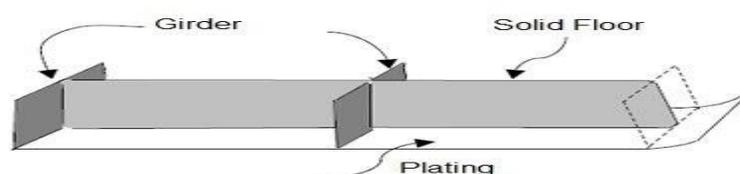
#### Q-43) DIFFERENCE BETWEEN DIFFERENT TYPES OF FLOOR PLATES?

Basically floors are of three types:-

- Solid floor
- Plate floor
- Bracket floor

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**Solid floor** :- Solid Floor is the one if the Stiffener/Floor plate is made of solid plate without any openings.



**Plate floor:** -Plate Floor is the one if the stiffener / floor plate is made of solid plate with openings. This is done to optimize weight and also to allow free flow of fluids based on the purpose of the floor plate / part of the ship (Like a tank).



$$\text{Reduction in GM due to free surface effect} = \frac{\rho_L}{\rho_S} \times \frac{I_L}{\nabla_S}$$

In the above expression,

$\rho_L$  = Density of the liquid in the tank.

$\rho_S$  = Density of seawater.

$I_L$  = Area moment of the free surface about the tank's longitudinal centre line.

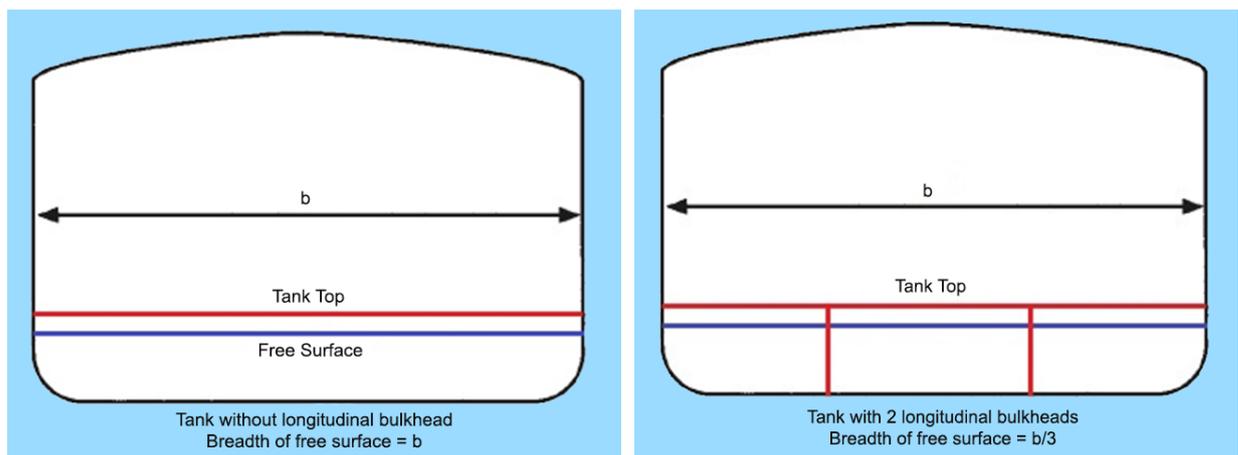
$\nabla_S$  = Mass displacement of the ship in sea water.

- There are some very important conclusions that can be drawn from the above expression, and these are used to develop design methods to combat free surface effect on ships. They can be enlisted as:
- **The effect of free surface is independent of the position of the tank. That is, a tank may be at any height within the ship, or at any longitudinal position, and the development of any free surface in it would affect the ship in the same way irrespective of its location.**

Reduction of metacentric height due to free surface effect is more for denser liquids.

The shape of the tank plays a major role in the evaluation of free surface effect. That is because; reduction in the stability of the ship is directly proportional to the area moment of the free surface about the tank's longitudinal centerline. What does this imply? The lesser transverse surface area of the free surface, lesser its area moment of inertia about the tank's longitudinal centerline, lesser the reduction in GM due to free surface effect.

In order to attain this, a design priority during the design of tanks is to reduce the longitudinal moment of the free surface by providing longitudinal bulkheads in tanks having large surface area, as shown in the figure below.



In the first case, a tank with breadth same as the beam of the ship ( $b$ ) would have produced significantly high reduction in GM due to a free surface. If the same tank is compartmentalised into three equal parts by providing two longitudinal bulkheads, the free surface would reduce by a factor of *cube of the breadth of the tank* ( $b$ ). If you study the tank plan of any ship, you would notice that large fuel and fresh water tanks are divided into Port, Center, and Starboard compartments for this reason.

#### **Q-45) PURIFIER ROOM FIRE, WHAT ACTIONS?**

A small purifier fire can be easily stopped with the help of small fire extinguisher. In case of a bigger fire, the following steps should be taken:

- 1) As soon as fire alarm is sounded, call the chief engineer and locate the fire.
- 2) Close the quick closing valves from which the oil is leaking.
- 3) Stop the transfer pump.
- 4) Both transfer and quick closing valves can be closed from remote location like ship control center or from the engine control room.
- 5) Stop all the motors and electrical equipments which can be stopped from emergency stop button outside the purifier room.
- 6) The fire can be stopped with the help of fire extinguisher.
- 7) In case of a big fire, close the air supply pump and exhaust from the purifier room.
- 8) The fire can be stopped by releasing water mist system if present on the ship.
- 9) Entry in the purifier room is made putting on the fire fighter suit, along with self contained breathing apparatus (SCBA) and fire hose.
- 10) The fire can be extinguished with the help of spraying water.
- 11) In case the fire is still not extinguished then the chief engineer will decide about using the carbon dioxide bottles for

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fighting fire.

12) When these bottles are to be used, there should not be any person present inside the Purifier space as Co2 can cause suffocation due to displacement of air and the person involved may die.

**Q-46) PUMP ROOM SAFETIES?**

- Ventilation system :-
  1. cargo pump-rooms should be mechanically ventilated and the capacity should be 20 air changes per hour of the total volume of the pump-room.
  2. the position of the vent outlet should be arranged at a distance of at least 3 m measured horizontally from any ignition source and from the nearest opening to accommodation, service or machinery spaces.
  3. floor gratings should not disturb the free flow of air.
  4. the fan blade should be non sparking type.
- A fixed gas detection system capable of continuously monitoring for the presence of hydrocarbon gas.
- A fixed sampling arrangement to enable the oxygen content within the pump room to be monitored from the deck by portable meter prior to pump room entry. Where such an arrangement is fitted it should ensure that remote parts of the pump room can be monitored.
- Temperature monitoring devices fitted to the main cargo pumps in order to provide remote indication of the temperature of pump casings, bearings and bulkhead seals.
- A high level alarm in pump room bilges which activates audible and visual alarms in the cargo control room, engine room and the navigating bridge.
- Manually activated trips for the main cargo pumps provided at the lower pump room level and at the top (main deck) level.
- Spray arrestors around the glands of all rotary cargo pumps in order to reduce the formation of mists in the event of minor leakage from the gland.
- On ships fitted with an inert gas system, the provision of an emergency facility for inerting the pump room could be an option, although careful attention must be paid to the safety and integrity of the arrangement.
- The provision of Emergency Escape Breathing Devices (EEBDs) located within the pump room and sited to be readily accessible.
- Fire extinguisher of foam type must be present at the bottom platform of the cargo pump room.
- Dead man alarm must be fitted in pump room.
- A Neil Robertson stretcher to be present on bottom platform of cargo pump room.(Important)
- ODMCS
- Intrinsically safe fire detectors are installed in pump room for detection of fire in pump room.

**Q-47) MARPOL ANNEX 1, REGULATION 13, 14, 15?**

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BY ANKUR SHARMA (MANET BATCH 6)**

Regulation 13 - Standard discharge connection

To enable pipes of reception facilities to be connected with the ship's discharge pipeline for residues from machinery bilges and from sludge tanks, both lines shall be fitted with a standard discharge connection.

**Standard dimensions of flanges for discharge connections**

Description	Dimension
Outside diameter	215 mm
Inner diameter	According to pipe outside diameter
Bolt circle diameter	183 mm
Slots in flange	6 holes 22 mm in diameter equidistantly placed on a bolt circle of the above diameter, slotted to the flange periphery. The slot width to be 22 mm
Flange thickness	20 mm
Bolts and nuts: quantity, diameter	6, each of 20 mm in diameter and of suitable length

The flange is designed to accept pipes up to a maximum internal diameter of 125 mm and shall be of steel or other equivalent material having a flat face. This flange, together with a gasket of oil-proof material, shall be suitable for a service pressure of 600 kPa.

Regulation 14 - Oil filtering equipment

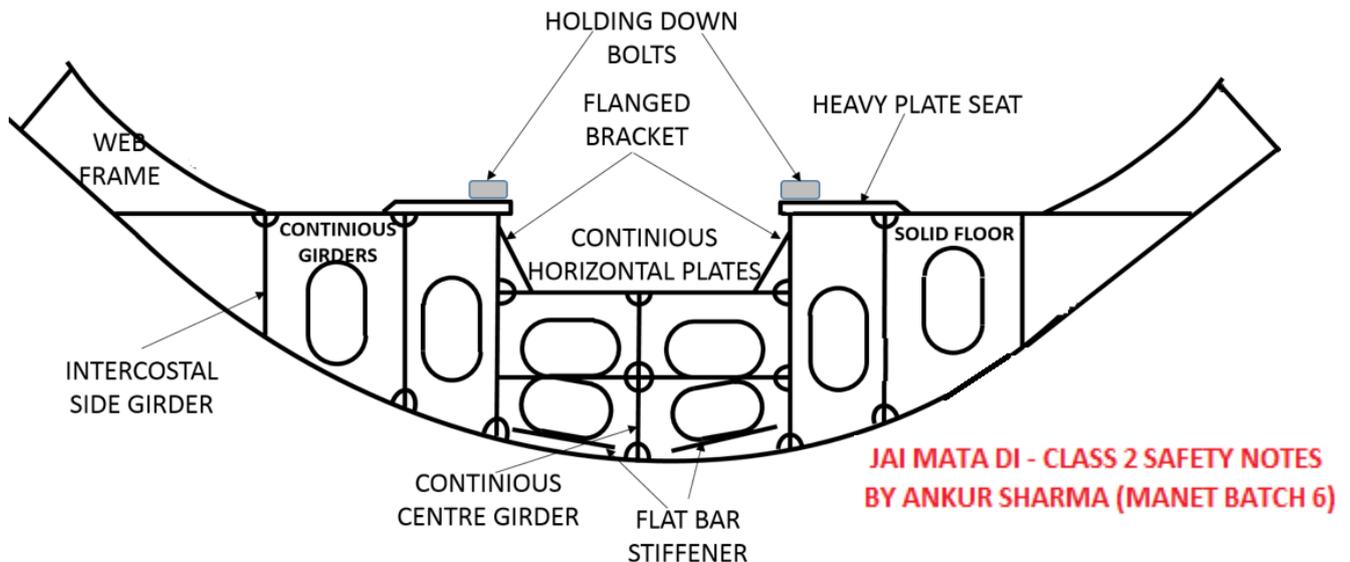
- Any ship of 400 gross tonnage and above but less than 10,000 gross tonnage shall be fitted with oil filtering equipment and shall comply with:  
It shall be of a design approved by the Administration and shall be such as will ensure that any oily mixture discharged into the sea after passing through the system has an oil content not exceeding 15 parts per million.
- Any ship of 10,000 gross tonnage and above shall be fitted with oil filtering equipment and shall comply with:

It shall be provided with alarm arrangements to indicate when this level cannot be maintained. The system shall also be provided with arrangements to ensure that any discharge of oily mixtures is automatically stopped when the oil content of the effluent exceeds 15 parts per million

Regulation 15: Includes discharge criteria outside special area, inside special area.

#### Q-48) FRAMING IN ENGINE ROOM ON TANKERS?

Double bottom heights often increase in ways of engine rooms, as they need to take up higher stresses due to heavy machinery in those regions. In engine room region, all the frames are provided with plate floors, and no bracket floors are used. However, there is another factor a designer must take care of, while providing an increased double bottom height in high stress regions. The height must not be increased abruptly, therefore resulting in a discontinuity, which would lead to concentration of stresses, and eventually a structural failure. So the increase in height should be gradually tapered up and down. The taper should start a few frames forward of the engine room bulkhead, and continue up to a three or four frames aft of the engine room to allow proper stress flow or structural continuity.



- The main engine seating are in general integral with this double bottom structure, and the inner bottom in way of the engine foundation has a substantially increased thickness of about 40mm and is continuous to the thrust block seating.
- In the machinery spaces, forces of pulsating nature are transmitted through the structure due to the general out of balance forces of machinery parts, so additional transverse flows and longitudinal intercostal side girder are provided to support the machinery effectively and to ensure rigidity of the structure.
- Often the machinery is built up on seating forming longitudinal bearers which are supported transverse by tripping brackets in line with the double bottom floors, the longitudinal bearers being in line with the double bottom side girders.
- Boiler bearers are similarly fabricated with support from transverse bracket and longitudinal members.
- In motor ships, where a drain tank is required under the machinery, a cofferdam is fitted giving access to the holding down bolts and isolating the drain tank from the remainder of the double bottom tanks.
- Additional longitudinal girders are fitted in way of heavy auxiliary machinery such as generator.

#### Q-49) DIFFERENCE BETWEEN FRICTIONAL AND WAVE MAKING RESISTANCE?

1. **Frictional resistance:** As a ship moves through the water, the friction of the water acting over the entire wetted surface of the hull causes a net force opposing the ship's motion.

$$R_t = R_f + R_r$$

$$R_f = f s v^n$$

**Where,** f = coefficient of frictional resistance, = 0.01

S = wetted surface area

V = velocity in knots

n = number, = 1.87

**2. Residual resistance:**

It is caused by distribution of pressure which develops about the hull because of the waves and eddies formed by the ship's motion.

Residuary resistance may be divided into following components:

- Resistance caused by formation of streamline around the ship due to change in direction of water.
- Eddy resistance due to sudden change in form.
- Resistance caused by formation of wave while passing through the water (**wave making resistance**).

**Wave making resistance:** The second major component of hull resistance is the resistance due to wave making. The creation of waves requires energy. As ship speed increases, the height of the waves produced by the ship increases and therefore the energy required to produce these waves also increases. This lost energy is referred to as wave making resistance and often becomes a limiting factor in the speed of a ship.

**Q-50) TWO SHIPS OF DIFFERENT BREADTH, EFFECT ON STABILITY?**

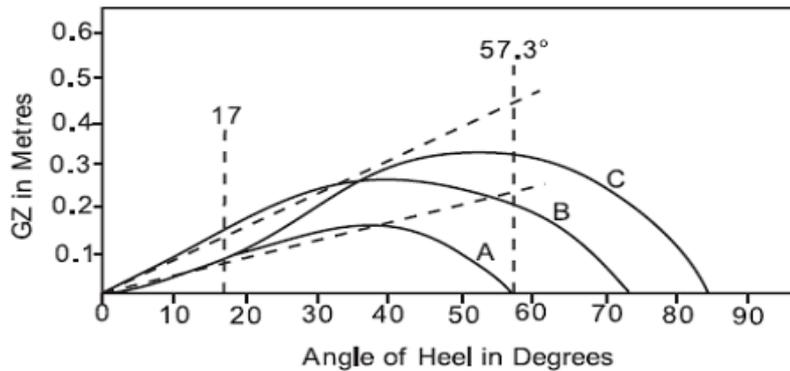


Fig. 23.1

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**The effect of increasing the beam**

Let the draft, freeboard and KG remain unchanged, but increase the beam and consider the effect this will have on the stability curve.

For a ship-shaped vessel  $BM = I/V$ , and for a box-shaped vessel  $BM = B^2/12d$ . Therefore an increase in beam will produce an increase in BM. Hence the GM will also be increased, as will the righting levers at all angles of heel. The range of stability is also increased. The new curve of stability would appear as curve B in Figure 23.1.

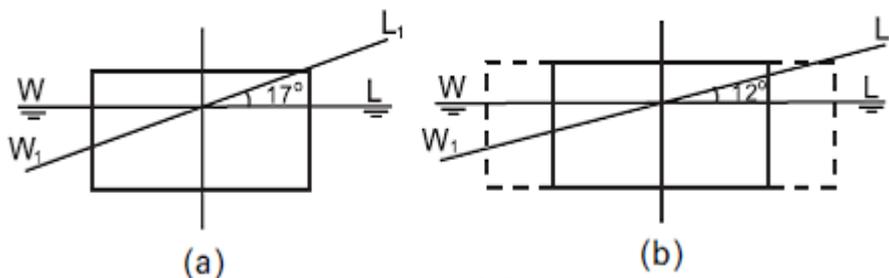


Fig. 23.2

It will be noticed that the curve, at small angles of heel, is much steeper than the original curve, indicating the increase in GM. Also, the maximum GZ and the range of stability have been increased whilst the angle of heel at which the deck edge becomes immersed, has been reduced. The reason for the latter change is shown in Figure 23.2. Angle  $\theta$  reduces from 17° to 12°.

Figure 23.2(a) represents the vessel in her original condition with the deck edge becoming immersed at about 17 degrees. The increase in the beam, as shown in Figure 23.2(b), will result in the deck edge becoming immersed at a smaller angle of heel. When the deck edge becomes immersed, the breadth of the water-plane will decrease and this will manifest itself in the curve by a reduction in the rate of increase of the GZs with increase in heel.

angles of heel. The range of stability is also increased. The new curve of stability would appear as curve B in Figure 23.1.

### Q-51) HRA SAFETIES?

1. Conduct trainings / drills with the crew;
2. Watchkeeping and Enhanced Vigilance;
3. Effective use of monitoring and/or surveillance equipment;
4. Maneuvering practice;
5. Alarm or Alerts systems to demonstrate awareness to any potential attacker;
6. Use of deck lighting and illumination to demonstrate awareness to any potential attacker;
7. Denial of use of ship's tools and equipment, and protection of equipment stored on the upper deck;
8. Control of Access to Bridge, Accommodation and Machinery Spaces and Physical Barriers;
9. Other equipment used for self-defense;
10. Safe-Muster Points and Citadels, if determined appropriate.
11. Submit vessel movements and transit plans to MSCHOA and all other organizations in the area before, during and after transiting High Risk Area
12. Make sure their LRIT System works properly at all times and must also report all their movements.
13. Fire hoses to be placed all around the deck with deflector to cover larger area to protect from pirates boarding.

### Q-52) BULBOUS BOW, WHY?

Consider a ship without a bulbous bow, as the ship moves forward, the water particles moves towards the stern along the entire length of the ship. But the water particle which is incident right at the centreline of the stem, their instantaneous velocity is zero, so it is called stagnation point and pressure at this point will be higher which will give rise to the crest of a wave. This wave is called bow wave. We are wasting a part of the engine power in generating this wave.

A bulbous bow is an extension of the hull just below the load waterline. It is of bulb like shape. The basic purpose is to create a low-pressure zone to reduce or eliminate the bow wave and reduce the resulting drag.

A ship with bulbous bow requires far less propulsive power and have considerably better resistance characteristics than the same ship without a bulbous bow.

The principle of the bulbous bow is that it is sized, shaped and positioned so as to create a wave system at the bow which partially cancels out the ship's own bow wave system, so reducing wave-making resistance.

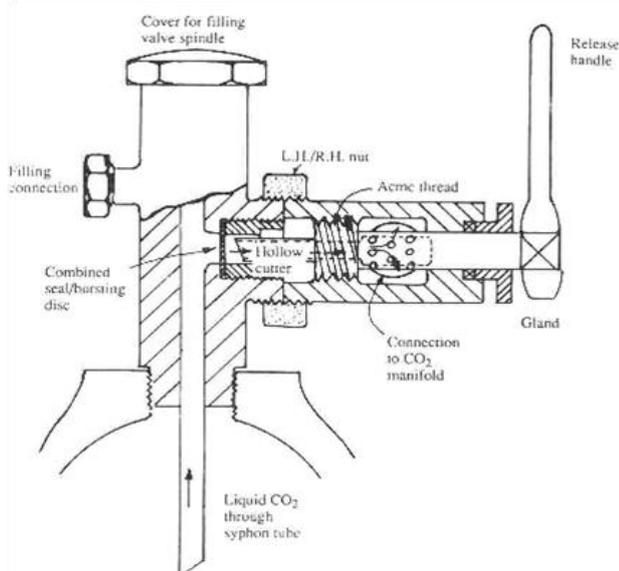
### Q-53) WHICH RUDDER IS MOSTLY USED AND HOW THE WEIGHT OF THE RUDDER IS TAKEN?

Semi balanced rudder is mostly used.

The weight of rudder may be taken by bearing pintles, or by a bearing at the rudder head (rudder carrier), or by a combination of both.

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### Q-54) CO2 CYLINDER HEAD, HOW IT LOOKS AND MECHANISM?



**CO2 Main Bottle Head Assembly**

Head assembly mainly consist of a cylinder valve, which is operated by a pneumatic actuator and linkages as shown in the figure below. CO2 from the release cabinet reaches the pneumatic actuator through time delay unit and actuator operates the cylinder valve to release CO2 from main bottles to the common manifold.

### Q-55) NEAREST LAND, TERRITORIAL WATERS, COASTAL LAND?

- **Nearest land:** The term "from the nearest land" means from the baseline from which the territorial sea of the territory in question is established in accordance with international law
- **Territorial waters:** The territorial sea extends to a limit of 12 nautical miles from the baseline of a coastal State. Within this zone, the coastal State exercises full sovereignty over the air space above the sea and over the seabed and subsoil.
- **Coastal Land:** It refers to the land which is near to the coast or where sea and land meets is called coastline and nearby land called coastal land.

### Q-56) WHAT ALL CHECKS DONE IN SEA CHEST DURING DRY DOCK?

- Inspect corrosion and condition of sea chest plating
- Check sea chest grating
- Inspect MGPS (Marine Growth Prevention System)
- Check for steam injection and vent valves in sea chest
- Gauging of sea chest plating for old ships
- Check overboard valve connections to sea chest
- Check the condition of sea growth and shell plating
- Check the amount of marine growth before cleaning to evaluate the effectiveness of anti-fouling paint
- Check welds at the joint, after cleaning
- Check condition of anodes. If anodes are fully corroded or consumed, that means either quality or quantity of the anodes used were insufficient and inadequate. If anodes are not at all corroded, that indicates improper fitting. Normally 75% of the anodes will be consumed.
- Check the welded area for any cracks, corrosion or deformations

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### Q-57) PORTABLE EXTINGUISHER INSPECTION AS PER SOLAS?

1. Minimum capacity of powder and co2 is 5 kg.
2. Minimum capacity of foam is 9 litre
3. Maximum mass of all portable not to exceed 23 kg and shall have a fire fighting capacity of a 9 litre liquid extinguisher.
4. Accommodation spaces, service spaces, control stations to be provided with Portable fire extinguishers.
5. Ships more than 1000 GT must have atleast 5 PFE.
6. Extinguisher intended to be used in a space must be near its entrance.
7. Co2 not to be placed in accommodation spaces.
8. Spare charges to be available for 100% of the first 10 and 50% of the remaining. Not more than 60 spare charges.

#### Checks on Portable Fire Extinguishers:

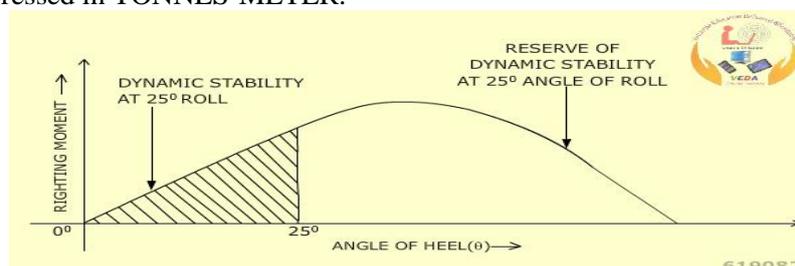
- Check if the location of the extinguisher is as per fire plan
- Brackets are firmly attached and are in good condition
- Check if the total number corresponds to the check list, both on the extinguishers and at location.
- IMO luminescent sign is in place
- Check for physical damage. There should not be any rust or crack on the body or on hose, nozzle etc.
- Safety Devices like pin with anti-tamper tag in place
- Physical Test date is not overdue.
- Make sure the Service Label is in place and not expired
- Check for the stored pressure, the gauge indicator should be in green sector
- For Cartridge operated extinguishers make sure that there are no leaks, powder not stacked
- For Carbon Dioxide extinguishers check for weight. weight shortage in the limits (within 10% of gas inside)
- Make sure there are enough of spares are available for that type of fire extinguishers.

### Q-58) HYPERMIST SOLAS REGULATIONS?

- System installation should be outside of the machinery space.
- It should be activated by 2 sensors.
- The system should be driven by independent internal combustion machinery but if it is dependent then emergency generator connection should be there.
- The effective average distribution of the nozzles shall be at least 5 litres/m<sup>2</sup>/minute.
- The system should be capable to supply water fog for the period of minimum 20 minutes to suppress the fire.
- Operating instructions should be displayed at the control station.

### Q-59) DYNAMIC STABILITY, HOW CALCULATED?

It is defined as the work done to incline the ship. It is the product of area under GZ curve in meter radian and vessel's displacement in tonnes, expressed in TONNES-METER.



The area under the curve represents the potential energy of a ship and to incline her, a work has to be done to vertically separate the G & B and incline her to a particular angle of heel. This is dynamic stability for that angle of heel.

There are a range of other reasons for rise in the centre of gravity of a ship, or in other words, reduction in its stability. We will list and discuss some of them below:

- Collapse of a longitudinal bulkhead or a tank bulkhead may lead to rise in the CG as it would increase the moment of inertia of the free surface.
- Stability of a ship is significantly reduced due to build-up of ice on its superstructure. It not only causes unwanted angles of list, but also unwanted trim conditions which cause the center of gravity of the ship to shift. The resultant value of righting arm would be significantly less for all angles of heel, therefore causing a *reduction* in:
  - Maximum GZ
  - Initial transverse metacentric height.
  - Dynamic stability.
  - Range of stability.

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BY ANKUR SHARMA (MANET BATCH 6)**

## **Q-60) DIFFERENCE BETWEEN PRODUCT AND CHEMICAL TANKER?**

### **OIL TANKER**

It's all about cargo compatibility, and the main differences are in the framing and the piping.

An oil tanker will have internal framing where the frames, or ribs, of the ship will pass through the tank. This creates pockets where the cargo can get trapped, but is usually negligible when it comes to vessel loading and unloading the same type of cargo repeatedly.

### **CHEMICAL TANKER**

A chemical tanker, however, will have external framing. This is because they will often change the type of cargo carried in a particular tank on each trip, and so they must be able to completely clean the tank and remove any residues from the previous cargo.

If you look closely, you'll be able to see a lot more piping running along the deck of the chemical tanker. In order to ensure cargo separation, each tank will have a dedicated pipe running from it to the cargo manifold where it is loaded or unloaded. Each tank will usually have its own pump located at each tank, too. This allows a chemical tanker to carry multiple types of chemicals safely.

An oil tanker, on the other hand, will usually have three connections at the manifold running to three pumps down in a pump room next to the engine room. Each pump will be connected to multiple tanks to pump cargo to a facility or another vessel.

## **Q-61) TAILSHAFT SURVEY IN DRY DOCK?**

Different types of survey:

**Normal survey** : These are the conventional survey processes in which the tail- shaft is completely withdrawn at interval of 5 years.

**Modified survey**: The Modified Survey comprise of the partial-withdrawal of the shaft, sufficient to ascertain the condition of the stern bearing and shaft in way.

**Partial Surveys**:- The Partial Survey consists of the propeller being backed off in any keyed shaft and the top half of the cone examined by an efficient crack detection method.

- The removal of the key.
- Oil gland and seals are to be examined and dealt with as necessary.
- Wear-down is to be measured and found satisfactory.
- Propeller and fastenings are to be examined.

### **Tail-shaft Condition Monitoring (TCM) Program:**

In this throughout the period with required periodical monitoring and tests, the intervals between the two consecutive withdrawals of tail-shaft may be extended to a maximum period of 10 years.

In this case incomplete withdrawal of the Tail-shaft will not be required at the Modified Survey.

- T/S survey carried out once in 5 years. Or as per classification society rules, the time interval can be extended depending upon certain information filled in log sheet. Information that include in condition monitoring of tailshaft are-
  - Water content in oil report
  - Oil consumption record
  - Fwd and aft bearing temperature
  - Particle analysis to be done
  - Oil ageing ( resistance to oxidation)
  - Upon analysis of data class may give extension for survey upto 7.5 years.
  - previous survey report
  - Spare seal is available onboard
  - Spare temperature sensor

- Sufficient oil for replacement
- Fwd and aft bearings are available
- Poker gauge is available
- Availability of special tool for removal of intermediate shaft coupling
- Draining of s/t lube oil
- Log sheet, lifting appliances (chain block, wire sealings etc.)

Tail shaft survey includes:

1. Complete with draw tail shaft
2. Propeller nut and tail shaft threaded end to be checked.
3. Cone, key and keyway to be checked, and forward part of the taper to be checked for crack with approved crack detecting method.
4. Tail shaft-bearing wear, to be checked.
5. Stern bush and bearings, to be checked.
6. Shaft sealing arrangement, including oil system, to be checked.

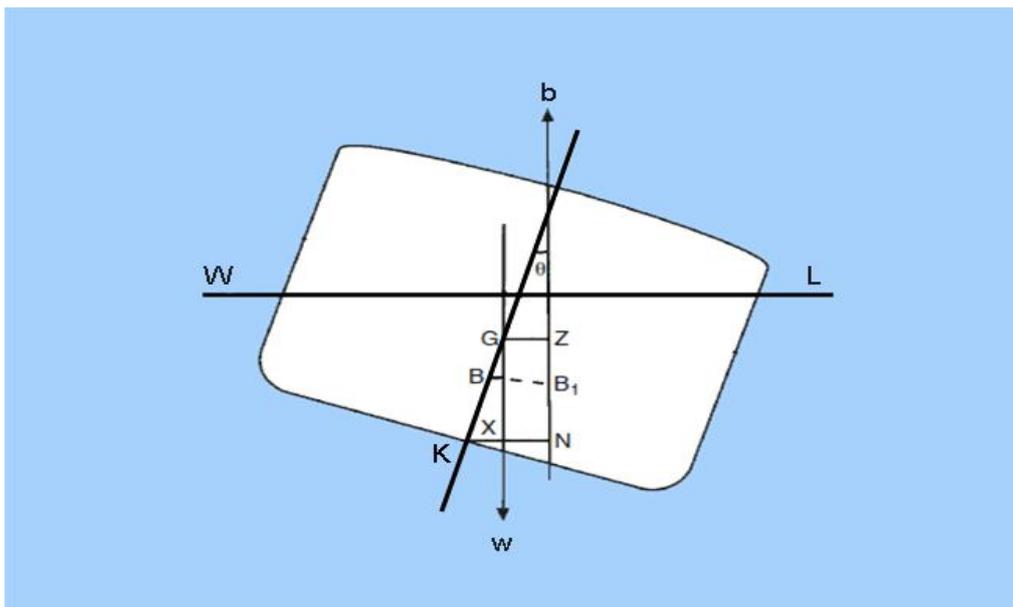
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### Q-62) CROSS-CURVES OF STABILITY OR KN CURVES AND ITS USE ONBOARD?

The cross curves of stability were developed, so that, for any loading condition (where KG is already known), values of righting lever (GZ) can be obtained for all angles of heel.

In order to make things easier, a few known facts were considered before developing the concept of cross curves of stability:

- KG will vary according to the loading condition.
- The KG of the ship is always known to the designer, and also the ship's captain, for every loading condition.
- The angle of heel at any condition is also known to the designer and the ship's captain.



In order to understand how, study the above figure. The point 'K' represents the keel of the ship. If at any angle of heel ( $\theta$ ), a line parallel to that of GZ is drawn from 'K', then the point of intersection of this line with the vertical line of action of buoyancy, is represented as 'N'.

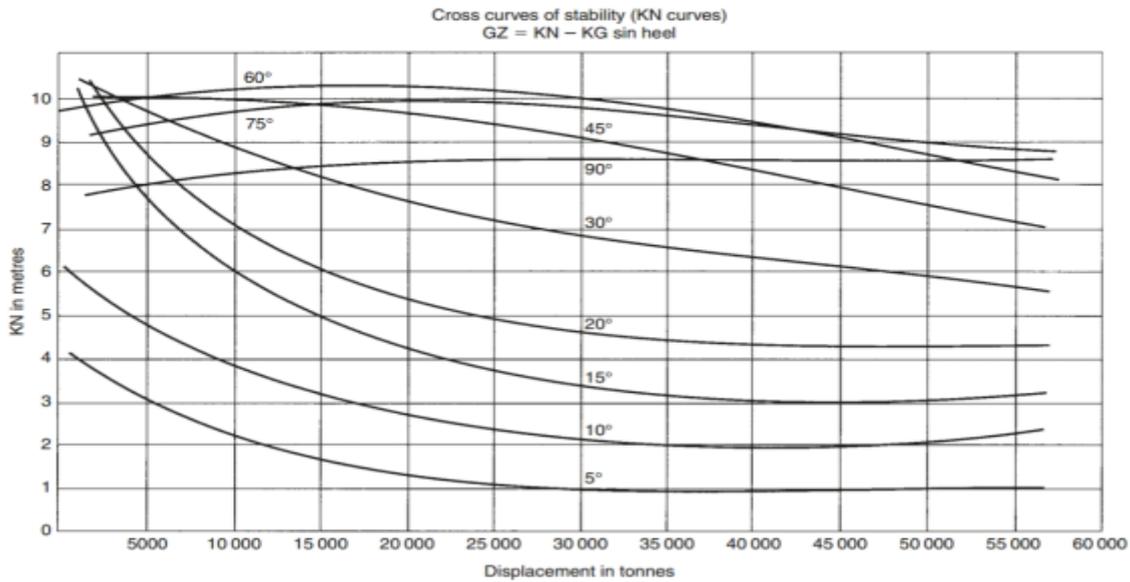
From the above figure, the following expression can be derived for righting lever:

$$\text{Righting Lever (GZ)} = KN - KG \sin \theta$$

The only unknown in the above expression is the value of KN. So, a computer generated plot of KN values for a range of displacements is obtained for different heel angles, and the resultant curves are collectively called KN Curves or Cross Curves of Stability, as shown in Figure below.

Let's look at an example to understand it better:

Let displacement = 40000 tonnes and KG = 10 mts for the given KN curve.



Then the GZ can be obtained by:

HEEL	KN	SIN(HEEL)	KG*SIN(HEEL)	GZ=KN-KG*SIN(HEEL)
5	0.9	0.087	0.87	0.03
10	1.92	0.174	1.74	0.18
15	3.11	0.259	2.59	0.52
20	4.25	0.342	3.42	0.83
30	6.30	0.5	5.0	1.3
45	8.44	0.707	7.07	1.37
60	9.39	0.866	8.66	0.73
75	9.29	0.966	9.66	-0.37

### Q-63) WHAT IS INCLINING EXPERIMENT?

The primary purposes for carrying out an inclining experiment are:

- To measure the lightship weight of the ship.
- To find the vertical, longitudinal, and transverse positions of center of gravity.
- To calculate the metacentric height of the lightship.

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It is always conducted by the shipbuilder because, at this stage, the shipbuilder must prove to the client that the lightship weight has not exceeded the design value. A weight margin of approximately 15 to 20 percent is allowed in the technical contract. However, if the difference between the design lightship weight and that calculated during the inclining experiment exceeds weight margin mentioned in the contract, the shipbuilder must pay a penalty for each extra ton.

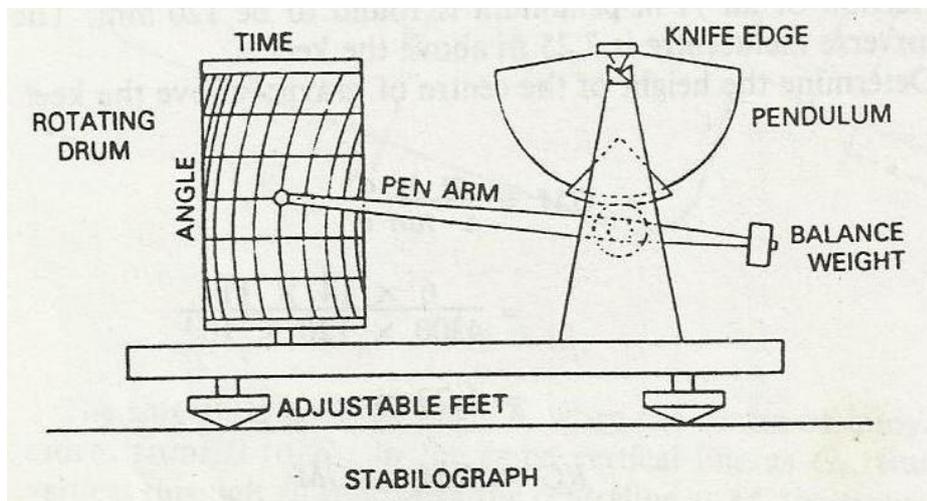
The Initial metacentric height of the ship is determined by an inclining experiment after the ship is completely built.

**The metacentric height** is the distance between the centre of gravity and metacentre of the ship i.e. GM and it is used to calculate the stability of the ship.

### Requirements:

- The experiment is carried out when the ship is built completely or when major structural changes have been done.
- The experiment is carried out with empty ship or as near to empty ship as possible.
- The ship must be in upright position.
- The ship should be sheltered and in calm waters.
- Mooring ropes should be slackened and gangway lifted.
- Draught and density of water are to be correctly noted.
- All tanks in the ship must be empty or pressed up tight to reduce free surface effect.
- Only those people responsible for conducting the experiment must go onboard.

**Experiment:** To conduct this experiment, a special tool known as stabilograph is required. The tool consists of a heavy metal pendulum balanced on a knife edge and connected to a pointer to record the heel angle readings.



- Normally minimum of two stabiographs under deck pendulums are used and are placed at maximum distance from each other i.e. one in forward and one at aft.
- Four masses are placed on the ships deck, two on each side of the mid ship, placed away from the centre line.
- In the next step, the masses are moved one at a time until all four are on the same side, then all four on the other side, and lastly two on each side.
- The deflection on both the stabiographs is recorded for all the movement of mass and an average of these readings are used to determine metacentric height.

Suppose  $\Theta$  is the angle of heel and  $G_1$  is the moved position of the centre of gravity after inclination. Then by trigonometry,

$$GG_1 = GM \tan \Theta$$

$$\text{Also } GG_1 \text{ is } = m \times d / \Delta$$

Where  $m$  = mass moved

$d$  = distance by which the mass is moved

$\Delta$  = displacement of ship in water

$$\text{Hence } GM = m \times d / \Delta \tan \Theta$$

and  $GM$  is **metacentric height**

Where  $\tan \Theta$  can be determined by the readings of stabiograph

#### Q-64) NO<sub>x</sub> AND SO<sub>x</sub> REDUCTION WAYS?

Reducing NO<sub>x</sub> emission

The presence of NO<sub>x</sub> in marine engine's exhaust emission is due to high combustion temperature which reacts with nitrogen in the air supplied for combustion.

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Following are the methods to reduce NO<sub>x</sub> emission from ship:

1. **Humid Air Method:** In this method, water vapour is mixed in the combustion air before supplying it to the cylinder. Air from the T/C blower is passed through a cell that humidifies and chills the hot air taking moisture from the cooling water until air saturation is achieved. Generally saline sea water is utilized in this method by heating it with jacket water and turbo charger heat, and the left over brine is disposed back to the sea. This method can achieve reduction of NO<sub>x</sub> by 70-80%.
2. **Exhaust Gas Recirculation (EGR):** As the name suggests, some amount of engine exhaust gases are sent back to the scavenge space to mix up with the air to be supplied to cylinder for combustion. This reduces the oxygen content of the air and hence reduces formation of NO<sub>x</sub>.
3. **Water Injection and Water emulsion:** In this method, water is added to reduce the temperature of combustion leading to low NO<sub>x</sub> emission. In water emulsion, fuel is blended with water and in water injection a separate fresh water injector is mounted in the cylinder head which injects water. This method has a drawback of increasing the specific fuel oil consumption with reduction in NO<sub>x</sub> by only 20-45%.
4. **High Scavenge Pressure and Compression Ratio:** With high scavenge pressure and compression ratio, large amount of air can be introduced inside the cylinder to lower combustion temperature and NO<sub>x</sub> emission.
5. **Selective Catalytic Reduction:** The SCR is the most efficient method to reduce NO<sub>x</sub> emissions from ships (up to 90-95% of reduction). In this method, low sulphur fuel oil is used and exhaust temperature is maintained above 300 deg C. The exhaust gas is mixed by water solution of urea and then it is passed through catalytic reactor. The only disadvantage of SCR is its expensive installation and operating cost.
6. **Two Stage Turbocharger:** ABB's latest two stage turbocharger can reduce the exhaust temperature in the intercoolers and also the NO<sub>x</sub> content in the emitted exhaust.
7. **Engine Component Modification:** It is better to design an engine which has a property to reduce the NO<sub>x</sub> formation during combustion process rather than investing on expensive secondary measures. Integration of slide valve type fuel

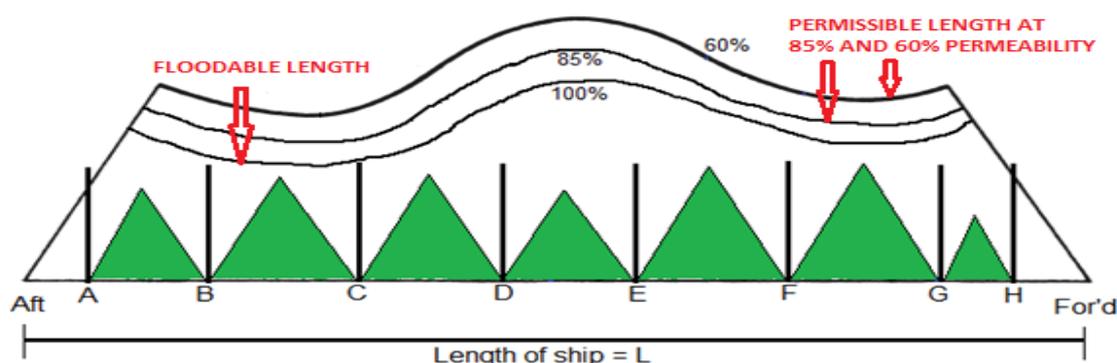
injector with almost zero sack volume eliminates any chance of fuel dripping and after burning, leading to cylinder temperature and NOx formation.

### Reducing SOx Emission

SOx or sulphur oxides are formed during combustion process in the engine because of presence of sulphur content in the fuel. Following are the methods and technologies used to reduce sulphur emission from marine engines.

1. **Use of Low sulphur fuel oil:** It is expensive but most commonly used method to comply with Annex VI of MARPOL while entering emission controlled Area or ECA.
2. **Exhaust Gas Scrubber Technology:** The exhaust gas from the engine is passed through the scrubber tower where a liquid is showered over it. Fresh water blended with caustic soda (NaOH) is used as a scrubbing liquid which reduces the SOx to 95%. The scrubbing water is then sent to a water treatment effluent emulsion breaking plant after which it can be discharged overboard.
3. **Cylinder Lubrication:** Good quality cylinder lubrication along with efficient control systems such as Pulse or Alpha lubrication systems can neutralise the sulphur in the fuel and reduce SOx emissions from the engine.

### Q-65) FLOODABLE LENGTH AND PERMISSIBLE LENGTH?



**Floodable Length:** It is also the maximum length of the ship that can be flooded without submerging the margin line. Margin line is a line just below the top of the bulkhead deck.

The floodable length of a vessel varies from point to point throughout her length and is usually the greatest amidships and the smallest near the quarter length.

**Permissible Length:** The floodable length of each point along the ship's length is multiplied by the permeability to obtain the Permissible Length. The permissible length curves for 85 percent and 60 percent permeability are now incorporated into the floodable subdivision diagram. Here, for machinery compartments (e.g. engine room compartment BC) the vertices for the triangle needs to be checked against the 85% curve, instead of the floodable length (100%) curve

The general values of permeability used for different types of compartments are listed below, followed by a logical understanding of the variation in the values:

- Watertight Compartment – 95 to 97%
- Accommodation spaces – 95%
- Machinery compartments – 85%
- Cargo holds – 60%
- Stores – 60 %

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### Q-66) DIFFERENCE BETWEEN STATIC AND DYNAMIC STABILITY?

<u>STATIC STABILITY:-</u>	<u>DYNAMIC STABILITY:-</u>
1) It is defined as the ability of a ship to regain its upright equilibrium position, after the removal of external factor which caused the vessel to heel at an angle.	1) It is defined as the energy required heeling the ship from upright equilibrium till the angle of heel in question.
2) It gives the stability information of a vessel under the condition that the outside water is static.	2) It gives the stability information of a vessel considering dynamic behaviour of the sea.
3) It is expressed in terms of metacentric height. i.e. GM ( for angle of heel up to 10 degree) and righting lever GZ ( for angle of heel above 10 degree)	3) It is expressed in terms of the area under righting moment curve. ( or GZ curve multiplied by displacement of the ship in tons)
4) It's unit is meter	4) It's unit is ton-meter-radian
5) Static stability at two different angle of heel can be the same.	5) The dynamic stability at two different angle of heel cannot be the same

### Q-67) DIFFERENCE BETWEEN STCW AND MLC WORK HOURS?

Convention	MLC 2006	STCW 2010
Application	All seafarers including the master	Watchkeepers and safety / pollution / security positions only
Work / Rest in any 24 hours	Maximum 14 hours of work Or Minimum 10 hours of rest	Minimum 10 hours of rest
Work/Rest in any 7 days	Maximum 72 hours of work Or Minimum 77 hours of rest	Minimum 77 hours of rest
Number and length of rest periods	Not more than two periods of rest, one of which must be at least 6 hours.  Interval between rest periods not to exceed 14 hours	Not more than two periods of rest, one of which must be at least 6 hours.  Interval between rest periods not to exceed 14 hours

### Q-68) WHAT IS INTACT AND DAMAGE STABILITY?

A ship is seaworthy if it fulfils two important stability criteria- Intact and Damage stability.

Requirements for Intact and Damage Stability of the Ship:

#### Intact stability

For a cargo vessel, the intact stability requirements are follows-

- Initial GM or metacentric height should not be less than 0.15 m.
- Righting lever GZ should be at least 0.2 m and angle of heel  $\Theta \geq 30^\circ$ .
- Maximum righting lever should occur at heel  $>30^\circ$  preferably but not less than  $25^\circ$ .

The Area of the GZ curve should be at least:

- 0.055 m radian up to  $\Theta = 30^\circ$
- 0.090 m radian up to  $\Theta = 40^\circ$
- 0.03 m radian between  $30^\circ$  and  $40^\circ$  or between  $30^\circ$  and angle of down flooding.

The angle of down flooding is an angle at which deck immersion takes place with subsequent water ingress.

#### Damage Stability

- A damage stability criterion varies from ship to ship and the requirement for the same is given in SOLAS chapter II-1. It may be single compartment flooding, multi compartment flooding, engine room flooding etc.
- Under all the criteria as applicable, vessel margin line should not be submerged after the damage. Margin line is an imaginary line drawn 75mm below the free board deck.

### Q-69) WHAT IS STATUTORY AND MADATORY CERTIFICATES?

#### Statutory Certificates:

Those certificates which are required by the law with respect to safety and environment protection that the vessel is required to comply with are called statutory certificates.

Eg-SOLAS, MARPOL, STCW, MLC 2006

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#### Mandatory Certificates:

Certificates which are required for trading purpose. Ship's registry certificate is a mandatory certificate however for Indian Ship's it is Statutory Certificate. OPA'90 is a Statutory certificate for ship's transiting in U.S waters but mandatory for other ship's.

### Q-70) ENGINE ROOM FLOODING, ACTIONS?

The engine room flooding can take place due to mainly three reasons:

#### 1) Leakage from Equipment and system

- Call for maximum man power to tackle the situation.
- The sooner you find the fault the better.
- Start the other circulating system and isolate the leaking pump, pipe, cooler etc.
- Close inlet and outlet valves of the affected system to stop the leak.
- Inform chief engineer regarding the leak and follow the instruction from him.
- Put a notice or placard regarding leaking equipment or system and trip the breaker until repairs has been done.

- In case of any tank leakage, start transferring the excess content from that tank to another tank and try to minimise it as much as possible.
- Tank should not be used until cement box or welding has taken place or a repair has been done.

## 2) In case of leakage from Overboard Valve

- If the Leakage is after the valve and if the valve is holding shut the valve if the system involved for that valve permits normal operation of the ship with the valve closed.
- If the valve is not holding then identify the leak. It may be from the valve stem gland or flange joint; try to repair the leak.
- If system for that valve can be isolated without disturbing the normal operation of the ship, put a blank in the valve.
- If the repair is temporary then when ship reaches the port, call the divers to blank the valve opening from outside and carry out permanent repair.

## 3) Flooding due to crack in the hull or small hole in the hull

- In this case, as soon as you find the leak, call for help from nearest coastal state because if the leakage is more, the ship's stability will be affected.
- By all means, the leakage has to be minimised and finally stopped.
- If the leak is not big enough, then cement box is to be put in place of the leak and repairs are to be done accordingly.
- In case of leakage due to damage from any accident like collision or grounding, there is nothing much that can be done as the opening in the bulkhead is large and there is no chance of stopping the leak. In such cases, the captain has to decide whether the ship is safe place to stay or not and decision for abandoning the ship has to be made.
- In case of abandon ship signal being announced, the crew should muster to their respective lifeboat and abandon ship operation should be carried out.

For any of the above reasons, if the water level ingress in the engine room is very high, then open the emergency bilge ejector valve with consent of the chief engineer and pump out the water overboard. Entry of the same is to be made in Oil record book (ORB) with date, time, and position of the ship and reason of direct discharge with signature of officer involved in operation, chief engineer, and master should be registered.

**Chief engineer has to be reported immediately in such condition without any delay.**

### Q-71) EMERGENCY SWITCHBOARD REGULATIONS?

1. Emergency switchboard and emergency generator should be located above the uppermost continuous deck.
2. Emergency switchboard should be in same place where the emergency generator is located.

### Q-72) WHY TANK INSULATION IS PROVIDED ON REFRIGERATED CARGO TANKS?

Thermal insulation must be fitted to refrigerated cargo tanks for the following reasons:

- To minimise heat flow into cargo tanks, thus reducing boil-off.
- To protect the tanker structure around the cargo tanks from the effects of low temperature.

Insulation materials for use on gas carriers should possess the following main characteristics:

- Low thermal conductivity.
- Ability to bear loads.
- Ability to withstand mechanical damage.
- Light weight.
- Unaffected by cargo liquid or vapour.

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### Q-73) IOPP SURVEY ? WHAT ALL YOU PREPARE?

Issued after Survey is carried out by Administration and its validity is 5 years.

#### IOPP Survey preparations:

1. Validity of the IOPP Certificate checked.
2. Proper entry of ORB and, sludge disposal receipts to shore facilities attached to ORB.
3. Calculate the sludge formation, and compared with 1% of voyage fuel consumption.
4. Incinerating time, incinerated waste oil amount, remainder of waste oil in waste oil tank should be reasonable.
5. Incinerator kept ready for demonstration, such as heating of waste oil tank, alarms, control and functional test, done prior to survey.
6. OWS in good order, its piping free from oil leaks, overboard valve from OWS locked in closed position. If possible, one section of discharge pipe removed and free from oil residues.
7. ODM checked for 15-ppm alarm and automatic stopping.
8. High level alarms of sludge tank, waste oil tank and bilge holding tank checked.

9. Spare filter for OWS must be onboard.
10. USCG Notice posted near OWS and bilge pumping out station

The survey will be carried out according to the form B of IOPP for oil tankers.

1. Checks for ODMCS and pipeline of ODMCS.
2. Slop tank to be checked
3. BHT checks
4. OWS will be checked.
5. OWS (15 ppm applicable from 6 July 1988)
6. SOPEP plan will be checked.
7. Dedicated clean ballast tank operating manuals.
8. COW manuals
9. If any alteration in equipment, fitting are done then all plans and relevant manuals are to be re-submitted for approval and form A/B to be amended.
10. The survey are done in such a way that 4 annual survey and one intermediate survey in period of 5 years.
11. Annual survey 12 months +- 3 months.
12. Intermediate survey 24 months +-6 months.

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**On Annual survey following are to be checked:**

1. All approved manuals such as SOPEP, ODME, COW, CBT must be verified and manuals to be in working language of ship.
2. ORB to be checked for discharging by 15ppm equipment and disposed by incineration. (Roughly calculation of sludge can be done by approx 1% of sludge if burning HFO)
3. Cargo record book for tanker only. (Regular entries to be made by person in-charge and signed by C/O and master)
4. 15ppm equipment to be checked for any signs of corrosion. The manual valve should not seize.
5. The automatic stopping is required only for vessel over 10000Gt and also audio and visual alarm.
6. Bilge pump in running condition.
7. No bypass for 15ppm filter.
8. Sludge tank for corrosion and discharge only from standard discharge connection.
9. E/R, pump room bilges checks for oily-water mixture.
10. Play cards to be posted at overboard valves, standard discharge connection, oil bilge pump, bunkering stations.
11. Verify correct functioning of incinerators.
12. Sounding checks of holding tanks and to have sufficient capacity.
13. OWS interface detector for proper functioning.
14. Check for segregated ballast tank for oil contamination.
15. Examination of COW to be carried out.
16. Effectiveness of stripping line to be checked.
17. Checks for emergency stopping device for cargo pumps from control station and pump room.

**On Intermediate Survey**

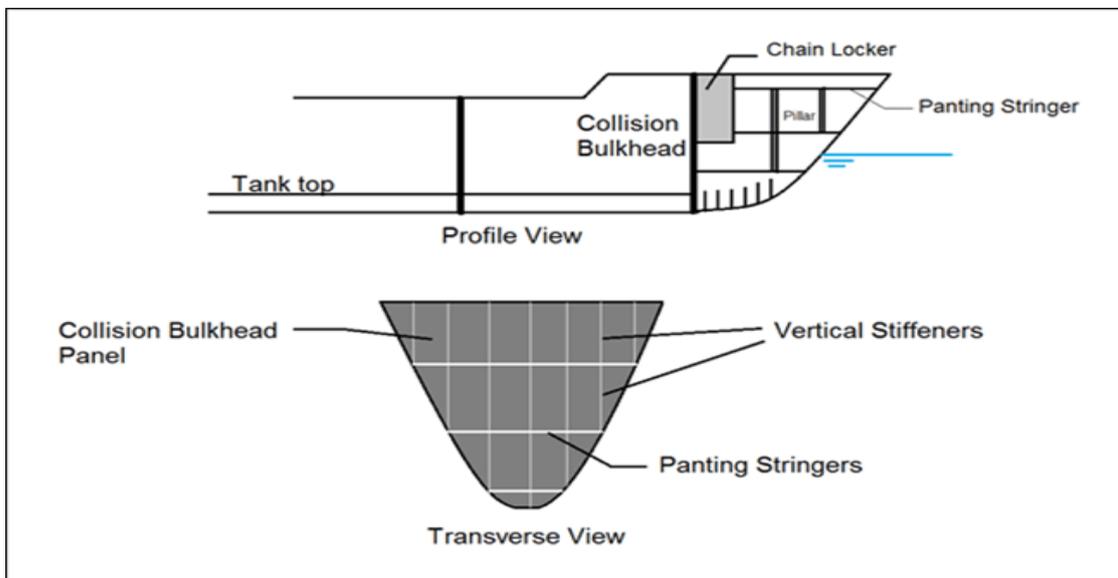
1. It should be in addition to requirement of annual survey.
2. Bilge pump to be dismantled, OWS to be dismantled, filter to be cleaned and damaged filter to be replaced.
3. 15ppm to be calibrated and complete piping to be thoroughly examined.
4. Sludge tank to be cleaned and examined.
5. Calibration of ODME.
6. COW piping to be visually examined.
7. For tankers, 10 years old, two selected cargo tanks to be examined for verifying the continued effectiveness of COW and stripping tanks.

**Renewal Survey:**

1. Through and complete examination to be carried out.
2. All equipment should be in working order till next renewal survey.
3. Tankers with COW, all tanks must be internally examined to confirm effectiveness of COW.
4. COW lines to be pressure tested (atleast working pressure)
5. Check no leaks from ballast pipes passing through cargo tanks and vice versa.
6. Examine Slop tanks.

**Q-74) COLLISION BULKHEAD POSITION AND PURPOSE?**

Collision Bulkhead is a heavy duty bulkhead in the forepart of the vessel to withstand damage after impact from collision.



- The collision bulkhead should be located aft of the forward perpendicular at a distance not less than 5 percent of the ship's length or 10 meters (whichever is less). The distance must also not exceed 8 percent of the ship's length.
- However, the position of the collision bulkhead should be such that maximum cargo storage volume is achieved.
- The collision bulkhead is a watertight bulkhead usually vertically stiffened with sections of scantlings higher than those on the surrounding structures. It is also stiffened by triangular stringers of higher scantling, called panting stringers. Panting stringers are usually provided at every 2 meters from the bottom, forward of the collision bulkhead.
- The collision bulkhead must be watertight up to the bulkhead deck. A bulkhead deck is basically the deck level up to which all the watertight bulkheads are extended.
- For providing access to chain locker room and the forward part of the bulkhead, steps may be provided on the collision bulkhead.
- There must be no doors, manholes, access hatches, ventilation ducts or any openings on the collision bulkhead below the bulkhead deck. Except only one opening for piping for fore peak should be allowed, provided pipe is fitted with a screw down valve which may be operated from bulkhead deck.
- In case of ships having superstructures at the forward region, the collision bulkhead is not terminated at the bulkhead deck. It must be extended to the deck level next to the weather deck. This would ensure sufficient structural continuity and keep the shear forces within safe limits.
- If the collision bulkhead is extended above the freeboard deck, the number of openings on the bulkhead should be restricted to a minimum in order to ensure sufficient buckling strength. All the openings should be watertight.

#### **Q-75) PIPE DIAMETER OF FIRE LINE IN ENGINE ROOM?**

The diameter of fire line should be between 50 mm to 180 mm. In case of cargo ships, the diameter need only be sufficient for the discharge of 140m<sup>3</sup>/h

#### **Q-76) WHAT IS THE REGULATION REGARDING HYDROSTATIC TESTING OF CO2 BOTTLES?**

MSC 103 approved amendments regarding significant increase in the hydrostatic testing of CO2 bottles.

First 10<sup>th</sup> year= 10% bottles will be tested.

Next 10<sup>th</sup> year (on 20<sup>th</sup> yr) = It has been increased from 10% to all of the remaining cylinder bottles (is.90%).

Then onwards, every 10<sup>th</sup> year= hydrostatic test of all bottles will be done.

#### **Q-77) ENCLOSED SPACE DEFINITIONS?**

Enclosed spaces are spaces that have:

- limited openings for entry and exit,
- inadequate ventilation and
- are not designed for continuous worker occupancy.

The atmosphere in any enclosed space may be oxygen-deficient or oxygen-enriched and/or contain flammable and/or toxic gases or vapors, thus presenting a risk to life

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Procedure for entering into enclosed spaces

1. Risk assessment to be carried out by a competent officer.
2. A list of work to be done should be made for the ease of assessment for e.g. if welding to be carried out or some pipe replacement etc. This helps in carrying out the work quickly and easily
3. Potential hazards are to be identified such as the presence of toxic gases.

4. Opening and securing has to be done.
5. All fire hazard possibilities should be minimized if hot work is to be carried out.
6. The confined space has to be well ventilated before entering.
7. Space has to be checked for oxygen content and other gases.
8. Enough lighting and illumination should be present in the enclosed space before entering
9. A proper permit to work has to be filled out and checklist to be checked so as to prevent any accident which can endanger life. The permission to work in an enclosed space specifies:
  - The location of the work
  - The nature and limitations of the work
  - Details of the working team and tools to be used
  - Potential hazards
  - Precautions are taken
  - Protective equipment to be used
  - Time of issue and its validity
  - Agreed communication methods and intervals
  - Signature of the person on issuing the permit and on completion of the work
  - Signature of the person who is supposed to enter thus confirming he has been advised on the hazards and the precautions to be observed
10. Permit to work is to be valid only for a certain time period. If the time period expires then again new permit is to be issued and the checklist is to be filled out.
11. Permit to work has to be checked and permitted by the Master of the ship in order to work in confined space
12. Proper signs and Men at work signboards should be provided at required places so that person should not start any equipment, machinery or any operation in the confined space endangering the life of the people working
13. Duty officer has to be informed before entering the enclosed space
14. The checklist has to be signed by the person involved in entry and also by a competent officer
15. One person always has to be kept standby to communicate with the person inside the space. Effective communication between the people inside the space and the person standing by is vitally important. The person may also carry a lifeline with him inside
16. The person should carry oxygen analyzer with him inside the enclosed space and it should be on all the time to monitor the oxygen content.
17. No source of ignition has to be taken inside unless the Master or competent officer is satisfied
18. The number of persons entering should be constrained to the adequate number of persons who are actually needed inside for work
19. The rescue and resuscitation equipment are to be present outside the confined space.
20. Means of hoisting an incapacitated person should be available
21. After finishing the work and when the person is out of the enclosed space, the after-work checklist has to be filled
22. The permit to work has to be closed after this.

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**Q-78) WHAT ALL GASES WE NEED TO CHECK BEFORE ENTERING ENCLOSED SPACES AND LIMITS?**

Atmosphere testing instruments should be capable of measuring and displaying concentrations of:

Oxygen	_____	% vol (not less than 20.9%)
Hydrocarbon	_____	% LFL (Less than 1 %)
<b>Toxic Gases &amp; TLV :</b> <b>(See note 5)</b>	H <sub>2</sub> S-	(Less than 2.5 PPM, TLV-5PPM)
	CO-	(Less than 12.5 PPM, TLV-25PPM)
	Others -	PPM (Must be less than 50% of the declared TLV of the

The table below shows approximate gas alarm concentrations for some common gases:

Gas	Alarm concentration % or parts per million (ppm)
<b>Oxygen</b>	<19.5%
<b>Oxygen</b>	>23%
<b>Methane</b>	5%
<b>Propane</b>	2%
<b>CO (carbon monoxide)</b>	30ppm

<b>CO<sub>2</sub> (carbon dioxide)</b>	5ppm
<b>H<sub>2</sub>S (hydrogen sulphide)</b>	10ppm
<b>Cl (chlorine)</b>	0.5ppm
<b>NO<sub>2</sub> (nitrogen dioxide)</b>	3ppm
<b>NH<sub>3</sub> (ammonia)</b>	25ppm

Since gases cannot combust without enough oxygen, a confined space's oxygen level can give you an idea of the concentration of combustible gases. There are two levels to pay attention to when measuring combustible gases:  
**Lower Explosive Limit (LEL):** This is the lowest concentration of a gas in the air that can combust or produce a flame when paired with an ignition source.

**Upper Explosive Limit (UEL):** This is the highest concentration of a gas in the air that can combust or produce a flame when paired with an ignition source.

If a gas concentration is below its LEL, it cannot ignite, and the confined space is considered safe. If the gas concentration is above its UEL, the gas is too rich and there's not enough oxygen for combustion.

### Q-79) REQUIREMENTS FOR DRY DOCK?

#### 1) Adequate Initial GM:

When the ship touches the blocks, there is a reaction at the point of contact which raises the centre of gravity "G" and reduces the metacentric height "G.M" so that adequate initial metacentric height is required to compensate the same.

#### 2) Vessel to be Upright:

While entering the dock the vessel needs to be upright, which means that there should be no port or starboard list when the ship touches the blocks. If the point of contact of the ship and keel blocks is outside the centre line of a vessel, it may force the vessel to tip over.

#### 3) Small or Moderate Trim Aft:

A moderate trim aft is usually kept when making the ship's keel sit on the keel block. As the water level in the dock lowers, the slight trim allows ascending of stern and bow in tandem rather than simultaneously which will reduce the load and pressure on a hull and the keel of a vessel.

### Q-80) TYPES OF STRESSES ON SHIP?

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#### 1. Longitudinal stresses (hogging and sagging)

**Hogging:** If ship is subjected to local loading at the fore and after ends, the hull would tend to hog. It will be worse if the wave crest is at midship.

**Sagging:** When the wave crest are at the ends of the ship and the wavelength similar to ship length, it will be termed as sagging.

**Resisting factors:** All continuous longitudinal material resist longitudinal stresses: Double bottoms, i.e., centre girder, side girders, inner bottom and outer bottom longitudinal, keel and bottom shell, tank top plating, the side shell at the top (the Sheer strake) and deck stringer plates, In tankers, longitudinal bulkheads also give great strength.

#### 2. Transverse stresses (racking and the effects of water pressure)

**Racking:** When a ship is rolling in a seaway or is struck by beam waves, the ship's structure is liable to distort in a transverse direction as shown.

**Resisting factors:** The stress mainly affects the corners of the ship, i.e., on the tank side brackets and the beam knees, which must be made strong enough to resist it. Transverse bulkheads, frames and web frames provide very great strength to resist racking.

**Water pressure:** It acts perpendicular to the shell of the ship, increasing with depth. The effect is to push the ship's sides in and the bottom up. **Resisting factors:** It is resisted by frames, bulkheads, floor and girders.

#### 3. Local dynamic stresses (panting and pounding)

**Panting** is an in and out motion of the plating which occurs at the forward end of the vessel due to the variation in water pressure as the vessel pitches in a seaway.

**Resisting factors:** Forward of the collision bulkhead, 'panting stringers' are fitted not more than 2.0m apart. The stringers are bracketed to the shell frames, and panting beams are fitted on alternate frames under each panting stringer

**Pounding:** When a ship is pitching, the bows often lift clear of the water and then slam down heavily onto the sea.

**Resisting factors:** To resist pounding, the forward bottom structure is strengthened for between 25% and 30% of the length, Plate floors are fitted on each frame station (transverse framing) or alternate frame stations (longitudinal framing) with intercostal side girders not more than 2.2m apart. The four strakes of shell plating either side of the keel are generally increased in thickness in the pounding region.

#### 4. Other stresses are caused by dry-docking, local weights, and vibration.

### Q-81) WHY TANKERS HAVE LESSER FREEBOARD THAN TANKERS?

1. Tankers have much smaller deck openings on main deck.
2. Tankers have greater sub-division, by the additional longitudinal and transverse bulkhead.
3. Tankers normally carry lesser density cargoes ie. Greater buoyancy.
4. Tankers have greater GM values.

### **Q-82) WHY RUDDER IS SITUATED AFT OF THE SHIP?**

- To make use of propeller outflow for thrust. The increased velocity of the propeller outflow results in a greater lift force. If a rudder is placed just forward of the propeller, it will have the same turning effect with respect to direction, but the magnitude won't be the same.
- The pivoting point of ship is 1/6 to 1/3 rd of length of ship from bow, the greater the perpendicular distance between point of action of force and pivoting point, the better rudder movement.
- Better protected at astern from damage.
- Drag is reduced if rudder is situated aft.

### **Q-83) DRY DOCK CRITICAL PERIOD?**

A Critical Period is the interval of time from, when the stern of the vessel touches the blocks to the time when the entire weight of the vessel is borne by the blocks (i.e. the vessel sits completely on blocks). This period is very crucial and continuous monitoring is required.

The word 'critical' means something which has the potential to cause a disaster. So, it is logical as to why the critical period is 'critical'.

Precautions:

- Vessel should have adequate initial metacentric height as it will start reducing when stern touches the aft.
- Vessel shall keep minimum required trim so that the critical period is reduced to minimum and it will also reduce the sudden load on hull and the keel of ship while coming on blocks.

### **Q-84) REGULATION FOR DRY DOCK, WHAT IS WRITTEN AND WHERE IT IS WRITTEN?**

As per SOLAS Chapter-1 Regulation-10, a minimum of two inspections of the outside of the ship's bottom during any 5 years period shall be carried out. The interval between any 2 such inspections shall not exceed 36 months.

The inspection may be carried out either in a dry dock or an underwater survey may be carried out as decided by the classification society depending on the vessel's condition.

### **Q-85) WHICH DRILLS ARE DONE AS PER SOLAS? AND THEIR INTERVAL?**

SOLAS Chapter 3 Regulation 19 states about emergency training and drills.

Drills shall be as far as practicable be conducted as if there were an "actual emergency".

1. Abandon Ship drill
2. Fire Drill

Every crew member shall participate in atleast one fire drill and one abandon ship drill every month.

If more than 25% of the crew have not participated in these drill in the previous month, these drills shall then take place within 24 hours of the ship leaving a port..

These drills shall be held before sailing:

- When ship enters the service for the first time.
- After modification of a major character.
- When a new crew is engaged.

3. Rescue or MOB drill
4. Enclosed space entry drill

Above two drill should be conducted atleast once in every two months.

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### **Q-86) WHAT IS DAMAGE CONTROL BOOKLET AND COMES UNDER?**

Damage Stability Booklet:

The information provided in damage stability booklet can be divided into three parts:

- Damage control plan (required for all type of ships)
- Damage control booklet (required for all type of ships)
- Damage stability calculation (required for tankers) Also refer marpol annex 1 reg 28

Sometime you may find all this as one booklet called "damage stability booklet". And on some ships, you may find three different booklets titled as above.

#### **1) Damage control Plan**

Damage control plan is required as per SOLAS chapter II-1/Regulation 19.

In simple words, the plan needs to show the layout of all the compartments such as cargo tanks, ballast tanks, fuel tanks etc., means of closer such as valves, watertight bulkheads, hatches or cargo tank domes and its position, arrangement for correction of the list during flooding.

## 2) Damage control booklet

The name says it all. This booklet gives the information to the master about how to control the effect of damage. Damage control booklet is also required as per SOLAS chapter II-1/Regulation 19. Damage control booklet need to have all the information as per damage control plan.

Apart from this, damage control booklet is supposed to provide information and guidance to the master about actions to take in case of damage to the ship.

These specific actions may include:

- Sounding of alarms to alert the crew
- The closing of all watertight doors and compartments
- Sounding of tanks to check where the water is flooding and with what rate
- Ways to reduce the effect of flooding such as by use of pumps to pump out water.

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## 3) Damage stability calculations

Damage stability calculations demonstrate the compliance with the applicable damage stability regulation.

These are the calculations made during the design stage of the ship and verified after the construction.

### Q-87) ENGINE ROOM FIRE, ACTIONS?

1. *Raise the alarm.*
2. *Inform the master*
3. *Reduce the vessels speed & Engage manual steering. Display NUC ( NOT UNDER COMMAND) lights, Weather reports, open communication with other vessels in the vicinity and send urgency signal.*
4. *Close all ventilation, fire and watertight doors.*
5. *Muster all crew- take a head count. Emergency fire p/p running.*
6. *Isolate all electrical units. Commence boundary cooling.*
7. *Fight fire by conventional means.*
8. *Main fire party to be properly equipped. Back up party ready at all times.*
9. *C/O not to enter as he monitors progress and communication with the bridge. Proper communication between bridge and engine room. Keep bridge informed accordingly of sequence of events.*
10. *At all times fire fighters to be well equipped with breathing apparatus and fireman suit. Checks on apparatus must be carried out prior to entering space.*

### Q-88) RUDDER INSPECTION?

- When ship enters dry dock and pumping out water, check water whether water is coming out from rudder or not. If yes, then rudder is breached.
- Open the top and bottom plug and check for any water inside.
- Pressure test the rudder at a water head of 2.46 meters.
- If the rudder is badly rusted or ship is older, surveyor may insist on thickness gauging of the rudder plate.
- Check the condition of the sacrificial anode on the rudder.
- Check the cement on the coupling bolts for rudder and rudder stock. Remove the cement and check the condition of the palm nut.
- Check the rudder pintle clearance.
- Check the rudder jumping clearance.
- Check the rudder drop.
- Check the rudder by hammer test by surveyor's hammer, by tapping on the rudder to evaluate the plate condition.
- Check the actual position of the rudder, compared to rudder angle indicator and see whether any difference is there by bending or deformations
- Carry out a visual inspection.

### Q-89) HOW TO TRAIN JUNIOR ENGINEER UNDER WHICH REGULATION?

1. As per the approved Tar book designed as per the training requirements mentioned in STCW Reg VI/1 "Safety familiarization and basic training"
2. Firstly only watch and then job with the responsible engineer.
3. Finally he has to reach the position to take the engine watchkeeping duties.
4. Also monitor his performance and guide him for his weakness.
5. Also guide him as per Code of Safe working practices.

## Q-90) TYPES OF DRY DOCK?

### **1) Graving Dry Dock:**

This type of dry dock is normally constructed on land near the coastal waters with a rectangular solid concrete construction with blocks, walls, and gates. The vessel is shifted inside the dry dock and rested on the blocks. After the ship is in the required position, the gate is closed and water is removed.

### **2) Floating Dry Dock:**

A floating dock is in the form of “U” structure which is mainly used in salvage, to carry ships that have met with an accident and are damaged to an extent that has made them unable to sail further to a coastal dock.

However, now many regular sea-going, small and mid-size vessels are also dry docking in a floating dock. Several “U” type floating docks can be joined to carry a large vessel.

The ship is brought near the channel where the floating dry dock will partly submerge itself and the ship slides inside the dock. The floating dry dock is usually built using steel framing which is similar to that of seagoing vessels with ballast tanks provided on sides and bottom to raise and lower the dock.

The floating dry docks are commonly operated in sheltered harbours as there is no wave or natural tidal activities present there.

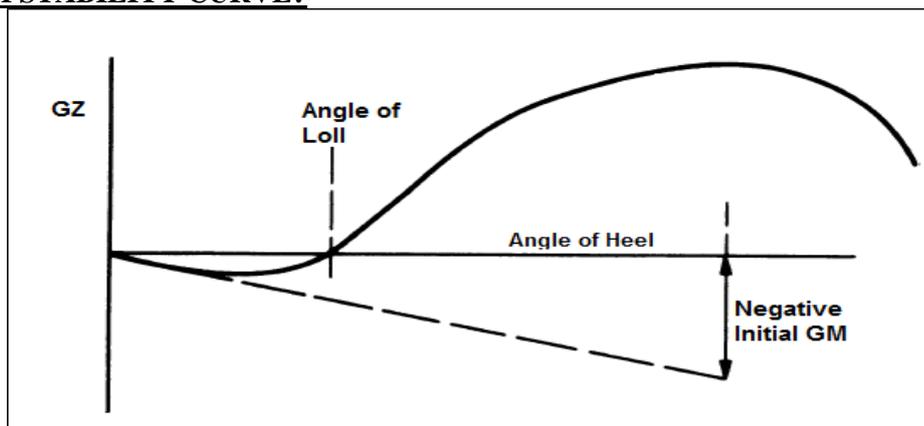
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## Q-91) NAME OF AUDITS UNDER ISM CODE?

- The International Safety Management Code (ISM) require Shipping Companies to have procedures for conducting both internal and external audits to ensure the ship as well as the shore organisation is doing what is documented in the Safety Management System.
- By carrying out internal SMS audits, companies measure the effectiveness of their own systems. Internal SMS or ISM audits are potentially more important than external audits for controlling the effectiveness of the system, since companies stand to gain or lose more than the external audit bodies if the system fails. The company, its employees, shipmasters, officers and crews ‘own’ the safety management system and have a direct interest in ensuring that it is effective. As a result, the internal SMS audit, which represents these interests, should be at least equal to if not exceed the thoroughness of the external SMS audit process.

COMPANY	SHIP
a. Interim	a. Interim Audit
b. Initial	b. Initial audit
c. Annual	c. Intermediate audit
d. Renewal	d. Renewal
e. Additional audits.	e. Additional audit
f. Surveillance audits	

## Q-92) NEGATIVE GM STABILITY CURVE?



## Q-93) HOW TO ORDER PIPE AND BY DEFAULT WHAT IS SCHEDULE? IF WE DON'T MENTION SCHEDULE, WHAT IS ASSUMED?

In marine field we generally use schedule 40 for light duty and schedule 80 for heavy duty. There are however many other schedules which have been incorporated due to improvement in metallurgy and requirements due to increased pressure demands.

Basically the schedule of a pipe refers to its pressure rating. The higher the schedule the higher pressure it can contain. The schedules are normally 5S, 10S, 10, 20, 30, 40S, 40, 60, 80 100, 120, 140 and 160. As the schedule increases the wall thickness increases and the ID decreases.

**Order taking into consideration several factors like:**

- Resistance to corrosion
- Pipe nominal diameter,
- Pipe internal diameter id,
- pipe thickness t
- pipe schedule rating will cover all these aspects

**Q-94) IOPP CERTIFICATE, VALIDITY AND EXTENSION PERIOD & IF EXPIRES AFTER EXTENSION?**

1. An International Oil Pollution Prevention Certificate shall be issued for a period specified by the Administration, which shall not exceed five years.
2. If the certificate has been issued for less than 5 years, then Flag state may extend it for the balance period up to 5 years from the original date of issue, provided that all surveys has been carried out.
3. If after completing the renewal survey, a new certificate cannot be issued, then RO may extend the existing certificate for 5 months.
4. If the certificate expires in a port where the ship cannot be surveyed, then the flag state may extend its validity by 3 months to allow the ship to reach the port of survey, and it shall not sail from that port without new certificate.
5. The certificate shall cease to be valid in following cases:
  - If the relevant surveys has not been carried out within the specific periods.
  - If annual or intermediate surveys are not endorsed on the certificate.
  - If ship tanker is transferred to another state.

**Q-95) WHY INERT GAS NOT USED IN BUNKER TANKS?**

1. Generally, bunkers have a flashpoint of greater than 60 degree Celsius. It's quite comprehensible that in no way the ambient temperature of the bunker tanks are gonna go above 60 degree Celsius. If the bunker tanks cannot reach 60 degree Celsius, it cannot produce cargo vapours that are rich in hydrocarbons; thus no explosion can occur. And thus, inert gas is not being used in bunker tanks.
2. Explosions of tankers have occurred mainly during tank washing with water (Pre-IG ships) and the tanks were not inerted. It happens because of static electricity. In other words if bunker tanks have to be washed then we have to inert bunker tanks for safety.

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**Q-96) BUNKER LINE PRESSURE TEST?**

- Bunker line pressure test should be done with any liquid medium as according to Pascal's law, "Pressure at a point in a liquid is equal in all directions"
- Bunker lines are required to be tested at 1.5 times to their allowable operating pressure by placing them under a constant hydrostatic pressure load for a prescribed period of time (usually 5-10 minutes are sufficient).

**Procedure for Doing Test By Water:**

1. Fill in the bunker line with water, close all valves and pressurize to the stated max. allowable working pressure as stated in the vessel drawings.
2. Air will need to be vented out till only water is coming out from the highest and further most point in the system.
3. At the completion of reaching the pressure close, all the valves.
4. Monitor the pressure at the installed pressure gauge and ensure it is steady.
5. The pressure should maintain with 1 % drop for one hour.
6. Visually check the lines for signs of any leakages.
7. Open the drain line connected to the sludge tank (a flexible hose may be connected from this line to the standard discharge connection).
8. Blow the line till the line is clear of water.
9. Some section of water will be trapped between the dead-end porting between the main pipe and individual valves.
10. Open the valves and drain this water into the bunker tank.
11. This is negligible amount of water which should be drained from the settling tank after transfer.
12. Watch keepers to ensure 4 hourly draining from the settling and service tanks whenever the bunker line testing is done.

**Procedure for Doing Test by Fuel Oil:**

1. Close all the valves, which deliver fuel to port and starboard F.O. storage tank(s).
2. Change over the transfer pump to manual mode, when the level in settling tank is low.
3. Confirm the valve for filling the settling tank is open.
4. Open the valve to send the fuel on deck.
5. Make sure the independent valves for delivery is closed with blank.
6. Confirm by the walkie talkie all 3 in position and

7. Start the transfer pump. In the beginning the pressure is very low due the fuel escape to settling Tank.
8. The officer in filling valve should slowly start to close the valve, always monitoring the pressure in pump location and in deck line, with the other 2 officers.
9. When the safety valve opens, remove protector cover and slowly tighten the bolt of safety valve, observing carefully the pressure, until desired pressure is achieved.
10. Continue to close the valve easy till the pressure on deck is at the desired testing pressure; keep and secure the filling valve in this position for about 10 minutes.
11. The bunker pipelines should be thoroughly examined for any leakages
12. Monitor the level of settling tank to stop the pump before overflow.
13. After completion of the inspection readjust/loosen slowly the safety valve at maker's set pressure and reinstall the protector cover.
14. After completion of the testing stop the pump and return all the valves in normal position and change over the transfer pump to auto mode.
15. Testing pressure used and date must be stenciled on the bunker line on deck. Note that last date of both 100% MAWP and 150% MAWP must be stencilled

**Q-97) DISTANCE BETWEEN HYDRANTS AND PRESSURE ON SHIP, WHICH REGULATION?**

It comes under SOLAS Chapter-II, Part 2 , Part C, Regulation 10.2

The number and position of hydrants shall be such that

1. Atleast two jets of water not emanating from the same hydrant may reach any part of the ship.
2. One of which shall be from a single length of hose
3. Engine room hydrant - one on each side and one in tunnel.

And fire hoses length should be atleast 10 mt, 15 mt for machinery space, 20 mt on open deck, and 25 mt for open deck if ship length is more than 30 mt. The minimum diameter of fire hose must be 38 mm.

When dual purpose nozzles are used , they should be capable in jet setting to provide a throw of atleast 12 mt.

If used in spray setting, should provide a fine spray which can be used as a curtain to approach fire. The diameter of cone of spray would be 5 mt at a distance of 2mt from the end of nozzle.

**Q-98) NAME 3 DEFICIENCIES ON WHICH PSC CAN DETAIN THE VESSEL?**

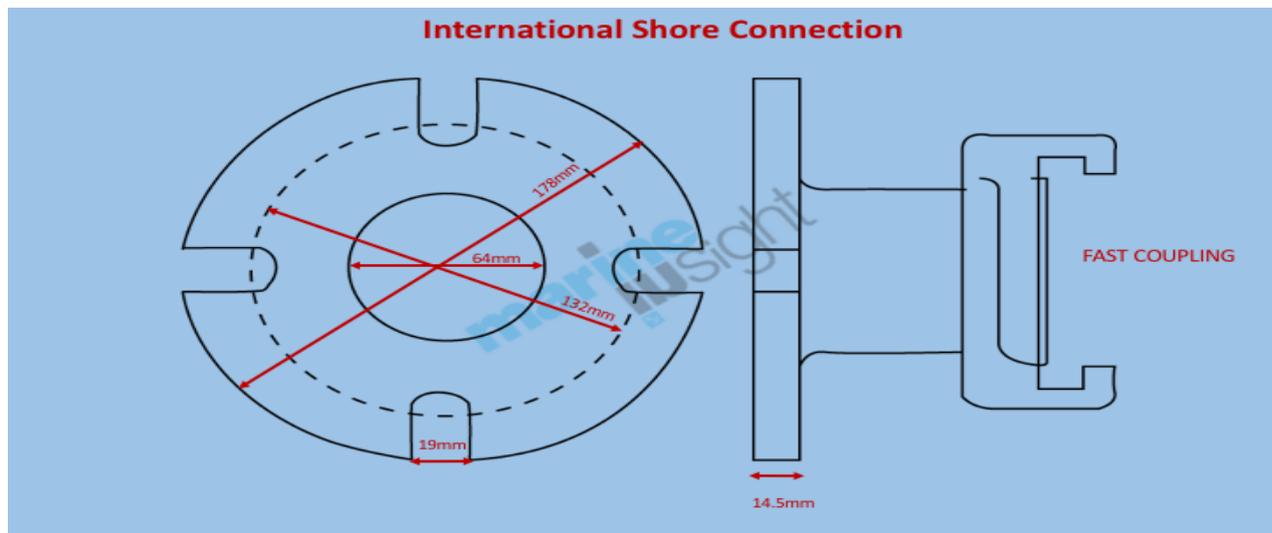
1. Structural defects in lifeboat
2. Inoperable fire pumps
3. Fire hoses missing or leaking
4. Inoperable oily water separator
5. Load line marks are not clear
6. Damaged Gangways
7. Engine room fire dampers not closing fully
8. Funnel flaps not closing fully
9. Emergency generator not coming on load

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**Q-99) INTERNATIONAL SHORE CONNECTION?**

The international shore connection is a universal hose connection that is to be provided on all ships as per the IMO SOLAS requirement. The purpose of the International Shore Coupling is to keep a standby hose attachment to get a connection from shore or from other ships for shipboard firefighting, in case there is a total failure of pumps onboard.

The international shore coupling SOLAS requirement under Chapter II-2, regulation 10.2.1.7 says; ships above 500 tons gross tonnage and upwards must have at least one international shore connection.



DESCRIPTION	DIMENSION
OUTSIDE DIAMETER	178 MM
INSIDE DIAMETER	64 MM
BOLT CIRCLE DIAMETER	132 MM
SLOTS IN FLANGE	4 HOLES 19 MM IN DIAMETER SPACED EQUIDISTANTLY ON A BOLT CIRCLE OF ABOVE DIAMETER, SLOTTED TO FLANGE PERIPHERY
FLANGE THICKNESS	14.5 MM
BOLTS AND NUTS	4, EACH OF 16 MM DIA, 50 MM IN LENGTH

**Q-100) CAN YOU TRANSFER SLUDGE OIL TO BILGE TANK? WHAT IS REGULATION?**

- No, we cannot transfer sludge oil to bilge tank.
- As there is an amendment adopted to the regulation 12 of MARPOL Annex 1 (MEPC 266 (68)) which entered into force on 1 January 2017.
- The amendments mean that oil residue tanks must have no discharge connection to the bilge system, oily bilge water holding tank, tank top or oily water separators.
- The sludge tank discharge piping and bilge water piping may be connected to a common discharge connection provided it does not allow for the transfer of sludge to the bilge system.

**Q-101) WHICH ONE IS FIRST CONVENTION? IMO OR SOLAS?**

1914: SOLAS First version came

1929: Second SOLAS version came

1948: Third version of SOLAS came

1948: IMCO adoption

1958: IMCO came into force

1960: Fourth version of SOLAS brought by IMO regarding maritime traffic, load lines, carriage of dangerous goods.

1967: Torrey Canyon Oil spill occurred

1973: Due to which IMO brought MARPOL in 1973 which was modified by the protocol of 1978

1974: New version of SOLAS came which came into force by the tacit acceptance procedure.

1982: Name of IMCO has been changed to IMO

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IMCO: Inter-governmental Maritime Consultative organisation

IMO: International Maritime Organization

**Q-102) WHAT IS STCW CODE AND WHAT IS STCW CONVENTION?**

STCW code is “Seafarer, Training, Certification and Watchkeeping.

STCW convention is “Standard of Training , Certification and Watchkeeping

**Q-103) DIFFERENCE BETWEEN EEDI AND EEOI?**

Both EEDI and EEOI measures the same thing which is the energy efficiency of the ship (the amount of CO2 emitted per tonne-mile)

But EEDI measures it by ship design and EEOI measures it by how efficiently ship is operated.

In the calculation of EEDI, the ship’s summer deadweight is taken into account whereas EEOI calculates the CO2 emitted for actual cargo carried during that period.

So two sister vessel will have the same EEDI but they may have different EEOI due to:

1. One ship’s hull may be cleaner than other.
2. One ship operating the equipments only when required like Aux engine.
3. One ship may be monitoring the weather more carefully and adjusting the speed and load on the engine.

**Q-104) SEWAGE TREATMENT PLANT VENT SPECIAL PROVISIONS?**

Marpol says in this case that design of STP is “upto the satisfaction of administration”

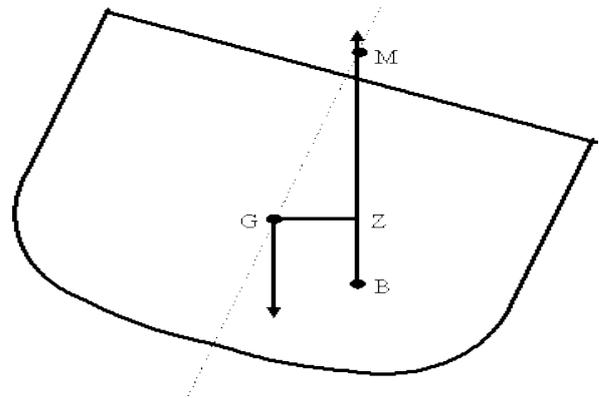
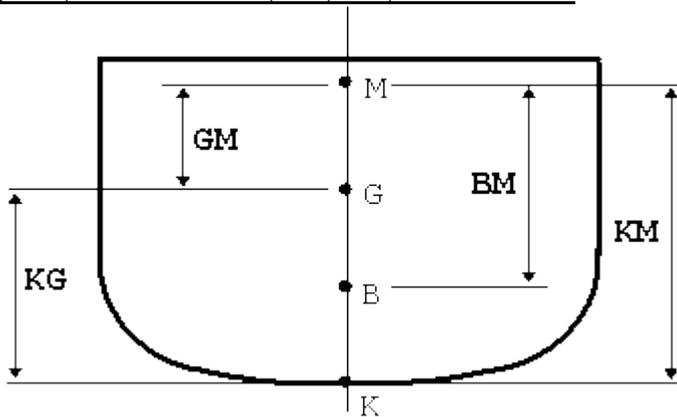
Some on the important points are as follows:

1. Flame gauge part is required to avoid gaseous mixture turning to fire (either flame gauge or steel mesh and 1m above ground)
2. The vent pipe of the unit should be installed with a slop to avoid blocking the piping by the condensed water.
3. The vent pipe should be placed where the air is not still and the top of the pipe should be bent downward so that water will not blow back from the sea into the tank

### Q-105) DIFFERENCE BETWEEN STIFF AND TENDER SHIP?

STIFF SHIP	TENDER SHIP
It has large GM because high-density cargo on the bottom and KG is very small.	It has small GM because most of the loading on top and KG is large.
It has a large righting lever.	It has a small righting lever.
In this ship rolls violently and irregular.	In this ship rolls smoothly and regular.
The time period to returns its original position is small.	The time period to returns its original position is large.
Very uncomfortable situation.	Uncomfortable but better than stiff ship situation.
Structural damage to the ship may occur due to racking.	Chances of having Structural damage to the ship is less.
Bulk cargo less likely to shift as the angle of roll is small, but loose gear will be thrown out.	This will create greater and more prolonged strain on cargo lashings and increase the risk of cargo shift, but to very less extent.
Severe stresses set up on the hull.	Less severe stresses set upon hull.

### Q-106) WHAT IS GM, GZ, KG, KM and BM?



- **KG - Height of the ship's Center of Gravity the above Keel:** This measurement is found in section II(a) of the DC Book for several conditions of loading. To find "KG" for loading conditions other than those in the DC Book, calculations must be performed.
- **KM - Height of Metacenter above the Keel:** This measurement is found by using the Draft Diagram and Functions of Form Curves located in section II(a) of the DC Book.
- **GM - Metacentric Height:** This measurement is calculated by subtracting KG from KM ( $GM = KM - KG$ ). GM is a measure of the ship's initial stability.
- **BM - Metacentric Radius:** The distance between the Center of Buoyancy and the Metacenter. It is actually the radius of the circle for the movements of "B" at small angles of heel.
- **GZ - Righting Arm:** The distance between the forces of buoyancy and gravity is known as the ship's righting arm. As shown above, the righting arm is a perpendicular line drawn from the center of gravity to the point of intersection on the force of buoyancy line.
- **RM - Righting Moment:** The Righting Moment is the best measure of a ship's overall stability. It describes the ship's true tendency to resist inclination and return to equilibrium. The Righting Moment is equal to the ship's Righting Arm multiplied by the ship's displacement.  $RM = GZ * Wf$

### Q-107) BULBOUS BOW LIMITATIONS?

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#### • Bad case for bulbous bow

- Fast ships
- Low block coefficient
- Sensitive at low wave steepness

#### • Better case for bulbous bow

- Slow ships
- High block coefficient
- Sensitive only a breaking waves

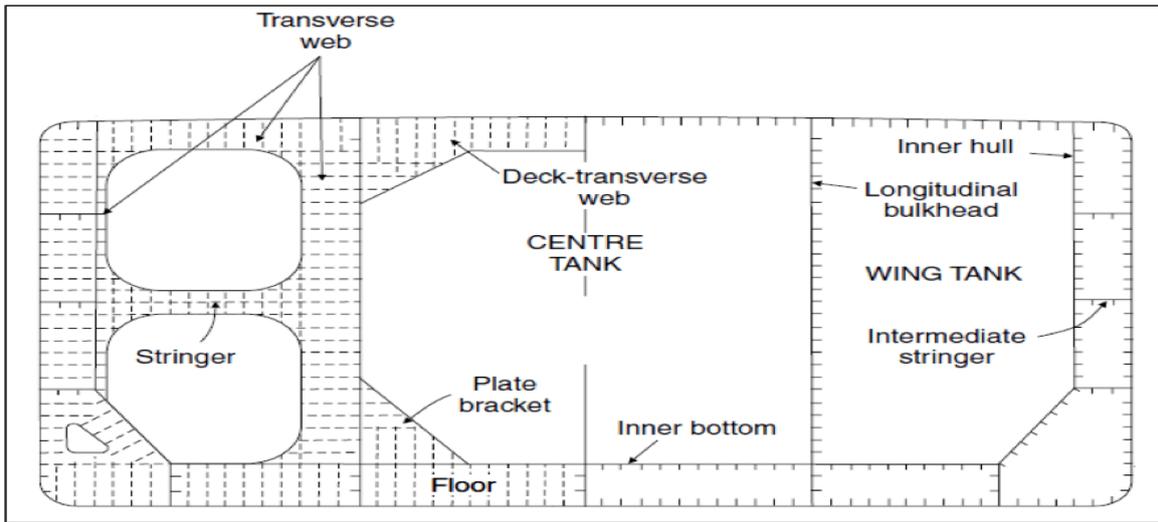
#### • Good application

- Large freighters with fixed schedule
- Container ships
- Liners / cruise ships

#### • Bad application

- Yachts
- High speed craft
- Small fishing vessels
- Towboats

**Q-108) TRANSVERSE CROSS-SECTION OF TANKER, HOW CARGO TANKS STRENGTHENED?**



- The above figure is the mid-ship section of a double hull tanker. The right half of the drawing shows an ordinary frame, where the outer and inner hull plates are longitudinally framed. The centre tank is used for storage of cargo oil, and the wing tanks or segregated ballast tanks (SBTs) are used for carrying sea water ballast. The SBTs are epoxy coated so as to prevent corrosion. Do observe that the longitudinal stiffeners on the wing tank longitudinal bulkhead are placed towards the wing tank, and not the centre cargo oil tank. Why? In order to prevent oil accumulation on them. The double bottom spaces are also used for water ballast, and the stiffeners on the inner bottom plating are always towards the double bottom space.
- *A deep transverse web frame (left half of the above figure) is given at every three to four frame spaces in order to provide transverse strength to the ship. The longitudinal stiffeners are welded to these web frames. Stringers are provided on these transverse webs to provide further strengthening.*

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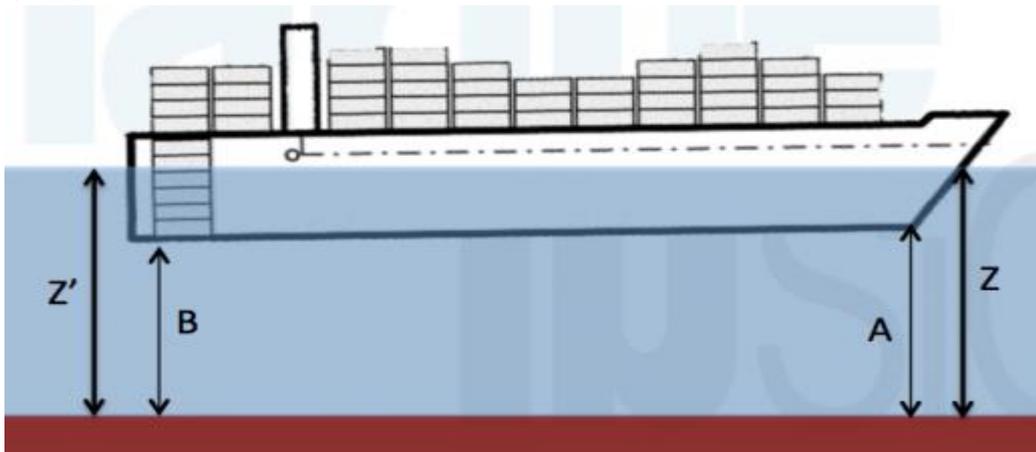
**Q-109) WHAT IS SHIP SQUAT?**

- Any ship (regardless of its size) navigating through restricted waterways is heavily affected by hydrodynamic effects.
- Ship squat is phenomenon which is observed when ship is lesser depth and water in forward tries to escape at higher velocity leading to drop in pressure on forward end and causes ship to squat i.e. sit down

Without going into anymore mathematical complexities, let us now understand the Squat Effect.

Let us consider the figure 2 of a ship in restricted waters:

A ship is plying in shallow water.



- If  $z$  and  $z'$  be the underwater clearance at fore and aft respectively, then obviously from the diagram it is evident that  $z > z'$ . Thus clearance under the keel at point A is greater than at point B. Now from the Continuity Equation we know that velocity of the flow of water (it is considered to be non-viscous and incompressible) at the stern is greater than that of the bow, or simply the flow is asymmetric.
- But Bernoulli's principle tells us that with increase in speed of flow at B, there is a decrease of all round pressure at B, which means that at B (at the stern) the ship will sink further and may touch the channel bed. If the vessel is trim by head, the bow will tend to sit in the mud because of less pressure. This is the Squat Effect.
- Squat effect increases doubly with speed. If the ship sinks  $x$  cm due to Squat Effect due to  $y$  speed then it will sink  $4x$  cm in  $2y$  speed.

- Thus to minimize squat, the pilot or the master of the ship has to maintain slow speed. If the pilot sees that with no considerable change in shaft speed, the vessel is slowing down, then the Squat is happening. He should immediately reduce the speed to minimize the Squat effect.

**Q-110) WHAT TO CHECK IN CHAIN LOCKER INSPECTION?**

Chain locker is an enclosed space so enclosed space permit is to be obtained and complied.

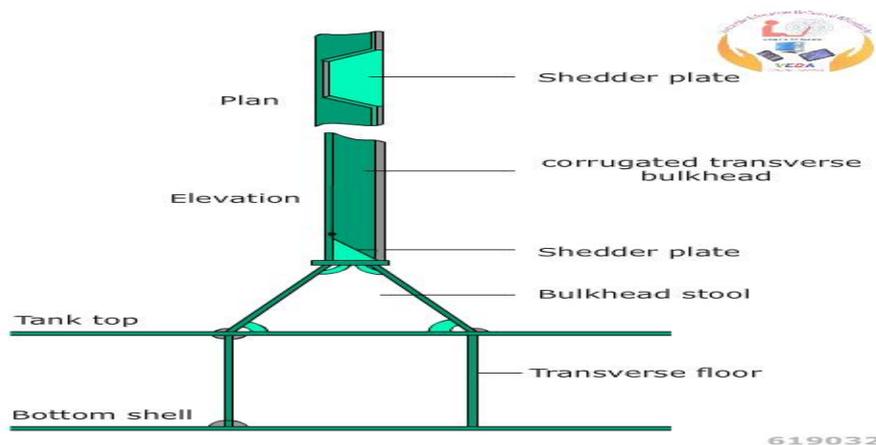
- Drop anchor and enter chain locker.
- Clean chain locker remove mud and silt deposit.
- Check mud box pumping system.
- After cleaning, check for signs of corrosion.
- Check bitter end of chain for signs of damage.
- Repaint chain locker with protective coating.

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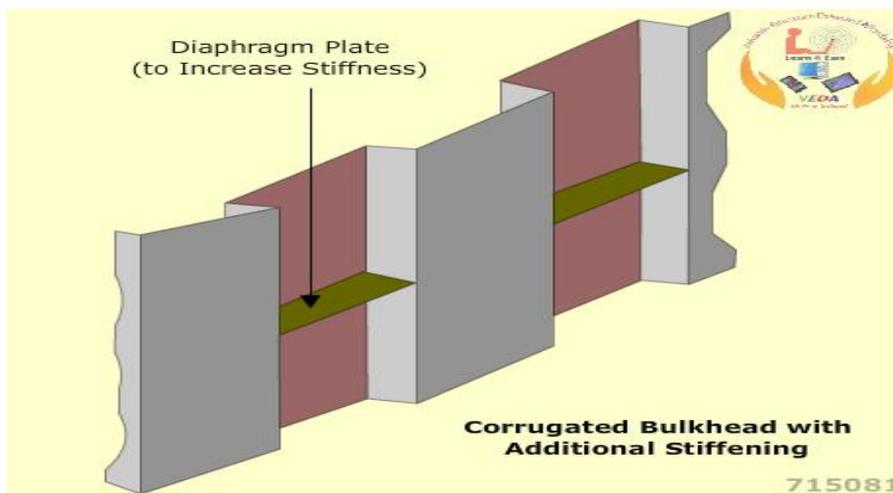
**Q-111) CORRUGATED BULKHEAD, PURPOSE, HOW IT TAKES STRESS?**

Corrugated bulkhead is used as the bulkhead of cargo hold compartment of the some kinds of vessels for having easier maintenance, easier loading and unloading and more flexible shape in shrinkage and expansion by thermal load compared to the flat stiffened bulkhead. Corrugated bulkheads can be commonly seen in bulk carriers, product oil carriers and chemical tankers.

Instead of stiffeners the bulkhead may be corrugated or swedged. The troughs are vertical in case of transverse & horizontal in case of longitudinal bulkhead. Corrugations are centred over the DB girders and placed over a watertight DB tank floor. Horizontal diaphragm plate is used in the trough to strengthen the bulkhead,

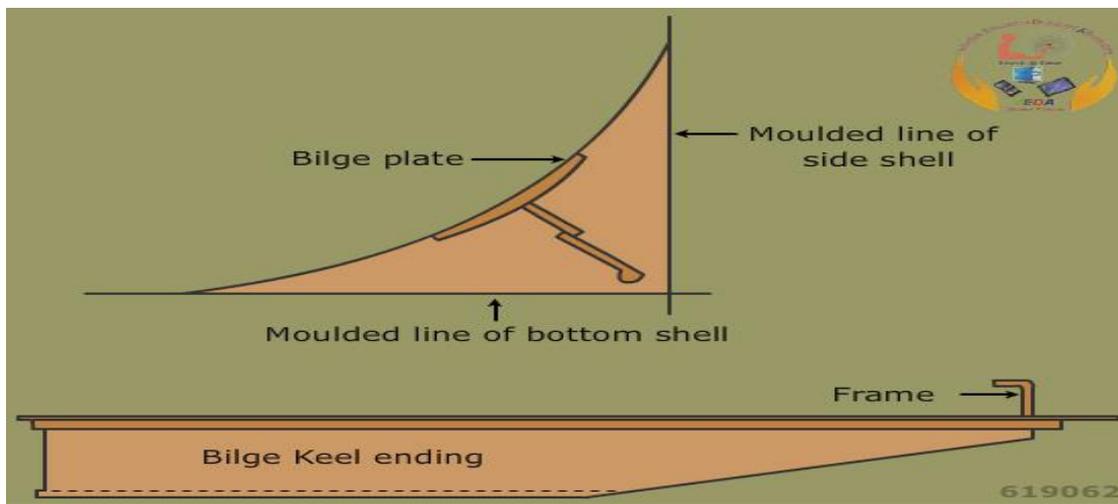


Reduced weight, smooth surface helps in cleaning cargo residues from bulkheads. Can withstand bending moments & pillar loads. In the case of corrugated bulkheads, the stiffening of the flange is made by the corrugation web.



**Q-112) BILGE KEEL?**

A longitudinal structure which runs along the length of the lower side of the ship's hull to reduce rolling motion.



Bilge keels are connected to the hull by a riveted angle or T-bar, which is strongly attached to the shell plating, but less strongly connected to the bulb-plate. If the bilge keel is ripped off, it will then part at the outer joint, leaving the hull intact.

### Q-113) ANTI-HEELING SYSTEM- HOW IT WORKS, CAPACITY OF THE TANKS?

The anti-heeling system of a ship automatically detects the heeling angle of the ship and compensates the same. This allows the vessels to have continues loading and unloading cargo operation without stopping in between for list correction. This saves considerable amount time on the port.

Working:-In this system, ballast tanks are internally connected to each other by means of pipe lines, automatic valves and control systems. When the ship heels to any of the sides, the heeling sensor sends the signal for change of ships angle with respect to the ship's upright position to the master control panel. This change in heeling angle is compensated by methods of auto transferring the water from the heeled side to the other side of the ship, making the vessel upright. Level control switches are also installed in the ballast tank involved with the anti-heeling system to avoid low level or over filling and hence over pressurising of the tanks.

#### Types:

- 1) **Pneumatic system:** This system comprises of air purging arrangement and regulating valve system to force the air on the top of ballast tank. The air is forced on one tank and purged from the other, making the water rapidly flow from pressurised to purged tank. This transfer of water is used to upright the vessel in quick time.
- 2) **Water pump system:** The pump system consists of electrical motor driven water pump, which can be a reversible or non-reversible pump, connected with remote controlled valves that can direct ballast water flow in between the tanks.

#### Advantages:

- Allows safer and rapid cargo loading and unloading.
- Shortens harbour time and saves port dues.
- Reduces damage to ramp, rolling cargo and containers.
- Ensures safety of the ship and personals.

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### Q-114) WHAT IS BREAST HOOK, SOLID FLOOR, SHEAR STRAKE, RISE OF FLOOR?

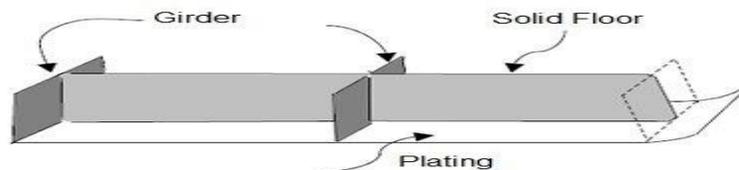
- **Breast hook:-** A triangular plate bracket joining structural members of the port and starboard sides at the stem.
- **Solid floor:** - These fitted to strengthen the bottom transversely and support the inner bottom. These run transversely from the continuous centre girder to the bilge, and manholes provided. - Lightning holes are cut in each solid plate floor.
- **Shear strake:** - Shear strake is the topmost strake of the Side shell plating. It is usually of higher thickness and strength than other strakes. This is because this strake can resist lot of physical damages during the life of ship.
- **Rise of floor:** - The rise of bottom shell plating line above base plane line, measured at the line of moulded beam. Or at the amidships region, the bottom of the ship is extended out to intersect the moulded breadth line. The rise or the height of this intersection above the keel is known as rise of floor or dead rise.

### Q-115) TYPES OF FLOOR AND WHERE FITTED?

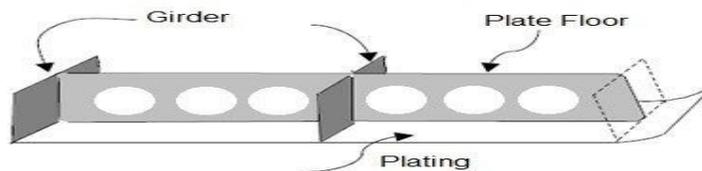
Basically floors are of three types:-

1. Solid floor
2. Plate floor
3. Bracket floor

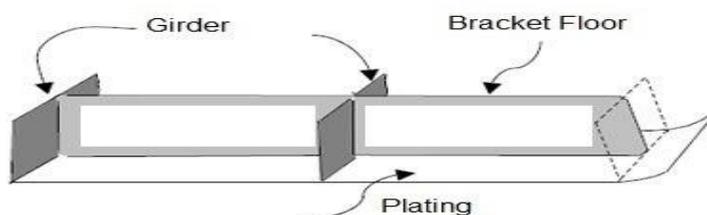
**Solid floor** :- Solid Floor is the one if the Stiffener/Floor plate is made of solid plate without any openings.



**Plate floor**: -Plate Floor is the one if the stiffener / floor plate is made of solid plate with openings. This is done to optimize weight and also to allow free flow of fluids based on the purpose of the floor plate / part of the ship (Like a tank).



**Bracket floor**: - Bracket floor is the one if the stiffener / floor plate is made of a built-up section with a large opening. This is also done to optimize the weight, provided where much strength / structural integrity is not required and also on the purpose of the area of the ship.



**Q-116) DIFFERENCE BETWEEN APPARENT SLIP AND REAL SLIP?**

**Apparent Slip**

Since the propeller work in water, the ship speed will normally be less than the theoretical speed. The difference between the two speeds is known as Apparent slip and is usually express as a ratio or percentage of the theoretical speed.

$$\text{Apparent slip} = \frac{\text{Theoretical speed } \{V_T\} - \text{ship speed } \{V_S\}}{\text{Theoretical speed } \{V_T\}} \times 100 \%$$

**Real slip or true slip**

This is the difference between the theoretical speed and the speed of advance, express as a ratio or percentage of the theoretical speed.

The real slip is always positive and it is dependent on current.

$$\text{Real slip} = \frac{\text{Theoretical speed } \{V_T\} - \text{speed of advance } \{V_A\}}{\text{Theoretical speed } \{V_T\}} \times 100\%$$

**Q-117) FREEING PORT, WHAT IS THIS AND WHERE LOCATED? HOW IT DIFFERS FROM SCUPPER?**

An opening in the lower portion of a bulwark, which allows deck water to drain directly overboard.

- Some freeing ports have hinged gates that allow water to drain overboard but that swing shut to prevent seawater flowing in board.
- But, Scuppers are a system of gravity deck drains and connected piping leading from scupper wells to the sideshell of the ship or to the bilge system.

**Q-118) WHAT IS ADMIRALTY COEFFICIENT?**

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A coefficient used in the preliminary estimations of the power required in a new design to attain the desired speed. Values range from 400 to 600, the higher the value the more economic the vessel.

$$C = \frac{D^{2/3} \cdot V^3}{P}$$

where: D = displacement in tons, V = speed in knots, P = shaft power in kW

### Q-119) ARRANGEMENT OF FORWARD STRENGTHENING?

At sea, the fwd part of shell plating is subjected to panting (movement like breathing in – breathing out) due to varying water pressure due to encountering waves and pounding due to slamming in heavy weather. These local stresses are considerably different and extra strengthening of forward shell plating is must. Hence construction within Fore Peak Tank differs from that of the rest of the ship. The cellular double bottom arrangement in the rest of the ship is discontinued in these tanks.

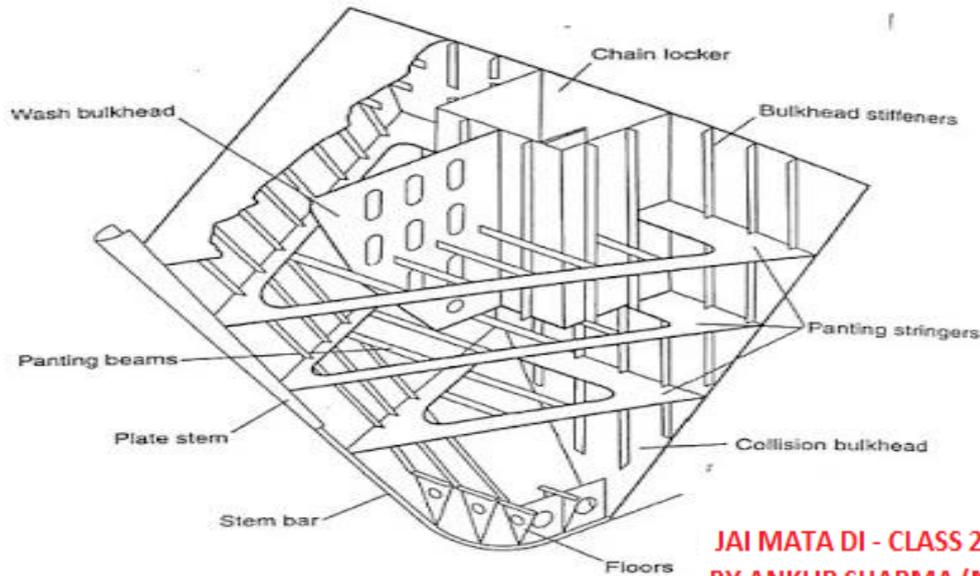
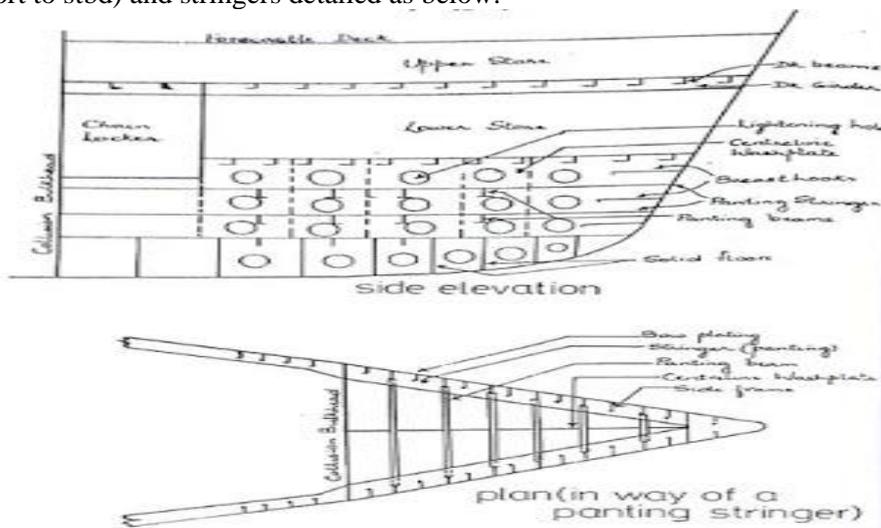


Figure 20.2 Fore end structure.

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**Pounding arrangement:** Solid plate floors are fitted at every frame space in the pounding region. Centre and side girders are extended fwd to few floors to resist the distortion of bottom due to slamming and it is discontinued as the width of bottom gets narrow.

**Panting arrangement:** Additional stiffening for panting is provided in the fore peak structure in form of panting beams (metal beams running port to stbd) and stringers detailed as below.



- Horizontal Side stringers spaced vertically about 2m apart and supported by panting beams are fitted at alternate frames.
- Panting beams are fitted to resist the in and out motion of shell plating either side of fore and aft line and connected to the frames by triangular brackets.
- They are supported by partial wash bulkhead at the centreline as required.
- Side stringers spaced vertically about 2m apart and supported by web frames or perforated flats spaced not more than 2.5m apart.
- Breast hooks are fitted between and at each level of panting stringer in the vicinity of stem.
- Collision bulkhead forms the aft most portion of the Fore peak tank. Usually, Port and Stbd chain lockers are fitted at the aft portion and at higher level. Anchor chains are stowed here and their bitter ends are secured at chain locker bulkhead which can be released in case of emergency. They must be marked properly.

### Q-120. WHAT IS A LIMBER HOLE AND WHY IT IS PROVIDED?

A small hole cut in a plate near the bottom of the frame or other structural member to permit the passage of water or oil.

### Q-121. TYPES OF GIRDER IN A SHIP?

- **Deck girder** – A continuous stiffening member which runs fore and aft along a ship to support the deck.
- **Double bottom girder** – A longitudinal, vertical plate extending from the bottom shell to the inner bottom, usually with large holes for access and weight saving (continuous centre girder, intercostal side girder).
- **Hull girder** – The components of a hull structure that contribute to its strength when subjected to longitudinal and/or transverse bending e.g. the shell plating, decks, inner bottom, longitudinals, bulkheads and girders.

### Q-122. WHAT IS CAMBER, SHEER AND FLARE? PURPOSE OF ALL THREE?

**Camber:** The transverse upward curve of the upper deck designed to enable the vessel to shed water overside easily. Also (rarely) called the belly of the deck. In America called the crown of the deck.

#### Purpose

- a) to facilitate drainage of water,
- b) Increase the resistance to deflection under load;
- c) Standard camber is parabolic and approximately 1/50th of the breadth of the ship. Modern ships have "dog-log" camber where they are level across the deck between the hatches then dropping in a straight line to the deck at side.
- d) the upper deck were to be constructed flat, the humps & hollows that occur due to welding distortion would delay complete drainage.

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**Sheer:** The longitudinal curve of the vessel decks in a vertical plane, the usual reference being to the ship side; in the case of a deck having camber, its centreline sheer may also be given in off sets. Due to the sheer, a vessel deck height above the baseline is higher at the ends than amidships.

Or

Sheer is the rise of the deck in a fore and aft direction. The amount of the sheer is measured vertically from a level line through the deck at the midship to the deck at the two perpendiculars.

#### Purpose

- a) To increase the reserve buoyancy at the ends of the vessel.
- b) To counter the immersion of the ends that may occur during pitching and is important particularly for smaller vessels
- c) To increase the "Seaworthiness of the ship, that is amount of water coming in on deck would be reduced
- d) since fore end is more susceptible to immersion than the aft end, "standard sheer is a parabolic curve with sheer twice that of sheer aft. Modern ships have straight line sheer, often in the fore body only, in some cases only over the forward one third ship's length. Sometimes, very large ships, the minimum bow height is achieved without the need for sheer, conversely, very small vessels may have very large sheer forward and aft

**Flare:** It is the outward curvature of the shell at the forward end of the ship.

#### Purpose

- a) It increases the reserve of buoyancy at the forward end to give better seaworthiness when pitching.
- b) water is dispersed away from the ship when lightly pitching (driver deck)
- c) creates it wider fore-castle deck, giving more spaces for the fitting off machinery such as the windlass
- d) allows it cleared up life of the anchor from the water, thus reducing hull damage by abrasion.

### Q-123) TPC IN DETAIL?

The Tonnes Per Centimetre Immersion (TPC) for any draft is the mass which must be loaded or discharged to change a ship's mean draft in salt water by one centimetre.

The TPC varies with the draught and with the water density. Changes in draught cause a change in displacement and the TPC assists in calculating the change.

$$TPC \text{ in sea water} = \frac{1.025 \times \text{Area of Waterplane}}{100}$$

$$TPC \text{ in fresh water} = \frac{\text{Area of Waterplane}}{100}$$

The above expressions give us some important results:

- TPC of a ship floating in water of uniform density, depends solely on the area of waterplane.
- The parallel sinkage resulting from a particular loading in fresh water would be more if the same loading was done in sea water.
- The crew must recalculate the predicted new drafts after loading or unloading when the ship moves from fresh water to sea or vice versa, to avoid unexpected observations.

**Q-124) STRUCTURAL DIFFERENCE BETWEEN BULK CARRIER AND OIL TANKER?**

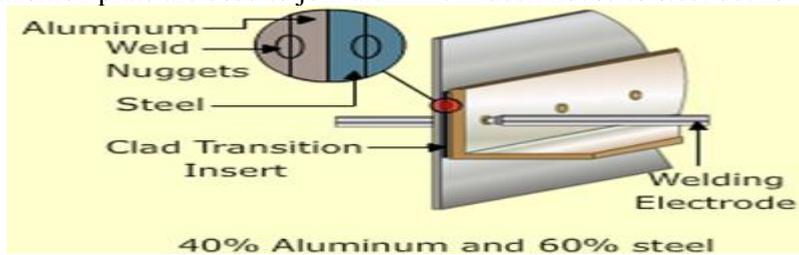
Structural Feature	Bulk Carrier	Oil Tanker
Cargo Hold openings	Large cargo hold openings	Small opening to enter cargo hold
Cargo Operation	By Ship/Shore gear, Sling, suit or conveyor	By pipe line
Appearance	Pipelines all around deck	Comparatively less pipelines
Cargo gear when fitted	Cranes, Derricks	Usually one or two mid ship cranes
Extra Machinery	Doesn't require extra machinery	Inert Gas, Separate pump room
Construction of Hull	Not Compulsory	Double Hull Compulsory
Cat walks	Fitted Athwart ship	Fitted longitudinally
Cargo Tank Cleaning	Easy	Comparatively different and COW washing
Company's permission	No need to obtain permission to enter in cargo hold. (Risk Assessment Carried out)	Permission from company is mandatory, (Risk Assessment Carried out)

**Q-125) ACCOMODATION MATERIAL AND HOW IT IS WELDED TO DECK?**

Accommodation material- aluminium alloy

A transition sheet comprising of pure aluminium and mild steel separated by polystyrene and is explosively bonded together, these sheets are used to separate aluminium and steel plate and weld nugget process is used to weld this sheet to aluminium and steel plate. The nugget is steel to steel on one side and aluminium to aluminium on another side. The latter is welded first.

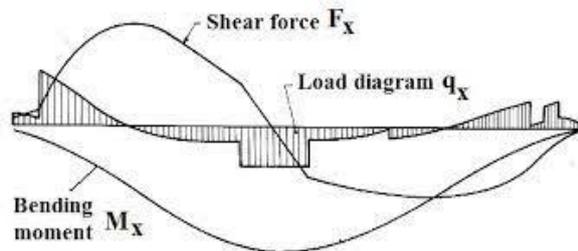
Explosive bonded transition plate are used to join aluminium deck house to steel decks.



**Note:** Modern welding technique like friction stir pot welding are being developed that will allow direct welding of steel to aluminium.

**Q-126) DRAW BENDING MOMENT AND SHEER STRESS DIAGRAM OF BALLAST SHIP IN EVEN CONDITION?**

There is a balance between the total downward forces of weight and mass acceleration, and the total upward forces of buoyancy and hydrodynamic reaction. For equilibrium conditions, the lines of action of these two forces should coincide. Because of the non-uniformity of the upward and downward forces, shear and bending moments are created.



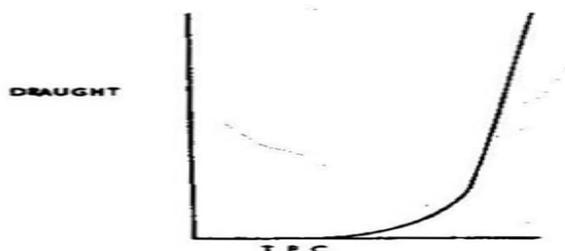
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**Q-127) HOW IS STERN FRAME ATTACHED TO BULKHEAD?**

Stern frame is a complete piece which is cast, forged or fabricated using steel plates and sections via cantilever beams.

**Q-128) TPC, GRAPH BETWEEN TPC AND DRAUGHT?**

The area between the TPC curve and the draught axis to any given draught represents the displacement of the ship at that draught, while its centroid represents the vertical position of the centre of buoyancy.



### **Q-129) DIFFERENCE BETWEEN PANAMAX, HANDYMAX, SUEZMAX AND CAPE SIZE?**

- **Panamax & New Panamax:**  
Panamax and New Panamax are terms used for ships that are designed to travel through the Panama Canal.
- **Handymax:**  
Handymax vessels, often classified as Handymax bulk carriers, are small sized cargo ships with load carrying capacity of up to 60,000 tonnes. One of the most commonly used vessels of the global merchant vessel fleet, Handymax vessels are typically 150-200 m in length. These vessels can gain easy entrance through most port and harbour facilities,
- **Suezmax:**  
The term Suezmax is used for the largest ship that can pass through the Suez Canal.
- **Capesize:**  
The term Capesize is used to signify those vessels which cannot pass through the canals of Panama and Suez and thus generally traverse through the Capes of Good Hope and Horn.

### **Q-130) WHICH PART OF SHIP HAS MORE RESISTANCE FORWARD OR AFT?**

AFT portion of the ship has more resistance.

As along the length of the hull, the laminar flow exists for very small distance and then converts to turbulence flow which creates boundary layer.

In the forward portion of the hull pressure forces acts normal to the surface. However, in the aft portion of the hull, boundary layer reduces the forward acting component of pressure. This reduction in forward acting component results in a net resistance force on the hull. This increase in resistance called viscous pressure drag.

### **Q-132) DIFFERENCE BETWEEN FLAME SCREEN AND FLAME ARRESTOR?**

#### **Flame Arrestor**

A permeable matrix of metal, ceramic or other heat resisting materials which can cool a deflagration flame, and any following combustion products, below the temperature required for the ignition of the flammable gas on the other side of the arrester. Its flame arresting mechanism is based on the principle of quenching. It is used to confine the fire within an area.

They are commonly used on:

- fuel storage tank vents
- fuel gas pipelines
- the exhaust system of internal combustion engines

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#### **Flame Screen**

A device comprised of a fine wire gauze that is fitted into the discharge end of a vent line. It prevents the passage of flame, but will allow vapour to pass through. It prevents the sparks from entering a tank for a short time, preventing the passage of flame. But it is capable of being ignited and of burning.

### **Q-133) PURIFIER ROOM SAFETIES?**

- All the pipes leading to the separator are to be double sheathed; the reason for this is that if inner pipe leaks, then it will not spray all over the place but instead it will leak into outer pipe.
- Drip trays should be provided below the purifier or separator, so that in case of oil spill the oil will not flow and spread in the purifier room and contact with any hot material and catch fire.
- All the pipes with flanges or connections are to be covered with anti spill tapes which can prevent spill from the flanges in case of a leakage.
- Fire fighting system such as water mist and CO<sub>2</sub> system should be installed.
- Quick closing valves and remote stopping of pumps and purifier should be provided.
- Fire detection and alarm system are to be provided so that quick action can be taken.

### **Q-134) EXPLAIN BLEVE?**

- A boiling liquid expanding vapour explosion (BLEVE) is an explosion caused by the rupture of a vessel containing a pressurized liquid that has reached temperatures above its boiling point.
- The cargo in the tanks of gas carrier is partially liquid and partially vapour in normal condition. However, when the tank structure collapses, the vapour tries to escape or leak through the opening, resulting in decrease in the pressure inside the tank. These drastic lowering of pressure inside the cargo tank results in rapid boiling of liquid and increase in vapour formation.

- The pressure of the escaping vapour becomes very high and leads to a shock wave or explosion in presence of a fire source, completely destroying the tanks structure and surrounding areas.

**Common Causes of BLEVE:**

- The most common reason which leads to BLEVE is fire near tanks containing gas cargo such as propane. Because of the high temperature of the surrounding, the tank temperature starts to increase and the inside of the tanks gets over pressurised. The high pressure inside the tank will be generally released by the relief valve.
- However, if the pressure builds up rapidly because of high temperature and high rate of heating in the surrounding, the tank will collapse at the weaker point, exposing pressurised and flammable vapour to the naked flame and leading to Boiling Liquid Expanding Vapour Explosion.

**BLEVE Warning Signs:**

- Ringing sound from the metal shell
- discolouration of the tank structure
- Flaking of small metal pieces
- Bubble or bulge on the tank surface
- A sudden increase in the tank pressure

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Reason for Failure of Tank Structure	Precautions to avoid BLEVE
<ul style="list-style-type: none"> <li>Improper maintenance of tanks</li> <li>Corrosion of the tank structure</li> <li>Relief valve of the tank is malfunction or stuck</li> <li>Mechanical damage to the tank</li> <li>Material failure</li> <li>Tank structure severely exposed to flame or fire</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance of the cargo tank at regular interval</li> <li>Relief valve to be functional at all time</li> <li>The size of the relief valve to be fitted should be as per the International Gas code</li> <li>Emergency preparedness of all ship staff</li> <li>Always think of safety first</li> </ul>

**Q-135) FIRE AND BALLAST PUMP AND EMERGENCY FIRE PUMP REGULATIONS?**



**Additional requirement on cargo ships for fire pump:**

- Total capacity does not need to be greater than 180m<sup>3</sup>/hr
- Each main fire pump for cargo ships shall have a capacity not less than 80% of the total required capacity divided by the minimum number of required fire pumps but not less than 25 m<sup>3</sup>/hr with at least discharge of water with 2 jets
- Each such pump should be able to deliver two jets of water simultaneously through 12 mm diameter nozzle with a horizontal throw of 13 meter from two different hydrants.
- With the two pumps simultaneously delivering through nozzles, the quantity of water, through any adjacent hydrants, the following minimum pressures are to be maintained at all hydrants:
  - ✓ vessels of 6,000 gross tonnage and upwards: 0.27 N/mm<sup>2</sup> (40 psi)
  - ✓ vessels of 1,000 gross tonnage and upwards, but under 6,000 gross tonnage: 0.25 N/mm<sup>2</sup> (37 psi)

**Regulation for emergency fire pump as per SOLAS?**

As per SOLAS Chapter II-2, part A regulation 4 all cargo ships of 2000 GT and above, and passenger ships of 1000 GT and above must have an emergency fire pump in a separate space other than the engine room where the main fire pumps are located.

- Can be fitted in the Steering flat
- Can be fitted in the Shaft tunnel
- Can be fitted in the Forward part of the ship (after collision bulkhead)

- It should be independently driven by a self cooled compression ignition engine or an electric motor driven by electric power from emergency generator.
- It must have own suction, total suction head should not exceed 4.5 meters under all conditions of list or trim.
- Pump capacity must *not less than 25m<sup>3</sup>/hr* and must be able to deliver two ½ inches bore jet of water having a horizontal throw not less than 40 ft.
- Fuel tank for engine shall contain sufficient fuel to run on full load for at least 3 hrs and reserve fuel for 15hrs, store outside the machinery space.
- The prime mover engine at that unit must be hand started and able to start by one man.
- If the pump is fitted above the water level, priming arrangement must be fitted.
- If diesel engine driven, (a) Easily started in cold condition (zero degree C by hand cranking ), (b) Fuel tank for engine shall contain sufficient to run on full load for at least 3 hrs and (c) Sufficient reserve fuel for 15 hrs, store outside the machinery space.
- If motor driven: emergency power supply heating arrangement to be provided.

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**Q-136) MAINTENANCE OF HYPER MIST?**

Alarm Test:

- Designated freshwater tank low level alarm shall be tried out by manually lowering the float.
- Electric source failure shall be tested by removing fuse from the control panel.

Line Test by Blowing Air:

- The whole piping system to be blown through with compressed air at a pressure of 7 to 8 bar.
- Check the free passage of air from the nozzles

**Maintenance of Hyper mist system**

To avoid any malfunctioning, for better operation and efficiency the system to maintain as per makers manual. We have to follow daily and periodic maintenance. Here we are discussing few points but for maintenance on ship refer your system manual.

<p><b><u>Daily</u></b></p> <ul style="list-style-type: none"> <li>• Control panel to be checked for any abnormal indication.</li> <li>• The alarm monitoring system to be checked for any abnormal indication.</li> </ul>	<p><b><u>Monthly</u></b></p> <ul style="list-style-type: none"> <li>• Pump operation to be checked. Running condition, water pressure, any abnormal noise or vibration.</li> <li>• Wire disconnection check and lamp tests to be carried out.</li> </ul>
<p><b><u>Every 6 month</u></b></p> <ul style="list-style-type: none"> <li>• Various alarm to be checked</li> <li>• If possible check the interlocks</li> </ul>	<p><b><u>Every year</u></b></p> <ul style="list-style-type: none"> <li>• Check the clogging of the nozzle. We can do it by air blowing.</li> <li>• Overhaul the pump unit, section valve, filter etc.</li> </ul>

**Q-137) FIRE IN PAINT LOCKER, WHAT TO DO? SAFETIES IN FIRE MAIN LINE?**

☞ *As per (SOLAS Reg. II-2/18)*

*Paint lockers and flammable liquid lockers shall be protected by an appropriate fire-extinguishing arrangement approved by the Administration.*

*Paint lockers and flammable liquid lockers of deck area 4m<sup>2</sup> and more shall be provided with a fire-extinguishing system enabling the crew to extinguish a fire without entering the space.*

***Fixed arrangements as specified below***

1. *CO<sub>2</sub> – system, designed for 40% of the gross volume of the space.*
2. *Dry-powder-system, designed for at least 0,5 kg powder/m<sup>3</sup>.*
3. *Water spraying system, designed for 5 l/m<sup>2</sup>, minimum.*
4. *Water spraying systems may be connected to the ship's main system.*
5. *Other systems than those mentioned above may be accepted.*
6. *For lockers of deck area less than 4 m<sup>2</sup> CO<sub>2</sub> or dry-powder fire extinguisher(s) may be accepted.*

**Safeties in Fire Main Line**

- **Relief valve:-** Relief valve is provided if pumps are capable of developing the pressure exceeding the design pressure of water service pipes, hydrants & hoses. It assists to avoid any overpressure to develop in any part of the fire main. The fire line is fitted with relief valve to prevent the damage to pipe in case , the V/L is fighting fire

with the help of shore while in dry-dock.

- **Drain Valve** :- Drain valve is fitted to drain the fire line when not in use & also prevent the damage to pipe due to icing, while V/L is operating in Sub-zero temperature area.

### **Q-138) WHAT ARE THE OTHER GAS WE CAN USE TO FIGHT FIRE IN FIXED SYSTEM?**

- Carbon dioxide (CO<sub>2</sub>)
- Argon - IG-01
- Nitrogen - IG-100
- HFC-125

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### **Q-139) WHAT IS SPONTANEOUS COMBUSTION?**

Spontaneous combustion is caused by the heating of the material to its auto ignition temperature. This happens in certain conditions when the surface area exposed to the air is low so that the dissipation of the heat cannot take place. The cause of the heating up has been identified as the oxidation of the material. If you take the example of oily rags as used in the engine room of merchant ships also in workshops and industries worldwide, they should be properly disposed off after use. Throwing the rags in a corner or in a heap is to invite trouble. When the rags are kept in a heap the rags in the center of the heap are being heated up but cannot release their heat to the environment, and they eventually catch fire

### **Q-140) EMERGENCY GENERATOR SOLAS REQUIREMENTS?**

1. Emergency generator and emergency switchboard should be located above the uppermost continuous deck.
2. Emergency switchboard should be in same place where the emergency generator is located.
3. Driven by a suitable prime mover with an independent fuel supply having flash point less than 43 degree Celsius.
4. Should be capable of giving power to the cargo ships for atleast 18 hrs and passenger for atleast 36 hrs.
5. Emergency generator should be easily started at zero degrees and if temperature is below this, heating arrangement should be provided.
6. It should come on load automatically within 45 seconds after the failure of main power supply.
7. Should give full rated power, when ship is upright and when inclined at any angle of list up to 22.5 degrees or inclined 10 degree either aft or forward.
8. Should have automatic starting system:
  1. Primary means is Battery: capable of providing 3 consecutive starts.
  2. Secondary means is either pneumatic, hydraulic or mechanical: capable of providing 3 consecutive starts within 30 mins.

### **Q-141) WHAT IS CBA? (WHAT IS DECIDED AND WHO DECIDES)?**

This Collective Bargaining Agreement (CBA), (hereinafter the "Agreement") sets out the standard terms and conditions applicable to all Seafarers serving on any ship of which there is in existence a Special Agreement made between International Transport Workers' Federation (hereinafter the "ITF") and the owner or operator (hereinafter the "Company").

In CBA following items are decided:

Duration of Employment, Hours of duty, Overtime, Holidays, Rest periods, Wages, Leaves, Allotments, Watch-keeping, Repatriation.

### **Q-142) DIFFERENCE BETWEEN IBC AND BCH CODE?**

1. Both IBC and BCH codes apply to the chemical tanker.
2. Both these codes provide an international standard for the safe carriage in bulk by the sea of dangerous chemicals and noxious liquid substances.
3. Both these codes prescribe the design and construction standards of ships and the equipment they should carry, with due regard to the nature of the products involved.
4. But the main difference between these codes lies in its applicability. The BCH code is applicable to the chemical tankers built before 1 July 1986. The IBC code is applicable to the chemical tankers built after 1 July 1986.
5. BCH code was not mandatory for long, but IBC code was mandatory from the start.

### **Q-143) EXPLAIN IBC CODE?**

Carriage of chemicals in bulk is covered by regulations in SOLAS Chapter VII - Carriage of dangerous goods and MARPOL Annex II - Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk. Both Conventions require chemical tankers built after 1 July 1986 to comply with the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code).

The IBC Code provides an international standard for the safe carriage in bulk by sea of dangerous chemicals and noxious liquid substances listed in chapter 17 of the Code. To minimize the risks to ships, their crews and the environment.

(Note: Also refer Q-25)

### Q-144) NAME FOUR CODES AND FOUR CONVENTIONS WITH YEAR?

CONVENTION	CODE
International convention on safety of life at sea (SOLAS) - 1974	<b>ISM Code(International Safety Management Code – 1998</b>
International convention for prevention of pollution at sea (MARPOL) – 1973	<b>ISPS Code</b> The International Ship and Port Facility Code- <b>2004</b>
International convention on Load Lines - 1966	<b>IMDG Code (International Maritime Dangerous Goods) – 1965</b>
International convention on Tonnage measurement of ships -1969	<b>IBC Code(International code for construction and equipment of ships carrying dangerous chemicals in bulk – 2007</b>

### Q-145) WHAT IS POLAR CODE?

The mandatory Polar Code, for ships operating in Arctic and Antarctic waters, enters into force in SOLAS on 1 January 2017.

The Polar Code includes mandatory provisions covering safety measures (part I-A) and pollution prevention measures (part II-A) and additional guidance regarding the provisions for both (parts I-B and II-B).

The safety provisions of the Polar Code will apply to new ships constructed after 1 January 2017. Ships constructed before 1 January 2017 will be required to meet the relevant requirements of the Polar Code by the first intermediate or renewal survey, whichever occurs first, after 1 January 2018.

The environmental provisions of the Polar Code apply both to existing ships and new ships.

The Code will require ships intending to operate in the defined Arctic waters and the Antarctic area to apply for a Polar Ship Certificate, which would classify the vessel as either:

- Category A – ships designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions
- Category B – a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions
- Category C – a ship designed to operate in open water or in ice conditions less severe than those included in categories A and B.

### Q-146) DRY DOCK PREPARATION AS A 2<sup>ND</sup> ENGG?

1. Make a repair and maintenance list, create or obtain a drydock handbook if required, and assign responsible ship staff to their duties on the list. Divide staff into groups to oversee the work carried out by yard gangs.
2. All spare parts must be checked and repair items kept ready for use.
3. Previous dry dock reports should be studied and previous clearance measures noted.
4. Clean engine room tank top and bilges.
5. Prepare sewage treatment tanks, dirty oil tanks and bilge tanks.
6. Flushing of bilge lines is to be carried out prior to dry dock.
7. The oil-water separator filter element should be renewed and the system checked for satisfactory operation.
8. For tankers, all cargo tanks are cleaned and gas freed.
9. Minimum bunkers (Fuel Oil and Fresh water) and ballast carried.
10. All heavy weights secured prior to dry dock.
11. All tanks and cofferdams must be sounded and recorded.
12. Fire fighting plans and safety measures discussed before dry dock
13. Fire fighting equipment on board should be checked and kept ready for use.
14. Emergency lighting and generator should be tested before entry.
15. Escape routes must be clearly marked.
16. All valves and chests to be overhauled must be clearly marked.
17. Shore connections for cooling water and fire line are to be readied.
18. Main engine, generators, and boiler are changed over to diesel oil.
19. CO2 total flooding systems are secured and locked before entry.
20. Vessel must approach dock with even keel.

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### **Preparation of Documents:**

1. The necessary plans , drawings , instruction manuals , service records of previous docking to be collected and kept ready . Copy of plans and drawing to be sent to dockyard on request.

2. List and intend the followings to be supplied in time
3. Needful machinery spares repair materials for ship staff's job
4. Paints
5. Collect and keep ready for special tools and devices
6. Issued needful instructions for safety , fire precaution and pollution prevention.
7. Issue assignments for the work to be done before entering dry dock and to be undertaken by E/R staffs under 2nd Engineer supervision.

**Q-147) DIFFERENCE BETWEEN SURVEY, AUDIT AND INSPECTION?**

- Inspection is a check of PHYSICAL condition of an item, such as inspection of Lifeboat or extinguishers (which you need to carry out physically).
- Audit focuses on past activities, detects faults, focuses on operations, system operation and documentation. Audits are not very thorough.
- Survey focuses on future activities so that the equipment continues to function in future. It focuses on physical status (eg. a machinery which should be working in order for the survey to clear). Survey is more thorough in nature.

**Q-148) DIFFERENCE BETWEEN MEPC AND MSC?**

MEPC: In order to ensure that a proactive stance is taken by in order to protect and safeguard the interests of the marine environment and ecosystem, the IMO has established the **Marine Environment Protection Committee** (MEPC). The IMO MEPC convenes every nine months over a five-day period to discuss and come to a consensus about the most pressing matters in terms of marine environment protection.

The Maritime Safety Committee (MSC) is the highest technical body of the International Maritime Organization (IMO). All Member States can sit on this committee. The functions of the Maritime Safety Committee are to consider any matter within the IMO's scope that is concerned with:

- aids to navigation
- construction and equipment of vessels
- manning from a safety standpoint
- rules for the prevention of collisions
- handling of dangerous cargoes
- maritime safety procedures and requirements
- hydrographic information
- log-books and navigational records
- marine casualty investigations
- salvage and rescue
- ships and port security
- piracy and any other matters directly affecting maritime safety.

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**Q-149) WHAT IS HONGKONG CONVENTION?**

The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (the Ship Recycling Convention or the Hong Kong Convention) was adopted in May 2009. After the entry into force of the Convention, the development and maintenance of an Inventory of Hazardous Materials, which identifies the amount and location of hazardous materials onboard a ship, will be required for all ships over 500GT. Furthermore, ships shall only be recycled at ship recycling facilities authorized by the competent authority. The Convention will enter into force 24 months after the date on which the following conditions are met:

1. Ratification by 15 States,
  2. Representation by 40 per cent of world merchant shipping by gross tonnage, and
  3. A maximum annual ship recycling volume not less than 3 per cent of the combined tonnage of the ratifying States
- As of November 2020, Norway, Congo, France, Belgium, Panama, Denmark, Turkey, Netherland, Serbia, Japan, Estonia, Malta, Germany, Ghana and India have acceded to the Convention.

The Convention is aimed at ensuring that ships, when being recycled after reaching the end of their operational lives, do not pose any unnecessary risks to human health, safety and to the environment.

## **Q-150) WHAT ARE SURVEYS CARRIED OUT BY CLASSIFICATION SOCIETY?**

### **To maintain a ship in the class:**

- The owner must carry out regular surveys of hull, machinery and equipment.
- Carry out repairs necessary from time to time, under the supervision of Class Surveyors.

### **Statutory Survey:**

- Carried out by Administration regarding the safety of the ship, sea worthiness and pollution, in accordance with national and international rules.
- Issued a certificate, this is essential to the ship's ability to trade.
- If Statutory Survey is not certified, the ship can be detained.

### **Statutory Surveys are:**

- International tonnage survey
- International load line survey 5 years interval
- Cargo ship safety construction survey 5 years
- Cargo ship safety equipment survey 2 years
- Cargo ship safety radio survey 1 year
- Marpol IOPP & IAPP survey 5 years

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### **Classification Survey:**

- Carried out by Classification Surveyor, to ensure that the ship has both structural and mechanical fitness, for intended voyage, in accordance with the class requirements.
- A classification survey is a visual examination that normally consists of:
  - an overall examination of the items identified in the Rules for survey;
  - detailed checks of selected parts, on a sampling basis;
  - Witnessing tests, measurements and trials where applicable.

## **Q-151) DIFFERENCE BETWEEN STATUTORY AND CLASSIFICATION SURVEY?**

- Statutory surveys are not assessing or measuring something for a client.
- Statutory survey will inspect something against a set standard or law.
- On completion of this survey, the ship is issued with a certificate, which is essential to the ship's ability to trade.
- Class cannot go to the ship unless requested by the owner, or unless the ship is detained by the Port State Control.

### **Why Classification Societies sometimes issue the Statutory Certificate?**

Sometimes Administration delegates the authority, to the Classification Society to inspect and issue Certificates, on their behalf, regarding statutory requirements.

## **Q-152) FUEL OIL DOUBLE BOTTOM TANK, PREPARE FOR SURVEY?**

### **FO DB Tank Survey:**

Transferring, cleaning and gas freeing must be done.

Testing of atmosphere:

- Toxicity
- O<sub>2</sub> content with Oxygen Analyser
- Explosive Gases with Explosimeter
- Gas free certificate from Chemist.

### **Survey:**

1. Heating coil leak test: [1.5 times working pressure.]
2. Condition and testing of level alarm
3. Condition of sounding pipe, striker plate and flame trap
4. High temp. alarm sensor
5. Internal inspection by surveyor.

### **Sounding pipe requirements:**

1. Used to determine the depth of liquid in a tank.
2. Should be as straight as possible.
3. If it is not possible, pipe curvature should allow easy passage of sounding rod or chain.
4. Normally, bore of pipe must be not less than 32mm.
5. Striking pad of adequate size and thickness placed under the pipe.

### **Q-153) PROCEDURES AND ARRANGEMENTS MANUAL?**

#### **Annex 2, Regulation 14, Procedures and Arrangements Manual**

Every ship certified to carry substances of category X, Y or Z shall have on board a Manual approved by the Administration. The Manual shall have a standard format in compliance with appendix 4 to this Annex. In the case of a ship engaged in international voyages on which the language used is not English, French or Spanish, the text shall include a translation into one of these languages.

The main purpose of the Manual is to identify for the ship's officers the physical arrangements and all the operational procedures with respect to cargo handling, tank cleaning, slops handling and cargo tank ballasting and de-ballasting which must be followed in order to comply with the requirements of this Annex.

#### **Benefits**

- Master will have a guidance with respect to the arrangements and equipment required to enable compliance with MARPOL Annex II and will identify all operational procedures with respect to cargo handling, tank cleaning, slops handling, residue discharging, ballasting and deballasting
- All latest legislation will be included
- Procedures as per vessel specific arrangements
- Already approved by most Administrations and ROs

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### **Q-154) DIFFERENCE BETWEEN CARGO SHIP SAFETY CONSTRUCTION AND CARGO SHIP SAFETY EQUIPMENT CERTIFICATE?**

<b>Cargo ship Safety Construction Certificate:</b>	<b>Cargo ship Safety Equipment Certificate:</b>
<ul style="list-style-type: none"><li>• Issued after survey to every cargo ship of 500 GRT and over, by the government of Flag State.</li><li>• Validity is 5 years, subjected to survey at specified intervals.</li></ul> <p>During survey, following items must be in accordance with the requirements of SOLAS 1974 Convention.</p> <ol style="list-style-type: none"><li>1. Ship structure, including structural fire protection.</li><li>2. External examination of ship's bottom.</li><li>3. Electrical installation.</li><li>4. Steering gear.</li><li>5. Pressure vessels and fitting.</li><li>6. Main and auxiliary machinery.</li></ol>	<ul style="list-style-type: none"><li>• Issued after survey to every cargo ship of 500 GRT and above, by the government of flag state.</li><li>• Validity is 2 years and annual inspection of <math>\pm</math> 3 months.</li></ul> <p>Safety Equipment Survey, consists of inspection and demonstration:</p> <ol style="list-style-type: none"><li>1. Fire fighting appliance, FFA</li><li>2. Life saving appliance, LSA</li><li>3. Navigation equipment</li><li>4. Vessel documentation</li><li>5. Alarm system.</li></ol>

### **Q-155) WHAT IS CERTIFICATE OF REGISTRY?**

This is the trading certificate issued to the ship by the flag state. This is the certificate that defines the nationality of the ship. This certificate also has the port of registry information.

The details in the certificate of registry of the ship has the:

- Port of registry of the ship
- Name and address of the ship owner
- Basic ship particulars like Length overall, Breadth, gross tonnage etc

For a ship to qualify for registration in a particular country, the ship owners need to meet the conditions set by that country.

### **Q-156) WHAT IS EPIRB? HOW DOES IT OPERATE?**

- Emergency Position Indicating Radio Beacon is a compact, buoyant, self-contained radio transmitter.
- As per SOLAS minimum 1 number has to be carried and as per DG Shipping min 2 on Indian vessel.
- It is located on the bridge wing attached with HRU.
- Capable of floating free and is automatically activated in the event of ship sinking.
- It emits a distinctive radio signal for a minimum of 48 hours.
- It is used to alert search and rescue services in the event of an emergency.
- It does this by transmitting a coded message on the 406.5 MHz distress frequency.
- Some EPIRBs have built in GPS which enables the rescue services to accurately locate you to +/- 50 metres
- 406 MHz EPIRBs work with the Cospas-Sarsat polar orbiting satellite.

### **Q-157) WHAT IS SART? LOCATION? FUNCTIONING?**

- A search and rescue transponder is the main means for locating ships in distress or their survival craft.
- As per SOLAS minimum 2 number has to be onboard.
- It is mounted in a mounting bracket which in turn is fixed to the bulkhead of the ship.
- It operates in the 9 GHz frequency band (ie. 9.2 to 9.5 GHz) and generates a series of response signals when being interrogated by any ordinary 9 GHz ship borne 3 cm X band radar.
- It generates a line of 12 blips code on a radar screen outward from the SART's position.
- The spacing between each dot will be 0.6 nautical mile.
- As the search craft approach to within 1 nautical mile of the SART, the blips code will change into wide arcs and even become complete circles as the SART is closed.
- SART also provides visual and audible indication when it is interrogated by radar.
- Audible beep will sound every 2 seconds when it is interrogated by radar, else 12 seconds when no radar in sight.
- It should have battery capacity of 96 hours in standby and 8 hours when interrogated by radar.

### **Q-158) SURVIVAL CRAFT DEFINITION AS PER SOLAS? TYPES OF LIFEBOAT?**

It is a craft capable of sustaining the lives of persons in distress from the time of abandoning the ships.

Lifeboat and Liferaft both are survival craft.

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There are three types of lifeboats used on merchant vessels:

#### **Open Lifeboat:**

As the name suggests, the open lifeboat has no roof and is normally propelled by manual power by using hand propelled oars. Compression ignition engine may also be provided for the propulsion purpose. However, open lifeboats are becoming obsolete now because of stringent safety norms, but one may find them on older ship.

The open lifeboat doesn't help much in rain or bad weather and the possibility of water ingress in the highest.

#### **Closed lifeboat:**

Closed lifeboats are the most popular lifeboats that are used on ships, for they are enclosed which saves the crew from sea water, strong wind and rough weather. Moreover, the water tight integrity is higher in this type of lifeboat and it can also get upright on its own if toppled over by waves. Closed lifeboats are further classified as – Partially enclosed and fully enclosed lifeboats.

#### **Free fall life boat:**

Free fall lifeboat is similar to an enclosed lifeboat but the process of launching is entirely different. They are aerodynamic in nature and thus the boat can penetrate the water without damaging the body when launched from the ship. The free fall life boat is located at the aft of the ship, which provides a maximum clear area for free fall.

### **Q-159) LIFEBOAT REGULATIONS AS PER SOLAS?**

1. The size, number and the capacity of the lifeboat for a merchant vessel is decided by the type of the ship and number of ship's crew, but it should not be less than 7.3 m in length and minimum two lifeboats are provided on both side of the ship (port and starboard).
2. The requirement for lifeboat of a cargo ship with 20,000 GT is that the boat must be capable of launching when the ship is heading with a speed of 5 knots.
3. The lifeboat must carry all the equipments described under SOLAS which can be used in survival at sea. It includes rations, fresh water, first aid, compass, distress signalling equipments like rocket etc.
4. The ship must carry one rescue boat for rescue purpose along with other lifeboats. One lifeboat can be designated as a rescue boat if more than one lifeboat is present onboard ship.
5. The gravity davits must be hold and slide down the lifeboat even when the ship is heeled to an angle of 15 degree on either side. Ropes are used to hold the lifeboat in stowed position with cradle. These ropes are called gripes.
6. The wires which lift or lower the lifeboat are known as falls and the speed of the lifeboat descent should not be more than 36m/ min which is controlled by means of centrifugal brakes.
7. The hoisting time for the boat launching appliance should not be less then 0.3 m/sec with the boat loaded to its full capacity.
8. The Lifeboat must be painted in international bright orange color with the ship's call sign printed on it.
9. The lifeboat station must be easily accessible for all the crew members in all circumstances. Safety awareness posters and launching procedures must be posted at lifeboat station.
10. Regular drills must be carried out to ensure that the ship's crew members are capable of launching the boat with minimal time during real emergency.

### **Q-160) SPECIALITY OF TANKER LIFEBOATS?**

1. Self rightening, fully enclosed.
2. Self contained air system (Oxygen bottle)
3. Fire protected lifeboat (Sprinkler system)

### **Q- 161) WHAT ALL WE CARRY IN LIFEBOAT?**

Sufficient buoyant oars	EPIRB	Tow line	First Aid Kit
2 boat hook.	SART	Anti-sea sickness tablets	Tools
2 Buckets	Food Ration.	1 set of fishing tackles.	Compass
6 Hand Flares	1 knife and	Waterproof torch	Sea Anchor
2 Rocket parachutes	3 tin opener.	Day light signalling lamp.	1 Whistle
2 smoke signals.	Hand Pump	Radar reflector	Portable fire extinguisher
			Thermal Protective aid

### **Q-162) REGULATION FOR LIFEBOAT ENGINE?**

1. Lifeboat shall be powered by a compression ignition engine. No life boat engine can be used if the fuel used in it has a flash point of 43 degree C or less. The lifeboat engine can either be two stroke or four-stroke type, and can be started either by hand or by power. Power starting can be by using accumulator batteries or hydraulic.
2. In power starting, normally two independent rechargeable energy sources are provided. However, any starting method should be capable of starting engines at 15 degrees C of ambient temperature within two minutes of commencing of starting procedure.
3. The engine power is transmitted to propeller through gearbox. The gearbox is capable of disengaging the engine as well as engaging in either ahead or astern direction.
4. The engine on starting should be allowed to run at slow speed, with propeller shaft disengaged. When the engine warms up, engine revolutions are increased gradually. The exhaust pipe outlet is located well clear of waterline. The engine, its accessories and gearbox is enclosed in fire retardant casing.
5. Essential tools such as shifter, screw driver, spanner, cranking levers etc. are kept in lifeboat at all times and should never be removed from lifeboat.
6. Engine should be capable of operating for not less than 5 minutes after starting from cold, with lifeboat out of water.
7. A fully loaded lifeboat in calm water has an engine speed of 6 knots and enough fuel for 24 hours. When towing the biggest liferaft it makes good a speed of at least 2 knots. Before lowering lifeboat, battery-charging connection should be disconnected, if provided.
8. Lifeboat engine operation will not interfere with the operation of radio life-saving appliances.

### **Q-163) LIFEBOAT LOWERING PROCEDURE? WHAT IS ONLOAD AND OFFLOAD RELEASE?**

1. Minimum of 5 persons is required to lower the L/B.
2. One person goes inside the L/B and passes the end of toggle painter and plugs the drain.
3. Check all lifeline and falls are clear of L/B.
4. Make fast the other end of toggle painter on a strong point forward of the ship.
5. Remove forward and aft gripes and both person stand by for passing bowing tackle and tricing pendant.
6. Remove harbour safety pin.
7. Make sure the ship's side is free of everything, no water or garbage is there.
8. Now, one person lift's the dead mans handle slowly which releases the brake.
9. The boat along with cradle sides downward till it comes to the embarkation deck.
10. By pulling tricing pendant , bring it alongside the embarkation deck.
11. Persons embark inside the boat.
12. Now, tricing pendant is removed and the whole load comes on falls.
13. Now, boat is further lowered with deadman's handle.
14. As soon as the boat comes around 1meter above the sea-water, it can be released.

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#### **Off load mechanism:**

The off load mechanism releases the boat after the load of the boat is transferred to water or the boat has been lowered fully into the sea. When the boat touches the surface of water, the load on the fall and hence the hook releases and due to its mechanism the hook detaches from the fall. If the detachment dose not takes place, any of the crew members can remove the hook from the fall. Most of the times the offload mechanism is manually disengaged in case of malfunction; however, in case of fire, it is dangerous to go out and release the hook.

#### **On load mechanism:**

On load mechanism can release the lifeboat from the wire, with the ship above the water level and with all the crew members inside the boat. The load will be still on the fall as the boat would not have touched the water. Normally the height of about 1 m is kept for the on load release, so that the fall is smooth without damaging the boat and harming the crew inside. A lever is provided inside the boat to operate this mechanism. As the lever is operated from inside, it is safe to free the boat without going of the out lifeboat, when there is a fire on ship.

## Q-164) LIFERAFT LAUNCHING PROCEDURE?

### **Manual Launching Procedure of Life raft:**

1. Check that one end of the painter of the raft is well secured to a strong point on ship's deck or structure.
2. Remove the lashing from the container of the raft and open the way to portable rail if available.
3. Check the ship side where the raft to be launched is clear.
4. Two people should lift the container from both sides horizontally and throw the container.
5. Make sure the painter is still fixed at a strong point so that the raft should not be waved away by waters.
6. Pull the painter with a hard jerk to fire the gas bottle to inflate the raft.
7. The life raft will take 20-30 sec to inflate.
8. Board the life raft one by one using ladder or rope.
9. Avoid sharp objects like knives, shoes and other sharp objects etc which may damage the raft surface.
10. When everybody is aboard, after a headcount, cut the painter with a sharp knife.

### **Launching Raft by Davit:**

1. Open the lashing and remove the raft container from HRU by opening the manual slip hook or bottle screw arrangement.
2. Tie up the one end of the painter of raft into a strong point at deck.
3. Keep the container in the open and attach the davit hook to the given eye in the canister/ container
4. Take up the raft load by davit and keep the container hanging at embarkation deck area.
5. Pull the painter and inflate the raft. Have a thorough check on the inflated raft.
6. Start boarding the raft without the shoes and other sharp object.
7. After the boarding is completed, check the bottom is clear and release the securing lines, if any.
8. Someone inside the raft will detach the hook of the davit from the raft when the raft is just above the water.
9. The davit operating person will board the raft either by jumping in to the sea, raft or by other boarding means if provided.
10. Cut the painter and cast away the raft from ship.

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## Q-165) LIFEBOAT MAINTENANCE?

- Every week survival crafts, rescue boats davits and all launching gear should be inspected visually.
- The lifeboat engine should be tested for a period of at least three minutes.
- Rescue boat out board motor should be tested in a drum of water if possible.
- The emergency alarm must be tested from all points.
- In addition, every month all equipment from lifeboats and rescue boats should be inspected as per the checklist.
- Boats should be swung out and lowered to the water level.
- Fixed radio installations and searchlights should be examined and tested.
- Enclosed lifeboats with water spray systems should be tested as per manufacturer's instruction.
- Entries are to be made in the logbook.

## Q-166) HOW MANY BRAKES ARE THERE ON A LIFEBOAT WINCH?

Lifeboat davits are equipped with two separate braking systems: a holding brake and a centrifugal brake.



**HOLDING BRAKE**



**CENTRIFUGAL BRAKE**

**Holding Brake:** The holding brake is designed to stop and hold the lifeboat stationary at any point between its fully housed position in the davit or when it is near the water's edge. The holding brake is disengaged by lifting the weighted brake handle thus allowing the lifeboat to descend downward toward the water.

**Centrifugal Brake:** A centrifugal brake is provided to control the rate at which the lifeboat is lowered. This limits the rate of descent of the boat when the hand brake is not engaged. Brake shoes of calculated weights act on the inner surface of a stationary drum, being thrown outward by centrifugal effect against the restraining springs. The lowering speed of the boat can be kept within the required 36 m/min

In many cases winch operators are unaware of how the centrifugal brake system works and end up controlling the rate of descent of the lifeboat entirely with the holding brake. This is very much like driving your car and accelerating with your foot on the brake at the same time. When abusing the brake system in this manner two things happen:

- The holding brake will wear out very quickly
- The centrifugal brake will be compromised and over time will not work as designed.

### **Q-167) WHAT IS DEADMAN'S HANDLE?**

During drills, the handle which bosun used to lift to lower lifeboat is called Deadman's handle.

There is a wire rope extend through pulleys and levers in the lifeboat for the same purpose.

So considering this even one person is enough to lower the lifeboat from inside when all other persons are dead.

### **Q-168) WHAT IS EEBD, LOCATIONS AND REGULATIONS?**

Emergency escape breathing device is a clear plastic hood with a small air cylinder that is designed to enable people to vacate a smoke filled compartment to exit outdoors within 10 minutes. It contains 2.5 litre oxygen.

SOLAS Requirement:

- On cargo ships in accommodation, minimum 2 EEBD and 1 spare EEBD
- 1 EEBD for the engine control room.
- 1 EEBD close to the area where workshops are located.
- 1 EEBD at each deck level.
- It should be located in easily visible areas of machinery spaces.

Typically EEBD is valid for 15 years.

### **Q-169) WHAT IS IMMERSION SUIT? REGULATIONS?**

- It is a special type of waterproof suit that protects the wearer from hypothermia from immersion in cold water. Immersion suit is designed for wearing with lifejacket or without a lifejacket.
- SOLAS Regulation:
- Each person onboard must have its own person immersion suit + extra suits for watchkeepers.
- Internationally red in color.
- Unpacked and donning should be done within 2 minutes without any assistance.
- It will not allow to go down our body temperature 2 degree Celsius for a period of 6 hours immersion in calm circulating water at a temperature of 0 degree C and 2 degree C

### **Q-170) WHAT IS LIFEJACKET REGULATION?**

- Each person should have its personal lifejacket + extra lifejacket for the watchkeeper.
- Internationally orange in color.
- Should be donned within 1 minute without any assistance.
- It is capable to allow jump from height of atleast 4.5 mt into water without injury of lifejacket and personal.
- Buoyancy should not be reduced by more than 5% after 24 hours submersion in fresh water.

### **Q-171) CONDITION OF CLASS?**

Condition of Class is issued if ship have issues with ship's hull or machinery and some temporary measures have been done. Class surveyor attends the ship to check temporary measures and issues condition of class, so that ship can sail for one voyage or for some time period.

In any case, if the condition of class is not removed before the said period, the certificate of class will become invalid and the ship will considered to be unseaworthy.

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### **Q-172) DEFINITION OF PERSISTENT OIL?**

Civil liability convention 92 and fund convention 92 applies to the pollution involving persistent oil only. Why so?

- Simply because persistent oil leave thick slurry of oil on water and are difficult to clean or remove. Persistent oils break up and dissipate more slowly in the marine environment and usually require a clean-up operation. Crude oil is one example of persistent oil.
- Non-persistent oils will dissipate easily and quickly through evaporation and so these oils will not require an active response to clean up.

### **Non-persistent oils include:**

- A petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions at least 50 percent of which by volume, distill at a temperature of 340 degrees C (645 degrees F); and at least 95 percent of which by volume, distill at a temperature of 370 degrees C (700 degrees F); and
- A non-petroleum oil, other than an animal fat or vegetable oil, with a specific gravity less than 0.8.

Persistent oils are oils that do not fall under above category.

## Q-173) CRITICAL SPARES

Specific parts of machinery, due to failure of which may render the whole machine unoperational.

- The SMS of the vessel shall clearly indicate the minimum number of spares and tools required for the safe operation of the ship while at sea and during long passages, additionally it is the responsibility of the shipboard engineers to ensure critical spares are in order for any planned voyages.
- Manufacturers recommendation on the minimum number of spares to be taken into account and the availability of spares in the region the ships plying and the time taken to reach the ship shall always be taken into account.
- The classification societies also recommend critical spares and the number to be carried onboard.
- Few critical spares are:

<ul style="list-style-type: none"><li>• Main Bearing</li><li>• Main thrust block</li><li>• Cylinder liner with joint rings and gaskets</li><li>• Cylinder head assembly</li></ul>	<ul style="list-style-type: none"><li>• Cylinder head assembly</li><li>• Starting air valve</li><li>• Relief valve</li><li>• Connecting rod bearings</li></ul>
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## Q-174) CONTINUOUS SYNOPSIS RECORD?

The Continuous Synopsis Record (CSR) is a form of log book that stays with the ship for its whole life, and records all changes of owner, flag, name, Class, ISM etc. The ship must keep its copy of the whole CSR onboard even when it transfers to another flag state, is sold to another owner, is taken over by another bareboat charter, or another company assumes the responsibility of the ship operation.

- According to SOLAS chapter 11-1, all passenger and cargo ships of 500 gross-tonnage and above must have a continuous synopsis record on board.
- It is used as a special measure under Safety of life at sea (SOLAS) for enhancing the maritime security at the sea.
- Continuous synopsis record (CSR) is issued by the administration of the ship, which would fly its flag.

## Q-175) SAFETIES IN ENGINE ROOM CRANE?

### 1. **Electromagnetic fail safe brakes**

*The brake pads are always in applied state and pushed by magnetic springs when not in operation or when there is a power failure.*

*As the crane is operated or the power is supplied, the spring gets pulled inward or compressed due to the electromagnetic effect of the current. This allows the crane to be operated normally.*

*As soon as power failure occurs, solenoid is demagnetized and brake is applied on the rotor. It is provided so that load do not fall in case of power failure.*

2. **Limit switch** on the forward, aft, port, starboard, hoisting and lowering prevents movements more than the allowed limits.

3. **Overload trip.**

4. **Dead man's handle.**

5. **Emergency stop provided in remote**

6. **Guards over the pulley.**

7. **Locking device on the lifting hook.**

8. **Mechanical locking (to avoid crane movement during heavy weather)**

9. **Mechanical stoppers are provided for both directions in case the electrical distance limit trips fail.**

10. **The motor is fitted with thermal protection trip. When the motor windings get overheated, trip will activate saving the winding from burning.**

11. **The controls switches of the crane are push button type. While pressing only the power is supplied.**

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## Q-176) UNCLOS?

- UNCLOS is an acronym for the United Nations Convention for the Law of the Sea.
- UNCLOS, is a law of the sea, came into operation and became effective from 16<sup>th</sup> November 1982.
- The law of the sea provides for full money rights to nations for a 200-mile zone by their shoreline. The sea and oceanic bed extending this area is regarded to be an Exclusive Economic Zone (EEZ) and any country can use these waters for its economic utilisation

- Even though UNCLOS has 160 member parties, the US is a country that has still not sanctioned (ratified) the nautical law. The main reason for the US not sanctioning the law of the sea arises mainly because of its disagreement about Part XI of UNCLOS.
- This part deals with the aspect of the minerals found on the seabed on the EEZ. The International Seabed Authority was established on the basis of this part of the nautical law and called for equitable distribution of the proceeds of such seabeds.
- The US is opposed to this theory and that is why it has not ratified UNCLOS in spite of it being one of the most important members of the United Nations.
- With the help of a nautical law like **UNCLOS**, it can be said that marine resources can be protected and safeguarded, especially in contemporary times

**Q-177) WHAT IS AIS AND LRIT AND DIFFERENCE BETWEEN THESE TWO?**

- Both Long Range Identification and Tracking (LRIT) and Automatic Identification System (AIS) have different purpose altogether but are important to ships at sea. AIS is an broadcast system, whereas LRIT is reporting system.
- AIS is a system which provides a means whereby ships exchange information such as ID, position, course, speed and other vital data, with all other ships in the vicinity and shore stations. The data exchange in AIS system is totally automatic and transparent to the users of the system.
- LRIT is developed to enhance maritime safety, security and to protect the marine environment. LRIT allows member states to receive position reports from vessels operating in proximity to the State's coastline.
- But the most asked question in examinations and doubts between candidates as to what is the difference between LRIT and AIS, so let us see.

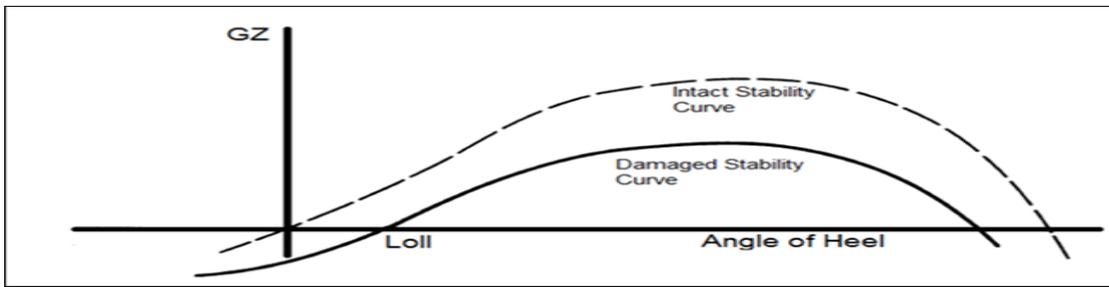
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**Difference between LRIT and AIS**

LRIT	AIS
Long Range Identification and Tracking	Automatic Identification System
All ships of 300 GT and above on International voyages, and all ships of 500 GT on coastal voyages are to be fitted with LRIT	All ships of 300 GT and above on International voyages, and all ships of 500 GT on coastal voyages are to be fitted with AIS
Any Indian Registered Ship on Indian Coast of 1600 GT and less is not required to carry LRIT	Any vessel of more than 100 GT or 20 meters in length along Indian coast is required to carry AIS
LRIT works on satellite Communication	AIS works on VHF communication
No Fixed Channel	AIS has 2 dedicated channels 87B and 88B
Worldwide coverage is available for LRIT	Coverage for AIS is 35-40 nautical miles
Closed Loop Communication	Broadcast System
Response to Flag State poll call / query	Transmits automatically at fixed time intervals
LRIT is not an Aid to navigation	AIS is an Aid to navigation
LRIT information is not available to vessels in the vicinity	AIS information is available to ships in vicinity.

**Q-178) WHAT HAPPENS IF ENGINE ROOM IS FLOODED, REGARDING MARGIN LINE?**

One of the most common terms that is used in damaged condition of a ship, is Margin Line. The Margin Line of a ship is an imaginary waterline considered 75 mm below the uppermost continuous watertight deck. If a ship is damaged, it is considered to be safe only if the margin line is not immersed. Once the waterline reaches the margin line at any point along the length of the ship, the ship is considered to be unsafe, and evacuation becomes mandatory.



The reduction in metacentric height due to damage can be extrapolated to the stability curve as a reduction in height of the GZ curve and range of stability, as shown in the figure above. So if the loss in metacentric height is such that the remaining maximum righting lever (GZ) is less than the heeling moment, the ship will capsize. It is therefore, the designers work to:

- Design the subdivision in such a way that the remaining righting arm is sufficient upto a certain level of damage.
- To identify the extent of damage that can be considered safe for the ship.

### **Q-179) AS A 2<sup>ND</sup> ENGINEER, MAINTENANCE YOU WILL DO ON LOAD LIFTING DEVICE?**

#### **Maintenance:**

**Weekly:** Grease nipples on winches, blocks, derrick cranes.

**3 months:** Aux. equipment (chain, ring, hook, swivels, block & shackles)

**6 months:** A thorough inspection of above equipment-

- Grease nipples to be checked.
- Derrick: stripped and aux. equipment gear taken apart, examined, greased and put back.
- Winches to be overhauled as per PMS.
- Location and identification of each part complying with rigging plan.
- Each item to have a certificate.

**12 months:** De-rust, paint and overhaul derrick goose necks.

**Test:** Rocking test, proof load testing needed by class for certification

**JAI MATA DI - CLASS 2 SAFETY NOTES  
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### **Q-180) HOW TO PREPARE SHIP FOR PSC INSPECTION?**

#### **Fundamental Precautions by the ship's staff for PSC inspections**

In order to avoid problems during Port State Control inspections, Owners ought to ensure that their ships are properly and continuously maintained and manned, in compliance with the international regulations. The following fundamental points ought to be observed:-

- Overall maintenance on board;
- Crew certification as per STCW 1995 and the Flag requirements;
- Regular training of the crew for emergency situations;
- Regular check of certificates' validity and due surveys
- Cleanliness on deck (first impressions)
- Access control on board
- Ensure correct and polite cooperation with the PSCO; accompany the PSCO to answer or clarify any questions on the spot, open locked doors as requested etc.

Fundamentally critical areas the ship's staff need to be cautious of:

- Machinery in general
- Maintenance of the ship and equipment
- Auxiliary engines (leakages, jacketed HP fuel pipes, cleanliness)
- Main propulsion (leakages)
- Lifeboats (on-load release gear, engines, inventory), life rafts, survival craft launching and embarkation arrangements
- Charts and nautical publications
- Cleanliness of engine room
- Safety in general, e.g. lifebuoys, smoke floats, line throwing apparatus, EPIRB, etc.
- Fire fighting equipment (fire pumps, fixed and portable extinguishing systems) and Personal Protection Equipment
- Oil Record Book
- Oil Filtering Equipment and 15 ppm alarm and automatic stopping device
- Ventilators, air pipes, quick closing valves, fire doors, fire dampers and watertight doors, crew certification and Flag endorsements.

### Q-181) SAFETIES OF STEERING GEAR?

<ul style="list-style-type: none"><li>• Relief valve for excess pressure</li><li>• Short circuit trip</li><li>• Hunting Gear</li><li>• Buffer spring for as shock observer</li><li>• Angle adjusting stop (Hand over position limit switch)</li></ul>	<ul style="list-style-type: none"><li>• Double shock valve</li><li>• Relief valve</li><li>• Hydraulic oil tank level alarm</li><li>• Overload alarm</li><li>• 200% insulation</li></ul>
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### Q-182) PROCEDURE TO RESCUE FROM AN ENCLOSED SPACE?

Proper trained team is required to perform such rescue operation, as proper training reduces the rescue time and do not add to any further incidents.

*Following precautions and procedures are to be followed for quick and effective rescue operation supposing a victim is to be rescued from an enclosed space.*

- General emergency to be announced through the ship's alarm.
- A responsible officer to be made in charge of the operation.
- Adequate man power to be present for the operation
- Two trained persons to be ready with SCBA and PPE.
- All prior checks to be carried out on SCBA used in the operation.
- Life line to be used by the entry person.
- Communication equipment (walky talky) to be given to all.
- Torch lights to be taken along.
- Extra ready breathing apparatus to be kept stand by.
- In charge of operation to be present at entry point co-ordinating the operation.
- Breathing apparatus to be carried by rescuing party along with stretcher for the victim.
- If not possible to carry SCBA, EEBD to be carried instead.
- A life line to be tied out in the stretcher of the victim so that it can be guided and lifted out of the tank.
- Never attempt to rescue a person alone from confined spaces. Always call for help, plan a quick rescue operation and do it with proper equipments and team efforts.

**JAI MATA DI - CLASS 2 SAFETY NOTES  
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### Q-183) DIFFERENCE BETWEEN CHECKLIST AND RISK ASSESSMENT?

- Checklist is a list of items required, things to be done, or points to be considered, used as a reminder.
- Risk assessment is to assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards.

Five steps to risk assessment can be followed to ensure that your risk assessment is carried out correctly, these five steps are:

- Identify the hazards
- Decide who might be harmed and how
- Evaluate the risks and decide on control measures
- Record your findings and implement them
- Review your assessment and update if necessary

We can also follow the chart developed on the basis of likelihood of risk and severity of risk.

### Q-184) HOW TO TEST OWS IN PORT?

There is a manual valve given before overboard valve which can direct the flow of water from OWS outlet back to the bilge holding tank by discharging water into the funnel. During the OWS in operation, below 15 ppm, water will keep flowing into the funnel. Once 15 ppm alarm comes, the three way valve operates and water will stop coming into the funnel as pneumatic three way valve directs the water back to bilge holding tank.

Proper entry has to be made in OIL RECORD BOOK.

### Q-185) RISK ASSESSMENT?

According to International Maritime Organization (IMO),

RISK is the “**combination of the frequency and the severity of the consequence**”

The marine risk assessment is a decision making tool which helps in evaluation of each hazard associated with the risks in terms of the likelihood of harm and its potential aftermath.

There are three main reasons as to why it is important to carry out risk assessment.

1. Because it financially beneficial as it helps to reduce the risk and thus accidents
2. Because it is regulatory requirement and thus legally required to conduct risk assessment. Paragraph 1.2.2.2 of the ISM Code states,  
“**Safety management objectives of the company should .... assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards**”. This 2010 amendment to ISM code has **included the risk assessment explicitly**.
3. Because it is morally and ethically right thing to do as risk assessment helps in preventing injuries and accidents.

#### **Q-186) AFS CONVENTION? HOW TO KNOW THAT AFS IS APPLICABLE TO YOUR SHIP?**

- Adoption: 5 October 2001; Entry into force: 17 September 2008
- The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention) prohibits the use of harmful organotins in anti-fouling paints used on ships. It establishes a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems.
- Anti-fouling paints are used to coat the bottoms of ships to prevent sealife such as algae and molluscs attaching themselves to the hull – thereby slowing down the ship and increasing fuel consumption.
- Under the terms of the Convention, Parties are required to prohibit and/or restrict the use of harmful anti-fouling systems (like TBT trybutyltin) on ships flying their flag, as well as ships not entitled to fly their flag but which operate under their authority and all ships that enter a port, shipyard or offshore terminal of a Party.
- Ships of 400 gross tonnage and above engaged in international voyages (excluding fixed or floating platforms, FSUs and FPSOs) will be required to undergo an initial survey before the ship is put into service or before the **International Anti-fouling System Certificate** is issued for the first time; and a survey when the anti-fouling systems are changed or replaced.
- Ships of 24 metres or more in length but less than 400 gross tonnage engaged in international voyages (excluding fixed or floating platforms, FSUs and FPSOs) will have to carry a Declaration on Anti-fouling System
- The Convention provides that by 1 January 2008 (effective date), all ships either:  
(a) shall not bear such compounds on their hulls or external parts or surfaces; or  
(b) shall bear a coating that forms a barrier to such compounds leaching from the underlying non-compliant anti-fouling systems.
- The Convention includes a clause in Article 12 which states that a ship shall be entitled to compensation if it is unduly detained or delayed while undergoing inspection for possible violations of the Convention.
- Now new amendment came in MEPC 76 to include controls on cybutryne. The scientific data presented so far indicates that cybutryne causes significant adverse effects to the environment, especially to aquatic ecosystems.

#### **Q-187) ESP and ESP CODE?**

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BY ANKUR SHARMA (MANET BATCH 6)**

- Enhanced Survey Programme is applicable to Bulk carrier and Oil tankers.
- It became mandatory as per SOLAS chapter 11-1 Reg 2
- On 30 November 2011, new resolution came which is called ESP code which came into force on 1 Jan 2014.
- It came as a lot of bulk carriers lost at sea during 1990's indicating that current survey measures were not sufficient.
- It came for tankers because of the nature of the cargo they carry, and the risk is of high factor.
- ESP is not a survey but an enhancement to the surveys, which provides guidelines for carrying out survey.
- More close up inspections, extra planning and extensive thickness measurement as the ship requires with age.

ESP is divided into 2 Annex:

Annex A: Code on the enhanced programme of inspection during surveys of Bulk carriers.

Part A: for single side skin construction

Part B: for double side skin construction

Annex B: Code on the enhanced programme of inspection during surveys of Oil tankers.

Part A: for double hull oil tankers

Part B: for other than double hull oil tankers.

Survey programme is developed before renewal survey which gives the complete detail of what needs to be inspected and what resources are required to conduct the survey. It is developed on the basis of:

#### **1. ESP code**

ESP code has detailed instruction on the minimum criteria for inspection during statutory survey.

ESP Code Annex 1 is related to requirements for close survey at renewal surveys.

ESP Code Annex 2 is related to thickness measurement at renewal surveys.

#### **2. Survey planning questionnaire**

The ship owner is required to complete a survey planning questionnaire to develop survey programme.

- Any hull related deficiencies during PSC inspection
- Any hull related non-conformity during SMS audits

### 3. Damage history

If the ship or its sister ships have suffered frequent damage of one particular area, that area is identified for more close up inspection during the renewal survey

**4. Critical areas and suspect areas:** During previous survey if certain areas are identified as having substantial corrosion, it will be considered as suspect areas.

#### Q-188) WHAT IS SUBSTANTIAL CORROSION?

T = ORIGINAL THICKNESS

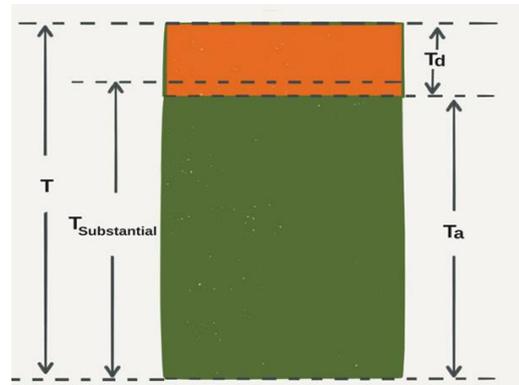
Ta = MINIMUM ALLOWED THICKNESS

Td = MAXIMUM ALLOWED THICKNESS REDUCTION

$$T_{\text{substantial}} = T_a + 0.25 T_d$$

$$T_{\text{substantial}} = T - 0.75 T_d$$

Such an extent of corrosion that assessment of corrosion pattern indicates wastage in excess of 75% of allowable corrosion, but within limits.



#### Q-189) DAMAGE STABILITY AND SUBDIVISION INDEX?

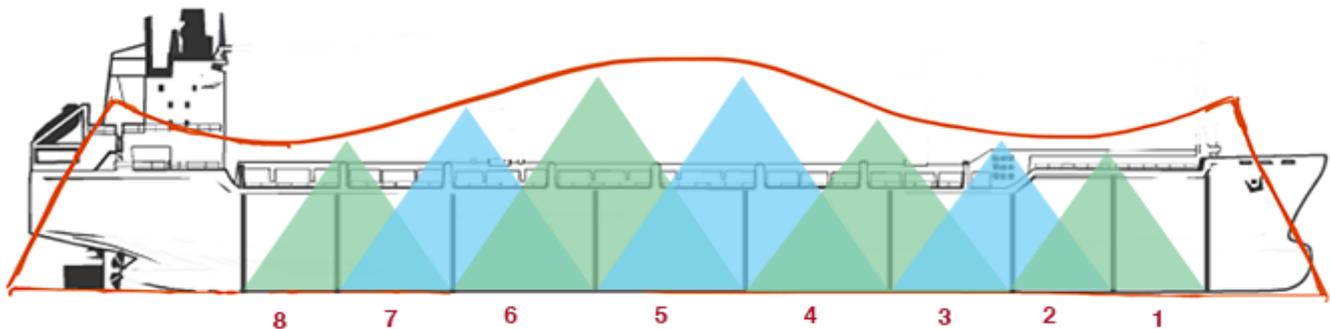
After getting flooded in any compartment / hold of a vessel, the subdivision (water tight bulkheads) should ensure the vessel can float and remain stable under moderate environment.

There are three approaches to decide the number of subdivisions of ship:

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##### 1. Floodable length and factor of subdivision

To check if the ship would comply with this damage stability requirement, the floodable length curve is superimposed on the ship's plan. Two compartment standard ship is the one if two compartments has been flooded, the triangle made by joining the two extreme ends of these compartments at the same floodable length, it should be under floodable length curve.



##### 2. Probabilistic Damage Assessment:

Damage stability calculations by probabilistic damage assessment is required by SOLAS Chapter II-1, part B. This is required for cargo ships 80 m in length and upwards and to all passenger ships regardless of length.

This approach uses the concept of probability to ensure that ships can survive damage to its compartment(s).

There are two probability factors that are used in this approach.

- Probability that a particular compartment(s) will damage in an incident (factor "p")
- The probability that ship will survive if that compartment(s) is flooded (Factor "s")

Multiplying these two factors (p x s) will give the probability of surviving that damage case.

Flooded Compartments	Probability of Flooding	Probability of Surviving this damage	Probability of Surviving this damage case
1 & 2	P <sub>1&amp;2</sub>	S <sub>1&amp;2</sub>	P <sub>1&amp;2</sub> x S <sub>1&amp;2</sub>
2 & 3	P <sub>2&amp;3</sub>	S <sub>2&amp;3</sub>	P <sub>2&amp;3</sub> x S <sub>2&amp;3</sub>
3 & 4	P <sub>3&amp;4</sub>	S <sub>3&amp;4</sub>	P <sub>3&amp;4</sub> x S <sub>3&amp;4</sub>
4 & 5	P <sub>4&amp;5</sub>	S <sub>4&amp;5</sub>	P <sub>4&amp;5</sub> x S <sub>4&amp;5</sub>
5 & 6	P <sub>5&amp;6</sub>	S <sub>5&amp;6</sub>	P <sub>5&amp;6</sub> x S <sub>5&amp;6</sub>
6 & 7	P <sub>6&amp;7</sub>	S <sub>6&amp;7</sub>	P <sub>6&amp;7</sub> x S <sub>6&amp;7</sub>
7 & 8	P <sub>7&amp;8</sub>	S <sub>7&amp;8</sub>	P <sub>7&amp;8</sub> x S <sub>7&amp;8</sub>
Probability of surviving flooding of two compartments			Sum of all probabilities of two compartments

SOLAS requires that these should be considered at three drafts:

- **Deepest subdivision draught (ds):** Which corresponds to the Summer Load Line draught of the ship.

$$A_s = A_{s_1} + A_{s_2} + A_{s_3} + \dots$$

Probability of survival at draught (ds) with one compartment flooding  
 Probability of survival at draught (ds) with three compartments flooding  
 Probability of survival at Deepest subdivision draught (ds)  
 Probability of survival at draught (ds) with two compartments flooding

- **Light service draught (dl):** Service draught corresponding to the lightest anticipated loading and associated tankage, including, however, such ballast as may be necessary for stability and/or immersion.

$$A_l = A_{l_1} + A_{l_2} + A_{l_3} + \dots$$

Probability of survival at draught (dl) with one compartment flooding  
 Probability of survival at draught (dl) with three compartments flooding  
 Probability of survival at Light service draught (dl)  
 Probability of survival at draught (dl) with two compartments flooding

- **Partial subdivision draught (dp):** light service draught plus 60% of the difference between the light service draught and the deepest subdivision draught.

$$A_p = A_{p_1} + A_{p_2} + A_{p_3} + \dots$$

Probability of survival at draught (dp) with one compartment flooding  
 Probability of survival at draught (dp) with three compartments flooding  
 Probability of survival at Partial subdivision draught (dp)  
 Probability of survival at draught (dp) with two compartments flooding

As per SOLAS Chapter II-1, part B-1, Regulation 6, the ship complies with damage stability when,

- Attained Subdivision Index > Required subdivision index

**Attained Subdivision Index:**

$$A = 0.4A_s + 0.4A_p + 0.2A_l$$

**Required Subdivision Index:**

For Cargo ships of more than 100 meters in Length

$$R = 1 - \frac{128}{L + 152}$$

L Subdivisional Length of Ship

NOTE: If the actual value of subdivision index (Attained value) is less than the required, the subdivisions need to be re-arranged or increased to have attained subdivision index to be more than required subdivision index.

**3. Damage stability by Deterministic damage assessment:**

Damage stability calculations by this method is required for all types of tankers.

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Unlike probabilistic method that uses the concept of probability, the deterministic method defines the variables in quantifiable terms.

In this method,

- the damaged area is defined (damage assumption); and
- The minimum required value of the stability factors is defined (Survival requirements)

In all the cases of damage assumptions, the vessel should have the stability factors value more than the survival requirements.

### **Q-190) WHAT IS MEPC 76?**

It was held between 10-17 June 2021.

The MEPC will consider, with a view to adoption:

- draft amendments to MARPOL Annex VI including EEXI and Carbon intensity indicator CII from 1 Jan 2023.
- draft amendments to MARPOL Annex I to prohibit the use and carriage for use as fuel of heavy fuel oil (HFO) by ships in Arctic waters from 1 July 2024.
- draft amendments to the AFS Convention to include controls on the biocide cybutryne.

### **Q-191) DAMAGE STABILITY CRITERIA FOR TANKERS?**

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Oil tankers shall be regarded as complying with the damage stability criteria if the following requirements are met:

1. The final waterline, taking into account sinkage, heel and trim, shall be below the lower edge of any opening through which progressive flooding may take place.
2. In the final stage of flooding, the angle of heel due to unsymmetrical flooding shall not exceed 25°, provided that this angle may be increased up to 30° if no deck edge immersion occurs.
3. The stability in the final stage of flooding shall be investigated and may be regarded as sufficient if the righting lever curve has at least a range of 20° beyond the position of equilibrium in association with a maximum residual righting lever of at least 0.1 m within the 20° range; the area under the curve within this range shall not be less than 0.0175 m·rad.
4. The Administration shall be satisfied that the stability is sufficient during intermediate stages of flooding.
5. Equalization arrangements requiring mechanical aids such as valves or cross-levelling pipes, if fitted, shall not be considered for the purpose of reducing an angle of heel or attaining the minimum range of residual stability. Sufficient residual stability shall be maintained during all stages where equalization is used.

### **Q-192) OWS NEW REQUIREMENT?**

Resolution MEPC. 107(49)

- The response time of the 15ppm Bilge Alarm should not exceed 5 seconds (20 seconds by MEPC. 60(33)).
- The operation of the Automatic Stopping Device preventing overboard discharge, should be as short as possible and in any case not more than 20 seconds (40 seconds by MEPC. 60(33)).

### **Q-193) WHAT ARE BONJEAN CURVES?**

- Curves of areas and moments of sections versus draught, plotted on the sheer plan
- It is used to determine the force of buoyancy during launching

### **Q-194) WHAT IS PFSO AND DUTIES OF PFSO?**

The Port Facility Security Officer must ensure that the port and all visitors to the port are adequately protected from threats that may arise from both land and sea. All visiting vessels particularly those arriving from international voyages should be scrutinised for any security risk.

The port facility dictates the security levels to be implemented on the ships which are operating within its territorial waters. The PFSO has a number of responsibilities but is ultimately responsible for the development and maintenance of the Port Facility Security Plan and the day-to-day security operations of the port.

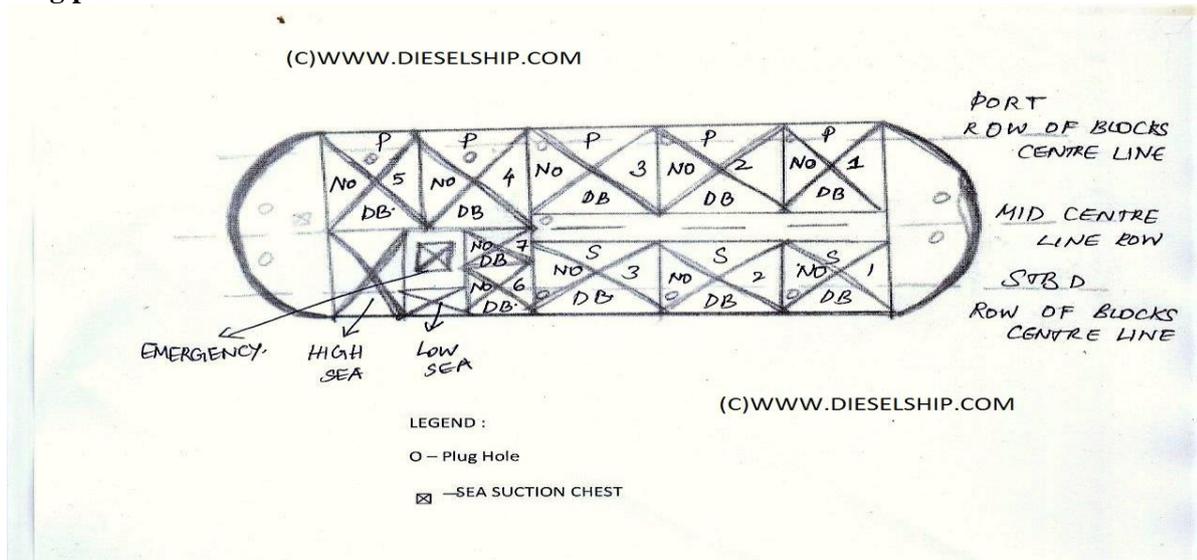
### **Q-195) WHAT ARE THE PLANS FOR DRY DOCK?**

#### **1. G.A Plan**

The General arrangement plan gives a profile view of the ship along with plan views at main deck level, and D.B. tank top level, and an end view from forward.

This drawing is used for berthing purposes alongside repair berths as well as to get a general appearance of the ship. Hence a reduced size drawing would do.

## 2. Docking plan



The docking plan is a detailed plan view seen from the bottom. It shows all openings on the bottom, including the openings for the main sea suction boxes provided at the machinery room area on the underside. The other openings are the individual drain plug holes normally one plug hole per tank. In large ships tanks may be provided with two holes per tank. The plan also shows the recommended lines for block laying with recommended pitch of the blocks

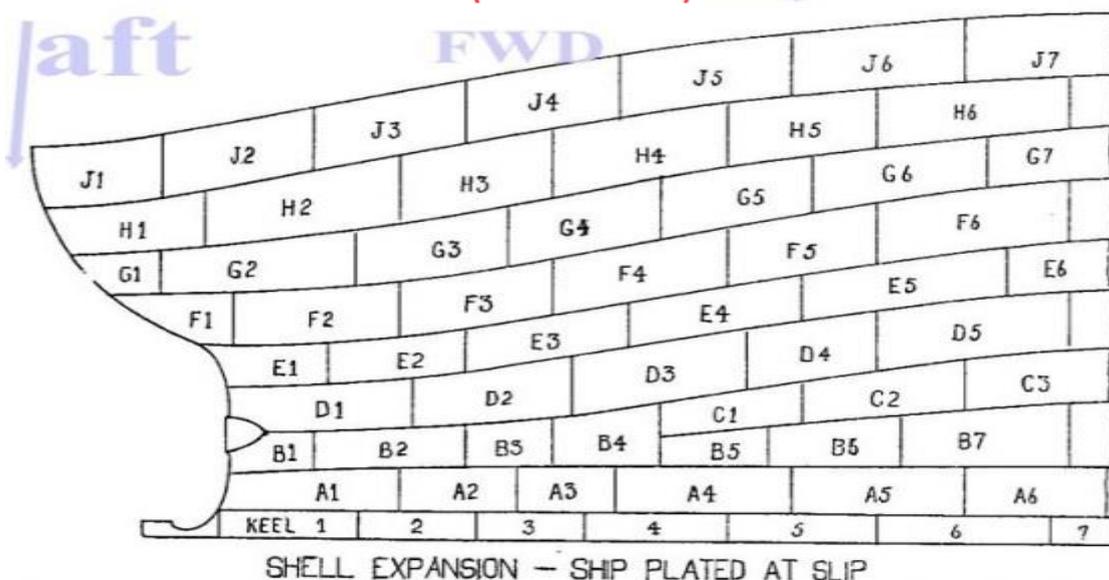
Normally three rows of blocks are sufficient to safely support bulkers tankers and container ships. For cargo ships with finer form locations for the fitting of Breast shores are shown in the plan.

It should be understood that this docking plan is to be used only for normal dry docking purposes. In the case of ships being dry docked after heavy collision or bottom damage, this docking plan will not be suitable. For this purpose an amended docking plan is made after the ships bottom is photographed in afloat condition

by the shipyard diver and an amended plan made to suit the purpose. It must provide for alternate locations of support for the damaged area where the original blocks cannot be laid for support.

## 3. Shell Expansion

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- It is a two dimensional drawing of a three dimensional surface of the ship's hull form.
- The shell platings are butt welded together, in which vertical joints are known as butts and horizontal welded joints are known as seams.
- Stakes of bottom plating to the bilges have their greatest thickness over 40% of the ships length amidships, where bending stresses are highest. Lesser thickness at the ends of the ship apart from increased thickness requirement in way of pounding region.

- Strakes of side shell plating are of greater thickness within 40% of the vessel's midship length and then tapers to the rule thickness at the ends. Thickness will be increased at the stern frame connection. Further shell plate thickness increases at the panting region.
- We count shell plating in 2 dimensions, one along the length and one athwartship position.
- Keel strake is on the centreline, next to keel strake is garboard strake which is name as "A", then next to it is "B" and so on till it reaches shear strake.
- From Aft to forward it is numbered as A1, A2, A3 and so on.

This plan is very useful for the following information:

- It is used for marking the location of a hull Damage on this plan by identifying the strake number , letter and frame number so that the exact location of the damage and also suggested repairs are marked in a localised copy.
- The shell expansion can be used for finding areas of painting surfaces such as topside, boot topping and bottom areas by applying Simpsons rules directly.
- In the shell expansion the vertical scale used is different from the horizontal scale and a suitable adjustment has to be made when calculating areas. This becomes useful in solving disputes concerning areas of preparation and painting.
- It gives information on the thickness of the original strake which is indicated by the number in the circle shown in the strake. The quality of steel used is also shown by letters A,B,D E and AH, BH,DH, EH.
- **Shell expansion plan gives shell plating size, shape, weight, thickness and their location.**

#### 4. Capacity plan

This plan is useful in finding the displacement of the ship for a selected mean draft. The Displacement is required to be known to decide on the total number of blocks to be used since each block can support only a maximum given mass. The capacity plan also gives information on

- (a) volumes of compartments/tanks in M3
- (b) location of centre of volume of compartment/tank

Hence the capacity plan may be used for making minor stability calculations for moments which are required for trim and heel adjustments.

#### Q-196) WHAT IS EEXI?

The amendments to MARPOL annex 6 were adopted at MEPC 76.

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##### 1. TECHNICAL APPROACH

- Introduce the Energy Efficiency Existing Ship Index (EEXI).
- The required EEXI is almost the same level as required EEDI for new ships as of 2023.

##### 2. OPERATIONAL APPROACH

- Ship is rated on a scale of A to E based on the annual operational carbon intensity indicator (CII)
- A ship rated D for 3 consecutive years, or E, would have to submit a corrective action plan.

Attained EEXI : It is calculated by an individual ship.

Required EEXI : It is specified for each ship type and size.

Attained EEXI should be less than or equal to Required EEXI

EEXI requirements shall apply to all ships more than 400 GT and above which are engaged in the international voyages regardless of the ships delivery date.

EEXI is calculated by the same formula as EEDI.

$$\text{EEXI [g/ton} \cdot \text{mile]} = \frac{\text{CO}_2 \text{ Conversion factor} \times \text{SFC [g/kW} \cdot \text{h]} \times \text{Engine Power [kW]}}{\text{Capacity [ton]} \times \text{EEXI Speed [knots]}}$$

**CO<sub>2</sub> emissions (gram) from a ship when ship sail transport 1 (ton) cargo for 1 (nautical mile)**

CO <sub>2</sub> Conversion factor (C <sub>F</sub> )	C <sub>F</sub> corresponds to the fuel used when determining SFC (DM grade: 3.206)
SFC	Fuel consumption at 75%MCR (M/E), at 50%MCR (A/E)
Engine Power	75% of the rated installed power (MCR) (In case of EPL, 83%MCR <sub>lim</sub> )
Capacity	Deadweight (For containerships, 70% of the deadweight)
EEXI Speed (V <sub>ref</sub> )	Ship speed at 75%MCR under the draught condition corresponding to the capacity

### **Q-197) ISPS CODE**

International Ship and Port Facility Security Code:

This code is a set of measures to enhance the security of ships and port facilities. It was developed after the 9/11 attacks. This code was adopted on 12 December 2002 and came into force on 1 July 2004. After this Chapter 11 of SOLAS has been amended and re-identified as 11-1. A new chapter 11-2 has been added based on special measures to enhance maritime security. ISPS code makes it mandatory that ship should have SSP (Ship Security Plan) and it provides the guidelines about security measures to be used as per the security level.

### **Q198) HOW MANY SECURITY LEVELS AS PER ISPS CODE? DETAILS?**

There are 3 security levels:

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#### **LEVEL 1**

It is the normal level at which ship or port facility operates on a daily basis.

- Minimum security measures are always maintained onboard and in port
- Ship and port operation is carried out as per ship and port facility security plan
- Port facility ensures to keep the 'no access' areas under surveillance at all times
- Ship and port authority mutually supervise the loading and unloading operation of cargo and stores, ensuring access control and other minimum security criteria.
- Minimum access on the ship is maintained at all times.

#### **LEVEL 2**

It is a level that will apply whenever there is a heightened risk of a security incident. At this level, additional security measures will have to be implemented and maintained for that period of time. This time frame will be determined by the security experts on the ship or at the port facility.

- Assigning additional personnel for patrolling the access areas
- Deterring waterside access to the ship
- Establishing a restricted area on the shore side of the ship
- Increasing the search frequency and detail of the persons due to board or disembark
- Escorting all visitors onboard
- Carrying out a full or partial search of the ship

#### **LEVEL 3**

At this level, it is considered that a security incident is imminent and specific security measures will have to be implemented and maintained for that period of time. At this level, the security experts will work in close conjunction with Government agencies and possibly follow specific protocols and instructions.

- Limiting access to a single, controlled access point
- Granting access strictly to authorised personnel or those responding to any security incident
- Suspension of embarkation and disembarkation
- Suspension of cargo operations and stores etc
- If needed, the evacuation of the ship
- Close monitoring of the movement of the people on board
- Preparing for a full or partial search of the ship

### **Q-199) CERTIFICATES RELATED TO ISPS CARRIED ONBOARD?**

1. Interim ISSC (valid for 6 months)
  2. International Ship Security Certificate (valid for 5 years)
- Interim ISSC is issued to new building ships or ships that changes flag or class.
  - Interim ISSC will be issued after verification by flag state or class that all elements of SSP are implemented onboard.
  - A full term ISSC is issued
  - After SSP has been implemented for at least 30 day
  - A successful ISPS audit has been conducted by the flag or RSO on behalf of flag

### **Q-200) EXPLAIN SSO, CSO, SSAS?**

#### **1. SSO (Ship security officer)**

ISPS code requires company to appoint a ship security officer. The crew member appointed as SSO must have done the security training required as per STCW.

The main duties of ship security officer are:

- to implement and maintain all the elements of ship security plan and
- to liaise with the company security officer and port facility security officer (PFSO) for all security related activities

For example SSO must know

- Percentage of baggage gangway watch need to check at each security level
- Procedure to follow if any unaccompanied baggage is found on board
- Restricted areas as per SSP
- Security equipments on board and what maintenance is required for these

One of the important duty of SSO is to review the ship security plan.

## 2. CSO (Company Security Officer)

ISPS code also requires company to appoint a company security officer. The main duties of the company security officer is to

- Carry out ship security assessment
- Develop ship security plan and submit it for approval
- Ensure efficient implementation of SSP on board

One of the important duty of CSO is to share regular security information to the SSO and ship.

## 3. SSAS (Ship Security Alert System)

- One of the main security equipment on board required by ISPS code is ship security alert system.
- There needs to be a minimum of two security buttons that can initiate SSAS. One of these buttons should be on the wheel house of the ship.
- Generally, when a SSAS button is pressed, the alert goes to the Flag state and the CSO. But some flag state may require that alert is only received by the CSO.
- Ship security alert system (SSAS) must be tested at least annually.

[The test procedure](#) is given in the SSP. SSO must know this procedure of testing.

## Q-201) CONVENTIONS RELATED TO OIL POLLUTION?

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### 1. CLC CONVENTION:

International Convention on Civil Liability for Oil Pollution Damage (CLC)

Adoption: 29 November 1969; Entry into force: 19 June 1975; Being replaced by 1992 Protocol

Adoption: 27 November 1992; Entry into force: 30 May 1996

The Civil Liability Convention was adopted to ensure that adequate compensation is available to persons who suffer oil pollution damage resulting from maritime casualties involving oil-carrying ships.

CLC applies to the pollution incidents of [persistent oils](#).

Leaving few exceptions, it is ship owner who needs to pay for the damages resulting from the oil pollution incidents

### Limit of Liability as per CLC 92



All ships that carry more than 2000 T of oil as cargo need to maintain insurance equal to the ship owner's liability as per CLC 92.

### EXEMPTION TO SHIP OWNERS UNDER CLC 92

1. From act of war or natural phenomenon
2. Third party who deliberately wanted to cause damage
3. Negligence of government or other authority responsible for maintaining lights or navigational aids.

Note: Limitations on liability does not apply if:

- Ship owner had the intent to cause the damage.
- Ship owner knew that his actions would result in the damages.

## 2. FUND CONVENTION:

### International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND)

Adoption: 18 December 1971; Entry into force: 16 October 1978; superseded by 1992 Protocol: Adoption: 27 November 1992; Entry into force: 30 May 1996

The aim of the fund convention is to compensate the victims of the oil pollution damage beyond the ship owner's liability set out in the CLC Convention.

As per article 10 of the fund convention,

Annual contributions to the Fund shall be made in respect of each Contracting State by any person who, in the calendar year has received in total quantities exceeding 150,000 tons

Fund convention is involved in cases:

- Oil pollution damage resulting from spills of persistent oil from tankers
- Pollution damage suffered in the **territory, territorial sea or exclusive economic zone (EEZ)** or equivalent area of a State Party to the Convention

Apart from this, while compensating for the pollution damage, there are three situations when money from the fund may be paid.

1. When a contracting state receives no compensation for pollution damage as per CLC Convention.
2. When ship owner is incapable of paying for the damages under the CLC convention.
3. When damages are more than the ship owner's liability as per CLC Convention.

#### Maximum amount of compensation allowed from IOPC Fund



## 3. BUNKER CONVENTION:

### International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER)

Adoption: 23 March 2001; Entry into force: 21 November 2008

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- The Convention was adopted to ensure that adequate, prompt, and effective compensation is available to persons who suffer damage caused by spills of oil, when carried as fuel in ships' bunkers.
- The Convention applies to damage caused on the territory, including the territorial sea, and in exclusive economic zones of States Parties.
- The bunkers convention provides a free-standing instrument covering pollution damage only.

"Pollution damage" means:

- (a) Loss or damage caused outside the ship by contamination resulting from the escape or discharge of bunker oil from the ship,
- (b) The costs of preventive measures and further loss or damage caused by preventive measures.

A key requirement in the bunkers convention is the need for the registered owner of a vessel to maintain compulsory insurance cover. The Convention requires ships over 1,000 gross tonnage to maintain insurance or other financial security, such as the guarantee of a bank or similar financial institution, to cover the liability of the registered owner for pollution damage in an amount equal to the limits of liability under the applicable national or international limitation regime, but in all cases, not exceeding an amount calculated in accordance with the CLC.

### **Q-202) EXPLAIN BALLAST WATER CONVENTION?**

- The International Convention for the Control and Management of Ships Ballast Water and Sediments.
- It was adopted on 13 Feb 2004 and came into force on 08 Sept 2017.
- It aims to protect the marine environment from the transfer of harmful aquatic organisms in ballast water carried by ships
- Following standards come under this convention:
  - Ballast water exchange standard (Regulation D-1)
  - Ballast water performance standard (Regulation D-2)

This consist of 22 Articles and an annex. Annex contains 5 sections.

Under the Annex, Section D has been elaborated such as:

#### **Regulation D-1 Ballast Water Exchange Standard**

In this we carry out ballast water exchange with 95% of volumetric exchange. And this should be atleast 3 times the volume of ballast tank. The methods are as follows:

- Sequential filling
- Flow Through Method

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This has to be carried as follows:

- Atleast 200 Nm from the nearest land and in 200 meter water depth. OR
- Atleast 50 Nm from the nearest land and in 200 meter water depth in case above not possible. OR
- If above both are not possible then in areas designated by the port authority.

#### **Regulation D-2 Ballast Water Performance Standard**

In addition, a ballast water discharge of indicator microbes, as a health standard, shall not exceed the following specified concentrations:

- Plankton > 50 micrometers : < 10 cell/m<sup>3</sup>
- Plankton 10-50 micrometers : < 10 cell/ml
- Toxicogenic Vibrio cholera : < 1 CFU/ 100ml
- Escherichia coli : < 250 CFU / 100ml
- Intestinal Enterococci : < 100 CFU / 100ml
- Where CFU = colony forming unit

### **Q-203) WHAT ARE THE TWO METHODS AS PER D1 STANDARD?**

In D1 regulation = We carry out ballast water exchange with 95% of volumetric exchange. And this should be atleast 3 times the volume of ballast tank. The methods are as follows:

**1. Sequential method:** In this process, the ballast water tank is first emptied and then refilled with replacement ballast water to achieve at least a 95 per cent volumetric exchange. All of the ballast water in each tank should be discharged until suction of the pumps is lost and stripping pumps or eductors should be used if possible, to avoid a situation where organisms are left in the bottom of the tank, the tank is then refilled with new water. Emptying of tanks can be done individually or in pairs.

**2. Flow-through method:** The flow-through method is a process by which replacement ballast water is pumped into a ballast tank intended for the carriage of ballast water, allowing water to flow through overflow or other arrangements in order to achieve at least 95 per cent volumetric exchange of ballast water. Pumping through three times the volume of each ballast water tank shall be considered to meet the standard D-1.

**3. Dilution method:** The dilution method is a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange operation.

### **Q-204) WHAT IS BALLAST WATER MANAGEMENT PLAN?**

Ballast water management plan is the plan for the handling or treating of ballast water onboard a vessel to minimize the transfer of harmful organisms or pathogens in the vessel's ballast water and sediment.

Each ship shall have onboard and implement a BWMP. Such a plan shall be approved by the Administration.

BWMP shall be specific to each ship and shall atleast:

- Safety procedures for ship and crew associated with Ballast water management.
- Description of the actions to be taken to implement the ballast water management requirements.
- Procedure for the disposal of sediments: (1) At sea (2) to shore.
- Procedures for coordinating with the authorities of the state into whose waters such discharge will take place.

- Designate the officer onboard in charge to ensure that the plan is properly implemented.
- Contain the reporting requirements for ships.
- Be written in the working language of the ship. If the language used is not English, French or Spanish, a translation into one of these languages shall be included.

**Q-205) WHAT ALL SHIPS HAS TO FOLLOW D1 AND D2 STANDARDS?**

Well, the convention applies to all the ships of a state that has ratified the convention and that carry ballast. There are few logical exemptions such as a ship that carries permanent ballast in sealed tanks on ships, that is not subject to discharge. Ballast water convention does not apply to such ships.

Vessels need to either comply with regulation D-1 (Ballast exchange) or Regulation D-2 (Ballast water treatment system).

But we can simplify it a bit. So in simple terms, as per the revised regulation B-3

- New ships (built on or after 08 Sept 2017) must meet D-2 standards.
- Existing ships (built before 08 Sept 2017) must meet D-2 standards at first IOPP renewal survey after 08 Sept 2019.
- All vessel must comply with D-2 standards before 08 Sept 2024.

**Q-206) HOW YOU MAKE SURE THAT THE SHIP IS COMPLYING BWM?**

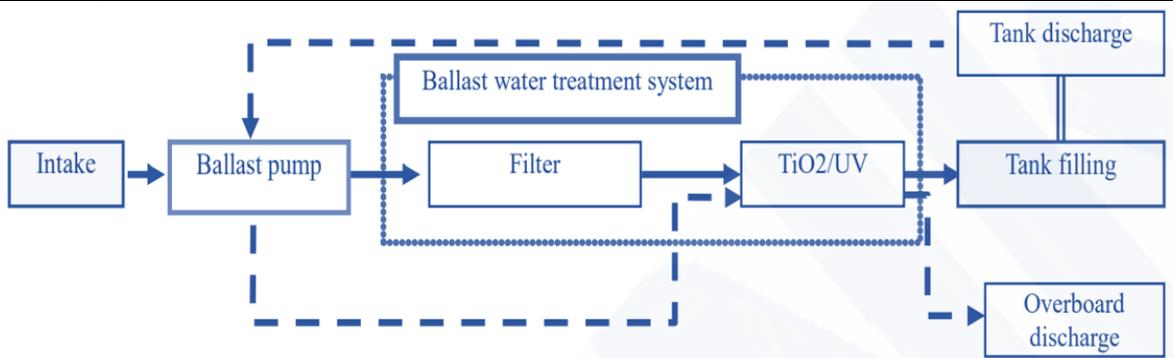
In order to show compliance with the requirements of the Convention, each ship shall have on board:

1. A valid Ballast Water Management Certificate
2. Ballast Water Management Plan
3. A Ballast Water Record Book.

**Q-207) DIFFERENT TYPES OF BALLAST WATER TREATMENT SYSTEM AVAILABLE?**

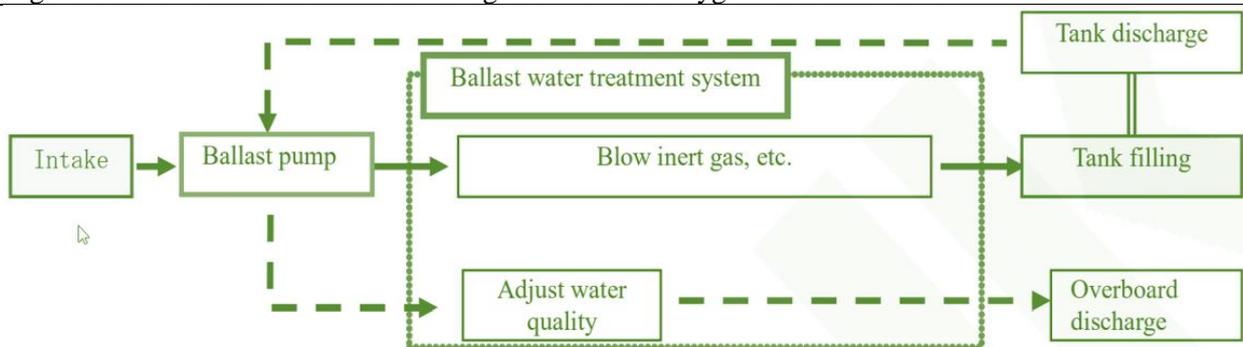
1. UV treatment method
2. Gas Treatment method
3. Electrolysis method
4. Magnetic Separation method.

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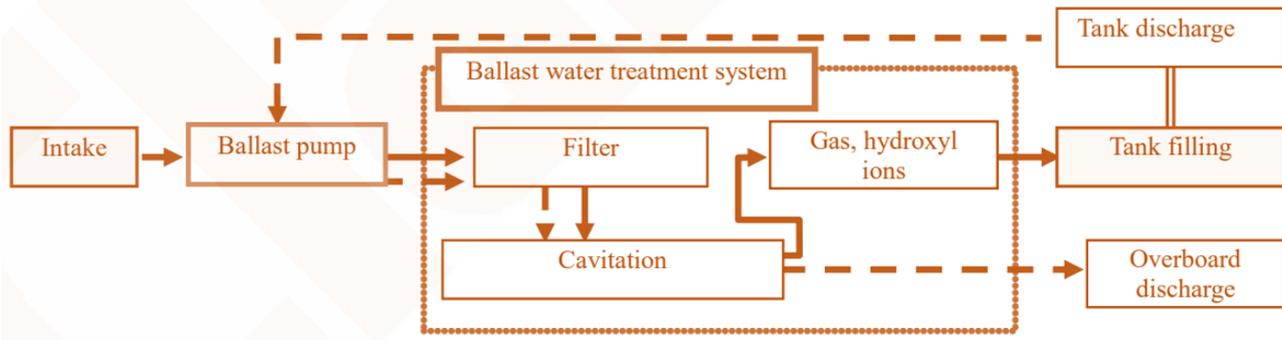
**UV TREATMENT METHOD**

- Filter removes particles above 50 microns.
- Light is emitted on Titanium Dioxide to generate active oxygen and OH radicals.



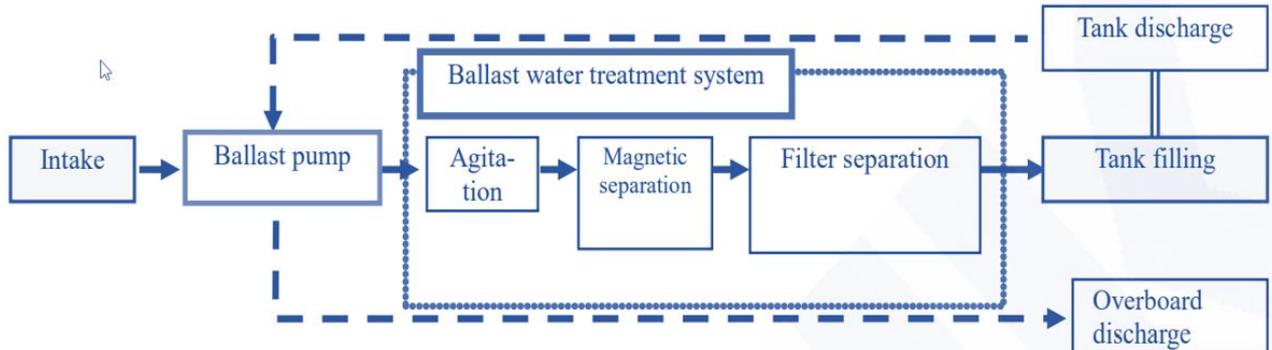
**GAS TREATMENT METHOD**

- Inert gas is blown into ballast water using a venture tube to sterilize water.
- It may need water quality adjustment or neutralization during discharge of ballast water.
- Sodium thiosulphate or sodium hypochlorite is used.



### ELECTROLYSIS METHOD

- Cavitation damages the cell membrane of organisms.
- Nitrogen gas and Hydroxyl ions generated by electrolysis are added to sterilize the ballast water.



### MAGNETIC SEPARATION METHOD

- Magnetic powder is fed to the ballast water, water is agitated and magnetic separation performed.
- No chemicals are used in the process

### Q-208) SOLAS REGULATION OF IG SYSTEM?

- Every oil tanker 20,000 DWT and above or a tanker less than 20,000 DWT but fitted with crude oil washing system must have an IG system.

#### **BLOWERS:**

- Minimum 2 number of blower to be fitted in I.G system.
- The capacity of each blower must be 1.25 times the overall capacity of the cargo discharge system onboard.
- Only 1 blower may be permitted by the administration if it fulfils the requirement stated in above point.
- A shut off arrangement must be provided in the suction and discharge connection side of the blowers.
- Generally the blowers are used for gas freeing hence an air inlet with blanking arrangement must be provided.
- Cargo tanks are pressure tested at 2500 mm water gauge and 700mm water gauge on the vacuum side. The blower pressure must not exceed the test pressure else the tank will get damage.
- Minimum pressure to be maintained by blower is 200 mm water gauge in cargo tank.
- There must be high temperature alarm (@ around 65 deg c) and a high temperature trip (@ around 75 deg to safeguard the blower.

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#### **NON-RETURN VALVES:**

- SOLAS Chapter II-2, Regulation 62 requires that the inert gas system is equipped with two non-return devices, one of which shall be a water seal, to prevent the return of hydrocarbon vapour to the gas-safe spaces.
- In addition, Regulation 62 requires that the arrangement of the deck seal shall be such that it will prevent the backflow of hydrocarbon vapours and will ensure the proper functioning of the seal under operating conditions.
- The second non-return device shall be a non return valve or equivalent capable of preventing the return of vapours or liquids or both and fitted forward of the deck water seal.

#### **FOR OIL AND CHEMICAL TANKERS:**

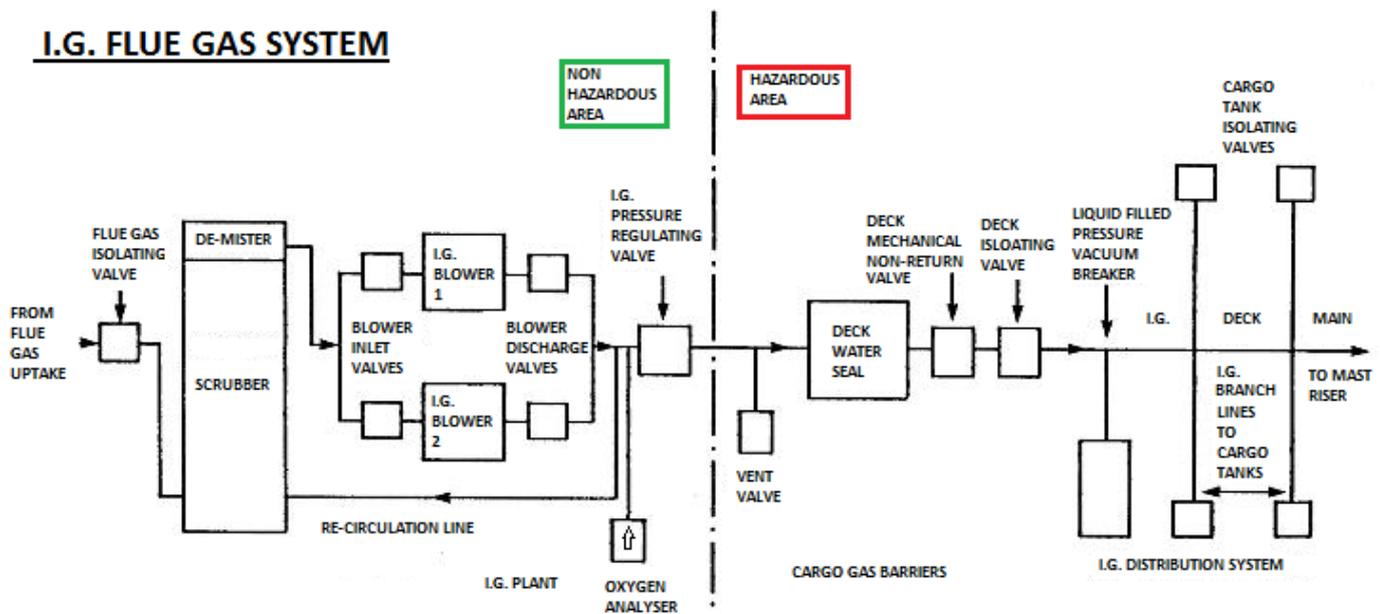
- For tankers fitted with exhaust gas inerting systems, the application of inert gas must be carried out during loading, on passage, unloading, tank cleaning and purging prior to gas freeing.
- However, for chemical tankers, the application of inert gas may take place after the cargo tank has been loaded, but before the commencement of unloading (only if nitrogen is used as the inerting medium) and shall continue to be applied until that cargo tank has been purged of all flammable vapours before gas freeing.
- The oxygen limit (all tankers) for inert gas supplied to cargo tanks has also been lowered from 8% to 5% for new systems.

## MISCELLANEOUS:

- A flue gas scrubber shall be fitted which will effectively cool the volume of gas and remove solids and sulphur products.
- Filters or equivalent devices shall be fitted to minimize the amount of water carry over.
- Two fuel pumps shall be fitted to the Inert Gas Generator.
- A gas regulating valve to be fitted which automatically regulates the flow of inert gas.
- One or more pressure-vacuum breaking devices shall be provided to prevent the cargo tanks.
- Scrubber and blowers shall be located aft of all cargo tanks, cargo pump rooms and cofferdams separating these spaces from machinery spaces of category A.

## Q-209) EXPLAIN IG SYSTEM?

JAI MATA DI - CLASS 2 SAFETY NOTES  
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1. **Exhaust gases source:** inert gas source is taken from exhaust uptakes of boiler or main engine as contains flue gases in it.
2. **Inert gas isolating valve:** It serve as the supply valve from uptake to the rest of the system isolating both the systems when not in use.
3. **Scrubbing tower:** Flue gas enters the scrub tower from bottom and passes through a series of water spray and baffle plates to cool, clean and moist the gases. The SO<sub>2</sub> level decreases up to 90% and gas becomes clear of soot.
4. **Demister:** Normally made of polypropylene, it is used to absorb moisture and water from the treated flue gas.
5. **Gas Blower:** Normally two types of fan blowers are used, a steam driven turbine blower for I.G operation and an electrically driven blower for topping up purpose.
6. **I.G pressure regulating valve:** The pressure within the tanks varies with the property of oil and atmospheric condition. To control this variation and to avoid overheating of blower fan, a pressure regulator valve is attached after blower discharge which re-circulates the excess gas back to scrubbing tower.
7. **Deck seal:** Purpose of the deck seal is to stop the gases to return back which are coming from the blower to cargo tanks. Normally wet type deck seals are used. A demister is fitted to absorb the moisture carried away by the gases.
8. **Mechanical non return valve:** It is an additional non return mechanical device inline with deck seal.
9. **Deck isolating valve:** The engine room system can be isolated fully with the deck system with the help of this valve.
10. **Pressure Vacuum (PV) breaker:** The PV breaker helps in controlling the over or under pressurization of cargo tanks. The PV breaker vent is fitted with flame trap to avoid fire to ignite when loading or discharging operation is going on when in port.
11. **Cargo tank isolating valves:** A vessel has numbers of cargo holds and each hold is provided with an isolating valve. The valve controls the flow of inert gas to hold and is operated only by a responsible officer in the vessel.
12. **Mast riser:** Mast riser is used to maintain a positive pressure of inert gas at the time of loading of cargo and during the loading time it is kept open to avoid pressurization of cargo tank.
13. **Safety and alarm system:** The Inert gas plant is provided with various safety features to safeguard the tank and its own machinery.

## Q-210) WHAT ARE THE ALARMS AND TRIPS FITTED IN IG SYSTEM?

Following are various alarms incorporated in the Inert Gas plant:

- Scrubber low level
- Deck seal High level
- Low O<sub>2</sub> Content (1%)
- High O<sub>2</sub> Content (5%)

Following are various alarms (with Shutdown) incorporated in the Inert Gas plant on board ship:

- **High Level in scrubber** leads to alarm and shutdown of blower and scrubber tower
- **Low pressure sea water supply (approx. 0.7 bar)** to scrubber tower leads to alarm and shutdown of blower
- **Low pressure sea water supply (approx. 1.5 bar)** to deck seal leads to alarm and shutdown of blower
- **High inert gas temperature (approx. 70 deg C)** leads to alarm and shutdown of blower
- **Low pressure in line after blower (approx. 250mm wg)** leads to alarm and shutdown of blower
- **Oxygen content high (8%)** leads to alarm and shutdown of gas delivery to deck
- **Low level in deck seal** leads to alarm and shutdown of gas delivery to deck
- **Power failure** leads to alarm and shutdown of blower and scrubber tower
- **Emergency stop** leads to alarm and shutdown of blower and scrubber tower

## Q-211) WHAT ARE THE IG CONSTITUENTS?

- Oxygen (O<sub>2</sub>) = 2-4%
- Carbon dioxide (CO<sub>2</sub>) = 12-14%
- Nitrogen (N<sub>2</sub>) = 80-85%
- Un-burnt Hydrocarbon (HC) = <0.1% (traces)
- Oxides of nitrogen (NO<sub>2</sub>) = 0.01-0.015% (traces)
- Carbon monoxide (CO) = NIL (traces)
- Sulphur dioxide (SO<sub>2</sub>) = <0.3% (traces)

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## Q-212) EXPLAIN PV VALVE AND PV BREAKER?

### PV VALVE : fitted on each and every tank

Pressure vacuum valve or PV valve in the ventilation system will prevent either over or under pressure. They are set usually so that tank pressure of about 0.14 bar will lift the main valve (The smaller valve will lift along with it) and release excess pressure. The vapour passes to atmosphere through a gauze flame trap. Drop in tank pressure compared with that of the outside atmosphere will make the small valve open downwards to equalize internal pressure with that outside. Simple PV valve is shown in fig.

The latest form of PV valves are High velocity vents, which vent out the IG at Very high velocity thus reducing health hazard caused due to inhaling IG.

Venting capacity: 30 meter/second minimum

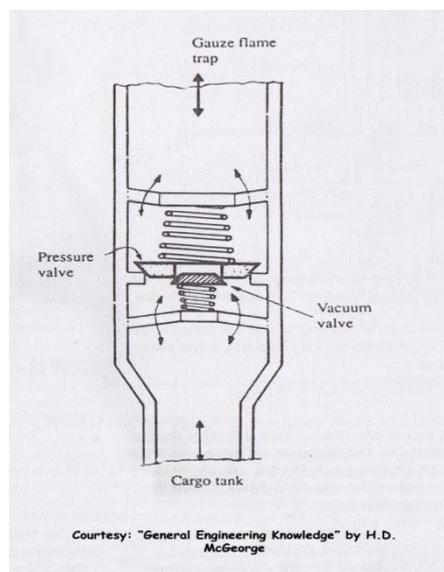
Height: should be fitted at height of following

- 1) 6 meter above the weather deck.
- 2) B/3 above the weather deck.
- 3) 6 meter above a walkway, if the walkway is 6 meter horizontal radius from the vent discharge

**Low pressure setting:** Low pressure alarm is at **200 mm of Water Column**. Low-Low pressure trip is at **100 mm of Water Column**. At this pressure cargo pumps are tripped.

**High pressure setting:** When IG pressure reaches **1200 to 1300 mm of Water Column**, recirculation valve for IG opens.

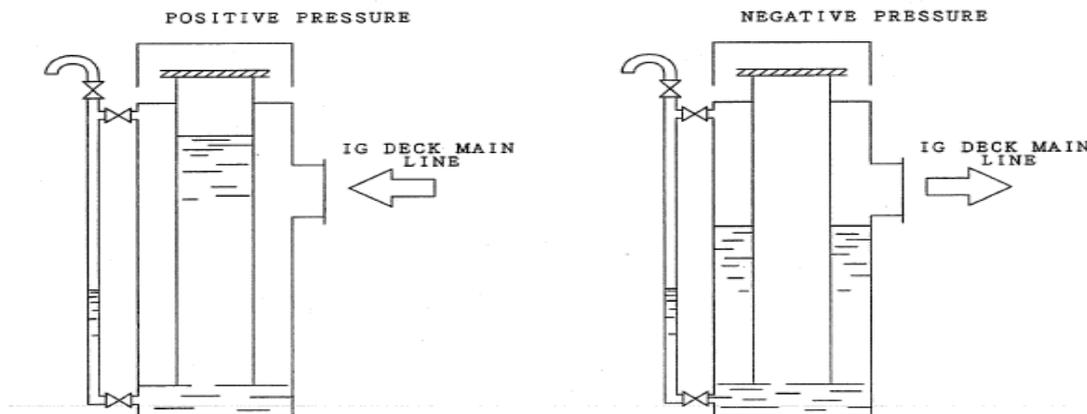
**PV valve lift setting:** Pressure vacuum valve operates at **1600 mm of Water Column** and at a **vacuum of -350 mm of Water Column**.



**PV BREAKER: (fitted only one on common line)**

Purpose is same for both but PV breaker is the final backup of any of the PV valves and consists of two concentric tubes which are filled with water with antifreeze mixture (glycol).

Setting of PV breaker is higher than PV valve.



**1) When Pressure Rises**

When the pressure in the cargo oil tanks rise, the seal liquid rises in the inner pipe. At this time, if the pressure beyond the specific capacity of the breaker, the seal liquid will push out of the pipe to let the pressure inside be out.

**2) When Pressure drops**

When the pressure in the cargo oil tanks fall, the seal liquid rises in the outer pipe. If the pressure beyond the specific capacity of the breaker, the seal liquid is drawn into the cargo oil tanks, and atmospheric air will be inhaled in the tank.

**PV breaker lift setting:** PV breaker operates at **1890 mm of Water Column** and at a **vacuum of -400 mm of Water Column** (varies from ship to ship)

**How much pressure a cargo tank can withstand ?**

Cargo tank is normally tested to a positive pressure of 2500 mm of Water Column and negative pressure of -750 mm of Water Column.

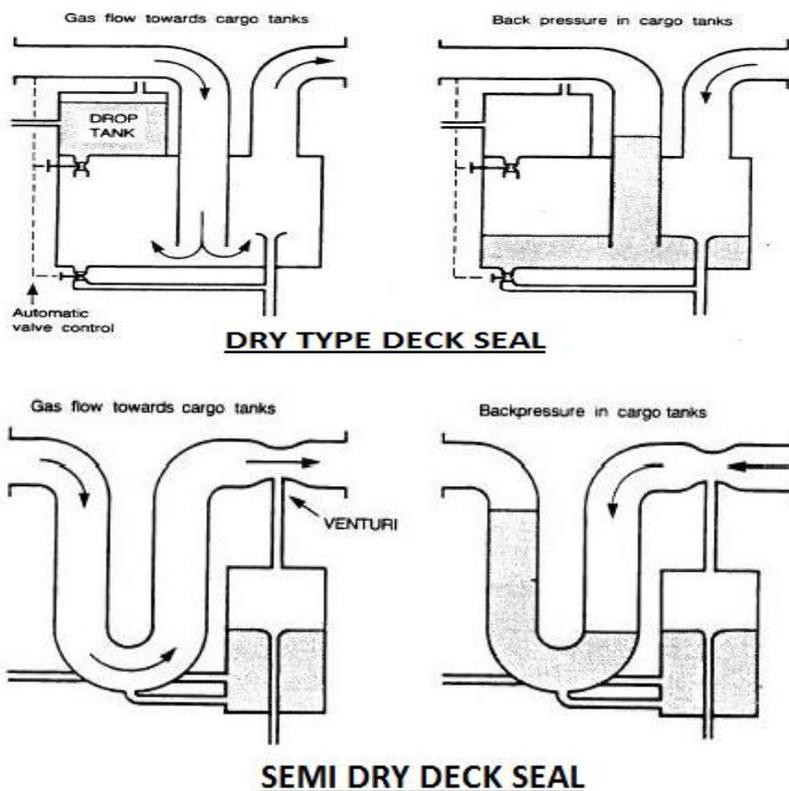
**How to convert mm of Water Column to bar ?**

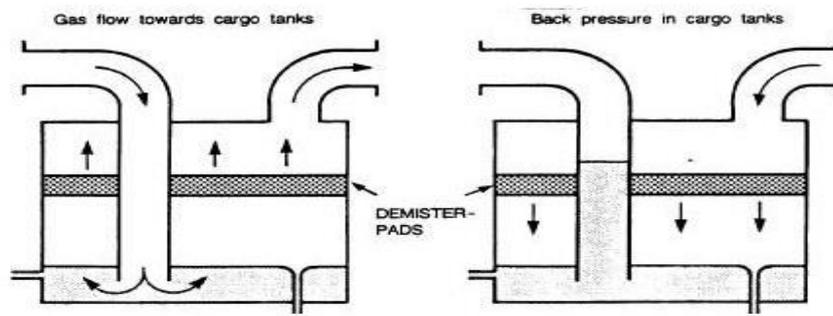
1000 mm of Water Column = 0.0980665 bar

For practical purposes we can take 1000 mm of water column = 0.1 bar

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**Q-213) TYPES OF DECK SEAL?**





**WET TYPE DECK SEAL**

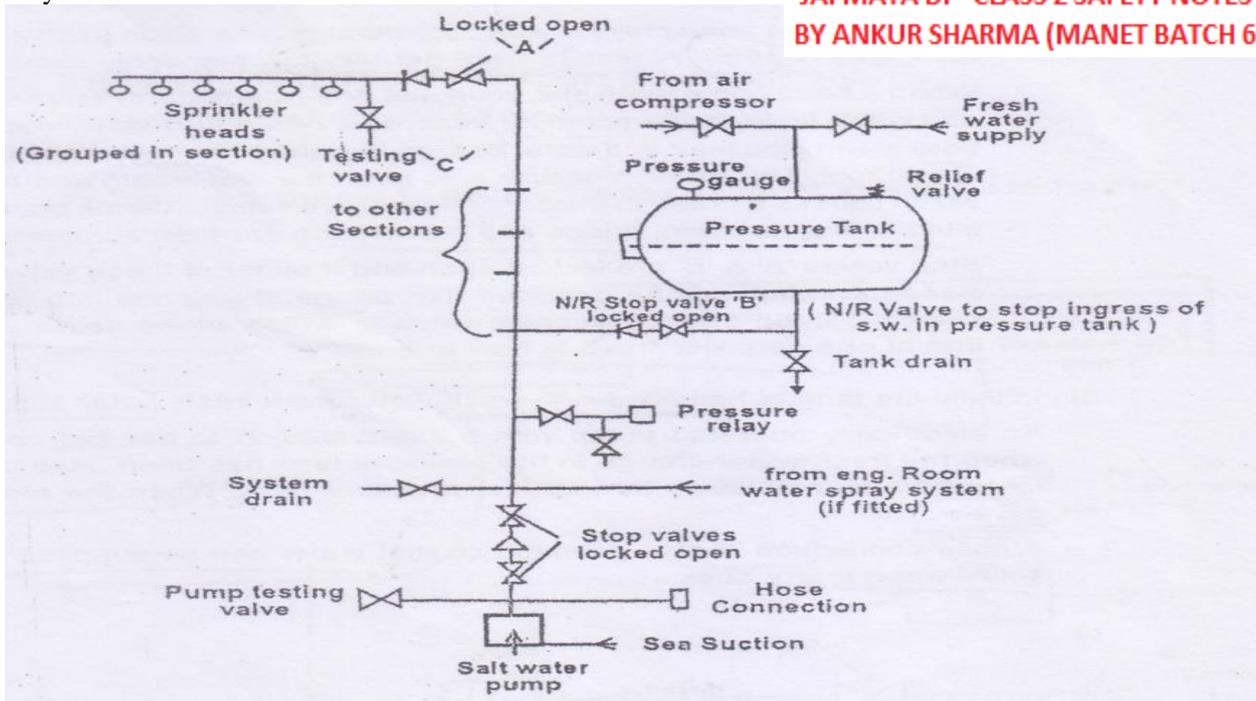
**Q-214) SOLAS REGULATION FOR AUTOMATIC SPRINKLER SYSTEM?**

1. Each sprinkler head must be capable of delivering water at a rate of 5 L / m<sup>2</sup> / minute.
2. Each sprinkler head is sufficient to cover the area of about 16 square meters.
3. One section is permitted to contain maximum 200 heads.
4. The pressure at the highest sprinkler head in the system is not less than 4.8 bar.
5. Sprinkler heads are spaced not more than 4 meter apart and 2 meter from the vertical wall.
6. There must be at least two powers source for the sea water pump, alarm system and FW pump.
7. This system consists of independent sea water pump with its own sea water suction.
8. Section alarm can be tested individually by test cock on each section.

**Q-215) EXPLAIN AUTOMATIC SPRINKLER SYSTEM?**

- The automatic water sprinkler system is an automatic fire detecting, alarm and extinguishing system which can deal quickly and effectively with any outbreak of fire that may occur in accommodation or other spaces on ships.
- The entire system is initially charged with fresh water at a pressure of about 8 bar by a tank (tank is half filled with fresh water), maintained under pressure by compressed air.
- It is also connected to an independent sea water pump with its own sea water suction. Each sprinkler head has a quartzoid bulb which retains a diaphragm seal in the outlet of the water pipe.
- When the sprinkler head comes into operation, the non return alarm valve for the section opens and water flows to the sprinkler head. This non return valve also uncovers the small bore alarm pipe lead and water passes through this small bore alarm pipe to a rubber diaphragm. The water pressure acts on this diaphragm and this operates a switch which causes a break in the continuously live circuit. Alarms both visible and audible, fitted in engine room, bridge and crew space are then automatically operated.
- When the system pressure dropped to 5 bar, the sea water pump will start automatically and continue supply with sea water. A hose connection is also provided so that water can be supplied to the system from shore when ship is in dry dock

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**What is the principle of shattering quartzoid bulb in sprinkler head ?**

- Principle is 'Boiling Liquid Expanding Vapour Explosion' (BLEVE). It is an explosion caused by the rupture of a vessel containing a pressurized liquid above its boiling point.

### How the sprinkler head operates in automatic water sprinkler system on ships ?

- Each sprinkler head is made up of steel cage fitted with a water deflector.
- A quartzoid bulb, which contains a highly expansible liquid, is retained by the cage.
- The upper end of the bulb presses against a valve assembly which incorporates a soft metal seal.
- When quartzoid bulbs are manufactured, a small gas space is left inside the bulb so that, if the bulb is subjected to heat, the liquid expands and the gas space diminishes. This will generate pressure inside the bulb and the bulb will shatter once a predetermined temperature is reached.
- Once the bulb shatters the valve assembly falls permitting water to be discharged from the head which strikes the deflector plate and sprays over a considerable area.
- Generally the operating temperature range of quartzoid bulbs is 68 °C to 93 °C but the upper limit of temperature can be increased. Quartzoid bulbs are manufactured in different colours which indicate the temperature rating of the bulb.
- **RED** 68dgC; **YELLOW** 80dgC; **GREEN** 93dgC; **BLUE** 141dgC; **VIOLET** 182dgC

### Safeties of Sprinkler system:

<ul style="list-style-type: none"> <li>• Relief valve on tank</li> <li>• Pressure relay</li> <li>• Alarm on each section (NR alarm vv)</li> <li>• Non return valve</li> </ul>	<ul style="list-style-type: none"> <li>• Stop valve are locked open, raise alarm in case of inadvertently closing.</li> <li>• Power supply from ESB</li> <li>• Pump test valve</li> <li>• Hose connection (dry dock)</li> </ul>
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### Q-216) REGULATION FOR FOAM SYSTEM?

It comes under SOLAS Chapter II-2, Regulation 9 and FSS code Chapter 6

- Should be capable of delivering foam to entire cargo tank deck as well as into a cargo tank if that is ruptured.
- Control station should be outside and away from the cargo area and readily accessible.
- Expansion ratio to be not more than 12:1
- Foam to be supplied from monitor and applicators and each monitor shall supply atleast 50% of the rate required.
- The capacity of any monitor shall be atleast 3 litres/m<sup>2</sup>/min.
- Applicator capacity shall not be less than 400 litres/minute and throw should not be less than 15 meter in still air.
- Foam supplied through foam monitors and applicators shall not be less than 1250 litre/minute.
- Minimum 4 applicators should be there.
- Any area on cargo deck to be reached by atleast 2 foam applicators.

### Regulation regarding rate of flow for fixed foam system:

The rate of supply of foam solution shall not be less than the greatest of the following:

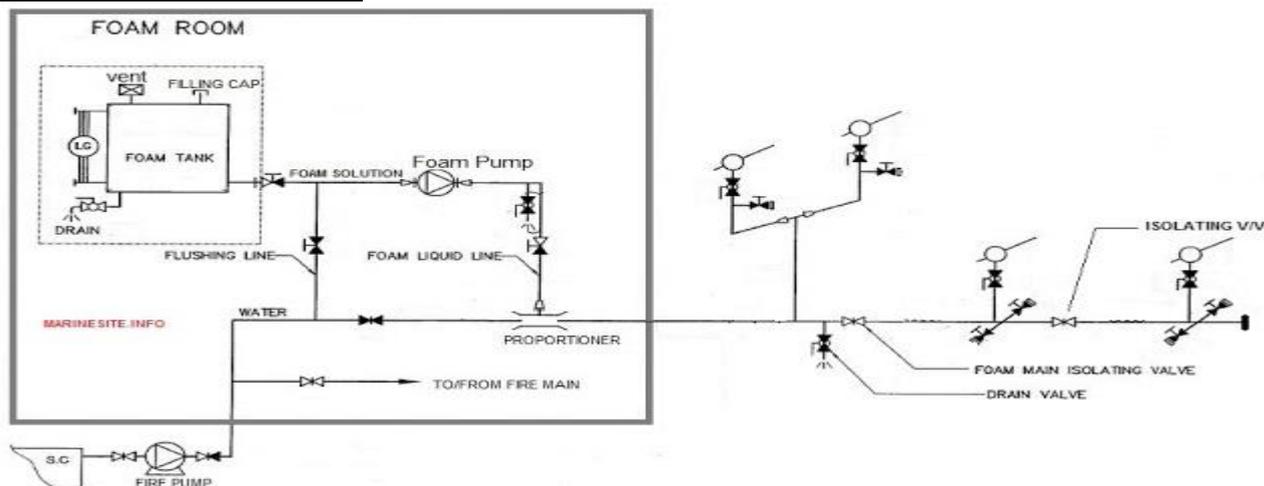
- 0.6 l/min per square meter of cargo tanks deck area, where cargo tanks deck area means the maximum breadth of the ship multiplied by the total longitudinal extent of the cargo tank spaces;
- 6 l/min per square meter of the horizontal sectional area of the single tank having the largest such area; or
- 3 l/min per square meter of the area protected by the largest monitor, such area being entirely forward of the monitor, but not less than 1,250 l/min

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### Sufficient foam concentrate shall be supplied to ensure atleast

- 20 min of foam generation in tankers fitted with an inert gas installation
- 30 min of foam generation in tankers not fitted with an inert gas installation

### Q-217) EXPLAIN FOAM SYSTEM?



Foam gives smothering and cooling effect to the applied area. It can be used in open areas like deck as well as closed areas like engine room.

Foam solution itself won't make foam, it requires water and air for making proper foam. The main components of foam system are,

- Foam tank
- Foam pump
- Proportioner
- Sea water pump
- Foam monitors
- Non return valve springs and isolation valves

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**Foam Tank**

It's the storage tank of foam solution having a level gauge to check the level of the foam solution. There is a filling cap to refill the foam solution. Also, a vent is provided to avoid over pressurisation and under pressurisation of the tank. A drain is also provided with the help of which you can check the foam solution and drain out the whole solution if it seems to be damaged.

**Foam pump**

It's a centrifugal pump having suction from foam tank and fire line. The suction from fire line is only for flushing and testing purpose of the pump. In some systems instead of pump, eductors are provided in the fire line to suck out the foam from fire line.

**Proportioner**

Improper water and foam mixture can't make proper foam; this is done with the help of Proportioner. Water and foam mixing ratios can be adjusted using this.

**Sea Water Pump**

This may be fire pump or emergency fire pump which will give enough water in the foam line.

**Foam monitors**

Mixing of air takes place in foam monitors. Foam monitors can be rotated to 360 degrees and have an elevation of -45 degree to +70 degree.

**Non return valve springs and Isolation valves**

At the suction side of the foam pump, a non return valve is provided to avoid the contamination of foam with sea water. Isolation valves are provided at particular interval in the foam line to isolate the line, if it got damaged during fire.

**Q-218) MAINTENANCE CHECKS TO BE DONE ON FOAM SYSTEM?**

<p><b>Weekly Checks</b></p> <ul style="list-style-type: none"> <li>➤ Check all valves for the freeness, and check whether it is in correct position, either normally open or closed.</li> <li>➤ Check whether the markings on the valves are visible</li> <li>➤ Check the level of the foam liquid storage tank.</li> </ul>	<p><b>Half Yearly Checks</b></p> <ul style="list-style-type: none"> <li>➤ Line up and run the system for 3 mins and ensure that proper foam is produced.</li> <li>➤ Check foam liquid strainer and clean whenever necessary</li> <li>➤ Check all monitors for the free movement</li> </ul>
<p><b>Monthly Checks</b></p> <ul style="list-style-type: none"> <li>➤ Check if the electrical supply to the foam liquid pump is normal</li> <li>➤ Start the fire pump and line up water to the foam hydrant. Check if the isolation valves are holding and make sure that no trace of foam is coming out.</li> </ul>	<p><b>Annually Checks</b></p> <ul style="list-style-type: none"> <li>➤ Foam pump motor to be greased</li> <li>➤ Send the foam sample for analysis</li> </ul>

**Q-219) WHY LOW EXPANSION FOAM IS USED ON DECK?**

- Low expansion foams are using in open areas like deck because it is having heavier density. If high expansion foam is used , because of low density it may get thrown by the wind
- High expansion foams are used in closed spaces like engine room
- The foam with expansion ratio between 1:2 and 1:20 is called low expansion foam.
- Foam with expansion ratio between 1:20 and 1:200 is called medium expansion foam.
- Foam with expansion ratio above 1:200 is called high expansion foam.

## Q-220) TYPES OF FOAM SOLUTION USED ONBOARD?

- **Chemical foam:**  
It produces the foam by chemical reaction of two chemicals, one being alkali and second an acid.
- **Mechanical foam:**  
It uses physical agitation of the foam concentrate to produce foam.

On board ships, the mechanical foam is mostly used. Various mechanical foams are:

<u>PROTEIN FOAM</u>	<u>FPF (Fluoro-Protein Foam)</u>	<u>AFFF (Aqueous Film foaming foam)</u>
<ul style="list-style-type: none"> <li>• Specific gravity : 1.13 – 1.18</li> <li>• It has high stability and high heat resistant.</li> <li>• Non-toxic</li> <li>• Cheap</li> <li>• Used on crude oil fires</li> </ul>	<ul style="list-style-type: none"> <li>• Specific gravity : 1 – 1.15</li> <li>• Same as Protein foam</li> <li>• Used on crude oil and refined oil</li> </ul>	<ul style="list-style-type: none"> <li>• Specific gravity : 1 – 1.12</li> <li>• It has 3 to 5% of foam and rest is water</li> <li>• It is non-toxic</li> <li>• It can be stored for longer period without degradation.</li> </ul>

## Why we use “Alcohol resistant” Aqueous film forming foam concentrate (AR-AFFF)?

- As I said foam has water in it. All the solvents like alcohols are miscible in water. So if we use normal foam on alcohol fires, alcohol will dissolve the water and foam will break up easily.
- So for extinguishing the fires involving solvents like alcohol, normal foam concentrate will not do.
- For fighting the fires involving alcohols and other solvents, [Alcohol resistant foam](#) is required.
- On chemical tankers, that have foam as fixed fire fighting system for cargo fires, alcohol resistant foam is a must. This is because these ships carry alcohols (like Methanol, ethanol) as cargo.
- So next time we check the foam certificate on a chemical tanker, we must look for the information mentioning the foam to be alcohol resistant.

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**BY ANKUR SHARMA (MANET BATCH 6)**

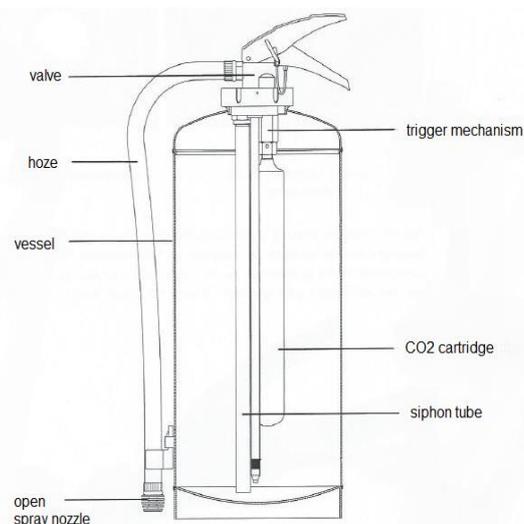
## Q-221) EXPLAIN STORED PRESSURE EXTINGUISHERS & CARTRIDGE OPERATED EXTINGUISHERS?

### Stored-pressure extinguishers

- A fire extinguisher under permanent pressure is immediately put under pressure at the factory. The pressure is usually between 12 and 17bar. The extinguishing vessel contains the extinguishing agent (foam, powder, water, or a variant) at the bottom, and the rest of the vessel is filled with a propellant to achieve the required pressure. Usually that propellant is di-nitrogen (N<sub>2</sub>). Because the fire extinguisher is under such pressure, the extinguishing agent will spray out as soon as you press the discharge lever.
- You recognise a stored-pressure extinguisher by the presence of a pressure gauge or pressure indicator (except for CO<sub>2</sub> extinguishers: they are always under permanent pressure (of their own) and never have a pressure gauge)



Stored pressure Extinguisher



Cartridge operated Extinguisher

### Cartridge-operated extinguishers

- Cartridge-operated extinguishers are not put under pressure in advance. Therefore, the vessel initially only contains the fire-extinguishing agent. You can activate the cartridge-operated extinguisher by pushing the plunger on top (as with our fire extinguishers), or by pressing a built-in squeeze lever.
- Whatever the system of activation is, pressing it causes a sharp pin to break open the internal cartridge filled with CO<sub>2</sub>. As a result, the CO<sub>2</sub> gas flows into the fire extinguishing tank, putting it under pressure. If you then press

the squeeze tap on the extinguisher or on the hose, the extinguishing agent (powder, foam, water or a variant) will spray out forcefully.

Stored-pressure extinguishers	Cartridge-operated extinguishers
<b>Advantages:</b> <ul style="list-style-type: none"> <li>• Simple construction</li> <li>• Slightly cheaper</li> <li>• User can check the state of fire extinguisher by pressure gauge</li> </ul>	<b>Advantages:</b> <ul style="list-style-type: none"> <li>• Can be opened on site.</li> <li>• Can be thoroughly checked internally on site.</li> <li>• Easily refilled</li> <li>• Easy to repair</li> <li>• Not sensitive to leakage.</li> <li>• Can be used for full life span of 20 years.</li> </ul>
<b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• More sensitive to leakage.</li> <li>• Cannot be opened or refilled on site.</li> <li>• Can never check thoroughly inside fire extinguisher on site</li> <li>• Must be replaced after 10 years.</li> </ul>	<b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• Slightly more expensive</li> </ul>

### **Q-222) SOLAS REQUIREMENT FOR CO2 FIXED FIRE FIGHTING SYSTEM?**

As per SOLAS requirements, ships of 500 gross volumes or more, engine room should have a fixed fire fighting system. And this should comply with these requirements:

- There should be two separate release controls, one from the CO2 room and another from fire control station.
- 50% of total quantity should be discharged within 1 minute and 85% within 2 minutes.
- Capacity of CO2 in the system to be:
  - A) 30% of the gross volume of the largest protected cargo space,
  - B) 40% of the gross volume of machinery space excluding engine casings,
  - C) 35% of the gross volume of machinery space including engine casings for vessels GT < 20000.
 Total amount of CO2 cylinders depends on the highest gross volume out of above A,B,C in a particular ship.
- Pressure test of manifold line to done at 122 bar.
- The diameter of distribution line should be 19mm.
- Pipes to cargo spaces not to pass through E/R unless all pipes tested to 122 bar.
- Audio visual alarm arrangement should be there while operating.
- Automatically trip of ventilation arrangement should be there.
- Safeguard against Unauthorized usage.
- Cu pipes and high flexible pipes allowed between cylinder outlet valve and manifold.

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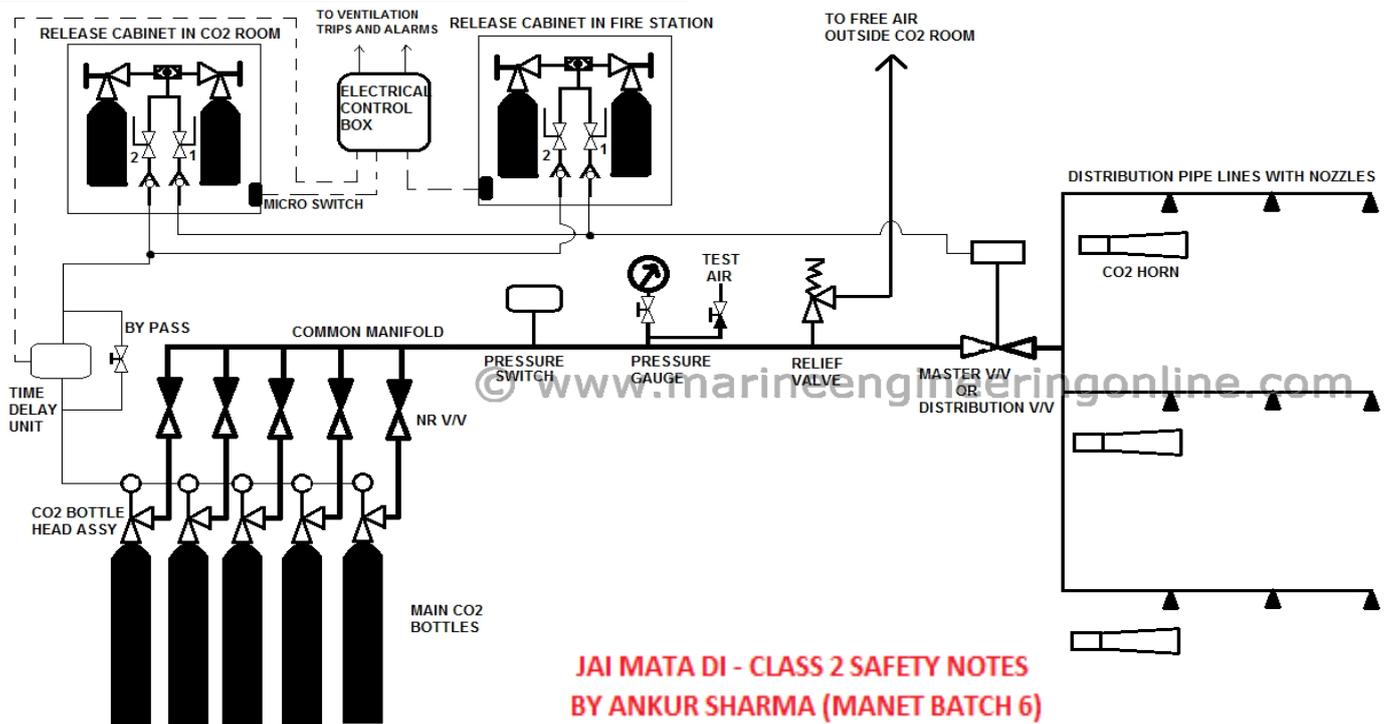
### **Q-223) SOLAS REQUIREMENT FOR CO2 BOTTLES?**

- The bottle should be recharged, if 5% loss or more, It can be checked by weighing bottle.
- Straps should be there to secure the bottle against movement and vibrations.
- All bottles labelled with 52bar.
- Bursting disc should operate at 63 degrees and 177-193 bar.
- At 228 bar hydraulic test of the bottle to be done.
- CO2 bottle should be stored less than 55 degrees temperature to avoid the evaporation of liquid CO2 in the bottle that will cause excess pressure and rupture of the bursting disc.

### **Q-224) SOLAS REQUIREMENT FOR CO2 ROOM?**

- The storage room should be used for no other purpose.
- The room should not be located below deck, If below deck is located then it should be directly accessible by stairway or ladder from the deck.
- The room should be fitted with mechanical ventilation designed to take exhaust from the space and should be sized to provide at least 6 air changes per hours.
- Entry door of the room should open outwards.
- All bulkhead, deck and opening and the closing door should be gas tight.
- Room temperature should maintain below 55 degrees.
- There should be a minimum clear height of 2.4M to provide the bottle weighing arrangement.

## Q-225) EXPLANATION OF CO2 FLOODING SYSTEM?



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### Explanation of System:

Main CO2 bottles contain carbon dioxide in liquid state with a pressure of 56 bar at 20 degree Celsius. Pressure of CO2 at 25 and 30 degree Celsius are 64 bar and 71 bar respectively. So it is important to keep the temperature of CO2 bottles low for limiting the pressure inside bottles. CO2 from the main bottle is released by a 'CO2 release cabinet' as shown in the figure. As soon as the release cabinet door is opened, a micro switch is activated. The micro switch will ensure the activation of CO2 warning alarms and ventilation shut off. CO2 release cabinet or release box consist of two pilot CO2 cylinders or bottles containing CO2 gas inside. The pressure of CO2 inside these pilot bottles is same as that of main CO2 bottles. Only quantity of gas is different. For releasing CO2 to the protected space, one of the pilot bottle valve is opened. Now CO2 reaches two valves marked 1 and 2. First valve 1 is to be opened. Then CO2 passes through a non return valve and opens pneumatically operated master valve. Now master valve is opened. Next, open valve 2 in the release cabinet, which supply CO2 to main CO2 bottle head assembly through a non return valve and 'time delay unit'. Function of the time delay unit is explained below. Head assembly consist of a pressure operated cylinder valve. This pressure operated cylinder valve prevents CO2 from bottle coming to the common manifold. As CO2 reaches the head assembly from pilot bottle, pneumatic actuator in the head moves and opens the pressure operated cylinder valve. Then CO2 from main bottle escapes to the common manifold via non return valve as shown. Each of the main CO2 cylinder have a head assembly and non return valve. The pilot CO2 line is connected to all these heads. All the CO2 from the main bottles now release to common manifold. Since the master valve is already open before, CO2 from manifold is released to the protected space through distribution pipe lines and nozzles.

## Q-226) PROCEDURE FOR RELEASING CO2?

### Precautions to be taken before releasing CO2:

1. The crew should muster at their muster stations and headcount to be taken.
2. It is Master to take the decision, depending on the situation and company policy.
3. Master will take the decision with consult of chief engineer.
4. Nearest coast guard and port authority to be informed as soon as possible.
5. Emergency generator should be on load because power will be required for running emergency fire pump for boundary cooling.
6. All access doors of the engine room, vent flaps, blower flaps, skylights, hatches, fire flaps, to be closed.
7. Quick closing valves to be closed to cut fuel and lube oil supply.
8. Emergency stops for lube oil pumps, fuel oil pumps to be operated.
9. All machinery in the engine room to be stopped.
10. Ensure all personnel vacated engine room in case of the port also ensure that all port persons are out of engine room. This can be ensured by gangway watch person. Muster station of all port crew in case of emergency is gangway.
11. CO2 must be released by a competent engineer.

### Procedure for releasing:

1. Again ensure that all persons are out of engine room.

2. Break the glass and take out the key for CO2 release cabinet from key box. Cabinet arrangement is provided at both place CO2 room and as well as in fire control station. Using local CO2 release cabinet is preferred.
3. Open the cabinet door. Audio visual alarms will sound and ventilation blower trips will activate as we open the door.
4. In the CO2 release cabinet, open pilot cylinder valve first. Now open valve 1 for master valve first. Then open valve 2 for CO2 releasing mechanism. CO2 will be released after 60-90 seconds of time delay.
5. Now check the manifold pressure located in line to ensure proper activation.
6. If CO2 is not released, then follow emergency releasing procedure. Open master valve manually and open each CO2 main bottle by manual actuation lever.

Precautions to be taken after releasing CO2:

1. CO2 released successfully or not can be check for manifold pressure and heavy noise of its releasing.
2. Continue the boundary cooling to reduce the inside temperature to avoid re-ignition.
3. Do not start ventilation immediately, wait for temperature fall and ensure that complete fire extinguisher and no chance of re-ignition.
4. After some time start ventilation, before entry sufficiently ventilate to avoid any danger.
5. Entry to be carried out by trained personnel wearing breathing apparatus SCABA.
6. Even after the fire has been extinguished completely, never bring bare flame such as candlelight or lighted cigarette into the burnt room, otherwise, fire may break out again due to the explosion of combustible gases if any.
7. Keep entrance clear to get out in case of any danger or emergency.
8. Back up team or support team to be standby in case any emergency or casualty.
9. Keep a person stand by at entrance for instructions and communication between team inside and control station.
10. An agreed system of communication and intrinsically safe lighting system to be set up.
11. In the event of any danger or ventilation system fails, person should leave the place immediately.

Q-227) SAFETIES PROVIDED IN CO2 FIXED FIRE FIGHTING SYSTEM?

1. **Relief valve** – it is for manifold line safety, operates in case of excess pressure 10% more than working pressure in the manifold line.
2. **Leak alarm** – it is fitted with the manifold line to detect any leakage from any bottle. It give the alarm when the manifold pressure reached 4 bar.
3. **Time delay** – it allows delay of 60-90 second to bottle opening pilot gas to ensure that master valve opened properly.
4. **Master Valve** – It is fitted to prevent any accidental release of co2. It will not allow any leaking gas to go to the engine room.
5. **Cabinet door Alarm & Trip** – An arrangement is made, when we open cabinet door ventilation will trip and the audio-visual alarm will sound.(Working check-in diagram).
6. **Safety pin**- Provided at each handle of the bottle to avoid accident manual release.
7. **Bursting Disc**- Provided at bottle head assembly to release excess pressure.
8. **Non return valve**- Non return valve arrangement is provided to prevent any backflow of gases.
9. **Syphon tube**- It is a tube in the bottle that goes till bottle that ensures liquid CO2 discharge first with help of top CO2 gas forces.
10. **Shore connection**- Shore connection is provided to take CO2 from shore when required.
11. **Compressed Air Connection**- It is provided to blow through manifold line and nozzle.

Q-228) SAFETIES PROVIDED FOR CO2 BOTTLE ROOM?

- Proper ventilation arrangements of capacity 6 air change per hour.
- Ventilation suction from the bottom of the room because CO2 is heavier than air it will settle in the bottom in case of any leakage.
- Access door opens outward.
- Proper insulation of room.
- Proper illumination.
- Procedure poster how to release.

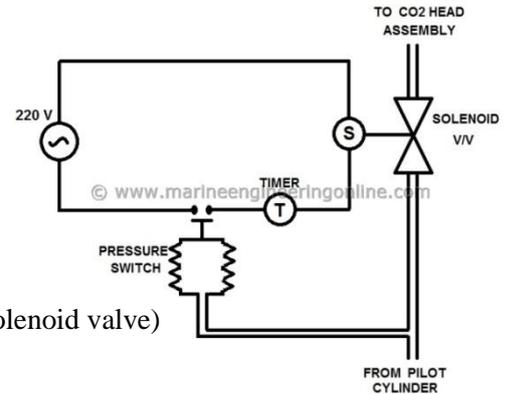
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Q-229) WHAT ALL CERTIFICATES ARE THERE FOR CO2 FLOODING SYSTEM?

1. Weight certificate (2 yearly)
2. Pressure test certificate of bottles (5 yearly)
3. Pressure test certificate of lines (15 yearly)
4. Installation certificate
5. Annual shore service certificate

**Q-230) PURPOSE OF TIME DELAY BOTTLE?**

- When cabinet door is open, then alarm will be sounded. If any person is in machinery space, then he will have time for escape within 60 to 90 seconds.
- In bulk CO2 system, there would be sudden pressure rise on the manifold if the master valve is not open. Therefore it provides a delay for opening of master valve.
- The time delay in no case should be less than 20 seconds.
- Time delay is of 2 types:
  - Electrical (It gets 220 Volt supply and has got a pressure switch and solenoid valve)
  - Empty bottle

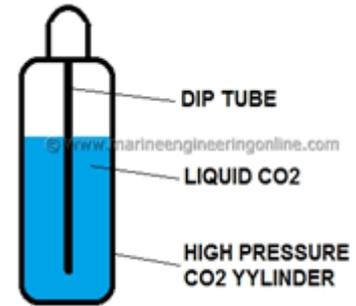


**Electrical Time Delay**

Power source is always available for the unit. Solenoid valve is normally in closed position. When CO2 from pilot cylinder (CO2 release cabinet) reaches the time delay unit, the pressure acts on the pressure switch. This closes the pressure switch. But the timer allows power supply to the solenoid only after 60-90 seconds, the timing can be adjusted as required. As soon as the specified time is reached, solenoid becomes energize and the solenoid valve will open. This allow passage of CO2 to the pressure operated cylinder valve of main bottle. Normally a by pass valve is also fitted across this time delay unit which can be used in case the unit goes defective.

**Q-231) EXPLAIN FUNCTION OF DIP TUBE?**

The function of dip tube is to deliver liquid carbon dioxide outside the bottle. If dip tube in not provided, CO2 evaporates from the surface while discharge taking latent heat of vaporization and remaining liquid CO2 will freeze inside and hence failure of CO2 discharge. Therefore it is necessary to operate CO2 fire extinguishers in upright position.



**Q-232) HOW TO ENSURE 85% OF CO2 DISCHARGED IN 2 MINUTES?**

- By selecting the design of CO2 pipeline in such a way that it will discharge 85% of CO2 in 2 mins.
- By seeing the pressure gauge, it will show full pressure for 2 mins and then it will start fluctuating.
- By siphon tube

*If not discharged in 2 mins:*

- Point of sublimation will reach and phase will be converted and CO2 will convert into ice and further lead to chocking of lines.
- Efficient blanket will not be formed if more than 2 minutes.

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**Q-233) CO2 MAINTENANCE AND INSPECTION?**

<p><b><u>MONTHLY</u></b></p> <ul style="list-style-type: none"> <li>• A visual inspection is carried out.</li> <li>• Check for alarm</li> <li>• Ventilation to be checked</li> <li>• Bottle to be properly secured</li> <li>• Sealing of the door to be checked</li> <li>• All valves to be in closed position</li> </ul>	<p><b><u>ANNUAL INSPECTION:</u></b></p> <ul style="list-style-type: none"> <li>• Inspect boundary of protected space and no modification has been carried out.</li> <li>• CO2 bottle inspection to be carried out for any rust.</li> <li>• Piping inspection to be done for any damage.</li> <li>• Nozzle to be checked for any damage.</li> <li>• All flexible discharge hoses to be properly tightened.</li> <li>• Air blow test to be carried out.</li> </ul>
<p><b><u>2 YEARLY INSPECTION:</u></b></p> <p>All above to be carried out and in addition to this</p> <ul style="list-style-type: none"> <li>▪ Weight checking of CO2 bottle should be done. If it is less than 90% then refill.</li> <li>▪ Discharge piping to be checked and nozzle to be checked for any blockage.</li> </ul>	<p><b><u>5 YEARLY INSPECTION:</u></b></p> <ul style="list-style-type: none"> <li>▪ The pilot lines to be pressure tested.</li> <li>▪ Relief valve to be checked at 180 bar.</li> </ul>
<p><b><u>10 YEARLY INSPECTION:</u></b></p> <ul style="list-style-type: none"> <li>▪ 10% of the bottle to be pressure tested at 250 bar hydraulically and if in this any one fails then 50 % of the bottles to be pressure tested and if in this any one fails then all the bottles to be</li> </ul>	<p><b><u>15 YEARLY INSPECTION AND 5 YEAR THEREAFTER:</u></b></p> <ul style="list-style-type: none"> <li>▪ Pressure test HP pipes, stop valves to engine room, pump room, purifier room etc. at 190 bar (hydraulic), medium pressure pipes at 80 bar</li> </ul>

<p>hydraulically pressure tested at 250 bar.</p> <ul style="list-style-type: none"> <li>▪ All the flexible hoses are to be replaced.</li> <li>▪ Discharge piping to be pressure tested at HP, MP and LP</li> <li>▪ CO2 bottles to be inspected internally. Siphon tube or dip tube to be checked.</li> <li>▪ After 20 years of installation of CO2 flooding system, these tests to be carried out every 5 years thereafter.</li> </ul>	<p>(hydraulic) and low pressure pipes at 7 bar air.</p> <ul style="list-style-type: none"> <li>▪ After hydraulic pressure testing, lines to be blown through by dry air.</li> </ul> <p style="text-align: center; color: red;"><b>JAI MATA DI - CLASS 2 SAFETY NOTES BY ANKUR SHARMA (MANET BATCH 6)</b></p>
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**Q-234) PRESSURE TESTING OF CO2 FLOODING SYSTEM AND MATERIAL OF CO2 LINES?**

PIPE SECTION	AREA	MATERIAL	TEST
High pressure section	From bottle to master valve	Galvanized seamless manganese steel	190 bar pressure test by liquid
Medium pressure section	From master valve to engine room	Galvanized seamless manganese steel	80 bar pressure test by liquid
Low pressure section	From engine room to nozzles	Galvanized seamless manganese steel	7 bar air blowing test
Pilot control line	Control lines	Copper tube	58 bar pressure test

**Q-235) HOW TO CALCULATE THAT HOW MANY CO2 BOTTLES ARE REQUIRED FOR SPACE?**

**CO2 calculation requirement:**

Quantity of free carbon dioxide calculation at 0.56 m<sup>3</sup>/ kg

Mixing ratio of CO2 based on the volume of protected spaces to be as follows:

- a) Gross volume of engine room space including casing = 35%
- b) Gross volume of engine room space excluding casing = 40%
- c) Gross volume of purifier room space = 40%

*Quantity of CO2 in kg = (GROSS VOLUME x MIXING RATIO) / 0.56*

NO.	NAME OF SPACE	GROSS MOLUME (M3)	QUANTITY OF CO2 (KG)	QUANTITY OF 45 KG CYLINDER
1	ENG ROOM SPACE INCL. CASING	7324	4577.5 (Mixing ratio=0.35)	102
2	ENG ROOM SPACE EXCL. CASING	6856	4897.14 (Mixing ratio=0.40)	109
3	PURIFIER ROOM SPACE	132	94.2 (Mixing ratio=0.40)	3

**Answer: Therefore required quantity of 45 kg CO2 cylinder for engine room = 109**

Note: The air reservoir in engine room space is not included in the above calculation since the outlet of safety valve shall be led to atmosphere outside engine room.

**Q-236) PROCEDURE FOR CO2 BOTTLE LEVEL MEASUREMENT?**

**Procedure for CO2 bottle level measurement**

- Level measurements of CO2 bottles is done every month, in which, a specified number of bottles are checked each month in such a manner that by the end of the year all the bottles are checked.
- The level measurement of CO2 bottles is done by a qualified engineer and is generally done in cold climatic conditions for during hot climate it is possible that the readings might be erratic.

**Tools Required for CO2 Bottle Level Measurement**

- A scale to measure height.
- Measuring device
- A marker to mark the point.

## Procedure

- Check the temperature of the room.
- Check if the level instrument is working fine and have good battery.
- Take out the instrument and switch it on.
- In cold climate the level is generally in the top part so we select top.
- Put the sensor on the bottle and keep moving it up and down until it indicates 100 on the panel.
- Make sure that the sensors of the instrument are touching the bottle properly.
- When the reading reaches 100, mark that point and continue with the other bottles listed as per the monthly plan.
- Now measure the height of the mark from the bottom of the bottle.
- Note and record the value.
- Put the values in the calculation sheet present onboard to find out the weight of the bottle.
- Bottles having wrong reading will be out of normal value range in the calculation sheet and will have to be checked again.
- In case of obtaining same reading after the 2nd attempt, report the chief engineer and replace the bottles as soon as possible.

## Q-237) ADVANTAGES OF CO2 SYSTEM?

- Density is 1.5 times higher than air. So CO2 settles down and displaces air.
- It can be easily liquefied and bottled.
- 20% – 30% CO2 concentration extinguishes fire by smothering
- Non-corrosive
- Non- conductor of electricity
- No residues left after application
- No deterioration with age

## Q-238) WHAT ARE THE DISADVANTAGES OF CHEMICAL PROPERTIES OF CO2 USED?

- CO2 is highly asphyxiating. 9% concentration causes unconsciousness within minutes
- Very little cooling effect. So there is danger of re-ignition.
- When discharged, solid CO2 particles present and generate sufficient static electricity to produce spark

## Q-239) CO2 WEEKLY CHECKS DONE ON YOUR SHIP?

1. Check emergency light and all other lights.
2. Check exhaust fan / ventilation.
3. Check all bottles overall condition, clamps, valves etc.
4. Check operating wire condition.
5. Check CO2 alarms.
6. CO2 room key should be in position.
7. Check the operating instructions.
8. Inspection to be recorded in log book and Saturday safety routine book

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## Q-240) HOW TO DO HYDROSTATIC PRESSURE TEST OF BOTTLES AND NEW AMMENDMENT?

### PROCEDURE

1. Put the CO2 bottle in a steel drum filled with water.
2. Put the drum in a tray
3. Apply hydraulic pressure for 250 bar bottle will expand, some water will overflow.
4. Release the pressure.
5. Collect the water from the tray and put it back.
6. If some water remains in tray = Plastic deformation
7. If more than 1 %, discard the bottle.

As per MSC 103, a significant increase in the hydrostatic test regime for CO2 cylinders.

- First 10 year = 10 % cylinders will be checked.
- Second 10 year = Instead of checking another 10%, now it has been changed and need to check remaining 90%
- From Third 10 year and so on = All cylinders shall be tested every 10 year.

### **Q-241) WHAT ARE THE CO2 BOTTLE SPECIFICATIONS?**

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Type of fire it can handle</li><li>• Instruction of operation, date of manufacturing</li><li>• Composition of chemical, operating temperature range</li><li>• Manufacturer name, address and serial number</li><li>• Warning instruction</li><li>• Quantity</li></ul> | <ul style="list-style-type: none"><li>• Last date of testing (sticker)</li><li>• Date of charging and pressure testing</li><li>• Approving authority</li><li>• Testing pressure</li><li>• Range, duration.</li><li>• Material of bottle.</li></ul> |
|---|--|

### **Q-242) HOW MANY CHAPTERS ARE THERE IN SOLAS? EXPLAIN ALL.**

- Chapter I - General Provisions
- Chapter II-1 - Construction - Subdivision and stability, machinery and electrical installations
- Chapter II-2 – Fire prevention, fire detection and fire extinction
- Chapter III - Lifesaving appliances and arrangements
- Chapter IV - Radio communications
- Chapter V – Safety of Navigation
- Chapter VI – Carriage of Cargoes
- Chapter VII – Carriage of dangerous goods
- Chapter VIII - Nuclear ships
- Chapter IX - Management for the Safe Operation of Ships
- Chapter X – Safety measures for high-speed craft
- Chapter XI-1 - Special measures to enhance maritime safety
- Chapter XI-2 - Special measures to enhance maritime security
- Chapter XII - Additional security measures for bulk carriers
- Chapter XIII – Verification of compliance
- Chapter XIV - Safety measures for ships operating in polar waters.

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#### **Chapter I - General Provisions**

It includes regulations concerning the survey of the various types of ships and the issuing of documents signifying that the ship meets the requirements of the Convention. The Chapter also includes provisions for the control of ships in ports of other Contracting Governments.

#### **Chapter II-1 - Construction - Subdivision and stability, machinery and electrical installations**

The subdivision of passenger ships into watertight compartments must be such that after assumed damage to the ship's hull the vessel will remain afloat and stable. Requirements for watertight integrity and bilge pumping arrangements for passenger ships are also laid down as well as stability requirements for both passenger and cargo ships.

The degree of subdivision - measured by the maximum permissible distance between two adjacent bulkheads - varies with ship's length and the service in which it is engaged. The highest degree of subdivision applies to passenger ships. Requirements covering machinery and electrical installations are designed to ensure that services which are essential for the safety of the ship, passengers and crew are maintained under various emergency conditions.

"Goal-based standards" for oil tankers and bulk carriers were adopted in 2010, requiring new ships to be designed and constructed for a specified design life and to be safe and environmentally friendly, in intact and specified damage conditions, throughout their life. Under the regulation, ships should have adequate strength, integrity and stability to minimize the risk of loss of the ship or pollution to the marine environment due to structural failure, including collapse, resulting in flooding or loss of watertight integrity.

#### **Chapter II-2 - Fire protection, fire detection and fire extinction**

Includes detailed fire safety provisions for all ships and specific measures for passenger ships, cargo ships and tankers. They include the following principles: division of the ship into main and vertical zones by thermal and structural boundaries; separation of accommodation spaces from the remainder of the ship by thermal and structural boundaries; restricted use of combustible materials; detection of any fire in the zone of origin; containment and extinction of any fire in the space of origin; protection of the means of escape or of access for fire-fighting purposes; ready availability of fire-extinguishing appliances; minimization of the possibility of ignition of flammable cargo vapour.

#### **Chapter III - Life-saving appliances and arrangements**

The Chapter includes requirements for life-saving appliances and arrangements, including requirements for life boats, rescue boats and life jackets according to type of ship. **The International Life-Saving Appliance (LSA) Code gives specific technical requirements for LSAs and is mandatory under Regulation 34**, which states that all life-saving appliances and arrangements shall comply with the applicable requirements of the LSA Code.

#### **Chapter IV - Radiocommunications**

The Chapter incorporates the Global Maritime Distress and Safety System (GMDSS). All passenger ships and all cargo ships of 300 gross tonnage and upwards on international voyages are required to carry equipment designed to improve the chances of rescue following an accident, including satellite emergency position indicating radio beacons (EPIRBs) and search and rescue transponders (SARTs) for the location of the ship or survival craft.

Regulations in Chapter IV cover undertakings by contracting governments to provide radiocommunication services as well as ship requirements for carriage of radiocommunications equipment. The Chapter is closely linked to the Radio Regulations of the International Telecommunication Union.

#### **Chapter V - Safety of navigation**

Chapter V identifies certain navigation safety services which should be provided by Contracting Governments and sets forth provisions of an operational nature applicable in general to all ships on all voyages. This is in contrast to the Convention as a whole, which only applies to certain classes of ship engaged on international voyages.

The subjects covered include the maintenance of meteorological services for ships; the ice patrol service; routing of ships; and the maintenance of search and rescue services.

This Chapter also includes a general obligation for masters to proceed to the assistance of those in distress and for Contracting Governments to ensure that all ships shall be sufficiently and efficiently manned from a safety point of view.

The chapter makes mandatory the carriage of voyage data recorders (VDRs) and automatic ship identification systems (AIS).

#### **Chapter VI - Carriage of Cargoes**

The Chapter covers all types of cargo (except liquids and gases in bulk) "which, owing to their particular hazards to ships or persons on board, may require special precautions". The regulations include requirements for stowage and securing of cargo or cargo units (such as containers). The Chapter requires cargo ships carrying grain to comply with the International Grain Code.

#### **Chapter VII - Carriage of dangerous goods**

The regulations are contained in three parts:

Part A - Carriage of dangerous goods in packaged form - includes provisions for the classification, packing, marking, labelling and placarding, documentation and stowage of dangerous goods. Contracting Governments are required to issue instructions at the national level and the Chapter makes mandatory the International Maritime Dangerous Goods (IMDG) Code, developed by IMO, which is constantly updated to accommodate new dangerous goods and to supplement or revise existing provisions.

Part A-1 - Carriage of dangerous goods in solid form in bulk - covers the documentation, stowage and segregation requirements for these goods and requires reporting of incidents involving such goods.

Part B covers Construction and equipment of ships carrying dangerous liquid chemicals in bulk and requires chemical tankers to comply with the International Bulk Chemical Code (IBC Code).

Part C covers Construction and equipment of ships carrying liquefied gases in bulk and gas carriers to comply with the requirements of the International Gas Carrier Code (IGC Code).

Part D includes special requirements for the carriage of packaged irradiated nuclear fuel, plutonium and high-level radioactive wastes on board ships and requires ships carrying such products to comply with the International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (INF Code).

The chapter requires carriage of dangerous goods to be in compliance with the relevant provisions of the International Maritime Dangerous Goods Code (IMDG Code).

#### **Chapter VIII - Nuclear ships**

Gives basic requirements for nuclear-powered ships and is particularly concerned with radiation hazards. It refers to detailed and comprehensive Code of Safety for Nuclear Merchant Ships which was adopted by the IMO Assembly in 1981.

#### **Chapter IX - Management for the Safe Operation of Ships**

The Chapter makes mandatory the International Safety Management (ISM) Code, which requires a safety management system to be established by the shipowner or any person who has assumed responsibility for the ship (the "Company").

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## **Chapter X - Safety measures for high-speed craft**

The Chapter makes mandatory the International Code of Safety for High-Speed Craft (HSC Code).

## **Chapter XI-1 - Special measures to enhance maritime safety**

The Chapter clarifies requirements relating to authorization of recognized organizations (responsible for carrying out surveys and inspections on Administrations' behalves); enhanced surveys; ship identification number scheme; and port State control on operational requirements.

## **Chapter XI-2 - Special measures to enhance maritime security**

Regulation XI-2/3 of the chapter enshrines the International Ship and Port Facilities Security Code (ISPS Code). Part A of the Code is mandatory and part B contains guidance as to how best to comply with the mandatory requirements. Regulation XI-2/8 confirms the role of the Master in exercising his professional judgement over decisions necessary to maintain the security of the ship. It says he shall not be constrained by the Company, the charterer or any other person in this respect.

Regulation XI-2/5 requires all ships to be provided with a ship security alert system. Regulation XI-2/6 covers requirements for port facilities, providing among other things for Contracting Governments to ensure that port facility security assessments are carried out and that port facility security plans are developed, implemented and reviewed in accordance with the ISPS Code. Other regulations in this chapter cover the provision of information to IMO, the control of ships in port, (including measures such as the delay, detention, restriction of operations including movement within the port, or expulsion of a ship from port), and the specific responsibility of Companies.

## **Chapter XII - Additional safety measures for bulk carriers**

The Chapter includes structural requirements for bulk carriers over 150 metres in length.

## **Chapter XIII - Verification of compliance**

Makes mandatory from 1 January 2016 the IMO Member State Audit Scheme.

Verification of Compliance: This chapter was adopted on 22 May 2014 which requires all the Contracting Party to undergo periodic audits by the approved organization following the audit standard to verify compliance with and implementation of the present Convention.

This chapter consists of regulation 1 to regulation 3 explaining the “Definition” of different terminologies which are used in the chapter and the details about the “Application” of this chapter, followed by the verification system for contracting government

## **Chapter XIV - Safety measures for ships operating in polar waters**

The chapter makes mandatory, from 1 January 2017, the Introduction and part I-A of the International Code for Ships Operating in Polar Waters (the Polar Code).

## **Q-243) EXPLAIN STCW**

- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.
- The 1978 STCW Convention was the first to establish basic requirements on training, certification and watchkeeping for seafarers on an international level.
- The 1995 amendments entered into force on 1 February 1997. One of the major features of the revision was the division of the technical annex into regulations, divided into Chapters as before, and a new STCW Code, to which many technical regulations were transferred. Part A of the Code is mandatory while Part B is recommended.

## **STCW Convention chapters**

Chapter I: General provisions

Chapter II: Master and deck department

Chapter III: Engine department

Chapter IV: Radiocommunication and radio personnel

Chapter V: Special training requirements for personnel on certain types of ships

Chapter VI: Emergency, occupational safety, medical care and survival functions

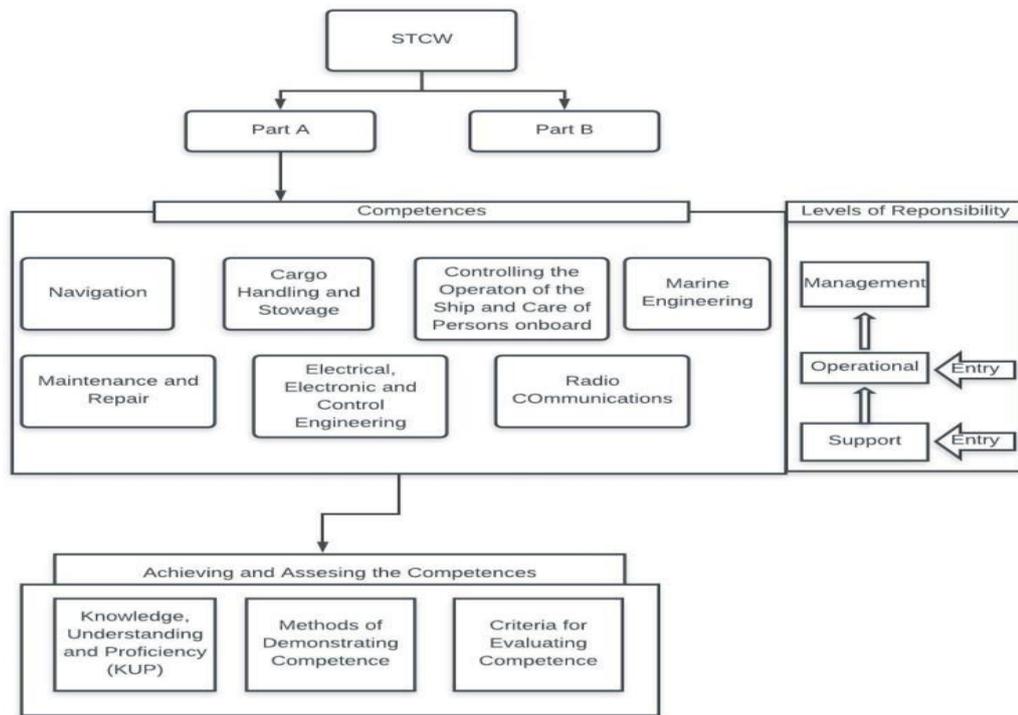
Chapter VII: Alternative certification

Chapter VIII: Watchkeeping

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## **STCW CODE: (Seafarer’s Training, Certification and Watchkeeping )**

The regulations contained in the Convention are supported by sections in the STCW Code. Part A of the Code is mandatory. The minimum standards of competence required for seagoing personnel are given in detail in a series of tables. Part B of the Code contains recommended guidance which is intended to help Parties implement the Convention.



Manila amendments to the STCW Convention and Code were adopted on 25 June 2010, marking a major revision of the STCW Convention and Code. The 2010 amendments are set to enter into force on 1 January 2012 under the tacit acceptance procedure and are aimed at bringing the Convention and Code up to date

#### **Q-244) CHANGES CAME TO STCW AFTER MANILA AMENDMENTS?**

##### **Major Changes and Amendments**

The following items outline the key improvements realised through the new Amendments:

- Certificates of Competency & endorsements to be issued only by Administration – thereby reducing the possibility of fraudulent practices associated with issue of certificates of competency.
- Common medical standards for seafarers – seafarers from one country can serve on board ships of another country without undergoing another medical exam.
- Revalidation requirements rationalized for the benefit of the seafarer.
- Introduction of modern training methodology i.e. distance learning and web based learning.
- Hours of rest harmonized with the requirements of ILO Maritime Labour Convention (2006) with a view to reducing fatigue.
- Requirements introduced to avoid alcohol and substance abuse.
- New Competencies required to be built and curriculum to be updated in line with modern developments and real life needs
- Refresher Training is properly addressed within the convention.

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#### **Q-245) LOAD LINE SURVEY?**

During load line survey, surveyor will check the condition of assignment.

##### 1. Documentation:

- a. Check validity of all the certificates as per SOLAS or ILLC.
  - b. Ensure sufficient information providing onboard for loading, discharging, ballasting or de-ballasting.
    - i. Stability booklet
    - ii. Loadicator system gives information :
      1. Shifting of cargo, ballasting, de-ballasting.
      2. Hogging and sagging condition
      3. Shear force and bending moment
      4. Loading plan
    - iii. Loading manual
    - iv. Intact and damage stability booklet.
  - c. To check report of last survey and any condition of class.
  - d. Record of condition of assignment.
2. Ensure approved “batton” onboard which is an engineering scale and all ships have this. By this surveyor checks the load line measurement.
  3. Make sure no modification is carried.
  4. To check access point: All dog clamp shall be well greased, dust free, gasket and water tight packing.
  5. To check air pipe, ventilator, sounding pipe, spring closing mechanism.

6. To check the condition of hatches
7. Condition of freeing ports, Gunwale and bulwark, manholes, all the scupper plugs.

Specifically as 2<sup>nd</sup> engineer, following needs to be checked.

1. Overboard valve condition: check for corrosion, pitting, damage/leakage, gland packing condition.
2. Sea water pipe: joints, elbows, leakage, condition.
3. Sea chest: condition and sea chest valve condition, remote operation of sea chest valve.
4. No pipe doubler, cement box and soft patches.
5. Check the condition of emergency bilge suction.
6. Bilge well alarm condition, operational or not.
7. To check the funnel condition, open or close.
8. Bilge pumping arrangement.
9. Check ballasting/ de-ballasting pumping arrangement.
10. Condition of vents and sounding pipe.
11. Check the condition of weather tight integrity of E/R door and funnel door.
12. Initial inspection of side plating.

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**CONDITION OF ASSIGNMENT: (CHAPTER 2 OF LOAD LINE CONVENTION : Regulation 10 to 26)**

1. The need to provide a ship specific approved stability booklet with relevant damage stability calculations for masters use.
2. Superstructure end bulkheads shall be of efficient construction and if needed fitted with approved steel weather tight doors.
3. Doors should be weather tight which is fitted on all access openings on exposed decks.
4. Hatchways, doorways and ventilators are to be checked for watertight integrity.
5. Cargo and other hatchways should be checked for water tight integrity
6. Hatchways closed by weather tight covers of steel or other equivalent material fitted with gaskets and clamping devices.
7. Machinery space openings like skylight should be weather tight.
8. Ventilators and air pipes should be of efficient means for prevention of ingress of seawater.
9. Cargo ports and other similar opening should be water tight if below freeboard deck.
10. Scuppers to be checked.
11. Side scuttles (Port holes) should be weather tight if fitted above freeboard deck and water tight if fitted below freeboard deck.
12. Freeing ports should be there in bulwarks for the prevention of seawater on freeboard deck.
13. Safe weather proof quarters for the accommodation of crew and provision for their safe movement within the ship and for entering as well as leaving the ship.
14. Weather-tight fittings for access to pump room, provision of catwalk connecting accommodation house to forecastle and freeing ports if bulwarks are fitted

ALSO REFER : <https://youtu.be/94CMPJi5PTI>

**Q-246) EEDI TECHNICAL FILE CONTENT?**

"EEDI Technical File" is a document that contains the information necessary for the calculation of the attained EEDI and that shows the process of calculation.

Items to be included in the EEDI technical file:

1. Basic data such as deadweight/gross tonnage, maximum continuous ratings of the main and auxiliary engines, estimated ship speed, specific fuel consumptions of the main and auxiliary engines;
2. Estimated power curves under the fully loaded condition and sea trial condition;
3. Principal particulars of the propulsion system and electric power supply system on board;
4. Estimation process and methodology for determining power curves;
5. Description of energy saving equipment;
6. Calculated value of Attained EEDI; and
7. Calculated values of attained EEDI<sub>weather</sub> and f<sub>w</sub> values (not equal to 1.0), if those values are calculated.

<b>EEDI Technical file</b>	<b>1</b>	<b>General Information &amp; Particulars</b>
	<b>2</b>	<b>Power Curves</b>
	<b>3</b>	<b>Overview of Propulsion System and electric power supply system</b>
	<b>4</b>	<b>Estimation process of power curves at design stage</b>
	<b>5</b>	<b>Description of energy saving equipments</b>
	<b>6</b>	<b>Calculated values of attained EEDI</b>

### Q-247) CLEAR GROUNDS?

Clear grounds exist when a Port State Control Officer finds evidence, which in his/her professional judgement warrants, a more detailed inspection of the ship, its equipment or its crew. The absence of valid certificates or documents is considered a clear ground. Other examples of clear grounds can be found in Annex 9, paragraph 6 of the MoU text.

"Clear grounds" to conduct a more detailed inspection:

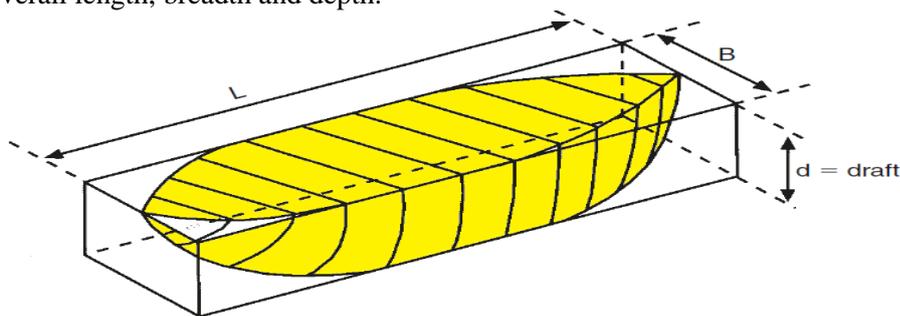
1. the absence of principal equipment or arrangements required by the applicable conventions;
2. evidence from a review of the ship's certificates that a certificate or certificates are clearly invalid;
3. evidence that documentation required by the applicable conventions is not on board, incomplete, not maintained or falsely maintained;
4. evidence from the PSCO's general impressions and observations that serious hull or structural deterioration or deficiencies exist that may place at risk the structural, watertight or weather-tight integrity of the ship;
5. evidence from the PSCO's general impressions or observations that serious deficiencies exist in the safety, pollution prevention or navigational equipment;
6. information or evidence that the master or crew is not familiar with essential shipboard operations relating to the safety of ships or the prevention of pollution, or that such operations have not been carried out;
7. indications that key crew members may not be able to communicate with each other or with other persons on board;
8. the emission of false distress alerts not followed by proper cancellation procedures; and
9. receipt of a report or complaint containing information that a ship appears to be [substandard](#).

### Q-248) WHAT ARE FOUR TYPES OF SHIP COEFFICIENT?

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#### 1. BLOCK COEFFICIENT:

The block coefficient of a ship is the ratio of the underwater volume of ship to the volume of a rectangular block having the same overall length, breadth and depth.



Now let us say that the extreme dimensions of the ship's hull at this draft are 'L' and 'B'. In other words if we have a box of length 'L', Width 'B' and height 'd', the ship's underwater area at this draft would exactly fit this box.

Now the ship's block coefficient at this draft ( $C_b$ ) would be

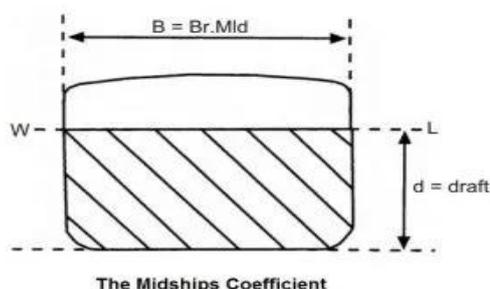
$$C_b = \text{Displacement of the ship} / L \times B \times d$$

- As all these factors would change with the change in draft,  $C_b$  would also change with change of ship's draft.
- Value of  $C_b = 0.8$  to  $0.85$  for ship speed between 12 to 17 knots for tankers.
- Application : By this we can determine underwater volume.
- Higher  $C_b$  indicates a hull with more interior volume and a flat bottom.
- Smaller  $C_b$  indicates a fine bow and fine stern section.

#### 2. MID-SHIP SECTION AREA COEFFICIENT:

It is the ratio of the actual area of the immersed portion of the ship's mid-ship section to the product of the breadth and the draught of the ship.

As seen below the shaded portion represents the area of the mid-ship section to the waterline WL, enclosed in a rectangle having the same breadth and depth.



**Mid-ship Coefficient (Cm) = Area of Immersed Mid-ship Section (Am) / (Breadth x Draught)**

Hence, **Am = B x d x Cm**

Cm gives an idea of shape of the ship.

**3. PRISMATIC COEFFICIENT:**

It is the ratio of underwater volume to mid-ship section area and length.

**Prismatic coefficient Cp = Displacement of the ship / L x Am = Cb / Cm**

As Cb = Displacement of the ship / L x B x d, therefore,  
 Displacement of the ship = Cb x L x B x d-----equation 1

And as Cm = Am / B x d, therefore,  
 Am = Cm x B x d-----equation 2

Putting both these equation values, in the above formula of Cp

Therefore,  $Cp = \frac{Cb \times L \times B \times d}{L \times Cm \times B \times d} = Cb / Cm$ , which proves,  $Cp = Cb / Cm$

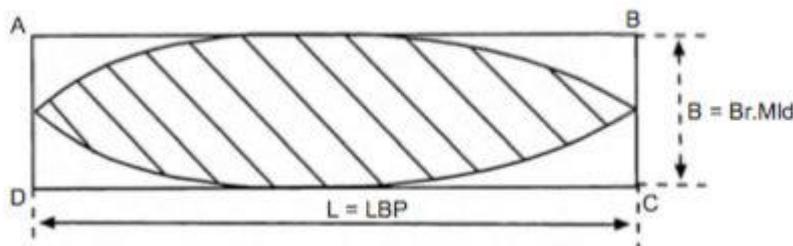
Prismatic coefficient provides an indication of distribution of the displacement.

- A small Cp means there are fine end and large mid body.
- A higher Cp means there is more displacement distributed toward ends.
- Cp is inversely proportional to cross sectional area.

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**4. WATERPLANE AREA COEFFICIENT:**

It is the ratio of the actual area of the waterplane to the product of the length and breadth of the ship.  
 As seen below, the area of the ship's waterplane is shown shaded and a rectangle having the same length and breadth of the ship:



Coefficient of fineness (Cw) = Area of waterplane ÷ (Length x Breadth)

As,

Cw is directly proportional to Aw, hence,

- If Cw is more then Aw will be maximum, resistance will be more, speed will reduce, F.C will increase but stability will be better.
- If Cw is less, then Aw will be minimum, resistance will be less, speed will improve, Frictional coefficient will reduce and stability will reduce,

**Q-249) DEFINE PERMEABILITY?**

- Permeability of a space in a ship is the percentage of empty volume in that space.
- Permeability is used in ship survivability and damaged stability calculations in ship design.
- The permeability of a space is a percentage from 0 to 100. Alternately, the permeability may be a coefficient from 0 to 1.
- The permeability of a space is the percentage of volume of the space which may be occupied by seawater if the space is flooded. The remaining volume [not filled with seawater] being occupied by machinery, cargo, accommodation spaces, etc.

**Q-250) PROPELLER SLIP?**

The difference between the actual distance travelled by a ship and the theoretical distance given by the product of the propeller pitch and the number of revolutions. It is usually expressed as a percentage and can have a negative value if a current or following wind exists.

### Q-251) ADMIRALTY COEFFICIENT?

**ADMIRALTY COEFFICIENT**

The admiralty coefficient method is used to obtain an approximation of the power of a ship.  
For small variations in the speed, the total resistance may be expressed as.  $R_t \propto \Delta S V^n$

It was seen earlier that  $S \propto \Delta^{2/3}$

Hence with constant density,  $R_t \propto \Delta^{2/3} V^n$

But Power,  $P \propto R_t \times V \propto \Delta^{2/3} V^{n+1}$

or 
$$\text{Power} = \frac{\Delta^{2/3} V^{n+1}}{\text{Coefficient}}$$

This coefficient is known as Admiralty Coefficient.  
Now, more merchant ships may be classed as slow or medium speed, for such v/s's 'n' may be taken as 2.

Thus, Admiralty coefficient ( $A_c$ ) =  $\frac{\Delta^{2/3} \cdot V^3}{P}$

Now,  $R_t$  = Total resistance ;  $S$  = density of seawater  
 $\Delta$  = mass displ. of the ship ;  $V$  = Ship's speed in knots  
 $n$  = an index of about 1.825 ;  $S$  = wetted surface area in sq. mtr.

→ The A.C. may be regarded as constant for similar ships at their corresponding speeds. Value of A.C. may vary b/w 350 to 600  
The higher value indicating more efficient ships

→ For small changes in speed, the value of c may be regarded as constant for any ship at constant displacement.

→ Thus if shaft power of one ship is known, the shaft power for a similar ship may be obtained at corresponding speed.

### Q-252) CONTENTS OF SHIP SECURITY PLAN?

- Preventive measures against weapons, hazardous substances, devices that may be intended for use against the safety and security of the ship
- Specific identification of restricted areas and preventive action against access to any such designated areas
- Action to be taken when the ship is facing a security threat or breach taking into account the critical operations of the ship
- Complying with instructions of the Contracting Government with respect to the security level
- Evacuation procedures that might have to be carried out in case of a breach that cannot be combatted
- Specific duties of the shipboard personnel with responsibilities when security is in question
- Procedures for auditing security-related activities
- Procedures for training and drills associated with the plan
- Procedures for liaising with the port facility
- Procedures for reporting security-related incidents
- Designation and identification of the SSO and the CSO with duties and contact details
- Procedures to maintain test and calibrate equipment pertaining to the Code. This shall include details of the frequency of the tests to be carried out as well
- Locations where the SSAS is provided and the guidance on using the SSAS. Usage instructions should also include details of testing of SSAS and information regarding false alerts as well

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### Q-253) CONTENT OF GARBAGE RECORD BOOK?

The record book must be filled in by the officer in charge after every discharge of garbage into the sea, every delivery of garbage to port waste reception facilities and every incineration operation. Each entry should highlight the position of the ship, the date and time of the operation, an estimate of the amount and a description of the type of garbage. The Master of the ship signs each page after it is completed. The record should be kept for two years once the book is completed.

Ship's Name: \_\_\_\_\_ Official No.: \_\_\_\_\_ IMO No.: \_\_\_\_\_

Date/time	Position of the Ship	Estimated Amount Discharged into Sea (m <sup>3</sup> )					Estimated Amount Discharged to Reception Facilities or to other ship (m <sup>3</sup> )		Estimated Amount Incinerated (m <sup>3</sup> )	Certification/Signature
		CAT.2	CAT.3	CAT.4	CAT.5	CAT.6	CAT.1	Other		
15.04/0530	MCOOROO off LOYANGG BARR						0.002	M3		
16.04/0545	" "						0.003	M3		
17.04/1800	φ=03°59'5N λ=099°35'11 E				0.006	M3				
18.04/1730	φ=06°04'32N λ=095°18'15 E				0.004	M3				
19.04/1745	φ=06°04'7N λ=096°38'6 E				0.003	M3				
20.04/1715	φ=06°05'2N λ=090°49'7 E				0.004	M3				

**Q-254) CONTENT OF STABILITY BOOKLET?**

Each ship should be provided with a stability booklet, approved by the administration. Contents of stability booklet are:

1. A general description of the ship
2. Instructions on the use of the booklet
3. General arrangement plans showing watertight compartments, closures, vents, down-flooding angles etc.
4. Hydrostatic curves or tables and cross curves of stability.
5. Capacity plan and centre of gravity for each cargo stowage space.
6. Tank sounding tables showing capacities, centre of gravity and free surface data for each tank.
7. Information on loading restrictions such as maximum KG or minimum GM curve or table.
8. A brief description of the stability calculations done including assumptions.
9. General precautions for preventing unintentional flooding.
10. Inclining test report for the ship.
11. Any other necessary guidance for safe operation of ship under normal or emergency conditions.

**Q-255) CONTENT OF ISPS CODE?**

1. General
2. Definitions
3. Application
4. Responsibilities of Contracting Governments
5. Deceleration of Security
6. Obligations of the Company
7. Ship Security
8. Ship Security Assessment
9. Ship Security Plan
10. Records
11. Company Security Officer
12. Ship Security Officer
13. Training, Drills and exercises on Ship Security
14. Port Facility Security
15. Port Facility Security assessment
16. Port Facility Security Plan
17. Port Facility Security officer
18. Training, Drills and exercises on Port Facility Security

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**Q-256) CONTENT OF SHIP SECURITY PLAN?**

“Ship security plan means a plan developed to ensure the application of measures on board the ship designed to protect persons on board, cargo, cargo transport units, ship’s stores or the ship from the risks of a security incident.”

Content of Ship Security Plan:

1. The organizational structure of security for the ship
2. The ship’s relationships with the Company, port facilities, other ships and relevant authorities with security responsibility
3. The communication systems to allow effective continuous communication within the ship and between the ship and others, including port facilities
4. The basic security measures for security level 1 that will always be in place
5. The additional security measures that will allow the ship to progress without delay to security level 2 and, when necessary, to security level 3

6. Procedures for regular review, or audit, of the SSP and for its amendment in response to experience or changing circumstances
7. The reporting procedures to the appropriate Contracting Governments contact points

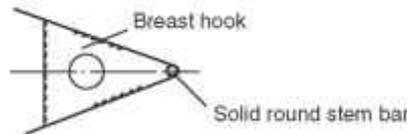
**Q-257) WHAT IS COVERED BY SHIP SECURITY ASSESSMENT?**

1. Physical security
2. Structural integrity
3. Personnel protection systems
4. Procedural policies
5. Radio and telecommunication systems, including computer systems and networks
6. Other areas that may, if damaged or used for illicit observation, pose a risk to persons, property, or operations on board the ship or within a port facility

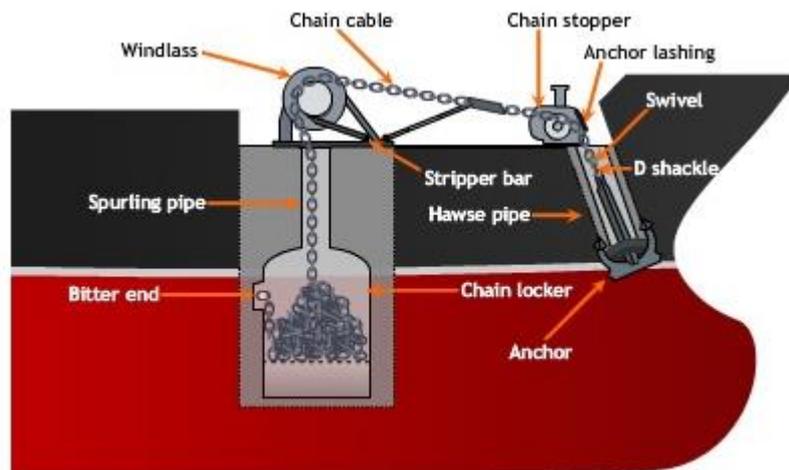
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BY ANKUR SHARMA (MANET BATCH 6)**

**Q-258) EXPLAIN BREAST HOOK, TIE, BITTER END, GUNWALE, GARBOARD STRAKE?**

1. **Breast hook** : A triangular plate bracket joining structural members of the port and starboard sides at the stem.

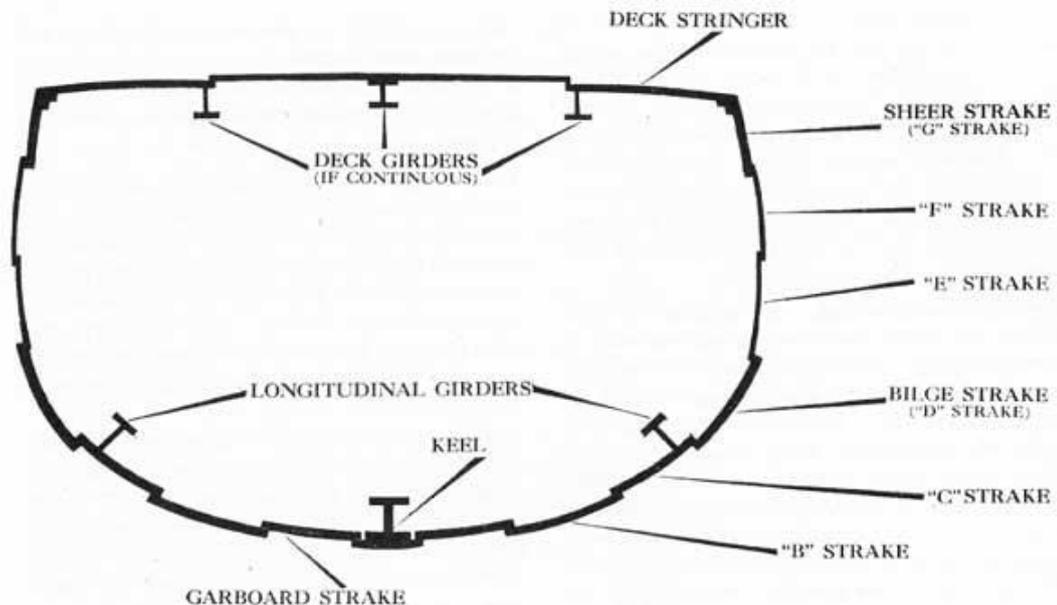


2. **Bitter end** : The inboard end of a ship anchoring cable which is secured in the chain locker by the clench pin.



3. **Gunwale** : The top edge of the hull of a nautical vessel, where it meets the deck. It is used as a valuable stiffener mounted inboard of the sheer strake on commercial vessel.

4. **Garboard Strake** : It is the first strake on each side of the keel strake. As we discussed in the bottom strakes, the first stake from the keel is named A-strake. So we can also say that Bottom A-strake is called Garboard strake.



**Q-259) HOW TO IMPROVE EEDI AS SECOND ENGG?**

<https://www.myseatime.com/blog/detail/ship-energy-efficiency>

As, EEDI is a design index, so we cannot improve it. But what we can improve is EEOI by efficiently running the ship.

- In simplest of the terms, EEOI is the amount of CO2 emitted by the ship per ton-mile of work.
- So, it is the ratio of the CO2 emitted to the ton-mile (amount of cargo x distance covered).
- But we could only know the amount of fuel consumed by the vessel. To know the amount of CO2 emitted from the fuel, we use “fuel mass to CO2 mass conversion factor”.
- Each type of fuel is given a conversion factor.

Type of fuel	Reference	Carbon content	$C_f$ (t-CO <sub>2</sub> /t-Fuel)
1. Diesel/Gas Oil	ISO 8217 Grades DMX through DMC	0.875	3.206000
2. Light Fuel Oil (LFO)	ISO 8217 Grades RMA through RMD	0.86	3.151040
3. Heavy Fuel Oil (HFO)	ISO 8217 Grades RME through RMK	0.85	3.114400
4. Liquefied Petroleum Gas (LPG)	Propane Butane	0.819 0.827	3.000000 3.030000
5. Liquefied Natural Gas (LNG)		0.75	2.750000

- The amount of fuel consumed when multiplied by this conversion factor would give the CO2 emitted by use of that fuel.
- So the formula to calculate EEOI becomes...

$$EEOI = \frac{\text{Fuel consumed} \times C_f}{\text{Cargo carried} \times \text{Distance travelled}}$$

$C_f$  = Fuel mass to CO2 mass conversion factor

**Q-260) TPC, FORMULA, EFFECT OF TPC, DOES IT CHANGE IN FRESH WATER AND SEA WATER?**

- The Tonnes Per Centimetre Immersion (TPC) for any draft is the mass which must be loaded or discharged to change a ship’s mean draft in salt water by one centimetre.
- The TPC varies with the draught and with the water density.

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Now  $A_w$  = Waterplane area;

Consider a ship floating in water of density  $\rho$  t/m<sup>3</sup>.

$$TPC = \frac{A_w \times \rho}{100}$$

For sea water  $\rho = 1.025$  t/m<sup>3</sup>

$\therefore$  TPC sw = 0.01025  $A_w$

Here, it shows that,

- TPC increases with WPA and for a normal ship-shape, the WPA will increase with draft.
- TPC increases with density which means TPC for seawater will be more, and fresh water will be less.

**Q-261) TRANSVERSE STABILITY?**

Transverse Stability is the ability of the vessel to return to vertical when she has been heeled. The heeling could be because of an external force including the action of the sea and swell. It is always necessary to maintain stability even when a vessel has altered distribution of weights within the ship. (Loaded or discharged cargo, ballasted or de-ballasted her tanks, taken in or used up freshwater, fuel, stores etc).

Heel is the phenomenon because of external factors like wave, swell, current, wind etc.

In this centre of gravity does not change because it depends on mass distribution and GM is always positive.

COG always at centreline of the ship, only COB can shift.

List is the phenomenon cause by internal factors like uneven distribution of mass while loading, discharging, shifting, ballasting, de-ballasting, bunkering.

In this COG will change, and will be off the centreline of the ship.

GM will remain positive.

### **Q-262) LONGITUDINAL STABILITY?**

It explains location of COB. It is based on wave direction. Longitudinal means throughout the length of the ship. It can be explained in 3 cases:

#### **CASE 1: WHEN SHIP IS IN UPRIGHT CONDITION**

1. Weather is calm
2. COB and COG both are situated at the same line ie. at the centreline of the ship.
3. Weight = buoyancy
4. Trim = Draft aft – Draft forward = 0

#### **CASE 2 : WHEN WAVE IS COMING FROM AFT DIRECTION**

1. Trim = Draft aft – Draft forward = negative
2. Trim is negative hence, Centre of floatation is in forward.

#### **CASE 3 : WHEN WAVE IS FROM FORWARD**

1. Trim = Draft aft – Draft forward = positive
2. Trim is positive hence, Centre of floatation is in aft.

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### **Q-263) IMO FOUR PILLARS?**

1. STCW (1976)
2. SOLAS (1974)
3. MARPOL (1973/78)
4. MLC (2006)

### **Q-264) SCBA PRESSURE TEST AND INTERVAL?**

#### **Weekly Inspections:**

SCBA should be inspected weekly to ensure that they do not present leakages

#### **Annual Examination:**

All SCBAs shall be examined at least annually as part of the annual statutory survey. If applicable, the SCBAs air recharging systems should be checked for air quality as part of the annual statutory survey

#### **Hydrostatic Testing of SCBA Cylinders:**

1. Hydrostatic testing of SCBA cylinders shall be carried out 5 yearly
2. The hydrostatic test date must be permanently marked on the bottles.
3. Intervals for hydrostatically testing cylinders of the ultra lightweight type may vary and will depend upon the requirements of the cylinder manufacturer and the ship's Classification Society.

#### **Spare Charges and Recharging of SCBA Cylinders:**

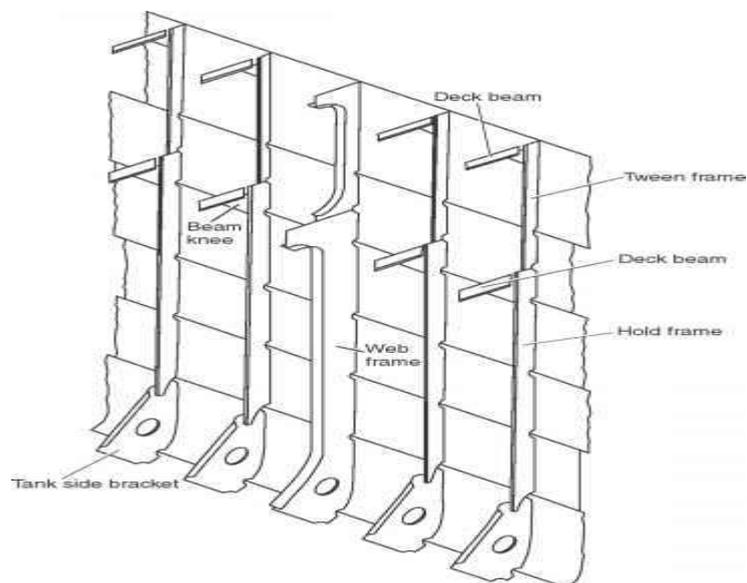
1. Two spare charges suitable for use with the SCBA should be provided for each required apparatus.
2. Passenger ships carrying not more than 36 passengers and cargo ships equipped with suitable located means for fully recharging the air cylinders free from contamination, only one spare charge is required for each required apparatus.

### **Q-265) CO2 SYSTEM SURVEY WHEN CONDUCTED AND WHAT ALL CHECKS?**

- All high pressure cylinders and pilot cylinders shall be weighed or have their contents verified by other reliable means to confirm that the available charge in each is above 90% of the nominal charge. Cylinders containing less than 90% of the nominal charge should be refilled.
- The hydrostatic test date of all storage containers should be checked
- The discharge piping and nozzles shall be tested to verify that they are not blocked. The test shall be performed by the discharge piping from the system and flowing dry air or nitrogen from test cylinders or suitable means through the piping.
- Emergency lights should be checked.
- Ventilation arrangements should be checked.
- Alarms have to be tested by opening the cabinet.

### **Q-266) POSITION OF WEB FRAMES, WHERE LOCATED AND WHY?**

- A deep transverse framing reinforcing the hull of a ship. It is a deep-section built-up frame which provides additional strength to the structure. Oversized members that replace a frame at certain locations on a ship.
- Web frames, that is built up frames consisting of plate web and face flat, where the web is considerably deeper than the conventional transverse frame, are often introduced along the side shell



- A number are fitted in mid-ship machinery spaces, generally not more than 5 frame spaces apart but may be omitted if the size of normal framing is increased.
- Forward of the collision bulkhead and in any deep tank adjacent to the collision bulkhead, and in tween decks above such tanks, web frames are required at not more than 5 frame spaces apart.
- In the tween decks above the after peak tank, web frames are required at every fourth frame space abaft the aft peak bulkhead.
- In all cases the provision of web frames is intended to increase the rigidity of the transverse ship section at that point.

#### **Q-267) TRADING CERTIFICATES?**

Statutory and mandatory certificates together are called trading certificates which are required by ship to trade freely.

#### **Q-268) GRT & NRT, HOW THEY ARE CALCULATED?**

They are calculated by the volume of water displaced and calculated as  $1 \text{ m}^3 = 1 \text{ ton}$ .

#### **Q-269) PSC INSPECTION AND FLAG STATE INSPECTION DIFFERENCE?**

Very important link for deficiency codes and how to close deficiency:

<https://www.myseatime.com/blog/detail/how-to-handle-port-state-control-deficiencies>

#### **FLAG STATE INSPECTION :**

- Flag state inspection is done by the country under which ship is registered.
- This is done by flag state inspector (FSI) or by RO (on behalf of flag)
- These inspections are carried out each year in the form of various surveys to ensure that standards are being maintained on the vessel flying their flag.
- Surveyors inspect the ship for verification of statutory documents and condition of ship in general.

#### **PORT STATE INSPECTION :**

- Port state inspection is done by the port in which the ship is calling.
- It is done by port state control officers (PSCO).
- This is done to ensure that the ship coming to the port follows rules and regulations.
- It is done to ensure that ship has proper and valid documents to comply with SOLAS, MARPOL & MLC. For E/R, MARPOL equipments are checked for proper working and safe working culture is being followed or not.

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#### **Q-270) PORTABLE FIRE EXTINGUISHERS LATEST AMMENDMENT?**

RESOLUTION A.602 (15) was old one and new one is RESOLUTION A.951 (23)

1. HALON extinguishers have been banned and WET chemical extinguishers have been added for class F or K fire involves cooking grease, fats or oil fires.
2. Extinguisher body and all other parts which are subjected to internal pressure should be tested to a pressure of 5.5 MPa or 2.7 times the normal working pressure whichever is higher.
3. In the class of fire Class F (as per ISO) or class K (as per NFPA) fire has been included which involves fire involving cooking grease, fats and oils.
4. Extinguishers should be serviced at intervals not exceeding one year.
5. Atleast one extinguisher of each type manufactured in same year and kept onboard a ship should be test discharged at five yearly intervals (as part of a fire drill)

6. All extinguishers together with propellant cartridges should be hydraulically tested in accordance with manufacturer's instruction at intervals not exceeding ten years.
7. Inspection has to be done as per the below mentioned table:

<b>ANNUAL INSPECTION</b>	
Safety clip and indicating devices	Check to see if the extinguisher may have been operated.
Pressure indicating device	Where fitted, check to see that the pressure is within limits. Check that dust covers on pressure indicating devices and relief valves are in place.
External examination	Inspect for corrosion, dents or damage which may affect the safe operation of the extinguisher.
Weight	Weigh the extinguisher and check the mass compared to the fully charged extinguisher.
Hose and nozzle	Check that hoses and nozzles are clear and undamaged.
Operating instructions	Check that they are in place and legible.
<b>INSPECTION AT RECHARGE</b>	
Water and foam charges	Remove the charge to a clean container if to be reused and check if it is still suitable for further use. Check any charge container.
Powder charges	Examine the powder for reuse. Ensure that it is free flowing and that there is no evidence of caking lumps or foreign bodies.
Gas cartridge	Examine for damage and corrosion.
<b>INSPECTION AT FIVE AND TEN YEAR INTERVALS</b>	
<b>INSPECTION AFTER DISCHARGE TEST</b>	
Air passages and operating mechanism	Prove clear passage by blowing through vent holes and vent devices in the cap. Check hose, nozzle strainer, discharge tube and breather valve, as applicable. Check the operating and discharge control. Clean and lubricate as required.
Operating mechanism	Check that the safety pin is removable and that the lever is undamaged.
Gas cartridge	Examine for damage and corrosion. Weigh the cartridge to ascertain that it is within prescribed limits.
O-rings washers and hose diaphragms	Check O-rings and replace hose diaphragms if fitted.
Water and foam bodies	Inspect the interior. Check for corrosion and lining deterioration. Check separate containers for leakage or damage.
Powder body	Examine the body and check internally for corrosion and lining deterioration.
<b>INSPECTION AFTER RECHARGE</b>	
Water and foam	Replace the charge in accordance with the manufacturers instructions.
Reassemble	Reassemble the extinguisher in accordance with the manufacturers instructions.
Maintenance label	Fill in entry on maintenance label, including full weight.
Mounting of extinguishers	Check the mounting bracket or stand.
Report	Complete a report on the state of maintenance of the extinguisher.

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**Q-271) EU MRV?**

The EU MRV Regulation on “monitoring, reporting and verification of carbon dioxide emissions from maritime transport” was adopted by European Council (EC) and Parliament and entered into force on 1 July, 2015. The primary aim of this regulation is for reducing CO<sub>2</sub> emissions from maritime transport.

The EU regulation applies to ships greater than 5000 Gross Tonnage, irrespective of their flag, undertaking following voyages in EU region.

Applicable Voyages and Ports
<ul style="list-style-type: none"> <li>• From an EU port to a non-EU port</li> <li>• To an EU port from a non-EU port</li> <li>• Between EU ports and</li> <li>• While the ship is at berth at an EU port</li> </ul>

- The EU MRV regulation requires ships to monitor and report their CO<sub>2</sub> emissions, fuel consumption, transport work and average energy efficiency.

- Under this regulation, Monitoring plan has been prepared and submitted by shipping company for verification which has to be verified by accredited independent verifier.
- Companies having ships covered under EU MRV regulations started monitoring the required parameters from 1<sup>st</sup> January 2018. This monitoring is on a per-voyage basis as well as annual basis. At the end of each calendar year commencing with 2018, a ship-specific emissions report is to be prepared and submitted for verification to an accredited verifier.
- On satisfactory compliance verification, a document of compliance (DOC) is issued in respect of EU MRV regulations. This is valid for a period of 18 months after the end of the reporting period.
- From 30 June 2019 onwards, ships arriving at or departing from an EU port are to carry on board a valid DOC.
- EC will publish information on ship's aggregated CO<sub>2</sub> emissions and efficiency by 30 June 2019 and then each subsequent year.

**Q-272) WATERTIGHT BULKHEAD FUNCTIONS?**

- Primary function of watertight bulkheads is to divide a ship into a number of watertight compartments.
- The transverse watertight bulkheads also add to the transverse strength of the ship
- The safety of a ship in damaged condition is majorly dependent on the strength and integrity of its watertight bulkheads.
- Watertight bulkheads are vertically designed watertight divisions/walls within the ship's structure to avoid ingress of water in the compartment if the adjacent compartment is flooded due to damage in ship's hull.

**Pressure Testing of Watertight Bulkheads**

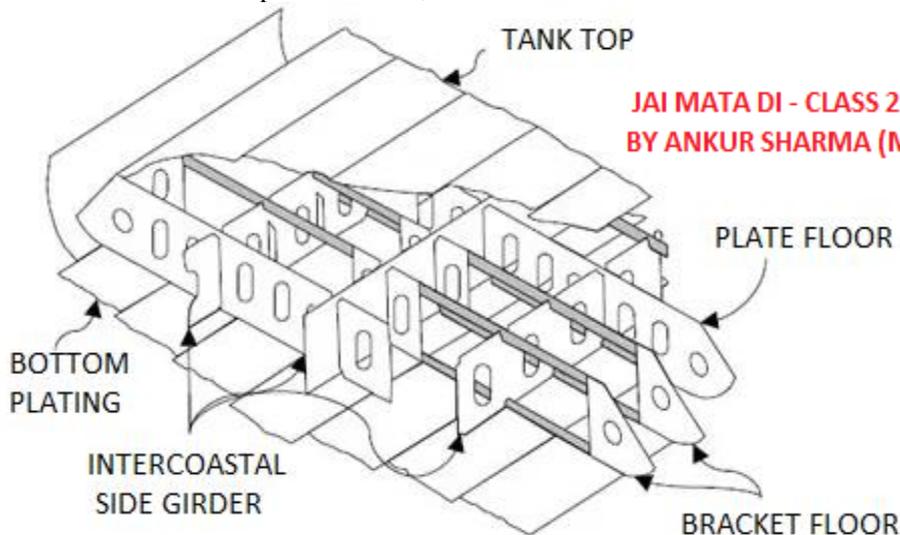
After installation of the bulkheads, they are to be tested for their integrity and water tightness. Since it is not feasible to fill all the cargo holds or compartments with water for this purpose, the test is done by a pressure hose. In this process, the bulkhead is subjected to a prerequisite water pressure from a hose for a fixed period of time, after which, the structural integrity of the bulkhead is inspected (checks are done for buckling and other deformations). Leak tests can also be done by pressurising the air in a compartment and checking for leakage of air to the other compartment.

**Q-273) DOUBLE BOTTOM TANK CONSTRUCTION?**

In double bottom construction, the bottom of the ship has two complete layers of watertight hull surface: one outer layer forming the normal hull of the ship and a second inner hull which is somewhat higher in the ship, which forms a redundant barrier to seawater in case the outer hull is damaged and leaks.

All seagoing ships are double-bottomed. In such a structural arrangement, a tank top is provided above the plate and bracket floors. Bracket floors are a little different from plate floors, in as much as they are not comprised of one single plate running athwartship, but only brackets at the port and starboard end, with struts that support the tank top with the bottom shell.

Bracket floors are mostly placed at each frame, and plate floors are generally placed at every three to four frame space. The space in between the two bottoms is often used as storage tanks for fresh water or ballast water. Fuel storage in the double bottom is not allowed for new built ships since 2007, due to MARPOL 73/78.



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- An even more extensive protection is available as a double hull, where the second hull layer extends up the sides of the ship as well as in the bottom.
- The height of the double bottom is governed by the height of the keel that is required by the ship. So the designer first calculates the height of the centre girder, which must always be housed within the double bottom. Hence, this factor now decides the double bottom height.

- Double bottom heights often increase in the ways of engine rooms, as they need to take up higher stresses due to heavy machinery in those regions.
- In the engine room region, all the frames are provided with plate floors, and no bracket floors are used.
- However, there is another factor a designer must take care of while providing an increased double bottom height in high-stress regions. The height must not be increased abruptly, therefore resulting in a discontinuity, which would lead to concentration of stresses, and eventually a structural failure. So the increase in height should be gradually tapered up and down.
- The taper should start a few frames forward of the engine room bulkhead, and continue up to three or four frames aft of the engine room to allow proper stress flow or structural continuity.

Some of the advantages of double bottom in ships are:

- provide protection to hull in case of grounding
- provide great longitudinal strength
- can be used as tanks to carry ballast water or fresh water.
- helps to prevent pollution in case of liquid cargo (like oil in tankers)
- helps to maintain stability of ship
- the tank top acts as a platform for machinery and cargo

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### **Q-274) MANILA AMENDMENTS?**

1. New and improved training guidance for crews and officer serving onboard. (refresher courses)
2. New requirements for MARPOL awareness which includes training in leadership and teamwork.
3. Stringent measures for preventing fraudulent certificate of competency (COC) to flow in international market. (Master checker, MTI check)
4. Rest hour onboard has been increased from 70 hours to 77 hours per week for decent working of seafarer onboard.
5. Introduction of Electro-technical officer with approved training and COC. (ETO COC)
6. New methods of training in modern technology like electronic chart display and information system (ECDIS).
7. New and improved requirement for ISPS trainings and also trainings to tackle the situation of piracy attack. (STSDSD)
8. Inclusion of modern training methods introducing distance learning and web based learning. (DGS ADU)
9. Stringent competency norm for ship staff serving on tanker, gas and chemical carrier.
10. More facilities and better training for junior engineer and cadets to tackle the problem of shortage of officer. (Administration approved TAR book)
11. Updated drugs and alcohol policy and stringent medical examination.
12. New requirement for Able seaman to have a certificate of competency for boarding vessel.
13. New training regulations for ship staff in polar water and personnel operating dynamic positioning system.
14. An initiative is taken by IMO to cope up the shortage of seafarer's world wide by starting "go to sea campaign".

### **Q-275) PORTABLE FIRE EXTINGUISHER RE-FILLING? HOW IT IS DONE?**

Spare charges and Refilling for portable fire extinguishers:

1. Spare charges shall be provided for 100% of the first 10 extinguishers and 50% of the remaining fire extinguishers capable of being recharged onboard. Not more than 60 total spare charges are required. Instructions for recharging should be carried onboard.
2. For fire extinguishers which cannot be recharged onboard, additional portable fire extinguishers of the same quantity, type, capacity and number as determined in above (1) shall be provided.
3. Periodic refilling of the cylinders should be in accordance with the manufacturer's recommendations. Only refills approved for the extinguisher may be used for recharging. Partially emptied extinguishers should be recharged.

Here is what you can expect when your fire extinguisher is recharged. This is *not a guide* for how to recharge a fire extinguisher, but an overview so that you can understand the process:

1. First, the extinguisher is completely depressurized and agent removed from the cylinder.
2. The discharge valve is removed from the cylinder.
3. The siphon tube is removed from the valve and the valve stem and spring is removed.
4. The technician cleans the valve, replaces the valve neck o-ring, and visually inspects the unit internally and externally for signs of damage.
5. Once cleaned the valve is reassembled with a new valve stem installed to insure proper seating and avoid future pressure loss.
6. The extinguishing agent (water, carbon dioxide, dry chemical, etc.) is refilled by weight to the appropriate amount for the size of the unit and as specified in the recharging instructions for that unit.

7. The unit is re-pressurized with the appropriate pressurizing gas and to the required pressure for that unit as noted on the recharging instructions.
8. The technician completes a Leak Test to check for signs of leakage and reinstalls the discharge nozzle or hose.
9. The extinguisher is weighed again to confirm that the total weight is within allowable tolerances indicated by the manufacturer.
10. A new tamper seal is installed on the safety pin and a new recharge tag is attached to the unit with each tag indicating the unit total weight and the identity of the technician completing the work.

**Q-276) WHY FREEBOARD IS LESS FOR TANKERS?**

1. Tankers have much smaller deck openings in the main deck.
2. They have greater sub-division by the additional longitudinal and transverse bulkhead.
3. Tankers normally carry lesser density cargoes, ie. greater buoyancy.
4. Tankers have greater GM values.
5. Tankers have more pumps to quickly control ingress of water after a bilging incident.
6. Tankers have a permeability of about 5% hence lower permeability will instantly allow less ingress of water following a bilging incident.

**Q-277) FREEING PORT AND BULWARK, CONSTRUCTION AND PURPOSE?**

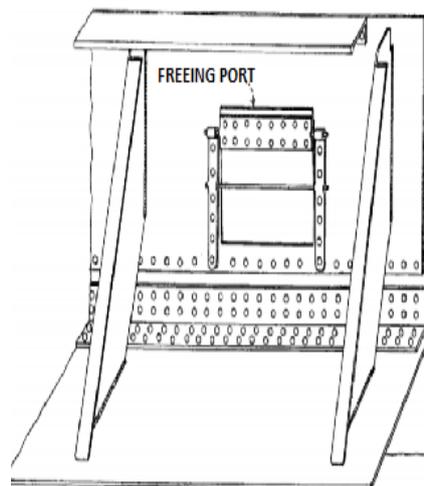
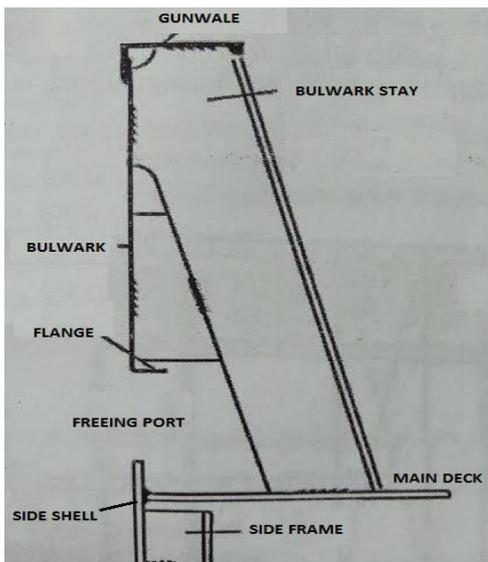
**FREEING PORT:**

- It is situated below the bulwark.
- It is provided to minimise the free surface effect and also to minimise dynamic heeling effect.
- It is provided for drainage of large amount of water on deck.

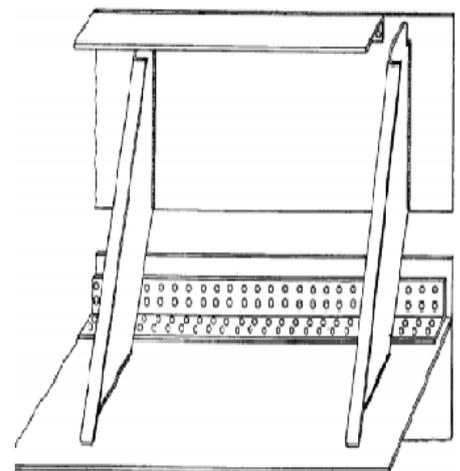
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**BULWARK:**

- A solid wall like structure fitted on the ship's side above the upper deck to protect crew member falling into the sea.
- It is situated above the freeing port.
- It is a small metal piece which is connected to deck via doubler.
- It is provided for the protection of the crew during bad weather and man getting overboard.
- The height of Bulwark is at least 1 metre high on the exposed freeboard and the superstructure deck.
- However, a reduced height may be allowed if this interferes with the operation of the ship.
- Bulwark should not be welded to the sheer strake to the half length amidship as this is liable to cause the plating to crack.
- This can be done by riveting the bulwark to the sheer strake or by using FLOATING BULWARK, which has the advantages that the space/gap between it and the edge of the deck serve as a freeing port.



**BULWARK RIVETED TO SHEERSTRAKE**



**FLOATING BULWARK**

**Q-278) DAVIT AND WINCH MAINTENANCE OF LIFEBOAT?**

**Table 6.3.1.1 - Inspection procedure and maintenance plan for davit**

Items	Method	Inspection procedure	Maintenance plan	
			Weekly	Monthly
Frame	Visual	Check corrosion, deformation and depression.	X	X
Davit arms	Visual	Check corrosion, deformation and depression.	X	X
	Operation	Moving out from stowed position.	X	
	Operation	Turning out from stowed position.		X
Sheave, suspension block	Visual	Check wear and corrosion.		X
	Operation	Check moving condition.	X	X
	Lubricate	Lubricate/grease.		X
Hinge pin, sheave pin	Lubricate	Lubricate/grease.		X
Davit arm stopper and trigger hook	Visual	Check wear and corrosion.	X	X
	Operation	Check moving condition.	X	X
	Lubricate	Lubricate/grease.		X
Boat fall, Turn buckle	Visual	Check wear, breakage of wire and corrosion.		X
	Lubricate	Lubricate/grease.		X
	Turn ends	Turn ends of boat fall (2.5 years).		
	Replacing	Replacing boat fall (5 years).		
Lashing wire rope	Visual	Check wear, corrosion and looseness.	X	X
Deck operation device	Operation	Check moving condition.		X
	Lubricate	Lubricate/grease.		X
Remote control wire	Visual	Check wear and corrosion.	X	X
	Operation	Check moving condition.		X
	Lubricate	Lubricate/grease.		X
Boat chock	Visual	Check wear and corrosion.	X	X

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**Inspection procedure and maintenance plan for winch**

Items	Method	Inspection procedure	Maintenance plan	
			Weekly	Monthly
Gear box, gear, bearing, oil seal	Visual	Check level and deterioration of lubricating oil.		X
	Operation	Check unusual noise.		X
Brake system, Centrifugal brake	Visual	Check corrosion or any defects.	X	X
Wire end cotter	Visual	Check looseness.		X
Brake lever	Visual	Check corrosion or any defects.	X	X
	Operation	Check operating condition.	X	X
Speed change lever	Lubricate	Lubricate/grease.	X	X

**Table 6.3.1.3 - Inspection procedure and maintenance plan for electric parts**

Items	Method	Inspection procedure	Maintenance plan	
			Weekly	Monthly
Electric motor	Visual	Check wiring.	X	X
	Operation	Check normal operation.		X
Limit switch	Visual	Check wiring.	X	X
	Operation	Check normal operation.		X
	Lubricate	Lubricate/grease.		X
Push-button switch box and cable	Visual	Check wiring and other defects.	X	X
	Operation	Check normal operation.		X
Start panel	Visual	Check wiring and other defects.	X	X
	Operation	Check normal operation.		X

### Q-279) HOW MANY LIMIT SWITCHES ON LIFEBOAT DAVIT?

Where power driven winches are used with gravity davits, two limit switches, one for each davit arm, shall be provided to limit the travel of the davit arms as they approach the final stowed position. These switches shall be connected in series, they may be connected in either the control or the power circuit, and they shall be so arranged that the opening of either switch will disconnect all electrical potential of the circuit in which the switches are connected. These switches shall be arranged to stop the travel of the davit arms not less than 12 inches from their final stowed position and they shall remain open until the davit arms move outboard beyond the tripping position of the switches.

### Q-280) SAFETIES ON LIFEBOAT DAVIT?

- Deadman handle
- Harbour pin
- Winch upper limit switch
- Drum brake
- Winch brake counter weight.

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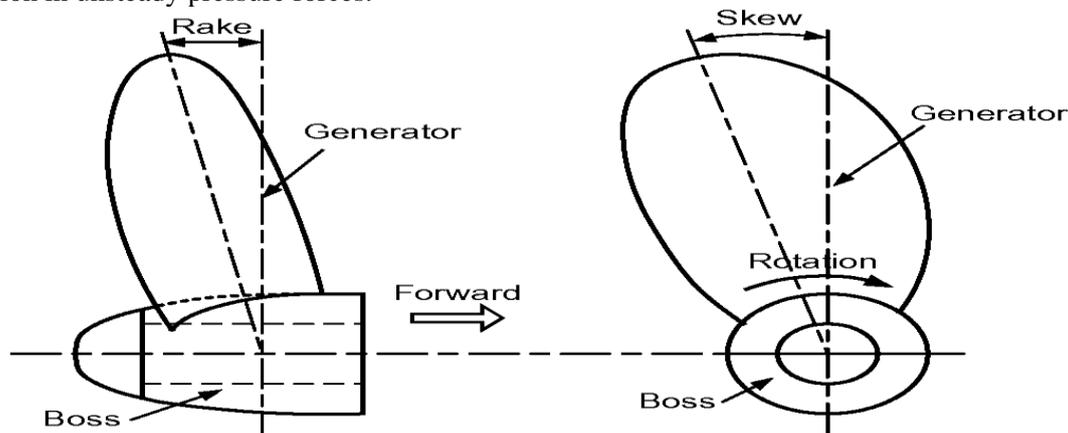
### Q-281) RAKE AND SKEW OF PROPELLER?

#### **RAKE:**

- When the propeller is viewed from sideways, we see that the blades of the propeller are not perpendicular to the surface of the hub. It is 'tilted' at an angle either towards the fore-end or the aft end of the ship. This is termed as Rake.
- One of the biggest reasons for the rake is allowing higher clearance between the blades and the vicinal hull surface. If the blade tip happens to be very close to the hull plating (which is very prone in case of no or little raked ones), there is a chance of induced vibration due to ship propeller action.
- When the blade is raked forward, that is in the direction of the shaft axis towards fore-end, it is called Negative Rake. Conversely, when it is raked aft, it is called Positive Rake

#### **SKEW:**

- When we look at the ship propeller surface from behind). The blade appears to be 'Skewed', that is, bent or twisted sideways.
- After years of experimentation, analysis and sea trials, it was observed that aptly skewing a ship propeller nullifies or considerably minimises the extent of unsteady hydrodynamic loading in this flow field. This indirectly has [positive effects in reducing resistance](#) due to viscous 'drag' effects. It also reduces propeller-induced vibrations.
- Reduction in unsteady bearing forces and moments.
- Reduction in unsteady pressure forces.



### Q-282) PUMP ROOM SAFETIES?

1. Cargo pumps, ballast pumps and stripping pumps, installed in cargo pumprooms and driven by shafts passing through pump-room bulkheads shall be fitted with temperature sensing devices for bulkhead shaft glands, bearings and pump casings. A continuous audible and visual alarm signal shall be automatically effected in the cargo control room or the pump control station;
2. Lighting in cargo pump-rooms, except emergency lighting, shall be interlocked with ventilation such that the ventilation shall be in operation when switching on the lighting. Failure of the ventilation system shall not cause the lighting to go out;
3. All pump-rooms shall be provided with bilge level monitoring devices together with appropriately located alarms.
4. A high level alarm in pump room bilges which activates audible and visual alarms in the cargo control room, engine room and the navigating bridge.
5. A system for continuous monitoring of the concentration of hydrocarbon gases shall be fitted. Sampling points or detector heads shall be located in suitable positions in order that potentially dangerous leakages are readily detected.

6. When the hydrocarbon gas concentration reaches a pre-set level which shall not be higher than 10% of the lower flammable limit, a continuous audible and visual alarm signal shall be automatically effected in the pump-room, engine control room, cargo control room and navigation bridge to alert personnel to the potential hazard; and
7. Ventilation system :-
  - cargo pump-rooms should be mechanically ventilated and the capacity should be 20 air changes per hour of the total volume of the pump-room.
  - the position of the vent outlet should be arranged at a distance of at least 3 m measured horizontally from any ignition source and from the nearest opening to accommodation, service or machinery spaces.
  - floor gratings should not disturb the free flow of air. **JAI MATA DI - CLASS 2 SAFETY NOTES**
  - the fan blade should be non sparking type. **BY ANKUR SHARMA (MANET BATCH 6)**
8. A fixed gas detection system capable of continuously monitoring for the presence of hydrocarbon gas.
9. A fixed sampling arrangement to enable the oxygen content within the pump room to be monitored from the deck by portable meter prior to pump room entry. Where such an arrangement is fitted it should ensure that remote parts of the pump room can be monitored.
10. Temperature monitoring devices fitted to the main cargo pumps in order to provide remote indication of the temperature of pump casings, bearings and bulkhead seals.
11. A high level alarm in pump room bilges which activates audible and visual alarms in the cargo control room, engine room and the navigating bridge.
12. Manually activated trips for the main cargo pumps provided at the lower pump room level and at the top (main deck) level.
13. Spray arrestors around the glands of all rotary cargo pumps in order to reduce the formation of mists in the event of minor leakage from the gland.
14. On ships fitted with an inert gas system, the provision of an emergency facility for inerting the pump room could be an option, although careful attention must be paid to the safety and integrity of the arrangement. Some ships have fixed CO2 system for pump room as well.
15. The provision of Emergency Escape Breathing Devices (EEBDs) located within the pump room and sited to be readily accessible.
16. Fire extinguisher of foam type must be present at the bottom platform of the cargo pump room.
17. Dead man alarm must be fitted in pump room.
18. A Neil Robertson stretcher to be present on bottom platform of cargo pump room.(Important)
19. ODMCS
20. Intrinsically safe fire detectors are installed in pump room for detection of fire in pump room.

New recommendations for new ships: (As per OCIMF-Oil companies international marine forum)

1. Vibration monitoring: It is recommended that fixed vibration monitoring equipment is provided on all centrifugal pumps. The equipment should include a remote alarm facility.
2. Cargo pump leakage detection: All centrifugal cargo pumps should be equipped with a double seal arrangement designed to contain any leakage from the shaft seal and to provide remote alarm indication for its occurrence.
3. Cargo system draining arrangements: Cargo systems shall be provided with a comprehensive stripping arrangement to enable all lines and pumps to be effectively drained to a cargo tank, slop tank or dedicated reception tank for subsequent discharge ashore.

### **Q-283) HOW TO CHANGE LIGHT IN PUMP ROOM?**

We have to remove fuse from the breaker before changing. We can proceed only after filling the permit of breaker isolation.

### **Q-284) SHIP ENTERING TO FW FROM SW, CHANGES IN TPC, TRIM, COF AND LIST?**

#### **EFFECT ON DRAFT AND TPC:**

As ship is moving from SW to FW, due to the density reduction, ship will sink more. This additional sinkage will be just enough to achieve more underwater volume so that vessel will get exact buoyancy as vessel floating in seawater. We know, TPC is directly proportional to density, hence when density gets reduced, TPC will get reduced which will result in additional sinkage of the vessel, hence draft will increase.

Consider a ship floating in water of density  $\rho$  t/m<sup>3</sup>.

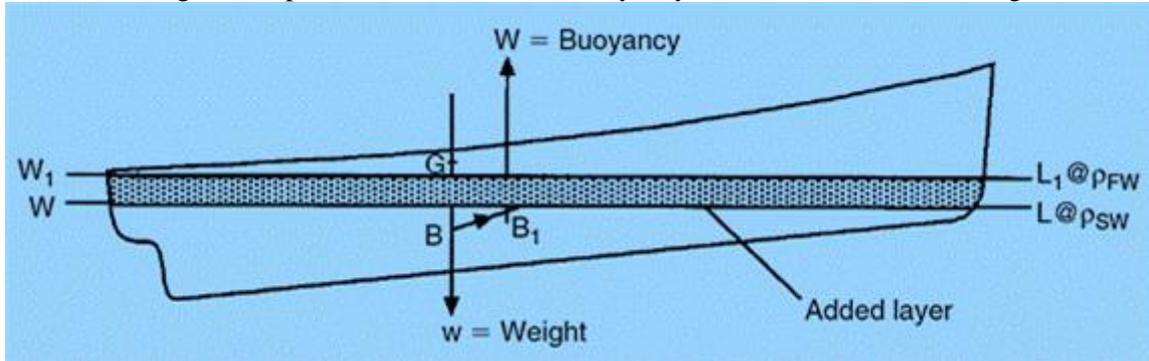
$$TPC = \frac{A_w \times \rho}{100}$$

For sea water  $\rho = 1.025$  t/m<sup>3</sup>

$\therefore$  TPC sw = 0.01025  $A_w$

**EFFECT ON TRIM AND COF:**

When a ship passes from water of one density to water of another density the mean draft is changed and if the ship is heavily trimmed, the change in the position of the centre of buoyancy will cause the trim to change.



When the vessel was in SW, waterline was WL, center of gravity and center of buoyancy was in the same line. Once the vessel moves to FW, water line become W1L1. As the extra volume of water has been displaced, center of buoyancy has shifted to B1. As now G and B are not in the centerline, it gives a trimming moment which will be equal to the product of the displacement and the longitudinal distance between center of gravity and center of buoyancy. The ship will trim more to bring G and B back in the same vertical line.

When trim will be in the aft, trim will be positive, hence center of floatation will also be in the aft and vice versa. There will be no effect on the list of the vessel.

**Q-285) HOW TO COLLECT STORES AT SECURITY LEVEL 1, 2, 3?**

The security measures relating to the delivery of ship's stores should:

- Ensure checking of ship's stores and package integrity.
- Prevent ship's stores from being accepted without inspection.
- Prevent tampering.
- Prevent ship stores from being accepted unless ordered.

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Security Level 1:

- Checking to ensure stores match the order prior to being loaded onboard.
- Ensuring immediate secure stowage of ship's stores.

Security Level 2:

Stores should be checked prior receiving onboard and inspection should be intensified.

Security Level 3:

- Subjecting ship stores to more extensive checking.
- Preparation for restriction or suspension of handling of ship's stores.
- Refusal to accept ship store's onboard the ship.

**Q-286) HOW BAGGAGE CHECK WILL BE CONDUCTED AT SECURITY LEVEL 1, 2, 3?**

**SECURITY LEVEL 1:**

SSP should establish the security measures to be applied when handling unaccompanied baggage to ensure that unaccompanied baggage is screened or searched up to and including 100%, which may include use of X-ray screening.

**SECURITY LEVEL 2:**

SSP should establish the additional security measures to be applied when handling unaccompanied baggage, which should include 100% X-ray screening of all unaccompanied baggage.

**SECURITY LEVEL 3:**

The ship should comply with the instructions issued by those responding to the security incident or threat thereof.

- Subjecting such baggage to more extensive screening, for example X-raying it from atleast two different angles.
- Preparation for restriction or suspension of handling unaccompanied baggage.
- Refusal to accept unaccompanied baggage onboard the ship.

### **Q-287) COFFERDAM VENT**

All tank vessels, the construction or conversion of which was started on or after November 10, 1936, cofferdams and void spaces shall be provided with gooseneck vents fitted with a flame screen or pressure-vacuum relief valves. The diameter of a vent shall be not less than 2 1/2 inches.

### **Q-288) WHAT IS RO?**

**Recognised Organisation "RO"**, an authorized organization that performs statutory requirements on behalf of a vessel's flag state.

The RO Code serves as the international standard and consolidated instrument containing minimum criteria against which organizations are assessed towards recognition and authorization and the guidelines for the oversight by flag States. The RO Code:

- provides flag States with a standard that will assist in achieving harmonized and consistent global implementation of requirements established by the instrument of the International Maritime Organization (IMO) for the assessment and authorization of recognized organizations (ROs);
- provides flag States with harmonized, transparent and independent mechanisms, which can assist in the consistent oversight of ROs in an efficient and effective manner; and
- clarifies the responsibilities of organizations authorized as ROs for a flag State and overall scope of authorization.

### **Q-289) NEW IG REQUIREMENTS**

From 1 jan 2016, all tankers of 8000 dwt and above to have fixed IG SYS

Previously it was for 20000 dwt and above

### **Q-290) AS 2<sup>ND</sup> ENGG PREPARATION OF IG BEFORE DISCHARGING**

- all alarm and safety functions;
- the functioning of the flue gas isolating valves;
- the operation of all remotely or automatically controlled valves;
- the functioning of the water seal and non-return valve (with a backflow pressure test);
- the vibration level of the inert gas blowers;
- for leakages: in systems four years old or more deck lines should be examined for gas leakage;
- the interlocking of the soot blowers;
- oxygen measuring equipment, both portable and fixed, for accuracy by means of both air and a suitable calibration gas.

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### **Q-291) ALL ALARMS AND TRIPS, HOW WILL YOU TEST EACH ONE OF THEM.**

- Basically all alarms need to be tried out
- Scrubber high and low level by operating floats
- Scrubber low pressure by pressure switch
- Deck seal no flow by stopping pump momentarily or by flow switch simulation
- Deck seal low level by float operation
- Control air low pressure by pressure switch simulation
- O2 analyser to be calibrated by nitrogen bottle
- Blower high temp trip by temperature calibrator.

### **Q-292) INTERLOCK IN IG SYSTEM**

As per FSS CODE, if uptake valves are open, soot blowers for boilers cannot be operated.

### **Q-293) RISK ASSESMENT MATRIX, KEY FEATURES OF MATRIX**

The Risk Matrix is a table that defines level of risk on the basis of relationship between likelihood and severity

Key features of matrix are:

- Hazards
- Existing safeguards
- Severity
- Likelihood
- Risk level
- Additional safeguards column if need to reduce risk level.
- Then again re-evaluation of risk by severity and likelihood.

Furthermore, risk ratings can be developed by companies in accordance with the conditions of each company. What needs to be underlined is that the severity viewed from various aspects.

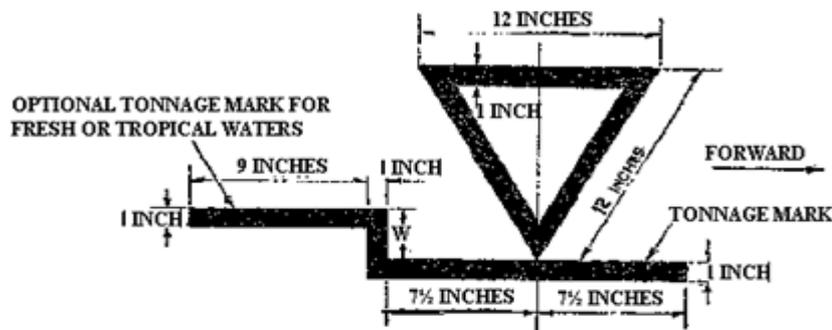
**Q-294) HOW TO DEAL WITH MNC, AS A 2<sup>ND</sup> ENGG WHAT PROCEDURE YOU WILL ADOPT TO RECTIFY MNC?**

- Whenever a ship gets an MNC during an audit, it should be immediately downgraded to NC by correction after which a corrective implementation plan is approved by DPA from the auditor who raised an MNC. This cap is implemented within 3 months period after its approval. After the end of 3 months, an additional audit is carried out to check effective implementation has been done and close out the MNC.
- The cap consists of root cause analysis to avoid reoccurrence of MNC.
- There is a time period of 2 weeks to approve the cap by DPA from the auditor who raised the MNC.
- Same process is there for NC with respect to cap getting approved by DPA from the auditor and the implementing cap within 3 months after its approval but here the effectiveness of implementation is checked at the next scheduled audit.

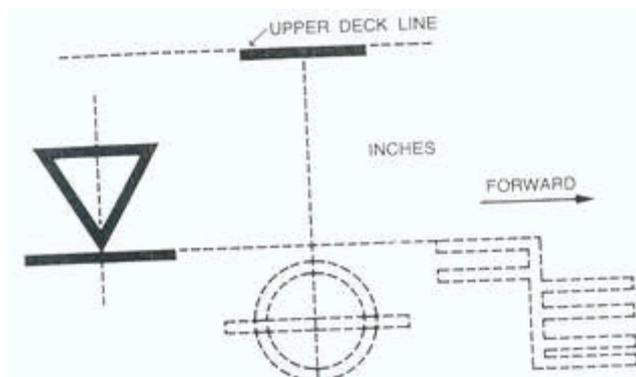
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**Q-295) TONNAGE MARK**

- The tonnage mark is a horizontal line 15 inches long and one inch wide. The tonnage mark must be designated by a welded bead or other permanent mark 15 inches long placed along the top edge of the tonnage mark.
- Above the tonnage mark is placed an inverted equilateral triangle, each side of which is 12 inches long and one inch wide, with its apex touching the upper edge of the center of the tonnage mark.
- Tonnage marks are totally different than the load lines and they should not be used for indication of drafts and other purposes.



Till the time, water is below the tonnage mark, a modified tonnage is applicable for such ship. The center of the point where triangle tip touches the tonnage line is situated 540 mm forward of the load line disc. For ships that carry timber, it will 1080 mm away.



**Q-296) CERTIFICATE IN AFS CONVENTION**

- “International Anti-Fouling System Certificate” with “Record of Anti-Fouling System” will be issued after completion of Initial Survey.
- In case where AFS is changed, new IAFS Certificate will be issued.
- In case where AFS is replaced, “Endorsement of Survey(s) the Record” will be issued and attached to existing AFS Certificate.
- In case where non-party of the convention, Document of Compliance (hereinafter, DOC) will be issued by the class.

**Q-297) BILGE KEEL FITTING**

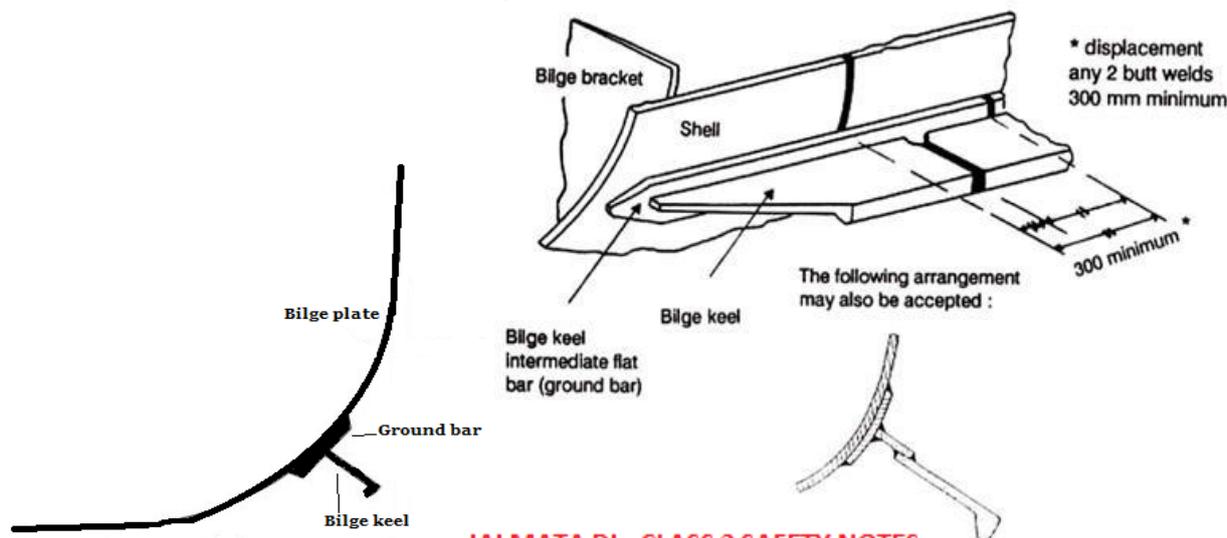
It is the longitudinal structure that runs along much of the length down to the lower side of ship’s hull to reduce the rolling motion of the ship.

Its purpose:

- Dampen the rolling motion of the ship
- Increase longitudinal strength to bilge strake.
- Protect bilge while grounding

Construction details:

- It fits along bilge radius either side of ship nearly half its length.
- Bilge keel fit at right angle to bilge radius plating.
- Outer end of bilge keel rivet or lightly welded.
- Outer joint easy to break and leave hull undamaged.
- Bilge keels are tapered at ends to minimize the hydraulic drag.
- Bilge keels are not fitted directly to the hull plating, a ground bar is attached to the bilge plate..
- Ground bar to shell is connected by continuous fillet weld.



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### **Q-298) SHIP LENGTH INCREASED WHAT HAPPENED TO RESISTANCE AND $R_f$ FORMULA**

The length of a vessel is directly proportional to its resistance: the longer the vessel, the greater the resistance. As  $R_f$  is directly proportional to Wetted surface area, hence increase in length will increase  $F_{ro}$ .

### **Q-299) IGGS AND IGS DIFFERENCE**

Inert gas generator system specifically used to produce inert gas of required quantity with the specified oxygen content. Inert gas system, used the flue gases from boiler exhaust and washes it to use as inert gas of required oxygen quantity.

### **Q-300) FTP CODE ITS SIGNIFICANCE**

- FTP Code (International Fire Test Procedure code): It contains fire test procedures for fire safe constructions and materials used on board of ships.
- It uses a fire test which covers non-combustibility, fire resistance, flammability, spread of flame, smoke and toxicity of constructions and material.
- The significance of FTP code is that it will set higher fire safety requirements and thereby improve the protection of ships against catastrophic fires.

### **Q-301) WHY MAX GX SHOULD NOT COME BEFORE 25 DEGREE ANGLE OF HEEL**

- As per intact stability criteria under Annex 1 of MARPOL and Chapter 12 of SOLAS requirement.
- Angle of down-flooding usually takes place around near 25 degrees so we need the maximum righting lever.
- Hence max GX should not come before 25 degrees.

### **Q-302) WHAT WE DO AT DESIGN STAGE TO COUNTER ROLLING OF SHIPS?**

- Bilge keels should be provided: They are plates projecting from the turn of the bilge and extending over the middle half to two-thirds of the ship's length. They cause a body of water to move with the ship and create turbulence thus dampening the motion and causing an increase in period and reduction in amplitude.
- Anti-rolling tanks: They are similar to the principle of passive tank system but the movement of water is controlled by pumps or by the air pressure above the water surface. The tanks either side of the ship may be connected by a lower limb or two separate tanks can be used.

- Active fins: With active fins, a sensitive gyro system senses the rolling motion of the ship and sends a signal to the actuating system which, in turn, causes the fins to move in a direction such as to cause forces opposing the roll. The actuating gear is usually electro-hydraulic.

**Q-303) MLC DETAINABLE DEFICIENCIES**

- Minimum age of seafarers
- Medical certification of seafarers
- Qualifications of seafarers
- Seafarers' employment agreements
- Recruitment and placement service for seafarers
- Hours of work or rest
- Manning levels for the ship
- Accommodation
- Onboard recreational facilities
- Food and catering
- Health and safety and accident prevention
- on-board medical care
- Onboard complaint procedure
- Payment of wages

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**Q-304) INCINERATOR HAS RUN FOR 8 HOURS, WHAT CHECKS TO BE DONE AFTER STOPPING**

There should be no flame visible.

**Q-305) HYDROGEN FIRE, IRON FIRE, HOW WILL YOU DEAL**

- When the fire causes the metal itself burning at about 700 °C, if steam smothering soot blowing system or water jetting system has been attempted, the big hydrogen fire may result.
- The applied steam dissociates into hydrogen and oxygen and accelerating the fire.
- Once such a fire has started, resulting two kind of fires may take place simultaneously, one kind, iron burning in steam, and the other, the hydrogen burning in an air exothermic way.
- This combined fire being self supporting and lasting until the supply of steam is exhausted.
- The primary objective of dealing the fire is to cool the surface and burning material as quickly as possible.
- Spray water on adjacent equipment to cool it

**Q-306) HOW TO FIGHT ENGINE ROOM BILGE FIRE, WHICH EXTINGUISHER TO BE USED TO FIGHT BILGE FIRE?**

- First check the condition of fire; it is small oil fire in the bilge well.
- Then raise the fire alarm signal.
- Remove the combustible material near vicinity.
- It is a small fire, extinguish by foam portable extinguisher.
- Release the foam direct to the fire by deflecting it from another surface.
- Foam is lower specific gravity than oil or water that it will flows across the surface of oil and cover.
- The fire will stop by blanking with foam.

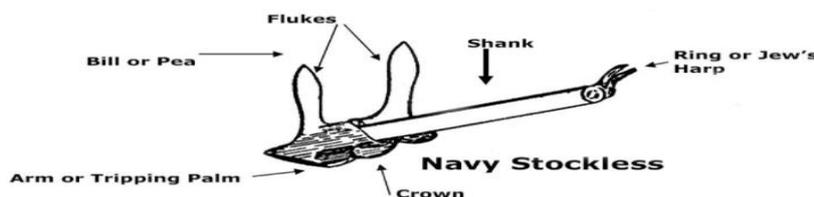
**Q-307) WHERE TO FIND THE AMOUNT OF CO2 REQUIRED FOR YOUR SHIP**

It is provided in the ship manual.

**Q-308) ANCHOR HOW ITS HOLDING THE SHIP**

The primary force holding an anchored ship in place is the weight of the chain lying on the bottom and its friction with the bottom of the sea. The anchor does help as the flukes are designed to dig into the bottom as well. When properly anchoring ship, the amount of anchor chain paid out is 5 to 7 times the depth of the water as a rule of thumb. The type of bottom is a contributing factor with mud being the best holding and rock being the worst.

The ship retrieves the anchor by hoisting the chain with an anchor windlass which has a great deal of torque.



### Q-309) ANCHOR ATTACHED HOW TO SHIP

Anchor is attached to the ship by the bitter end in the chain locker.

### Q-310) MATERIAL OF ANCHOR?

Galvanised Steel

### Q-311) LATEST FSS CODE AMMENDMENT

#### **FSS Code, Chapter 8 – Automatic Sprinkler, Fire Detection and Fire Alarm Systems**

MSC.1/Circ.1516 includes amendment to Chapter 8 of the FSS Code adds a new requirement for special attention to be paid to the specification of water quality provided by the system manufacturer, to prevent internal corrosion and clogging of sprinklers.

#### **Helicopter facility foam fire fighting appliances**

##### **(Amendments to SOLAS Regulation II-2/18 and the FSS Code Chapter 17)**

MSC.404(96) states that amendments to SOLAS II-2/18 have a new paragraph 2.3 to require a foam application system that complies with the new chapter 17 of the FSS Code. The new Chapter 17 of the FSS Code details the specifications for foam fire fighting appliances for the protection of helidecks and helicopter landing areas as required by chapter II-2 of SOLAS. As per MSC.403(96), for helicopter landing areas, at least two portable foam applicators or two hose reel foam stations shall be provided, each capable of discharging a minimum foam solution discharge rate.

#### **FSS Code Chapter 13 – Arrangement of Means of Escape**

A revision has been made to 2.1.2.2.2 distribution of persons, case 2 for passenger ship evacuation analysis, for the purpose of clarifying the distribution of crew in public places. In particular, MSC.410(97) mentions that *“Passengers in public spaces occupied to 3/4 of maximum capacity, 1/3 of the crew distributed in public spaces; service spaces occupied by 1/3 of the crew; and crew accommodation occupied by 1/3 of the crew”*

### Q-312) RISK ASSESSMENT PROCEDURE?

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BY ANKUR SHARMA (MANET BATCH 6)**

According to International Maritime Organization (IMO),

**RISK** is the **“combination of the frequency and the severity of the consequence”**

The marine risk assessment is a decision making tool which helps in evaluation of each hazard associated with the risks in terms of the likelihood of harm and its potential aftermath.

There are three main reasons as to why it is important to carry out risk assessment.

4. Because it financially beneficial as it helps to reduce the risk and thus accidents
  5. Because it is regulatory requirement and thus legally required to conduct risk assessment. Paragraph 1.2.2.2 of the ISM Code states, “Safety management objectives of the company should assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards”. This 2010 amendment to ISM code has included the risk assessment explicitly.
  6. Because it is morally and ethically right thing to do as risk assessment helps in preventing injuries and accidents.
- Risk assessment is to assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards.
  - Five steps to risk assessment can be followed to ensure that your risk assessment is carried out correctly, these five steps are:

1. <b>Hazard identification:</b> Substance, situation or practice that has the potential to cause harm or Danger.
2. <b>Risk Evaluation:</b> Risk = Likelihood x Severity <ol style="list-style-type: none"><li>1. Every company SMS have different matrix for calculating the risk.</li><li>2. We can also follow the chart developed on the basis of likelihood of risk and severity of risk.</li></ol>
3. <b>Risk Control:</b> The most effective way of reducing risk is to eliminate the hazard. In the cases, where elimination is not possible, risk will be controlled by implementation of procedures like checklists, permits, Standard operating procedures. PPE should be the last resort only when control is not possible by other means. Risk exposure should be lowered to ALARP level “As low as reasonably practicable”
4. <b>Monitoring:</b> Evaluation of whether the controls are put in place and are being used correctly. Evaluation also includes whether the perceived risk was sufficiently reduced.
5. <b>Review:</b> All risk assessment should be reviewed regularly. <ol style="list-style-type: none"><li>1. Will the implemented controls lead to tolerable risk level?</li><li>2. Are new hazards created which requires new controls?</li><li>3. What is the practicality of the preventive measures?</li><li>4. Will the controls be used in practice and not ignored?</li></ol>

## MLC 2006

### WHAT IS MLC 2006?

The MLC 2006 has become a global legal instrument that will be the fourth pillar of IMO.

MLC stands for Maritime Labour Convention. It was adopted on 23 February 2006 and came into force on 20 August 2013. It is applicable to all ships above 500 GT.

Purpose of MLC:

- Enforced seafarers' rights.
- Conditions of fair competition for ship owners.
- One comprehensive set of global standards.
- Almost all of the maritime labour instrument tools were included into the new MLC 2006 with an intention to make it globally applicable, easily understandable, readily understandable and uniformly enforced.

MLC is not under IMO but is taken care by ILO.

The aim of MLC is: 1. It is a level playing field for ship owners.

2. Minimum standard to ensure decent work in one place.

- It has total 15 Articles and 5 titles. There are total 22 regulations under 5 titles.

**The titles are as follows:**

1. Minimum requirements of seafarers to work on ships.
2. Conditions of employment
3. Accommodation, Recreation, food and catering.
4. Health protection, medical care, welfare and social security protection.
5. Compliance and enforcement.

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For flag of a state that has not ratified the MLC 2006, "no more favourable treatment" will be given. This concept is also found in IMO conventions. It means the ships flying flag of countries that have ratified the convention will not be placed at a competitive disadvantage as compared to the countries that have not ratified mostly in the context of Port state control.

MLC 2006 does not directly apply to ships, ship owners or seafarers but like all international law, it relies on implementation by countries through their national laws which would then apply to ship owners, seafarers and ships.

### TITLE 1: Minimum requirements of seafarers to work on ships.

#### **Regulation 1.1 = Minimum age**

**PURPOSE : To ensure that no under-age persons work on a ship**

- The employment, engagement or work on board a ship of any person under the age of 16 shall be prohibited.
- Night work of seafarers and work in hazardous area under the age of 18 shall be prohibited.
- For the purposes of this Standard, "night" shall be defined in accordance with national law and practice.
- It shall cover a period of at least nine hours starting no later than midnight and ending no earlier than 5 a.m.
- Young seafarer means any seafarer between age of 16 and 18.
- Hazardous works are prohibited for young seafarers like
  - Operating power machines, cranes etc.
  - Work on deck during foul and heavy weathers.
  - Entry into boilers, tanks or confined spaces.
  - Lifting, moving or carrying heavy loads.

#### **Regulation 1.2 = Medical Certificate**

**PURPOSE : To ensure that all seafarers are medically fit to perform their duties at sea**

- The competent authority shall require that, prior to beginning work on a ship, seafarers hold a valid medical certificate attesting that they are medically fit to perform duties at sea.
- A medical certificate shall be valid for a maximum period of
  - Two years for seafarer above 18 years
  - One year for the seafarers under the age of 18
  - Certificate of color vision shall be valid for a maximum period of 6 years.
- In urgent cases, the competent authority may permit seafarer to work without medical certificate until next port of call where seafarer can obtain a valid medical certificate from qualified medical practitioner provided:
- The period of such extension shall not exceed 3 months.
- The medical certificate minimum be provided in English.

### Regulation 1.3 = Training and Qualification

**PURPOSE :** To ensure that seafarers are trained or qualified to carry out their duties on board ship

### Regulation 1.4 = Recruitment and Placement

**PURPOSE :** To ensure that seafarers have access to an efficient and well-regulated seafarer recruitment and placement system

- All seafarer shall have access to an efficient, adequate and accountable system for finding employment onboard ship without charge to the seafarer.
- Each recruitment and placement service shall ensure that service is operated in an orderly manner that protects and promotes seafarers employment rights.
- It requires that no fees or other charges shall be taken from any seafarer directly or indirectly, in whole or in part other than medical certificate, seafarer's book, and a passport or other similar personal travel documents.
- Such placement services should maintain an up to date register of all seafarers recruited or placed through them, so that it will be available for inspection by any competent authority.

## TITLE 2: Condition of Employment

### Regulation 2.1 = Seafarer's employment agreements

**PURPOSE :** To ensure that seafarers have a fair employment agreement

- SEA must be signed by the seafarer and the ship owner, or his authorised representative.
- Copies of the SEA and Collective Bargaining Agreement (CBA) (if applicable) must be available onboard.
- English translations of the SEA and CBA must be available onboard.

The SEA must also include:

- A notice period for early termination of the SEA of not less than 7 days.
- The right to terminate the contract for compassionate measures.

All seafarer's must be given an original copy of the SEA.

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### Regulation 2.2 = Wages

**PURPOSE :** To ensure that seafarers are paid for their services

- Wages are paid in accordance with the SEA and (CBA if any).
- Minimum basic monthly wage as agreed by the ILO joint maritime commission from time to time.
- An individual monthly statement of account is provided to all seafarers onboard, indicating their monthly wage and any authorised deductions, such as allotments.
- Seafarers have the right to make an allotment of all or part of their earnings.
- Charges for the allotments and exchange rates are reasonable and in accordance with the flag state's requirements.
- There are no unauthorised deductions such as payments for travel to or from the ship.

### Regulation 2.3 = Hours of work and hours of rest

**PURPOSE :** To ensure that seafarers have regulated hours of work or hours of rest

The limits on hours of work or rest shall be as follows:

Maximum hours of work shall not exceed: (i) 14 hours in any 24-hour period; and (ii) 72 hours in any seven-day period; or	Minimum hours of rest shall not be less than: (i) 10 hours in any 24-hour period; and (ii) 77 hours in any seven-day period.
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- Hours of rest may be divided into no more than two periods, one of which shall be at least six hours in length, and the interval between consecutive periods of rest shall not exceed 14 hours.
- Musters, fire-fighting and lifeboat drills shall be conducted in a manner that minimizes the disturbance of rest periods and does not induce fatigue.
- When a seafarer is on call, such as when a machinery space is unattended, the seafarer shall have an adequate compensatory rest period if the normal period of rest is disturbed by call-outs to work.
- Table of shipboard working arrangement shall be posted in easily accessible place which shall contain for every rank atleast:
  - The schedule of service at sea and service in port; and
  - The maximum hours of work or the minimum hours of rest required by national laws or regulations.

Working hours for young seafarers at sea or in port it should apply:

- Working hours should not exceed 8 hours per day and 40 hours per week and overtime should be worked only where unavoidable for safety reasons.

- Sufficient time should be allowed for all meals, and a break of at least one hour for the main meal of the day should be assured.
- 15 minute rest period as soon as possible following each two hours of continuous work.

#### **Regulation 2.4 = Entitlement to leave**

**PURPOSE : To ensure that seafarers have adequate leave**

- Each Member shall require that seafarers employed on ships that fly its flag are given paid annual leave.
- Seafarers shall be granted shore leave to benefit their health and well-being and with the operational requirements of their positions.
- The annual leave with pay entitlement shall be calculated on the basis of a minimum of 2.5 calendar days per month of employment. The manner in which the length of service is calculated shall be determined by the competent authority.

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#### **Regulation 2.5 = Repatriation**

**PURPOSE : To ensure that seafarers are able to return home**

- Seafarers have a right to be repatriated at no cost to themselves in the circumstances and under the conditions specified in the code.
- Each member shall require ships that fly its flag to provide financial security to ensure that seafarer's are duly repatriated.

Each Member shall ensure that seafarers on ships that fly its flag are entitled to repatriation in the following circumstances:

- (a) if the seafarers' employment agreement expires while they are abroad;
- (b) when the seafarers' employment agreement is terminated:
  - (i) by the shipowner; or (ii) by the seafarer for justified reasons; and also
- (c) when the seafarers are no longer able to carry out their duties under their employment agreement.
- (d) the maximum duration of service periods on board should be less than 12 months following which a seafarer is entitled to repatriation.

If a seafarer is found to be in serious default of seafarer's employment obligations, the cost of repatriation may be recovered from the seafarer.

With respect to this regulation, "Certificate of Insurance or other financial security in respect of seafarer repatriation costs and liabilities" is required.

#### **Regulation 2.6 = Seafarer compensation for the ships loss or foundering**

**PURPOSE : To ensure that the seafarers are compensated when a ship is lost or has foundered.**

- Seafarers are entitled to adequate compensation in the case of injury, loss or unemployment arising from the ships loss or foundering.
- In every case of loss or foundering, the ship owner shall pay to each seafarer on board an indemnity against unemployment resulting from ships loss or foundering but the total indemnity payable to any one seafarer may be limited to two months wages.

#### **Regulation 2.7 = Manning levels**

**PURPOSE : To ensure that seafarers work on board ships with sufficient personnel for the safe, efficient and secure operation of the ship**

- Every ship shall be manned by enough crew to ensure the safety and security of the ship and its personnel, in accordance with the minimum safe manning document.
- When determining or revising manning levels, the competent authority should take into account to avoid or minimise the excessive hours of work to ensure sufficient rest and to limit fatigue.

#### **Regulation 2.8 = Career and skill development and opportunities for seafarer's employment**

**PURPOSE : To promote career and skill development and employment opportunities for seafarers**

- Each member shall have national policies to promote employment in maritime sector
- It should encourage career and skill development and greater employment opportunities for seafarers.

### **TITLE 3: Accommodation, Recreation, food and catering.**

#### **Regulation 3.1 = Accommodation and Recreational Facilities**

**PURPOSE : To ensure that seafarers have decent accommodation and recreational facilities on board.**

- General arrangement plans of the vessels accommodation are available and up to date.
- Records of the master's inspections of the vessel's accommodation are maintained and available.
- Accommodation spaces are clean and in a good state of repair, and fixtures and fittings are in good working order.
- Mess rooms are clean, hygienic and comfortable.
- Cabins have hot and cold running water.
- Bedding is clean and hygienic.
- Heating and ventilation including air conditioning, where fitted, is adequate and well maintained.
- Sanitary facilities are accessible, hygienic and working correctly.
- Laundry facilities are in good working order.
- Recreational facilities are appropriate and in good working order.
- Adequate natural and artificial light is available.

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### **Regulation 3.2 = Food and Catering**

**PURPOSE : To ensure that seafarer have access to good quality food and drinking water provided under regulated hygienic conditions**

- The galley is clean, hygienic and in a good state of repair.
- Spaces used for the storage of food are clean, hygienic and good state of repair.
- Temperature of refrigerators and freezers are appropriate.
- Food is of good quality and quantity and caters for different religious beliefs among the crew.
- Food is provided free of charge on board the vessel.
- Drinking water is of good quality and the quantity available is appropriate.
- The cook is over 18 years of age and holds appropriate qualifications.
- All other catering staff are adequately trained.

### **TITLE 4: Health protection, medical care, welfare and social security protection**

#### **Regulation 4.1 = Medical care onboard ship and ashore**

**PURPOSE : To protect the health of seafarers and ensure their prompt access to medical care on board ship and ashore.**

- Health protection and medical care including essential dental care is available and free of charge to all seafarers.
- Seafarers have the right to visit a qualified medical doctor without delay in ports of call.
- Medical equipment and supplies and medical publications should be available onboard.
- The ship's hospital is clean and hygienic and for medical use only.
- An up to date list of radio contacts where medical advice can be obtained is readily available.

#### **Regulation 4.2 = Ship owner's liability**

**PURPOSE : To ensure that seafarer's are protected from the financial consequences of sickness, injury or death occurring in connection with their employment.**

- Ship owners shall be liable to bear the costs for seafarers working on their ships in respect of sickness and injury of the seafarers occurring between the date of commencing duty and the date upon which they are deemed duly repatriated, or arising from their employment between those dates;
- Ship owners shall provide financial security to assure compensation in the event of the death or long-term disability
- Ship owners shall be liable to defray the expense of medical care, including medical treatment and the supply of the necessary medicines and therapeutic appliances, and board and lodging away from home until the sick or injured seafarer has recovered, or until the sickness or incapacity has been declared of a permanent character; and
- Ship owners shall be liable to pay the cost of burial expenses in the case of death occurring on board or ashore during the period of engagement.

With respect to this regulation, "Certificate of Insurance or other financial security in respect of ship owner's liability" is required.

#### **Regulation 4.3 = Health and safety protection and accident prevention**

**PURPOSE : To ensure that seafarer's work environment onboard ships promotes occupational safety and health.**

- The occupational health and safety (OHS) policy, procedures and programmes are in place.
- Risk assessment are carried out and documented.
- Accidents and incidents are investigated and reported and records are available.
- Safety committee meetings are held regularly.
- All seafarers are aware of their responsibilities which are clearly documented.
- Onboard training and familiarization is carried out and records are available.

#### **Regulation 4.4 = Access to shore based welfare facilities**

**PURPOSE : To ensure that seafarer's working onboard a ship have access to shore-based facilities and services to secure their health and well-being.**

#### **Regulation 4.5 = Social security**

**PURPOSE : To ensure that measures are taken with a view to providing seafarers with access to social security protection**

Medical care, sickness benefit, unemployment benefit, old-age benefit, family benefit, maternity benefit, invalidity benefit, survival benefit has to be given to a seafarer.

#### **TITLE 5: Compliance and enforcement**

##### **Regulation 5.1 = Flag state responsibilities**

**PURPOSE : To ensure that each member implements its responsibilities under this convention with respect to ships flying its flag.**

- Each member is responsible for ensuring implementation of its obligations.
- Each member shall ensure that ships have onboard procedures for the fair and effective handling of seafarers complaints alleging breaches of the requirements of this convention.
- Each member shall ensure that ships carrying and maintaining a MLC certificate.
- Each member shall ensure that ships carrying and maintaining a DMLC certificate.

##### **UNDER 5.1.5 – Onboard complaint procedures**

- Each member shall ensure that ships have onboard procedures for the fair and effective handling of seafarers complaints.
- All seafarers shall be provided with a copy of the on-board complaint procedures.

Procedure:

- Any complaint by a seafarer as soon as possible should be submitted to the Head of department in written format. He should resolve it to the satisfaction of the seafarer within 3 days of the receipt of the complaint.
- If he fails to resolve, he will refer it to the master of the ship, he should resolve it within 7 days period.
- If he fails to resolve, he will refer it to the ship owner concerned. And then shipowner should resolve it within maximum one month period.
- If the complaint has not been resolved, seafarer has the right to approach competent authority.

##### **Regulation 5.2 = Port state responsibilities**

**PURPOSE : To enable each Member to implement its responsibilities under this Convention regarding international cooperation in the implementation and enforcement of the Convention standards on foreign ships**

##### **Regulation 5.3 = Labour-supplying responsibilities**

**PURPOSE : To ensure that each Member implements its responsibilities under this Convention as pertaining to seafarer recruitment and placement and the social protection of its seafarers**

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#### **WHAT ARE CERTIFICATES UNDER MLC?**

The ships engage in foreign voyages are issued with DMLC, (Declaration of Maritime Labour Compliance).

DMLC has two parts:

Part 1 : To be implemented by flag state ie. they will ensure that it has been followed.

Part 2 : For ship owners, that measures are adopted to ensure compliance.

Other documents under MLC are:

1. Maritime Labour Certificate
2. Evidence proving that all seafarer's onboard are above 16 years of age.
3. Medical certificate of maximum one year validity for seafarer's under 18 years of age.
4. Medical certificate of maximum 2 years validity for seafarer's above 18 years of age.
5. A seafarer's employment agreement
6. A copy of CBA (Collective Bargaining Agreement)
7. Records of seafarer's rest/work hours

#### **MLC AMMENDMENT?**

An amendment came into force on 8 January 2019 for improving crew safety and welfare.

- Measures have to be taken to eliminate shipboard harassment and bullying.
- In addition to various health and safety matters, "harassment and bullying" has been added.
- To the list of matter for investigation, "problems arising from harassment and bullying" has been added.

**INTERNATIONAL MANAGEMENT CODE FOR THE SAFE OPERATION OF SHIPS  
AND FOR POLLUTION PREVENTION  
(INTERNATIONAL SAFETY MANAGEMENT (ISM) CODE)**

**PART A: IMPLEMENTATION**

**1. GENERAL**

**1.1 Definitions**

The following definitions apply to parts A and B of this Code.

- 1.1.1 *International Safety Management (ISM) Code* means the International Management Code for the Safe Operation of Ships and for Pollution Prevention as adopted by the Assembly, as may be amended by the Organization.
- 1.1.2 *Company* means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the shipowner and who, on assuming such responsibility, has agreed to take over all the duties and responsibility imposed by the Code.
- 1.1.3 *Administration* means the Government of the State whose flag the ship is entitled to fly.
- 1.1.4 *Safety Management System* means a structured and documented system enabling Company personnel to implement effectively the Company safety and environmental protection policy.
- 1.1.5 *Document of Compliance* means a document issued to a Company which complies with the requirements of this Code.
- 1.1.6 *Safety Management Certificate* means a document issued to a ship which signifies that the Company and its shipboard management operate in accordance with the approved safety management system.
- 1.1.7 *Objective evidence* means quantitative or qualitative information, records or statements of fact pertaining of safety or to the existence and implementation of a safety management system element, which is based on observation, measurement or test and which can be verified.
- 1.1.8 *Observation* means a statement of fact made during a safety management audit and substantiated by objective evidence.
- 1.1.9 *Non-conformity* means an observed situation where objective evidence indicates the non-fulfillment of a specified requirement.
- 1.1.10 *Major non-conformity* means an identifiable deviation that poses a serious threat to the safety of personnel or the ship or a serious risk to the environment that requires immediate corrective action or the lack of effective and systematic implementation of a requirement of this Code.
- 1.1.11 *Anniversary date* means the day and month of each year that corresponds to the date of expiry of the relevant document or certificate.
- 1.1.12 *Convention* means the International Convention for the Safety of Life at Sea, 1974 as amended.

**1.2 Objectives**

- 1.2.1 The objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment, and to property.
- 1.2.2 Safety-management objectives of the Company should, *inter alia*:
  - .1 provide for safe practices in ship operation and a safe working environment;
  - .2 assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards; and
  - .3 continuously improve safety-management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.
- 1.2.3 The safety-management system should ensure:
  - .1 compliance with mandatory rules and regulations; and
  - .2 that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account.

**1.3 Application**

The requirements of this Code may be applied to all ships.

#### **1.4 Functional requirements for a safety-management system**

Every Company should develop, implement and maintain a safety management system (SMS) which includes the following functional requirements:

- .1 a safety and environmental-protection policy;
- .2 instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag State legislation;
- .3 defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel;
- .4 procedures for reporting accidents and non-conformities with the provisions of this Code;
- .5 procedures to prepare for and respond to emergency situations ;and
- .6 procedures for internal audits and management reviews.

### ***2. SAFETY AND ENVIRONMENTAL PROTECTION POLICY***

- 2.1 The Company should establish a safety and environmental-protection policy which describes how the objectives given in paragraph 1.2 will be achieved.
- 2.2 The Company should ensure that the policy is implemented and maintained at all levels of the organization both, ship-based and shore-based

### **3. COMPANY RESPONSIBILITIES AND AUTHORITY**

- 3.1 If the entity who is responsible for the operation of the ship is other than the owner, the owner must report the full name and details of such entity to the Administration.
- 3.2 The Company should define and document the responsibility, authority and interrelation of all personnel who manage, perform and verify work relating to and affecting safety and pollution prevention.
- 3.3 The Company is responsible for ensuring that adequate resources and shore-based support are provided to enable the designated person or persons to carry out their functions.

### **4. DESIGNATED PERSON(S)**

To ensure the safe operation of each ship and to provide a link between the Company and those on board, every Company, as appropriate, should designate a person or persons ashore having direct access to the highest level of management. The responsibility and authority of the designated person or persons should include monitoring the safety and pollution-prevention aspects of the operation of each ship and ensuring that adequate resources and shore-based support are applied, as required.

### **5. MASTER'S RESPONSIBILITY AND AUTHORITY**

- 5.1 The Company should clearly define and document the master's responsibility with regard to:
  - .1 implementing the safety and environmental-protection policy of the Company;
  - .2 motivating the crew in the observation of that policy;
  - .3 issuing appropriate orders and instructions in a clear and simple manner;
  - .4 verifying that specified requirements are observed; and
  - .5 periodically reviewing the SMS and reporting its deficiencies to the shore-based management.
- 5.2 The Company should ensure that the SMS operating on board the ship contains a clear statement emphasizing the master's authority. The Company should establish in the SMS that the master has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the Company's assistance as may be necessary.

## **6. RESOURCES AND PERSONNEL**

- 6.1 The Company should ensure that the master is:
- .1 properly qualified for command;
  - .2 fully conversant with the Company's SMS; and
  - .3 given the necessary support so that the master's duties can be safely performed.
- 6.2 The Company should ensure that each ship is:
- .1 manned with qualified, certificated and medically fit seafarers in accordance with national and international requirements; and
  - .2 appropriately manned in order to encompass all aspects of maintaining safe operation on board.\*
- \* Refer to the Principles of minimum safe manning, adopted by the Organization by Resolution A.1047(27)
- 6.3 The Company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the environment are given proper familiarization with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given.
- 6.4 The Company should ensure that all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, codes and guidelines.
- 6.5 The Company should establish and maintain procedures for identifying any training which may be required in support of the SMS and ensure that such training is provided for all personnel concerned.
- 6.6 The Company should establish procedures by which the ship's personnel receive relevant information on the SMS in a working language or languages understood by them.
- 6.7 The Company should ensure that the ship's personnel are able to communicate effectively in the execution of their duties related to the SMS.

## **7. SHIPBOARD OPERATIONS**

The Company should establish procedures, plans and instructions, , including checklist as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel.

## **8. EMERGENCY PREPAREDNESS**

- 8.1 The Company should identify potential emergency shipboard situations, and establish procedures to respond to them.
- 8.2 The Company should establish programmes for drills and exercises to prepare for emergency actions.
- 8.3 The SMS should provide for measures ensuring that the Company's organization can respond at any time to hazards, accidents and emergency situations involving its ships.

## **9. REPORTS AND ANALYSIS OF NON-CONFORMITIES, ACCIDENTS AND HAZARDOUS OCCURRENCES**

- 9.1 The SMS should include procedures ensuring that non- conformities, accidents and hazardous situations are reported to the Company, investigated and analysed with the objective of improving safety and pollution prevention.
- 9.2 The Company should establish procedures for the implementation of corrective action, including measures intended to prevent recurrence.

## **10. MAINTENANCE OF THE SHIP AND EQUIPMENT**

- 10.1 The Company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant rules and regulations and with any additional requirements which may be established by the Company.
- 10.2 In meeting these requirements the Company should ensure that:
- .1 inspections are held at appropriate intervals;
  - .2 any non-conformity is reported, with its possible cause, if known;
  - .3 appropriate corrective action is taken; and
  - .4 records of these activities are maintained.
- 10.3 The Company should identify equipment and technical systems the sudden operational failure of which may result in hazardous situations. The SMS should provide for specific measures aimed at promoting the reliability of such equipment or systems. These measures should include the regular testing of stand-by arrangements and equipment or technical systems that are not in continuous use.
- 10.4 The inspections mentioned in 10.2 as well as the measures referred to in 10.3 should be integrated into the ship's operational maintenance routine.

## **11. DOCUMENTATION**

- 11.1 The Company should establish and maintain procedures to control all documents and data which are relevant to the SMS
- 11.2 The Company should ensure that:
- .1 valid documents are available at all relevant locations;
  - .2 changes to documents are reviewed and approved by authorized personnel; and
  - .3 obsolete documents are promptly removed.
- 11.3 The documents used to describe and implement the SMS may be referred to as the Safety Management Manual. Documentation should be kept in a form that the Company considers most effective. Each ship should carry on board all documentation relevant to that ship.

## **12. COMPANY VERIFICATION, REVIEW AND EVALUATION**

- 12.1 The Company should carry out internal safety audits on board and ashore at intervals not exceeding twelve months to verify whether safety and pollution-prevention activities comply with the SMS. In exceptional circumstances, this interval may be exceeded by not more than three months.
- 12.2 The Company should periodically verify whether all those undertaking delegated ISM-related tasks are acting in conformity with the Company's responsibilities under the Code.
- 12.3 The Company should periodically evaluate the effectiveness of the SMS in accordance with procedures established by the Company
- 12.4 The audits and possible corrective actions should be carried out in accordance with documented procedures.
- 12.5 Personnel carrying out audits should be independent of the areas being audited unless this is impracticable due to the size and the nature of the Company.
- 12.6 The results of the audits and reviews should be brought to the attention of all personnel having responsibility in the area involved.
- 12.7 The management personnel responsible for the area involved should take timely corrective action on deficiencies found.

## ISM CODE

International Safety management Code are to ensure the safety at sea, prevention of human injury or loss of life, and avoidance of damage to the marine environment and property.

It was adopted on 4 November 1993 and came into force on 1 July 1998. ISM comes under chapter 11 of SOLAS.

These are divided into 2 parts:

- Part A = 12 elements = generally implementation
- Part B = 4 elements = generally certification and verification

### **PART B :**

1. Certification and periodic verification
2. Interim certification
3. Verification
4. Form of certificates

The surveys which are carried out are:

- ✓ Initial Survey
- ✓ Periodic Survey (12+- 3 months)
- ✓ Intermediate Survey (24 +- 6 months)
- ✓ Renewal Survey

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### Types of DOC:

1. Interim DOC (12 months)
2. Full term DOC (5 years)
3. Short term interim DOC (3 months)
4. Short term DOC (5 months)

- The interim DOC is issued to a newly established company or when a new fleet comes.
- DOC depends upon the number of fleet a company have.
- For every fleet only one DOC will be given.
- Like a separate DOC will be given to Oil fleet, Bulk fleet, chemical fleet etc.
- Once the DOC is withdrawn then automatically all SMC will be withdrawn.

### **Requirement to get interim DOC:**

Demonstration at the company premises that the company has documented SMS which addresses all the elements of ISM code and plan exists for SMS implementation throughout the organisation and its fleet within the period of validity of interim DOC.

### Types of SMC :

1. Interim SMC (6 months)
2. Full term SMC (5 years)
3. Short term interim SMC (3 months)
4. Short term SMC (5 months)

- The interim SMC is given when ship changes its flag or when new ship comes in fleet.
- SMC is for every ship in its fleet.
- SMC indicates company operates in accordance with the SMS.

### **Requirement to get interim SMC:**

SMS includes essential elements of ISM code and has been assessed relevant to vessel type during the audit for issuance of doc. Master and relevant officers are familiar with SMS and planned arrangement for implementation.

### **In issuing of DOC certificate, it is written:**

This is to certify that company safety management system was audited and it complies with the ISM code. Then for which fleet it is given, flag state name who is issuing it, then validity of certificate. Name and address of company, company identification number.

### **In issuing of SMC certificate, it is written:**

This is to certify that ship safety management system was audited and it complies with ISM code. Then given name of ship, Port registry, validity of certificate, ship identification number.

## WHAT IS NC, MAJOR NC, OBSERVATION AND EVIDENCE?

### 1. NON CONFORMITY

It means an observed situation where objective evidence indicates the non-fulfilment of a specified requirement. (within 3 months)

### 2. MAJOR NON-CONFORMITY

Its a serious threat to the ship or environment and which requires an immediate corrective action.

Eg. Emergency fire pump, OWS, Lifeboat (within 12 hours)

### 3. OBSERVATION

A statement or fact made during safety management audit.

### 4. EVIDENCE

Means quantitative or qualitative information record for implementation on SMS based on observation, which can be verified.

## WHAT IS ISM REVIEW?

There are two types:

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### MASTER REVIEW

It will be such that he will find deficiencies in SMS and will report to shore based management system or company.

### MANAGEMENT REVIEW

- Safety audit to be carried out by the company
- The SMS to be revised in accordance to the procedure established by the company.
- Person carrying audit should be independent of the area to be audited.
- The result of audit to be brought in attention to all personnel.

## SMS MANUAL?

A safety management system (SMS) includes:

- Policies on safety and environment protection
- Procedures to ensure safe operation of ships
- Procedures to ensure environment protection
- Defined levels of authority and lines of communication between ship and shore
- Procedures for reporting accidents and non-conformities
- Procedures to prepare for and respond to emergency situations

The objectives of the safety management system are:

- To provide a safe working environment
- To provide safe practices in ship operations
- To safeguard against all identified risks
- To improve skills of ship / shore personnel in preparing for emergencies

## HOW TO FIND OUT THAT ISM IS IMPLEMENTING ONBOARD?

1. Lost time due to accident/incident (display)
2. Drill/training records.
3. Findings of internal/external audits.
4. Flag state inspection/port state control report.
5. Rest hours.
6. General standard operating procedure.
7. Familiarization.
8. Standing instruction.
9. Name of DPA/ADPA
10. Procedures are there to tackle emergency situations.
11. Inspection of machinery at required intervals of time can be checked in PMS
12. Check that company has appointed a safety officer.
13. Check that crew is aware of the SMS onboard.
14. Check safety and environmental policy.
15. Medical certificates of seafarers
16. Safety and environment policies.
17. Risk assessment

Note: If surveyor asks answer in one line, then say, valid SMC and a copy of DOC.

## HOW TO DEAL WITH MNC AND NC?

- Whenever a ship gets an MNC during an audit, it should be immediately downgraded to NC by correction after which a corrective implementation plan is approved by DPA from the auditor who raised an MNC. This cap is implemented within 3 months period after its approval. After the end of 3 months, an additional audit is carried out to check effective implementation has been done and close out the MNC.
- The cap consists of root cause analysis to avoid reoccurrence of MNC.
- There is a time period of 2 weeks to approve the cap by DPA from the auditor who raised the MNC.
  
- Same process is there for NC with respect to cap getting approved by DPA from the auditor and the implementing cap within 3 months after its approval but here the effectiveness of implementation is checked at the next scheduled audit.

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## NAME OF AUDITS UNDER ISM CODE?

- The International Safety Management Code (ISM) require Shipping Companies to have procedures for conducting both internal and external audits to ensure the ship as well as the shore organisation is doing what is documented in the Safety Management System.
- By carrying out internal SMS audits, companies measure the effectiveness of their own systems. Internal SMS or ISM audits are potentially more important than external audits for controlling the effectiveness of the system, since companies stand to gain or lose more than the external audit bodies if the system fails. The company, its employees, shipmasters, officers and crews 'own' the safety management system and have a direct interest in ensuring that it is effective. As a result, the internal SMS audit, which represents these interests, should be at least equal to if not exceed the thoroughness of the external SMS audit process.

<b>COMPANY</b>	<b>SHIP</b>
g. Interim (for issuing interim DOC)	f. Interim Audit (for issuing interim SMC)
h. Initial (for issuing full term DOC)	g. Initial audit (for issuing full term SMC)
i. Annual	h. Intermediate audit
j. Renewal (for revalidation)	i. Renewal (for revalidation)
k. Additional audits. (for closing MNC)	j. Additional audit (for closing MNC)
l. Surveillance audits	

## OIL RECORD BOOK CODES?

### A. Ballasting or cleaning of fuel oil tank

### B. Discharge of dirty ballast and cleaning water from fuel oil tank

### C. Collection, transfer and disposal of oil sludge

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- Weekly inventory of oil residues (sludge) tanks

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy	C	11.1	[Name of sec 3.1 Tank & Designation]
		11.2	xx m <sup>3</sup>
		11.3	xx m <sup>3</sup>
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

- Recording of oil residue (sludge) collected by manual operation in oil residue (sludge) tank

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy	C	11.1	[Name of sec 3.1 Tank & Designation]
		11.2	xx m <sup>3</sup>
		11.3	xx m <sup>3</sup>
		11.4	xx m <sup>3</sup> collected from [identification of source]
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

- Disposal of oil residue (sludge) via shore connection = C 12.1
- Draining of water (disposal) from an oil residue (sludge) tank = C12.2
- Transfer from one oil residue (sludge) tank to another oil residue (sludge) tank = C 12.2
- Incineration of oil residue (sludge) in Incinerator = C12.3
- Evaporation of water (disposal) from an oil residue (sludge) tank = C12.4

### D. Non automatic start of discharge overboard, transfer and disposal otherwise of bilge water accumulated in machinery spaces

- Pumping of bilge water from engine-room bilge wells to a tank

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy	D	13	xx m <sup>3</sup> bilge water from engine-room bilge
		14	wells, Start: hh:mm, stop: hh:mm
		15.3	To [Name of sec 3.3 Tank & Designation], retained in tank(s) xx m <sup>3</sup>
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

- Pumping of bilge water overboard from tank

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy	D	13	xx m <sup>3</sup> bilge water from [Name of sec 3.3 Tank & Designation] Capacity xx m <sup>3</sup> , xx m <sup>3</sup> retained
		14	Start: hh:mm, stop: hh:mm
		15.1	Through 15 ppm equipment overboard
			Position start: xx deg xx min N/S, xx deg xx min E/W
			Position stop: xx deg xx min N/S, xx deg xx min E/W
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

- Disposal of bilge water from tank to oil residue (sludge) tank

Date	Code	Item No.	Record of operation and signature of officer in charge
dd-MONTH-yyyy	D	13	x m <sup>3</sup> bilge water from [Name of sec 3.3 Tank & Designation], now xx m <sup>3</sup>
		14	Start: hh:mm stop: hh:mm
		15.3	Collected in [Name of sec 3.1 Tank & Designation] retained in tank(s) xx m <sup>3</sup>
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

**E. Automatic start of discharge overboard, transfer and disposal otherwise of bilge water accumulated in machinery spaces**

**F. Condition of oil filtering equipment**

- Failure of Oily Filtering Equipment, Oil Content Meter or stopping device
- When proper operation of the Oily Filtering Equipment, Oil Content Meter or stopping device is restored

**G. Accidental discharge in sea**

- Accidental Pollution

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy	G	22	hh:mm
		23	Place or Position: xx deg xx min
		24	Type and Quantity of oily residue (if known)
		25	Circumstances of the discharge
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

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**H. Bunkering of fuel or bulk lubricating oil**

- Bunkering of Fuel oil

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy	H	26.1	[Name of Port]
		26.2	Start dd-MONTH-yyyy-hh:mm Stop dd-MONTH-yyyy-hh:mm
		26.3	xxxx MT of ISO-xxxxx HFO x.x % S bunkered in tanks:
			aaaa MT added to [Tank Name & Designation] now containing bbbb MT
			cccc MT added to [Tank Name & Designation] now containing dddd MT
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

- Bunkering of Lube Oil

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy	H	26.1	[Name of Port]
		26.2	Start dd-MONTH-yyyy-hh:mm Stop dd-MONTH-yyyy-hh:mm
		26.4	xx MT [Type of Oil] bunkered in tanks:
			xx MT added to [Tank Name & Designation] now containing xx MT
			signed: (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

**I. Additional operation requirement.**

- Entry pertaining to an earlier missed operational entry

Date	Code	Item No.	Record of operations/signature of officer in charge
dd-MONTH-yyyy (1)	I		Entry pertaining to an earlier missed operational entry
dd-MONTH-yyyy (2)	C	12.2	xx m <sup>3</sup> sludge transferred from [Name of sec. 3.1 Tank and Designation], xx m <sup>3</sup> retained to [Name of sec 3.1 Tank & Designation], retained in tank(s) xx m <sup>3</sup>
			signed (1): (Officer-in-charge, Name & Rank) dd-MONTH-yyyy
			signed (2): (Officer-in-charge, Name & Rank) dd-MONTH-yyyy

Note: Date (1) to be the date of the original operation.  
Date (2) to be the current date i.e. the date the entry is made.  
Signed (1) Signature of Officer making I entry  
Signed (2) Signature of Officer making missed entry

## MARPOL ANNEX-1

Annex 1 is the regulation for the prevention of pollution by oil. It came into force on 02<sup>nd</sup> October 1983. It consists of 11 chapters in which total 47 regulations are there.

CHAPTER	REGULATIONS	TOPICS
1	1-5	General, Definitions and Applications
2	6-11	Surveys and certification; Flag Administration and Port State Control
3	12-17	Machinery Space: Construction, discharge control and equipment (all ship types)
4	18-36	Cargo areas: Construction, discharge control and equipment (oil tankers)
5	37	Shipboard oil pollution emergency plan (SOPEP)
6	38	Reception facilities
7	39	FPSOs and FSUs
8	40-42	STS operations
9	43	Carriage of oil in Antarctic area
10	44-45	Verification
11	46-47	Polar waters

Important regulations of Annex 1:

**JAI MATA DI - CLASS 2 SAFETY NOTES  
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### CHAPTER-1

#### Regulation 1: Definitions

- **Nearest land:** The term "from the nearest land" means from the baseline from which the territorial sea of the territory in question is established in accordance with international law.
- **Special area:** It is a sea area where for recognised technical reasons in relation to its oceanographical and ecological condition and to the particular character of its traffic, the adoption of special mandatory methods for the prevention of sea pollution by oil is required.
- **Instantaneous rate of discharge of oil content:** It means the rate of discharge oil in litres per hour at any instant divided by the speed of the ship in knots at the same instant.
- **Clean ballast:** It means the ballast in a tank which since oil was last carried therein, has been so cleaned that effluent there from if it were discharged from a ship which is stationary into clean calm water on a clear day would not produce visible farces of oil on the surface of the water or on the adjoining shore Line.
- **Segregated Ballast:** It means the ballast water introduced into a tank which is completely segregated from the cargo oil and oil fuel system & which is permanently allocated to the carriage of ballast or to cargos other than oil & Noxious Liquid substances.

*Special Areas under Marpol Annex 1:*

1. <i>Mediterranean Sea</i>	6. <i>The Gulf of Aden</i>
2. <i>Red sea</i>	7. <i>Antarctic sea</i>
3. <i>Black sea</i>	8. <i>North west European waters</i>
4. <i>Baltic sea</i>	9. <i>Oman area of the Arabian sea</i>
5. <i>Gulf area</i>	10. <i>Southern South African waters</i>

#### Regulation 2: Application

Unless expressly provided otherwise, the provisions of this annex shall apply to all ships.

#### Regulation 4: Exceptions:

The Annex 1 shall not apply when:

- Safety of a ship or saving life at sea.
- Damage to a ship or its equipment.
- Discharge of substances containing oil when used to minimize the damage from pollution.

### CHAPTER-2

#### Regulation 6: Surveys

Every oil tanker of 150 gross tonnage and above and every other ship of 400 gross tonnage and above shall be subject to the surveys.

- **Initial survey:** This survey shall be such as to ensure that the structure, equipment, systems and fittings are complying with the requirements of Annex 1.
- **Renewal survey:** At intervals specified by the administration but not more than 5 years.
- **Intermediate survey:** within 3 months before or after the second anniversary date or within 3 months before or after the third anniversary date of the certificate.

- Annual survey: within 3 months before or after each anniversary date of the certificate
- Additional survey: either general or partial, shall be made after repair resulting from investigations.

**Regulation 10: Duration and validity of certificate**

Period specified by administration but shall not exceed 5 years.

If a renewal survey has been completed and a new certificate cannot be issued or placed onboard, extension of 5 months from the expiry date can be given by the person authorized by the administration.

**CHAPTER-3**

**Regulation 12: Tanks for oil residues (sludge)**

**Sludge tank requirements:**

1. Capacity must be minimum 1% of used HFO for 30 days or 0.5% of used DO for 30 days.
2. Sufficient manholes to reach all parts of tank.
3. Adequate heating arrangement.
4. No direct connection between sludge tank discharge piping and overboard discharge piping.
5. Fitted with designated pump, having suitable capacity and discharge head.
6. Fitted with standard discharge connection.
7. Fitted with high level alarm.

**Regulation 12B : Sludge tank capacity and requirements: (For ships constructed on or after 31 December 1990)**

For ship, which does not carry ballast water in oil fuel tank, minimum sludge tank capacity should be calculated as:

$V = KCD \text{ m}^3$

Where, K = 0.015 for ship, where HO is purified for ME (1%)

0.005 for ship using DO or HO, which does not require purification before use (0.5%)

C = Daily fuel consumption

D = Maximum period of voyage between ports (in days)

In absence of precise data, a figure of 30 days should be used.

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For ships fitted with homogenizers, sludge incinerators or other recognised means to control the sludge onboard, the minimum sludge tank capacity should be

- 50% of the above mentioned capacity.
- 1 m<sup>3</sup> for ships of 400GT and above and less 4000GT or 2 m<sup>3</sup> for ships of 4000GT and above.

whichever is greater.

**Requirements:**

1. MANHOLE	4. SLUDGE PUMP
2. HEATING COIL	5. INTERNATIONAL DISCHARGE CONNECTION
3. NO DIRECT CONNECTION TO OVERBOARD.	6. HIGH LEVEL ALARM

**Regulation 13 : Standard Discharge Connection**

To enable pipes of reception facilities to be connected with the ship's discharge pipeline for residues from machinery bilges and from sludge tanks, both lines shall be fitted with a standard discharge connection.

**Standard dimensions of flanges for discharge connections**

Description	Dimension
Outside diameter	215 mm
Inner diameter	According to pipe outside diameter
Bolt circle diameter	183 mm
Slots in flange	6 holes 22 mm in diameter equidistantly placed on a bolt circle of the above diameter, slotted to the flange periphery. The slot width to be 22 mm
Flange thickness	20 mm
Bolts and nuts: quantity, diameter	6, each of 20 mm in diameter and of suitable length

The flange is designed to accept pipes up to a maximum internal diameter of 125 mm and shall be of steel or other equivalent material having a flat face. This flange, together with a gasket of oil-proof material, shall be suitable for a service pressure of 600 kPa.

**Regulation 14 : Oil filtering equipment**

- The Administration shall ensure that ships of less than 400 gross tonnage shall retain on board oil or oily mixtures or discharge them in accordance with the requirements of regulation 15 of this Annex.
- Any ship of 400 gross tonnage and above but less than 10,000 gross tonnage shall be fitted with oil filtering equipment and shall comply with:

It shall be of a design approved by the Administration and shall be such as will ensure that any oily mixture discharged into the sea after passing through the system has an oil content not exceeding 15 parts per million.

- Any ship of 10,000 gross tonnage and above shall be fitted with oil filtering equipment and shall comply with: It shall be provided with alarm arrangements to indicate when this level cannot be maintained. The system shall also be provided with arrangements to ensure that any discharge of oily mixtures is automatically stopped when the oil content of the effluent exceeds 15 parts per million

### **Regulation 15 : Control of Discharge of Oil (FOR ENGINE ROOM BILGES)**

#### **A) Discharges outside special areas**

Any discharge into the sea of oil or oily mixtures from ships of 400 gross tonnage and above shall be prohibited except when all the following conditions are satisfied:

- The ship is proceeding en route;
- The oily mixture is processed through an oil filtering equipment approved by administration.
- The oil content of the effluent without dilution does not exceed 15 parts per million;
- The oily mixture does not originate from cargo pump-room bilges on oil tankers; and
- The oily mixture, in case of oil tankers, is not mixed with oil cargo residues.

#### **B) Discharges in special areas**

- The ship is proceeding en route;
- The oily mixture is processed through an oil filtering equipment approved by administration. In addition, it shall be provided with alarm arrangements to indicate when this level cannot be maintained. The system shall also be provided with arrangements to ensure that any discharge of oily mixtures is automatically stopped when the oil content of the effluent exceeds 15 parts per million
- The oil content of the effluent without dilution does not exceed 15 parts per million;
- The oily mixture does not originate from cargo pump-room bilges on oil tankers; and
- The oily mixture, in case of oil tankers, is not mixed with oil cargo residues.

Any discharge into the sea of oil or oily mixtures from any ship shall be prohibited in Antarctic area.

### **Regulation 17: Oil Record Book Part 1**

- Every oil tanker of 150 GT and above and every other ship of 400 GT and above shall be provided with an oil record book Part 1.
- It shall be kept in such a place as to be readily available for inspection.
- Preserved for a period of 3 years after the last entry has been made.

Entries has to be made in ORB as per these codes:

- (A) Ballasting or cleaning of oil fuel tanks
- (B) Discharge of dirty ballast or cleaning water from oil fuel tanks
- (C) Collection and disposal of oil residues (sludge and other residues)
- (D) Non-automatic discharge overboard or disposal otherwise of bilge water which has accumulated in machinery spaces
- (E) Automatic discharge overboard or disposal otherwise of bilge water which has accumulated in machinery spaces
- (F) Condition of the oil filtering equipment
- (G) Accidental or other exceptional discharges of oil
- (H) Bunkering of fuel or bulk lubricating oil
- (I) Additional operational procedures and general remarks

**JAI MATA DI - CLASS 2 SAFETY NOTES  
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## **CHAPTER : 4**

### **Regulation 18 : Segregated Ballast Tanks**

- Every crude oil tanker of 20000 tonnes dwt and above and every product carrier of 30000 tonnes dwt and above delivered after 1 June 1982 shall be provided with segregated ballast tanks.
- Every crude oil tanker or product carrier of 40000 tonnes dwt and above delivered on or before 1 June 1982, shall be provided with segregated ballast tanks.
- Every crude oil tanker of 40000 tonnes dwt and above delivered on or before 1 June 1982, may either use SBT or operate with a cargo tank cleaning procedure using COW.
- Every product carrier of 40000 tonnes dwt and above delivered on or before 1 June 1982 may use CBT equipped with an oil content meter approved by administration.

### **Regulation 19 : Double hull and double bottom requirements for oil tankers delivered on or after 6 July 1996**

Every oil tanker of 5000 tonnes dwt and above

The entire cargo tank length shall be protected by ballast tanks or spaces other than tanks that carry oil as follows:

**1. Wing Tanks or spaces:**

They shall be arranged such that cargo tanks should be located at a distance nowhere less than “w” Distance measurement is done at right angles to the side shell.

$$w = 0.5 + \frac{DW}{20,000} \text{ (m) or}$$

$w = 2.0 \text{ m}$ , whichever is the lesser.

The minimum value of  $w = 1.0 \text{ m}$ .

**2. Double bottom tanks or spaces:**

They shall be so arranged that bottom of the cargo tanks should be located nowhere less than “h” Distance measurement is done at right angles to the bottom shell plating.

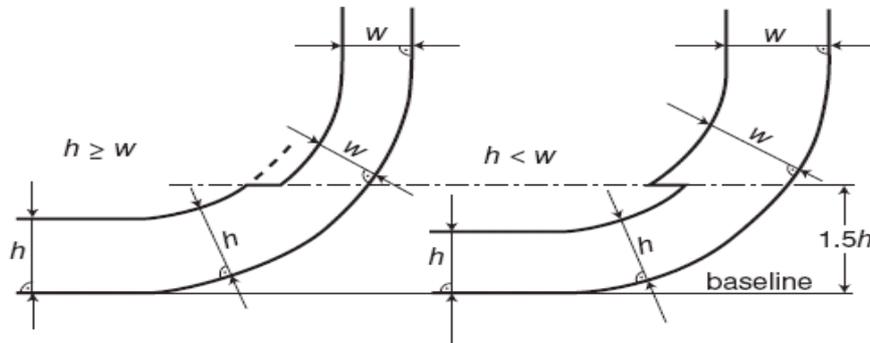
$$h = B/15 \text{ (m) or}$$

$h = 2.0 \text{ m}$ , whichever is the lesser.

The minimum value of  $h = 1.0 \text{ m}$ .

**3. Turn of the bilge area or at locations without a clearly defined turn of the bilge**

When the distances  $h$  and  $w$  are different, the distance  $w$  shall have preference at levels exceeding  $1.5h$  above the baseline.



**Regulation 22 : Pump Room Bottom Protection**

Oil tankers of 5000 tonnes dwt and above constructed on or after 1 January 2007.

The pump room double bottom depth shall be so arranged that bottom of the pump room should be located nowhere less than “h”. Distance measurement is done at right angles to the ship’s baseline.

$$h = B/15 \text{ (m) or}$$

$h = 2.0 \text{ m}$ , whichever is the lesser.

The minimum value of  $h = 1.0 \text{ m}$ .

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**Regulation 24 : Damage assumptions**

For the purpose of calculating oil outflow from oil tankers, three dimensions of the extent of damage on the side and bottom of the ship are assumed.

SIDE DAMAGE	BOTTOM DAMAGE
<b>Longitudinal extent</b> = $\frac{1}{3} L^{2/3}$ or 14.5mt, whichever is less.	<b>Longitudinal extent</b> = $L/10$ or 5mt, whichever is less.
<b>Transverse extent</b> = $B/5$ or 11.5mt, whichever is less.	<b>Transverse extent</b> = $B/6$ or 10mt, whichever is less.
<b>Vertical extent</b> = From the baseline upwards without limit.	<b>Vertical extent</b> from the baseline = $B/15$ or 6mt, whichever is less.

**Regulation 27 : Intact Stability**

Every oil tanker of 5000 tonnes dwt and above delivered on or after 1 February 2002, shall comply with these criterias:

Intact stability

For a cargo vessel, the intact stability requirements are follows-

- Initial GM or metacentric height should not be less than 0.15 m.
- Righting lever GZ should be at least 0.2 m and angle of heel  $\Theta \geq 30^\circ$ .
- Maximum righting lever should occur at heel  $>30^\circ$  preferably but not less than  $25^\circ$ .

The Area of the GZ curve should be at least:

- 0.055 m radian up to  $\Theta = 30^\circ$
- 0.090 m radian up to  $\Theta = 40^\circ$
- 0.03 m radian between  $30^\circ$  and  $40^\circ$  or between  $30^\circ$  and angle of down flooding.

The angle of down flooding is an angle at which deck immersion takes place with subsequent water ingress.

### **Regulation 28: Subdivision and damage stability**

Oil tankers of 150 GT and above and delivered after 31 December 1979, shall comply this criteria:

#### **Damage stability criteria:**

- The final waterline shall be below the lower edge of any opening through which progressive flooding may take place.
- In the final stage of flooding, the angle of heel shall not exceed 25 degrees (may increase up to 30 degrees if no deck edge immersion occurs)
- Administration shall be satisfied that the stability is sufficient during intermediate stages of flooding.

### **Regulation 29 : Slop tanks**

Oil tankers of 150 gross tonnage and above shall be provided with slop tank arrangements.

1. Adequate means shall be provided for cleaning the cargo tanks and transferring the dirty ballast residue and tank washings from the cargo tanks into a slop tank approved by the Administration.
2. In this system, arrangements shall be provided to transfer the oily waste into a slop tank or combination of slop tanks in such a way that any effluent discharged into the sea will be such as to comply with the provisions of regulation 34 of this Annex.
3. The total capacity of the slop tank or tanks shall not be less than 3 per cent of the oil-carrying capacity of the ship, except that the Administration may accept:
  - a. 2% for such oil tankers where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system;
  - b. 2% where segregated ballast tanks or dedicated clean ballast tanks are provided or where a COW is fitted.
  - c. 1% for combination carriers where oil cargo is only carried in tanks with smooth walls. This capacity may be further reduced to 0.8% where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system.

### **Regulation 34 : Control of discharge of oil**

#### **A) Discharges outside special areas**

Any discharge into the sea of oil or oily mixtures from the cargo area of an oil tanker shall be prohibited except when all the following conditions are satisfied:

- the tanker is not within a special area;
- the tanker is more than 50 nautical miles from the nearest land;
- the tanker is proceeding en route;
- the instantaneous rate of discharge of oil content does not exceed 30 litres per nautical mile;
- the total quantity of oil discharged into the sea does not exceed for tankers 1/15,000 of the total quantity of the particular cargo delivered on or before 31 December 1979,
- the total quantity of oil discharged into the sea does not exceed for tankers 1/30,000 of the total quantity of the particular cargo delivered after 31 December 1979,
- the tanker has in operation an oil discharge monitoring and control system and a slop tank arrangement

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#### **B)Discharges in special area**

Any discharge into the sea of oil or oily mixture from the cargo area of an oil tanker shall be prohibited while in a special area.

### **Regulation 36 : Oil Record Book Part 2 (Cargo/Ballast operations)**

Every oil tanker of 150 gross tonnage and above shall be provided with and ORB part 2.

It shall be filled on each occasion:

1. loading of oil cargo
2. unloading of oil cargo
3. ballasting of cargo tanks and dedicated clean ballast tanks
4. discharge of ballast except from segregated ballast tanks
5. internal transfer of oil cargo during voyage
6. disposal of residues
7. discharge of water from slop tanks

Any failure of ODMCS shall be noted in ORB part 2.

It shall be kept for a period of three years after the last entry has been made.

## **CHAPTER : 5**

### **Regulation 37 : SOPEP**

- Every oil tanker of 150 gross tonnage and above and every ship other than an oil tanker of 400 gross tonnage and above shall carry onboard a Shipboard oil pollution emergency plan approved by the administration.
- Such a plan shall be written in working language of the master and officers.

The plan shall consist atleast of:

- The procedure to be followed by master or other persons having charge of the ship to report an oil pollution incident.
- The list of authorities or persons to be contacted in the event of an oil pollution incident.
- A detailed description of the action to be taken immediately by persons onboard to reduce or control the discharge of oil following the incident.
- The procedures and point of contact on the ship for coordinating shipboard action with national and local authorities in combating the pollution.

SOPEP Equipment:

Saw dust	Protective gloves	Non-spark scoop	Heavy duty brooms
Scupper plug	Disposable suit	Non-spark pump	Oil spill dispersant
Absorbent pillows	Quick absorbent pads	Weldon pump	Cotton rags
Nitrile gloves	Brushes	Buckets	Drum to collect oil 200 ltr capacity

## **CHAPTER : 8**

### **Regulation 40 : Application for STS**

It is applicable to oil tankers of 150 gross tonnage and above engaged in the transfer of oil cargo between oil tankers at sea (STS operation)

### **Regulation 41 : General Rules on safety and environment protection regarding STS**

Any oil tanker involved in STS operations shall carry onboard a plan prescribing how to conduct STS operations. Records of STS operation shall be retained onboard for three years.

### **Regulation 42: Notification**

Each oil tankers which plans STS operation should notify the party not less than 48 hours in advance of the scheduled STS operation.

The notification shall include atleast:

1. Name, flag, call sign, IMO number
2. Date, time and location
3. Whether STS will be conducted at anchor or underway.
4. Oil type and quantity
5. Planned duration of the operation

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## **CHAPTER : 9**

### **Regulation 43: Special requirements for the use or carriage of oils in the Antarctic Area**

It states that the ships which carry or use fuel of the following is prohibited in Antarctic area:

- Crude oil having a density at 15 degrees Celsius higher than 900 kg/m<sup>3</sup>.
- Oils other than crude oil having a density at 15 degrees Celsius higher than 900 kg/m<sup>3</sup> or kinematic viscosity at 50 degree Celsius higher than 180 mm<sup>2</sup>/s or
- Bitumen, Tar and their emulsions.

## **CHAPTER : 11**

### **Regulation 46 : Definition**

Polar code means the International Code for Ships operating in Polar waters.

Polar means Arctic waters and/or the Antarctic area.

### **Regulation 47: Application and requirements**

The chapter applies to all ships operating in polar waters.

The mandatory Polar Code, for ships operating in Arctic and Antarctic waters, enters into force in SOLAS on 1 January 2017.

The Polar Code includes mandatory provisions covering safety measures (part I-A) and pollution prevention measures (part II-A) and additional guidance regarding the provisions for both (parts I-B and II-B).

The safety provisions of the Polar Code will apply to new ships constructed after 1 January 2017. Ships constructed before 1 January 2017 will be required to meet the relevant requirements of the Polar Code by the first intermediate or renewal survey, whichever occurs first, after 1 January 2018.

The environmental provisions of the Polar Code apply both to existing ships and new ships.

The Code will require ships intending to operate in the defined Arctic waters and the Antarctic area to apply for a Polar Ship Certificate, which would classify the vessel as either:

- Category A – ships designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions
- Category B – a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions
- Category C – a ship designed to operate in open water or in ice conditions less severe than those included in categories A and B.

### **Miscellaneous question of Annex 1:**

#### **1. EXPLAIN CLEAN, SEGREGATED, DIRTY AND DEDICATED BALLAST?**

##### **Clean ballast:-**

It means the ballast in a tank which since oil was last carried therein, has been so cleaned that effluent there from if it were discharged from a ship which is stationary into clean calm water on a clear day would not produce visible farces of oil on the surface of the water or on the adjoining shore Line.

##### **Segregated Ballast:-**

It means the ballast water introduced into a tank which is completely segregated from the cargo oil and oil fuel system & which is permanently allocated to the carriage of ballast or to cargos other than oil & Noxious Liquid substances.

##### **Dirty Ballast:**

Ballast containing even a small amount of oil which can leave a trace on the sea is dirty ballast and is prohibited to be pumped out at sea. Dirty ballast is usually taken in port alongside, immediately on completion of discharging, into tanks that have not been water washed after it has carried cargo.

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##### **Dedicated Ballast:**

To have so-called dedicated clean ballast tanks (CBT) means that specific cargo tanks are dedicated to carry ballast water only. Operational oil separation and filtering equipment with an automatic stopping device. Bilge water is produced when the machinery spaces of a vessel are cleaned.

## MARPOL ANNEX-2

Annex 2 is control of pollution by Noxious Liquid Substances in bulk. It has entered into force 06 April 1987.

It states no tank washings containing chemicals can be discharged into the sea unless:

- The ship is proceeding enroute at a speed of atleast 7 knots in the case of a self propelled ships.
- In the case of ship not self propelled at least 4 knots speed.
- The discharge is made below the waterline through the underwater discharge outlet not exceeding the rate for which underwater discharge outlet is designed for.
- The discharge is made at a distance of not less than 12 NM from nearest land and in a depth of water of not less than 25 mt.

### **Special Area:**

1. Antarctic Sea
2. Black Sea
3. Baltic Sea

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### **Noxious liquid substances are divided into four categories:**

- **Category X** : If discharge into the sea from tank cleaning or de-ballasting, it presents a **major hazard** to either marine resources or human health.
- **Category Y** : If discharge into the sea from tank cleaning or de-ballasting, it presents a **hazard** to either marine resources or human health.
- **Category Z** : If discharge into the sea from tank cleaning or de-ballasting, it presents a **minor hazard** to either marine resources or human health.
- Other substances If discharge into the sea from tank cleaning or de-ballasting, it presents **no harm** to either marine resources or human health.

### DOCUMENTS UNDER ANNEX 2

1. IBC Code
2. Certificate of fitness or NLS certificate.
3. Officers specialized chemical tanker certificate.
4. P & A manual approved to which a particular vessel is approved.
5. Cargo Record Book
6. SMPEP P & A – Procedures of arrangements.

### WHAT SHOULD BE RECORDED IN CARGO RECORD BOOK?

For ships carrying Noxious liquid substances in bulk It shall record:

1. Loading of Cargo
2. Internal transfer of cargo during voyage.
3. Mandatory prewash in accordance with ship procedures and arrangements manual.
4. Unloading of cargo
5. Cleaning of cargo tanks except mandatory wash.
6. Discharge into the sea of tank washings.
7. Ballasting of cargo tanks.
8. Discharge of ballast water from cargo tanks.
9. Accidental or other exceptional discharge.
10. Control by authorized surveyors.

- It shall be retained for a period of 3 years after the last entry has been made.
- SMPEP (Shipboard Marine Pollution Emergency Plan) for Noxious liquid substances everything same as SOPEP
- An IOPP certificate for the carriage of Noxious liquid substances in bulk shall be issued for a period of not more than 5 years.

## MARPOL ANNEX-4

- This annex is “Regulation for the prevention of pollution by Sewage”. It came into force on 27 Sept 2003.
- A revised annex 4 was adopted on 1 April 2004 and entered into force on 1 August 2005.
- This annex has 4 chapters which includes 12 regulations.

### **CHAPTER 1: General**

#### **Regulation 1: Definitions**

##### **What is Sewage as per MARPOL?**

- Drainage and other wastes from any form of toilets and urinals.
- Drainage from medical premises via wash basins, wash tubs and scuppers located in such premises.
- Drainage from space containing living animals.
- Other waste waters when mixed with the drainages defined above.

#### **Regulation 2: Application**

- This annex is applicable to all the ships of 400 GT and above.
- All ships which are less than 400 GT but are certified to carry more than 15 persons.

#### **Regulation 3: Exemptions**

Annex 4 shall not apply when:

- Safety of a ship or saving life at sea.
- Damage to a ship or its equipment.

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### **CHAPTER 2: Surveys and Certification**

#### **Regulation 4: Surveys**

- Initial survey: This survey shall be such as to ensure that the structure, equipment, systems and fittings are complying with the requirements of Annex 4.
- Renewal survey: At intervals specified by the administration but not more than 5 years.

#### **Regulation 8: Duration and validity of certificate**

- The validity of the certificate should not exceed 5 years.
- If a ship at the time when a certificate expires is not in port, the administration may extend the validity of the certificate just to complete the voyage.
- No certificate can be extended for more than 3 months.
- When ship is undergoing short voyages, period of extension can be maximum for one month.

### **CHAPTER 3: Equipment and control of discharge**

#### **Regulation 9: Sewage system**

Every ship shall be equipped with one of the following sewage systems:

- A sewage treatment plant, approved by administration.
- A sewage comminuting and disinfecting system approved by administration with facilities for temporary storage of sewage when the ship is less than 3 nautical miles from the nearest land.
- A holding tank of the capacity to the satisfaction of the administration for the retention of all sewage.

#### **Regulation 10: Standard discharge connection**

To enable pipes of reception facilities to be connected with the ship's discharge pipeline:

Standard dimensions of flanges for discharge connections

Description	Dimension
Outside diameter	210 mm
Inner diameter	According to pipe outside diameter
Bolt circle diameter	170 mm
Slots in flange	4 holes, 18 mm in diameter, equidistantly placed on a bolt circle of the above diameter, slotted to the flange periphery. The slot width to be 18 mm
Flange thickness	16 mm
Bolts and nuts: quantity and diameter	4, each of 16 mm in diameter and of suitable length
The flange is designed to accept pipes up to a maximum internal diameter of 100 mm and shall be of steel or other equivalent material having a flat face. This flange, together with a suitable gasket, shall be suitable for a service pressure of 600 kPa.	

### **Regulation 11: Discharge of sewage**

- Ship can discharge comminuted or disinfected sewage using an approved system at a distance of more than 3 NM from the nearest land and sewage which is not comminuted or disinfected at a distance of more than 12 NM.
- Sewage from holding tank shall not be discharged instantaneously but at a moderate rate when the ship is enroute and proceeding at not less than 4 knots.
- The ship has in operation an approved sewage treatment plant which has been certified by the administrations.
- The test results of the plant are laid down in the International Sewage Pollution Prevention Certificate.
- Additionally the effluent shall not produce visible floating solids nor cause discoloration of surrounding water.

### **CHAPTER 4: Reception facilities**

#### **Regulation 12: Reception facilities**

Provision of facilities at ports and terminals for the reception of sewage, without causing delay to ships, adequate to meet the needs of the ships using them.

### **EXPLAIN ABOUT COD AND BOD IN TERMS OF SEWAGE? WHAT “BOD IS HIGH” MEANS?**

#### **Chemical Oxygen Demand (COD)**

- The amount of oxygen that is required for the chemical oxidation of the organic and inorganic chemicals present in the wastewater is called as chemical oxygen demand (COD).
- It is determined by incubating a closed water sample with a strong oxidant like potassium chromate in combination with boiling surface sulphuric acid under specific temp for a specific period of time.
- Permissible limit is 250-500 ppm
- Always greater than BOD value.

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#### **Biological Oxygen Demand (BOD)**

- The amount of oxygen demanded by the micro-organisms in the sewage for the decomposition of bio-degradable matter under aerobic condition.
- It is determined by incubating sealed water under specific temperature for five days and measuring the loss of O<sub>2</sub> from the beginning of test.
- Permissible limit is 30 mg/L
- Value is always lower than COD.

“**BOD is high**” indicates more oxygen is required, signifies water of lower quality.

“**BOD is low**” indicates less oxygen is being removed from water, so water is generally purer.

#### **Coliform Count**

- Coliform is a type of organism which is present in human intestine and is recognised as indicator organisms of sewage pollution. Presence of these organisms in water is an indication of pathogen (pathogen count), which are diseases causing bacteria responsible for cholera, dysentery, typhoid etc.
- The number of coliform organisms present in sewage on ship is very large, with each person contributing around 125 billion in winters and 400 billion in summer.
- IMO recommends faecal coliform count of less than 250 faecal/100ml. of affluent after treatment.

## MARPOL ANNEX-5

- Annex 5 is applicable to all ships, including merchant ships, fixed or floating platforms, non-commercial ships.
- Regulation for the Prevention of Pollution by garbage. It came into force on 31 December 1988.
- **But from 1<sup>st</sup> January 2013, entire annex has been changed regarding discharge.**

Garbage type <sup>1</sup>	All ships except platforms <sup>4</sup>		Regulation 5 Offshore platforms located more than 12 nm from nearest land and ships when alongside or within 500 metres of such platforms <sup>4</sup>
	Regulation 4 Outside special areas and Arctic waters (Distances are from the nearest land)	Regulation 6 Within special areas and Arctic waters (Distances are from nearest land, nearest ice-shelf or nearest fast ice)	
Food waste comminuted or ground <sup>2</sup>	≥3 nm, en route and as far as practicable	≥12 nm, en route and as far as practicable <sup>3</sup>	Discharge permitted
Food waste not comminuted or ground	≥12 nm, en route and as far as practicable	<b>Discharge prohibited</b>	<b>Discharge prohibited</b>
Cargo residues <sup>5,6</sup> not contained in washwater	≥ 12 nm, en route and as far as practicable	<b>Discharge prohibited</b>	<b>Discharge prohibited</b>
Cargo residues <sup>5,6</sup> contained in washwater		≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)	
Cleaning agents and additives <sup>6</sup> contained in cargo hold washwater	Discharge permitted	≥ 12 nm, en route and as far as practicable (subject to conditions in regulation 6.1.2 and paragraph 5.2.1.5 of part II-A of the Polar Code)	<b>Discharge prohibited</b>
Cleaning agents and additives <sup>6</sup> in deck and external surfaces washwater		Discharge permitted	
Animal Carcasses (should be split or otherwise treated to ensure the carcasses will sink immediately)	Must be en route and as far from the nearest land as possible. Should be >100 nm and maximum water depth	<b>Discharge prohibited</b>	<b>Discharge prohibited</b>
All other garbage including plastics, synthetic ropes, fishing gear, plastic garbage bags, incinerator ashes, clinkers, cooking oil, floating dunnage, lining and packing materials, paper, rags, glass, metal, bottles, crockery and similar refuse	<b>Discharge prohibited</b>	<b>Discharge prohibited</b>	<b>Discharge prohibited</b>

### Special Areas under MARPOL Annex V:

1. Mediterranean Sea	5. Antarctic Area
2. The Baltic Sea	6. The Red Sea Area
3. The Black Sea	7. The North Sea
4. The Gulf Areas	8. The Wider Caribbean Region

### DOCUMENTS WHICH COMES UNDER ANNEX 5?

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#### 1. Garbage Management Plan (GMP)

A Garbage Management Plan details procedures for collecting, processing, stowing, and disposing of the garbage onboard ships. The plan also mentions a designated person who is in charge of carrying out the plan. This is Applicable to ships ≥100 GT or certified to carry 15 or more persons, and fixed and floating platforms.

#### 2. Garbage Record Book

The Garbage Record Book consists of all the entries that are to be made while disposing or discharging garbage. All the ships which are ≥400 GT or certified to carry 15 or more persons, and fixed and floating platforms must carry a garbage record book.

The Ships under appendix II of MARPOL Annex V now needs to carry two garbage record book:

- Part I for all garbage other than cargo residues, applicable to all ships
- Part II for cargo residues only applicable to ships carrying solid bulk cargo

#### Entries to be made in the garbage record book are:

- When garbage is discharged into the sea, reception ashore or other vessels
- When garbage is incinerated i.e. start-stop time, date and position of the ship need to be recorded.

- Accidental and other exceptional discharge of garbage, along with the time of occurrence, port or position of the vessel at the time of occurrence, category of garbage and estimation of the amount in m<sup>3</sup>, and the reason of disposal and remarks.

**LATEST AMMENDMENT IN ANNEX 5?**

**The main amendments included in MARPOL Annex V, which was adopted at MEPC 70, cover:**

On 01st March 2018, the MEPC committee introduced an amendment to MARPOL Annex V which differentiates between hazardous and non-hazardous waste. Post this amendment, the Garbage Record Book is divided into two parts considering those ships which carry cargoes in bulk solid form and with a new category inclusion of e-waste produced on ships.

- 1. Declaration of cargo residues:** The shipper has to declare that cargo residues are harmful or not harmful to the marine environment.
- 2. Garbage Record Book** A new form of the Garbage Record Book (GRB) has been included in appendix II to MARPOL Annex V. The GRB will be divided into two parts:
  - Part I for all garbage other than cargo residues, applicable to all ships
  - Part II for cargo residues only applicable to ships carrying solid bulk cargo
 The GRB garbage categories have also been amended to include e-waste), and the category for cargo residues has been split into HME (harmful to the marine environment) and non-HME.

The new garbage category distribution will be as follows:

A. Plastics B. Food waste C. Domestic wastes D. Cooking oil E. Incinerator ashes F. Operational waste	G. Animal carcasses H. Fishing gear I. E-waste J. Cargo residues (non-HME) K. Cargo residues (HME)
--	--

The new GRB part II for solid bulk cargo residues includes entries for position or port, garbage category (J or K), amount discharged to sea or reception facilities, and start and stop positions for sea discharge. Along with the GRB, receipts obtained from receptions facilities will also be required to be kept on board for at least two years. Even though Annex V of MARPOL is mandatory for all ships, there are neither certification nor approval requirements.

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**Cargo residue discharge criteria:**

Type of garbage	Ships outside special areas	Ships within special areas	Offshore platforms and all ships within 500 m of such platforms
Cargo residues not considered harmful to the marine environment and not contained in wash water	Discharge permitted ≥12 nm from the nearest land and <i>en route</i>	Discharge prohibited	Discharge prohibited
Cargo residues not considered harmful to the marine environment contained in wash water		Discharge only permitted in specific circumstances <sup>1</sup> and ≥12 nm from the nearest land and <i>en route</i>	Discharge prohibited
Cargo residues considered harmful to the marine environment	Discharge prohibited	Discharge prohibited	Discharge prohibited

**MARPOL Annex 5 Regulation 1.12 (operational waters)**

Excludes grey water, bilge water or other similar discharges essential to the operation of the ship like:

1. Boiler blow down
2. Chain locker effluent
3. Reverse osmosis brine
4. Fire main systems water
5. Machinery waste water etc.

## MARPOL ANNEX-6

Annex 6 is the regulation for the prevention of pollution by air. It came into force on 19 May 2005. It consists of 4 chapters in which total 23 regulations are there.

CHAPTER	REGULATIONS	TOPICS
1	1-4	General
2	5-11	Survey, certification and means of control
3	12-18	Requirements for control of emissions from ships
4	19-23	Energy efficiency regulations

### **CHAPTER : 1**

The provision of this annex shall apply to all ships except when

- Securing the safety of a ship or saving life at sea.
- Damage to a ship or its equipment.

### **CHAPTER : 2**

**JAI MATA DI - CLASS 2 SAFETY NOTES  
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#### **Regulation : 5**

Every ship of 400 gross tonnage and above shall be subject to the surveys.

- Initial survey: This survey shall be such as to ensure that the structure, equipment, systems and fittings are complying with the requirements of Annex 1.
- Renewal survey: At intervals specified by the administration but not more than 5 years.
- Intermediate survey: within 3 months before or after the second anniversary date or within 3 months before or after the third anniversary date of the certificate.
- Annual survey: within 3 months before or after each anniversary date of the certificate
- Additional survey: either general or partial, shall be made after repair resulting from investigations.

#### **Regulation 9 : Duration and validity of certificate**

- An IAPP shall be issued for a period specified by the administration which shall not exceed 5 years.
- If a certificate is issued for a period of less than 5 years, the administration may extend the validity of the certificate beyond the expiry date to a maximum period of 5 years provided that surveys has been carried out as appropriate.
- If a renewal survey has been completed and a new certificate cannot be issued or placed onboard before the expiry date of the existing certificate, the person or authorization approved by the administration may extend the validity for further period which shall not exceed 5 months.
- If a ship, at the time when a certificate expires, is not in a port in which it is to be surveyed, the administration may extend the validity just to complete its voyage, but it should not be more than 3 months. If a ship is on short voyage, then this grace period will be for maximum 1 month.

A certificate will be ceased if:

- The relevant surveys are not completed within the periods.
- The certificate is not endorsed in accordance with regulation 5 of this annex.
- Ship is transferred to the flag of another state.

#### **Regulation 10 : Port state control (PSC)**

### **CHAPTER : 3**

#### **Regulation 12: Ozone depleting substances**

It states that installations which contains ODS, other than HCFC shall be prohibited on ships constructed on or after 19 May, 2005 and installations contains HCFC shall be prohibited on ships constructed on or after 1 January 2020.

#### **Regulation 13: NOx emissions**

Restricts NOx emissions from diesel engines according to a corresponding technical code. NOx emission from an engine is closely related to the design of the engine. The quality of the fuel itself also has a significant impact on the NOx emission level. Certificates are EIAPP and NOX technical code.

Tier	Ship construction date on or after	Total weighted cycle emission limit (g/kWh) n = engine's rated speed (rpm)		
		n < 130	n = 130 - 1999	n ≥ 2000
I	1 January 2000	17.0	$45.n^{-0.2}$ e.g., 720 rpm – 12.1	9.8
II	1 January 2011	14.4	$44.n^{-0.23}$ e.g., 720 rpm – 9.7	7.7
III	1 January 2016*	3.4	$9.n^{-0.2}$ e.g., 720 rpm – 2.4	2.0

### **Regulation 14: SOX**

Restricts SOx emissions from ships by introducing limits on sulphur content in marine fuels.

#### **Outside ECA**

- 4.5% m/m prior to 1<sup>st</sup> January 2012
- 3.5% m/m on or after 1<sup>st</sup> January 2012
- 0.5% m/m on or after 1<sup>st</sup> January 2020

#### **Inside ECA**

- 1.5% m/m prior to 1<sup>st</sup> July 2010
- 1.0% m/m on or after 1<sup>st</sup> July 2010
- 0.1% m/m on or after 1<sup>st</sup> January 2015

### **Regulation 15: Volatile Organic Compounds**

It states that in ports where there is a need to control the emission of VOCs, there is also a requirement for the ports to ensure appropriate recovery facilities are available.

There are 2 aspects of VOC control,

- VOC emitted to atmosphere controlled by VECS
- All tankers carrying crude oil have an approved VOC management plan.

### **Regulation 16: Shipboard Incineration**

Each incinerator installed on or after 1<sup>st</sup> January 2000 comes under this.

Incineration of following is prohibited:

- Annex 1,2,3 cargo residues
  - Polychlorinated biphenyls (PCB's)
  - Garbage containing more than traces of heavy metal
  - Refined petroleum products containing halogen compounds
- ✓ Incineration of sewage sludge and sludge oil generated is allowed but not inside ports, harbours and estuaries.
- ✓ Incineration of PVC (Polyvinyl chlorides) shall be prohibited unless incinerator is approved for that by IMO.

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### **Regulation 17: Reception facility**

The government of each party undertakes to ensure that the provision of facilities adequate for the reception of Ozone depleting substances and exhaust gas cleaning residues from an approved exhaust gas cleaning system.

### **Regulation 18: Fuel oil quality**

It contains standards regarding the quality documentation requirements for fuel oil. The fuel oil must be free from inorganic oil. With respect to documentation, a bunker delivery note must be issued and retained specifying, among others, the oil-product name, density at 15 degrees Celsius and the sulphur content.

## **CHAPTER : 4**

### **Regulation 19 : Applications**

- This chapter shall apply to all ships of 400 gross tonnage and above.
- This chapter shall not apply to ships solely operating in Flag's national waters.
- Regulation 20 and 21 shall not apply to ships with non-conventional propulsion with the exception of cruise passenger ship with electric propulsion and LNG carriers.

### **Regulation 20 : Attained EEDI**

Attained EEDI is the actual EEDI of a ship which shall be calculated for:

- Each new ship
- Each new ship which has undergone a major conversion
- Each new or existing ship which has undergone a major conversion.

The attained EEDI shall be specific to each ship and be accompanied by the EEDI technical file.

It is called Energy Efficiency Design Index. It reflects the amount of CO2 generated per tonne-mile. It aims at promoting the use of more energy efficient equipment and engines. The empirical formula is

$$\text{ATTAINED EEDI} = \frac{[\text{Engine Power (KW)} \cdot \text{SFOC (gm/Kwhr)} \cdot \text{Carbon conversion}]}{\text{Capacity (DW)} \cdot \text{Speed (Knots)}}$$

Unit = gm/ton nautical mile

- It can be said as maximum amount of cargo carried with minimum amount of Co2 emission.
- Applies to all ships constructed on or after 1<sup>st</sup> January 2013.
- The smaller the EEDI, the more energy efficient design index.

Measures to improve EEDI:

- Built the hull with less friction with water.
- More efficient material of steel used.
- Better quality of Paint.
- Use of ME engine and RT flex

EEDI Technical file:

- Ship particular
- ME & AE particular
- ME power calculation with speed power curve
- Ship speed with 75% of MCR with speed power curve

### Regulation 21: Required EEDI

Required EEDI is the regulatory limit of EEDI for a ship.

Required EEDI =  $(1 - \frac{X}{100}) \times \text{Reference line value}$   
Where X = Reduction factor

Reduction Factor value is:

- 0 (2013-2015)
- 10 (2015-2020)
- 20 (2020-2025)
- 30 (2025 – onwards)

Reference line value is the function of

- Deadweight of the ship
- Type of ship

Reference line value (baseline) shall be calculated as follows:

Reference line value =  $a \times b^{-c}$  where a, b and c are the parameters given below:

Ship type	a	b	c
Bulk carrier	961.79	DWT of the ship	0.477
Gas carrier	1120.00	DWT of the ship	0.456
Tanker	1218.80	DWT of the ship	0.488
Container ship	174.22	DWT of the ship	0.201
General cargo ship	107.48	DWT of the ship	0.216

$$\text{Attained EEDI} \leq \text{Required EEDI}$$

### Regulation 22: SEEMP

- Ship Energy Efficiency Management Plan is an operational measure to improve the energy efficiency of a vessel in a cost effective manner by reducing greenhouse gas emission.
- It can be achieved by speed optimization, weather routing, hull monitoring and maintenance, efficient cargo operation.
- It is implemented on a ship in following hierarchy:  
Planning → Implementation → Monitoring → Self Evaluation and improvement
- It is applicable for all the ships above 400 GT and platform and drilling rigs engage in FG voyages.
- Content of SEEMP 1 are:
  - Ship particulars
  - Energy efficiency measures
  - Description of monitoring tools
  - Measurable goals
  - Procedures of evaluation

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### Regulation 22A: Fuel consumption data collection system for ships

Regulations for mandatory measurement and reporting of the ship's annual fuel consumption.

The system have three main elements:

- Data collection and reporting by ships (company)
- Data verification by flag state and delivery to IMO
- Data storage in a centralised database at the IMO

### **IMO ship fuel DCS have such main features:**

- Applicable to ships greater than 5000 GT.
- Annual reporting with no need for voyage data.
- IMO number for ship identification
- Company responsible for submission of data.
- Flag administration responsible for data verification.
- Compliance through having a Statement of compliance (SOC) issued annually.
- Aggregated data to be submitted and stored in an IMO database.

### **Types of data to be reported annually:**

1. Ship IMO number
2. Technical details
  - Ship type
  - Gross tonnage
  - Net tonnage
  - Deadweight at summer load line
  - Main and Auxiliary engine MCR (Maximum continuous rating)
  - EEDI (if applicable)
  - Ice class (if applicable)
3. Total annual consumption by fuel type
4. Distance travelled
5. Hours underway

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### **Miscellaneous questions from Annex 6:**

#### **1. CAN WE BURN COOKING OIL IN INCINERATOR, WHERE TO MAKE ENTRY?**

Yes we can burn but it does not get into bilge/sludge systems.

The reasons of the above are:

1. OWS are not designed to use with cooking oil, as it can cause malfunction to 15 ppm alarm.
2. There could be potential problems with the port state control.

Due to above two points, it is recommended that galley oil should be kept separately for landing ashore, along with other garbage and certificate should be obtained.

Entry should be made in Garbage record book.

#### **2. MENTION CERTIFICATES OF ANNEX 6?**

1. International Air Pollution Prevention (IAPP) certificate given by Administration
2. Engine International Air Pollution Prevention (EIAPP) certificate given by Maker
3. International Energy Efficiency (IEE) certificate given by Administration
4. NO<sub>x</sub> technical file
5. Type approval and operation of shipboard incinerators
6. Bunker Delivery Note
7. Statement of compliance for DCS
8. EEDI technical file
9. SEEMP Part 1 and Part 2

#### **3. EXPLAIN ABOUT NOX TECHNICAL FILE?**

A record containing all detailed parameters, including components and settings of an engine, which may influence the NO<sub>x</sub> emission, in accordance with the NO<sub>x</sub> Technical Code.

According to IMO regulations,

- A Technical File shall be made for each engine.
- This Technical File contains information about the components affecting NO<sub>x</sub> emissions.
- Each critical component is marked with a special IMO number.
- Such critical components are the injection nozzle, injection pump, camshaft, cylinder head, piston, connecting rod, charge air cooler and turbocharger.
- The allowable setting values and parameters for running the engine are also specified in the Technical File.

#### **4. HOW WILL YOU ENSURE ANNEX 6 COMPLIANCE?**

For SO<sub>x</sub> compliance, it can be checked by:

- checking the limits of Sulphur content of fuel in BDN and Lab analysis report.

For NO<sub>x</sub> compliance, it can be checked by

- EIAPP certificate which is issued for each engine separately by maker before the engine is fitted onboard.
- IAPP is issued for each engine after it is fitted on onboard.
- NO<sub>x</sub> technical file records can be checked.
- For incinerator, Type approval and operation of shipboard incinerator certificate can be checked.

## **5. EXPLAIN EEOI AND IEEC?**

### **EEOI :**

It is not mandatory but voluntary. It is a tool adopted by the company owner which collects information globally and helps in improving EEDI of the ship. Both have same formula only the CO<sub>2</sub> conversion factor differs. By this 10% of CO<sub>2</sub> emission will be reduced by 2020 and around 30% by 2030.

### **IEEC:**

International Energy Efficiency Certificate is a statutory certificate covering both the SEEMP and EEDI. This certificate is valid for the life of the ship unless it undergoes major conversion or a change of flag. IEEC is provided to new ships on delivery, while for existing ships after the intermediate or renewal survey.

## **6. DOES NO<sub>x</sub> FORMS IN INCINERATOR OR BOILER?**

No, NO<sub>x</sub> doesn't form in Incinerators or boilers because it requires high temperature to form NO<sub>x</sub> which is usually above 1100 degree Celsius and temperature in both incinerators and boilers do not reach this limit. Where as in engine, the temperature of combustion reaches about 1300-1400 degree Celsius.

## **7. HOW TO CHECK NO<sub>x</sub> and SO<sub>x</sub> IN CONTROL AS PER ANNEX 6?**

### **NO<sub>x</sub> in control:**

By certificates we can say it is complying, but how can we prove that even after 10 or 20 years in operation, the ship's engines still comply with these requirements.

There are three ways in which ship can prove that it still complies with the NO<sub>x</sub> requirements.

- Engine Parameter Check method
- Simplified Measurement method
- Direct Measurement and Monitoring method
- The method that the ship is certified to use for on board verification of NO<sub>x</sub> is specified in the EIAPP certificate of the engine.
- And the procedure to verify on board compliance (and using the certified method) is provided in the NO<sub>x</sub> technical file that accompany the EIAPP certificate of the engine.

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The "simplified measurement" and "Direct measurement and monitoring" methods are based on measuring the NO<sub>x</sub> emissions from the engine. But these two methods are rarely used.

### **Mostly used method is Engine parameter check method:**

- This method is based on the principle that if the engine complied with the NO<sub>x</sub> parameters at the time it was fitted on board, it should continue to comply if there are no modifications/adjustment made to the engine.
- This is really a simple and logical thing to say.
- And as there are absolutely no extra costs involved to use this method, this method is most common among ship owners.
- So there are few things that are required from this method that we must know.
- We must know the engine parts that contribute to the NO<sub>x</sub> emission. Modification and adjustments of these parts must be as per the Maker's guidelines.
- If any of these spare parts of the engine need to be changed, it must be changed with the original part supplied by the maker.
- Any adjustments made to these parts must be within the range specified by the maker of the engine.
- A record must be kept of all the replacements of the spare parts and all the adjustments made to these parts.
- During annual, intermediate and renewal survey of the Air pollution prevention certificate, these records, and engine parameters are checked by the class surveyor.
- The international air pollution prevention certificate is endorsed or renewed on the basis of these verifications by the class surveyor.

### **Sox in control:**

Compliance with SO<sub>x</sub> is simple. Just use the fuel with sulphur content as per the limitation set for the area the ship is trading. Ship staff must have the procedures to change over from high sulphur to low sulphur fuels.

## **8. DOES NO<sub>x</sub> APPLIES TO EMERGENCY GENERATOR?**

No, it does not apply to emergency generators, as Annex 6 Regulation 13 states that, NO<sub>x</sub> regulation only applicable to diesel engines of over 130 KW output power other than those used solely for emergency purposes.

## **9. IAPP SURVEY**

1. All documents of Annex 6 will be checked.
  - a. International Air Pollution Prevention (IAPP) certificate given by Administration
  - b. Engine International Air Pollution Prevention (EIAPP) certificate given by Maker
  - c. International Energy Efficiency (IEE) certificate given by Administration
  - d. NOx technical file
  - e. Type approval and operation of shipboard incinerators
  - f. Bunker Delivery Note
  - g. Statement of compliance for DCS
  - h. EEDI technical file
  - i. SEEMP Part 1 and Part 2
2. No ozone depleting substances have been used.
3. The rated power and rated speed of the engine nameplates are equal to the rated power and rated speed stated on the engines EIAPP certificate.
4. Engine settings or adjustments do not exceed the allowances as specified in the Technical file.
5. For incinerator, operating personnel is trained and capable of implementing the guidance provided in the operating manual.
6. Alarms of incinerator will be checked.
7. An approved Vapour collection system is installed.
8. In bunker delivery note, sulphur content is specified.
9. Record of BDN is kept for atleast 3 years.
10. Fuel oil samples shall be kept onboard for atleast 12 months (sealed and signed by supplier)
11. Fuel oil does not exceed 0.5% sulphur content by mass. In special areas, fuel oil with maximum S 0.1 % is used.
12. Fuel changeover records will be inspected.

**JAI MATA DI - CLASS 2 SAFETY NOTES  
BY ANKUR SHARMA (MANET BATCH 6)**

**LIST OF VARIOUS CONVENTIONS WITH DATES:**

SR NO.	CONVENTION	ADOPTED ON	CAME INTO FORCE
1	LOAD LINE (International convention on load lines)	05 APRIL 1966	21 JULY 1968
2	UNCLOS (United nations convention on the law of the sea)		16 NOV 1982
3	STCW (International convention on Standards of training, certification and watchkeeping for seafarers)	7 JULY 1978	28 APRIL 1984
	STCW 95		1 FEB 1997
	STCW 2010		1 JAN 2012
4	CLC CONVENTION (International convention on civil liability for oil pollution damage)	27 NOV 1992	30 MAY 1996
5	FUND CONVENTION	27 NOV 1992	30 MAY 1996
6	ISM (International safety management code)	04 NOV 1993	1 JULY 1998
7	ISPS (International ship and port facility security code)	12 DEC 2002	1 JULY 2004
8	IBC CODE (International code for the construction and equipment of ships carrying dangerous chemicals in bulk)		1 JAN 2007
9	AFS CONVENTION (International convention on the control of harmful anti-fouling systems on ship)	05 OCT 2001	17 SEPT 2008
10	BUNKER CONVENTION (International convention on civil liability for bunker oil pollution damage)	23 MARCH 2001	21 NOV 2008
11	MLC (Maritime Labour Convention)	23 FEB 2006	20 AUG 2013
12	ESP (Enhanced Survey Programme)	30 NOV 2011	1 JAN 2014
13	POLAR CODE (International code for ships operating in Polar Waters)		1 JAN 2017
14	BWM (International convention for the control and management of ships ballast water and sediments)	13 FEB 2004	08 SEPT 2017

**MARPOL ANNEX WITH DATES:**

ANNEX	ANNEX NAME	ENTERED INTO FORCE
ANNEX 1	Regulation for the prevention of pollution by Oil	02 OCTOBER 1983
ANNEX 2	Regulation for the control of pollution by Noxious Liquid Substances in Bulk	06 APRIL 1987
ANNEX 3	Regulation for the prevention of pollution by harmful substances carried by sea in packaged form	01 JULY 1992
ANNEX 4	Regulation for the prevention of pollution by Sewage from Ships	27 SEPTEMBER 2003
ANNEX 5	Prevention of pollution by garbage from ships	31 DECEMBER 1988
ANNEX 6	Regulation for the prevention of air pollution from ships	19 MAY 2005