2ND MATE (F.G.) – MMD ORALS EXAMS NOTES BASED ON FREQUENTLY ASKED QUESTIONS

FUNCTION 3

Last Updated Feb'23

Shipboard Operations Management

IMO Role:
The International Maritime Organization (IMO) is a specialized agency of the United Nations (UN) responsible for regulating and promoting safety and environmental standards in international shipping. The IMO develops and maintains a comprehensive framework of international regulations, codes, and guidelines for the safety and security of shipping, the prevention of marine pollution, and the reduction of greenhouse gas emissions from ships. The organization also provides technical assistance and capacity building to member states and works with other UN agencies, intergovernmental organizations, and the shipping industry to promote sustainable and safe shipping. The IMO is headquartered in London and has 174 member states.

IMO structure & which committees have sub committees?
The International Maritime Organization (IMO) is a specialized agency of the United Nations, responsible for the regulation of international shipping to ensure maritime safety, security, and the prevention of marine pollution. The structure of the IMO consists of various bodies and committees that work together to develop and maintain maritime regulations and standards.

The main bodies within the IMO structure are:
1. Assembly: The Assembly is the highest governing body of the IMO, comprising all member states. It meets once every two years to adopt the budget, determine policies, and elect the Council members.
2. Council: The Council serves as the executive body of the IMO and is responsible for supervising the work of the organization between Assembly sessions. It comprises 40 member states elected by the Assembly.
3. Secretariat: Headed by the Secretary-General, the Secretariat is responsible for implementing the decisions made by the Assembly and the Council. It provides administrative, technical, and logistical support to the organization.

The IMO has five main committees that address various aspects of maritime regulations and standards:
1. Maritime Safety Committee (MSC): The MSC is responsible for developing and maintaining regulations and recommendations related to maritime safety, navigation, and radiocommunications.
2. Marine Environment Protection Committee (MEPC): The MEPC is responsible for developing and maintaining regulations and guidelines related to the prevention of marine pollution from ships.
3. Legal Committee: This committee is responsible for addressing legal matters related to the IMO's work, such as liability and compensation issues arising from maritime accidents and incidents.
4. Technical Cooperation Committee: This committee oversees the IMO's technical cooperation program, which assists member states in implementing and enforcing IMO regulations and standards.
5. Facilitation Committee: This committee focuses on streamlining and simplifying the procedures for international maritime traffic, including customs and immigration procedures, to ensure efficient and secure maritime trade.

Two of the main IMO committees have sub-committees that work on specific technical issues:

1. Maritime Safety Committee (MSC) has six sub-committees:
   - Sub-Committee on Navigation, Communications and Search and Rescue (NCSR)
   - Sub-Committee on Ship Design and Construction (SDC)
   - Sub-Committee on Ship Systems and Equipment (SSE)
   - Sub-Committee on Carriage of Cargoes and Containers (CCC)
   - Sub-Committee on Human Element, Training and Watchkeeping (HTW)
   - Sub-Committee on Implementation of IMO Instruments (III)
2. Marine Environment Protection Committee (MEPC) has one sub-committee:
   - Sub-Committee on Pollution Prevention and Response (PPR)

What surveys to be done to keep certificates valid?

To keep certificates valid, various surveys are required to be done as per the requirements of different conventions and regulations. Some of the common surveys that are required to be conducted include:

1. Annual surveys: These surveys are carried out once a year to ensure that the vessel is maintained in accordance with the applicable rules and regulations.
2. Intermediate surveys: These surveys are conducted at intervals of 2.5 years to ensure that the vessel continues to meet the requirements of the relevant regulations.
3. Renewal surveys: These surveys are conducted every five years to ensure that the vessel remains in compliance with the relevant regulations.
4. Special surveys: These surveys are conducted at any time to address specific concerns that may arise during the life of the vessel.
5. Additional surveys: These surveys may be required to be carried out to address changes made to the vessel, such as modifications or upgrades.

The specific surveys required for each vessel depend on its type, size, and intended use, as well as the relevant regulations and conventions to which it is subject.

Anchor Chain Maintenance at dry dock?

Anchor chain maintenance is an important aspect of vessel maintenance, and it should be performed regularly, especially during dry dockings. During a dry docking, the anchor chain is usually removed from the vessel and inspected. The following are some of the activities that can be carried out during anchor chain maintenance at dry dock:

1. Chain cleaning: The anchor chain should be cleaned to remove any rust or other debris that may have accumulated on it. This can be done by sandblasting or wire brushing.
2. Chain inspection: The anchor chain should be inspected for any signs of wear, such as cracks or bent links. If any damaged links are found, they should be replaced.
3. Chain measuring: The length of the chain should be measured to ensure that it meets the required length for the vessel. If the chain is found to be too short, additional links may need to be added.
4. Chain painting: After the chain has been cleaned and inspected, it should be painted to protect it from corrosion.

5. Chain testing: The anchor chain should be tested to ensure that it can support the weight of the vessel. This can be done using a load testing machine.
6. Chain storage: The anchor chain should be stored properly to prevent it from becoming damaged. It should be stored in a dry place and protected from the elements.

By performing these activities, the anchor chain can be kept in good condition, which can help to ensure the safety of the vessel and its crew.

Polar Code Volumes and Parts:
The Polar Code is a code of international regulations for ships operating in polar waters, including both the Arctic and the Antarctic. It is a mandatory part of the International Convention for the Safety of Life at Sea (SOLAS) and is divided into two volumes:
- Volume I - Safety measures
- Volume II - Pollution prevention measures

Each volume is further divided into parts:

Volume I - Safety measures:
1. General
2. Polar Water Operation Manual (PWOM)
3. Ship structure
4. Subdivision and stability
5. Watertight and weathertight integrity
6. Machinery installations
7. Fire safety/Protection
8. Life-saving appliances and arrangements
9. Safety of navigation

Volume II - Pollution prevention measures:
1. Prevention of pollution by oil
2. Control of pollution by noxious liquid substances in bulk
3. Prevention of pollution by harmful substances carried by sea in packaged form
4. Prevention of pollution by sewage from ships
5. Prevention of pollution by garbage from ships

The Polar Code was adopted in 2014 and became mandatory under SOLAS on January 1, 2017.

Paint Composition
Paints are typically composed of four basic components: pigments, binders, solvents, and additives.
- Pigments: These are finely ground powders that provide color, opacity, and hiding power to the paint. They are typically made from minerals or synthetic materials and can be organic or inorganic.
- Binders: These are resins that hold the pigments together and bind them to the surface being painted. They provide the paint with its durability, adhesion, and flexibility.
- Solvents: These are liquids that dissolve the binders and pigments and allow the

paint to be applied to a surface. They also help the paint dry by evaporating quickly.
- Additives: These are substances added to the paint to give it specific properties, such as improved flow, faster drying time, or resistance to mold and mildew. Examples of additives include surfactants, thickeners, and biocides.

The exact composition of a paint can vary depending on the intended use and the manufacturer, but these four components are typically included in some form.

Solas Chapter 7:
Chapter 7, Carriage of Dangerous Goods, provides the regulations for the safe carriage of dangerous goods by sea, including the classification and identification of dangerous goods, the packaging, marking, labeling and documentation of dangerous goods, stowage and segregation, and emergency procedures.

Solas Chapter 11:
Chapter 11, Passenger Ships, provides the regulations for the safety of passengers on board passenger ships. It includes the requirements for the construction and stability of passenger ships, life-saving appliances, fire protection and firefighting equipment, and means of escape in case of emergency. The chapter also specifies the requirements for operational and maintenance procedures, crew training, and passenger safety drills.

VTS according to which Chapter of SOLAS:
The requirements for Vessel Traffic Services (VTS) are given in SOLAS Chapter V, Regulation 12, and guidelines for their implementation are given in IMO Resolution A.857(20).

Explain ISM Code?
The International Safety Management (ISM) Code is a set of guidelines and standards for the safe operation of ships and pollution prevention. It was adopted by the International Maritime Organization (IMO) in 1993 and came into force in 1998. The primary objective of the ISM Code is to provide an international standard for the safe management and operation of ships and to establish a framework for an effective safety management system (SMS) on board.

The ISM Code requires ship owners and operators to implement a safety management system that covers the following key elements:
1. A safety and environmental protection policy
2. Company responsibilities and authority
3. Designated person(s) to ensure the link between the company and the ship
4. Development of procedures for reporting accidents and non-conformities
5. Procedures for responding to emergency situations
6. Procedures for internal audits and management reviews
7. Training and familiarization of personnel with safety and environmental protection matters

Certificates under ISM code?
There are two main certificates associated with the ISM Code:

1. Document of Compliance (DOC): The DOC is issued to the ship management company (usually the ship owner or operator) after a successful audit of the company's safety management system by the flag state or a recognized organization (RO) on its behalf. The DOC confirms that the company's SMS complies with the requirements of the ISM Code. The DOC is valid for a period of five years, subject to annual verification audits.
2. Safety Management Certificate (SMC): The SMC is issued to individual ships after a successful audit of the ship's safety management system. The audit verifies that the ship's SMS complies with the requirements of the ISM Code and that the company's SMS has been effectively implemented on board. The SMC is valid for a period of five years, subject to intermediate verification audits.

Both the DOC and SMC are subject to periodic audits to ensure continued compliance with the ISM Code. Failure to maintain compliance with the ISM Code may result in penalties, such as fines, detention, or withdrawal of the certificates.

SMC:
The Safety Management Certificate (SMC) is a document issued to a ship which indicates that the company operating the ship has a Safety Management System (SMS) that meets the requirements of the International Safety Management (ISM) Code. The SMC serves as evidence that the ship has a systematic approach to ensuring safety of the ship and protection of the environment. It is issued by the flag state administration or an authorized classification society on behalf of the flag state. The SMC is valid for a period of 5 years, subject to annual verification by the flag state administration or a recognized organization on their behalf.

Explain FAL Convention:
The FAL Convention, also known as the Convention on Facilitation of International Maritime Traffic, is an international treaty adopted by the International Maritime Organization (IMO) in 1965. The primary objective of the FAL Convention is to simplify and harmonize the administrative procedures related to international maritime traffic, making it more efficient and cost-effective.

The FAL Convention covers various aspects of maritime traffic, including the arrival, stay, and departure of ships engaged in international voyages. It also addresses the documentation and procedures associated with the clearance of ships, cargo, and passengers.

Key provisions of the FAL Convention include:
1. Standardized documentation: The FAL Convention prescribes a set of standardized documents for use in international maritime traffic, such as cargo manifests, crew lists, passenger lists, and ship's stores declarations. This standardization reduces the administrative burden on ships and port authorities and streamlines the clearance process.
2. Single Window: The FAL Convention encourages the use of a Single Window

system, which allows all required information to be submitted electronically through a single entry point. This reduces the need for repetitive data entry and simplifies the clearance process for ships, cargo, and passengers.
3. Advance electronic data exchange: The Convention requires that public authorities exchange data electronically to facilitate the clearance process. It also encourages the use of electronic data interchange (EDI) systems for the submission of required information by ships and shipping-related service providers.
4. Efficient procedures: The FAL Convention encourages contracting governments to simplify and expedite the clearance procedures for ships, cargo, and passengers. This includes minimizing the administrative burden on ships and port authorities, reducing waiting times, and facilitating the efficient movement of ships in and out of ports.
5. Assistance to ships in distress: The Convention urges contracting governments to provide assistance to ships in distress, including the provision of necessary facilities and the simplification of formalities to expedite their clearance.

Shipboard Personnel Management and Training

STCW Functions:
STCW stands for the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers. Its functions include:
1. Setting minimum training, certification and watchkeeping standards for seafarers at the international level.
2. Establishing the requirements for the issue, revalidation and endorsement of certificates of competency and proficiency for seafarers.
3. Promoting safety at sea and the protection of the marine environment through the proper training of seafarers.
4. Ensuring that seafarers are trained to operate vessels safely and efficiently, and that they are capable of responding to emergencies.
5. Facilitating the recognition of seafarers' certificates issued by one country by other countries, to promote mobility of seafarers and eliminate unnecessary duplication of training and certification.
6. Regularly reviewing and updating the STCW Convention and Code to ensure that they remain relevant and up-to-date with changes in technology and the shipping industry.
7. Promoting a culture of safety and continuous learning and development among seafarers and the shipping industry.

Chapters in STCW:
The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) has five chapters:
1. General provisions - outlines the objectives and scope of the convention, definitions, and the responsibilities of governments, companies, and seafarers.
2. Master and deck department - covers the training and certification requirements for officers and ratings serving in the deck department.
3. Engine department - covers the training and certification requirements for officers and ratings serving in the engine department.
4. Radio communication - covers the training and certification requirements for radio personnel.

5. Special training requirements for personnel on certain types of ships - covers the training and certification requirements for personnel on ships carrying dangerous goods, passenger ships, and offshore support vessels.

Official Log Book Entry?

The official log book is a legal document that must be maintained by every seagoing ship. It is used to record important events that occur during a voyage, such as weather conditions, navigational hazards, and any other significant incidents.

An official log book entry should be made for each event that is required to be recorded. These may include, but are not limited to:

1. Departure and arrival of the ship from a port or place
2. Navigation events such as speed changes, course changes, and position fixes
3. Weather and sea conditions
4. Accidents or incidents involving the ship, crew, or passengers
5. Cargo handling operations
6. Medical emergencies or illnesses onboard
7. Communications with other vessels or shore-based facilities
8. Fire or safety drills
9. Changes in crew or personnel

Each entry in the official log book should be signed and dated by the officer making the entry. It is important that the log book is kept up to date and accurate as it may be used as evidence in legal proceedings.

MLC Enforce Date:

The Maritime Labour Convention (MLC) entered into force on August 20, 2013, after being ratified by 30 countries representing more than 33% of the world's gross shipping tonnage. The convention was created to protect seafarers' rights and to ensure decent working and living conditions on board ships. The MLC applies to all ships engaged in commercial activities, regardless of size or type, and to all seafarers, including those on fishing vessels.

MLC Titles:

The Maritime Labour Convention (MLC) is an International Labour Organization (ILO) convention that sets out minimum working and living standards for all seafarers working on ships. The convention aims to ensure that seafarers have decent working and living conditions and have their rights protected.

The MLC has four main titles that address different aspects of seafarers' working and living conditions:

1. Title 1 - Minimum requirements for seafarers to work on a ship: This title sets out the minimum age for seafarers, medical fitness requirements, training and certification requirements, and rest hours.
2. Title 2 - Conditions of employment: This title sets out the requirements for seafarers' employment agreements, including the terms and conditions of employment, wages and compensation, and repatriation.
3. Title 3 - Accommodation, recreational facilities, food and catering: This title sets out the requirements for seafarers' living conditions on board ships, including the

minimum size and standards of cabins, recreational facilities, food, and catering.
4. Title 4 - Health protection, medical care, welfare and social security protection: This title sets out the requirements for seafarers' health and welfare, including medical care, access to health and welfare facilities on shore, and social security protection.

Why the drills are conducted onboard?

Drills are conducted onboard ships to ensure that the crew is well-prepared, efficient, and confident in responding to various emergency situations that may arise during the ship's operation. Regular training and practice through drills are essential for maintaining the crew's proficiency and enhancing their ability to work as a team in high-stress situations. Some of the primary reasons for conducting drills onboard include:

1. Familiarization: Drills help the crew members become familiar with the ship's layout, equipment, and procedures related to emergency situations. This familiarity ensures that they can quickly locate and operate the necessary equipment and follow the appropriate procedures when a real emergency arises.
2. Skills development: Drills provide an opportunity for the crew to practice and develop their skills in firefighting, damage control, lifesaving, and other essential tasks required during emergencies. Regular practice helps to build muscle memory, making it easier for the crew to perform these tasks effectively in a real situation.
3. Teamwork and communication: Emergency situations often require the coordinated efforts of multiple crew members. Drills help to develop and reinforce effective communication, cooperation, and teamwork among the crew, which is crucial for a successful response to emergencies.
4. Identifying weaknesses: Drills can help to identify any weaknesses in the ship's emergency procedures, equipment, or the crew's abilities. By evaluating the performance during drills, the ship's management can address these weaknesses through additional training, improvements to procedures, or updates to equipment.
5. Regulatory compliance: Conducting regular drills is a requirement of various international maritime regulations, such as the International Convention for the Safety of Life at Sea (SOLAS) and the International Safety Management (ISM) Code. Regular drills ensure that the ship is in compliance with these regulations and can demonstrate its preparedness during inspections by flag state and port state control authorities.

Some common drills conducted onboard ships include fire drills, abandon ship drills, man overboard drills, and security drills. The frequency and type of drills may vary depending on the ship's type, operation, and specific regulations. However, conducting drills regularly and effectively is essential for ensuring the safety of the crew, the ship, and the environment.

What are MS Notices?

MS Notices, also known as Marine Notices or M Notices, are official guidance documents issued by maritime authorities to provide important information, recommendations, and regulations to the maritime community. They cover a wide range of topics, including safety, environmental protection, ship operations, crew training, and certification. M Notices are typically issued by national maritime administrations, such as the Maritime and Coastguard Agency (MCA) in the United Kingdom.

M Notices can be categorized into different types, depending on their purpose and content. Some common categories include:

1. Marine Guidance Notes (MGN): These notices provide guidance and recommendations on various aspects of maritime safety, environment, and operations. MGNs are not legally binding, but they offer best practices and advice on how to comply with maritime regulations and requirements.
2. Marine Information Notes (MIN): These notices provide time-sensitive information or updates on specific issues, such as changes in regulations, procedures, or equipment requirements. MINs are intended to inform the maritime community of the latest developments and may have a limited validity period.
3. Marine Safety Notices (MSN): These notices detail mandatory requirements related to maritime safety, such as regulations, procedures, and equipment standards. MSNs are legally binding and must be followed by the maritime community to ensure compliance with national and international regulations.

Emergency Preparedness and Response

Radio medical crew with Acute Order:
If a crew member is experiencing a medical emergency that requires immediate attention, the first step is to contact the onboard medical officer or, if one is not available, to contact a remote medical support service for guidance. The radio medical crew should be able to provide assistance and advice on appropriate medical treatments and any necessary evacuations.

In case of an acute order, such as a cardiac arrest or other life-threatening condition, the radio medical crew may provide instructions for cardiopulmonary resuscitation (CPR) or other emergency treatments until the patient can be transferred to a medical facility. It is essential to follow the instructions provided by the radio medical crew carefully and to have any necessary medical equipment and medications available for immediate use.

Fire in Alley:
If there is a fire in the galley, the following actions should be taken as the OOW:

- Sound the alarm to alert the crew and passengers of the emergency.
- Call the bridge to inform them of the situation and the actions being taken.
- Try to contain the fire by shutting off the ventilation system to prevent it from spreading.
- If the fire is small and can be extinguished easily, use the appropriate fire-fighting equipment to put out the fire.
- If the fire is too big to handle, or if it cannot be extinguished easily, activate the fire suppression system and evacuate the area.
- Ensure that the crew and passengers are aware of the situation and are taking appropriate actions, such as donning life jackets and proceeding to the designated muster stations.
- Keep the bridge informed of the situation and provide regular updates on the progress of the fire-fighting and evacuation efforts.
- Follow the vessel's emergency procedures and any specific instructions provided by the master or other senior officers.

Fire on Mast Riser:
A fire on a mast riser can be a serious emergency that requires immediate attention from the OOW (Officer on Watch) to ensure the safety of the ship and crew. The following actions can be taken by the OOW in case of a fire on a mast riser:

- Alert the crew: The OOW should immediately sound the alarm and alert the crew of the fire.
- Report to the bridge: The OOW should report to the bridge and inform the master and other officers about the fire.
- Stop the vessel: The vessel should be stopped immediately to prevent the fire from spreading.
- Use fire-fighting equipment: The OOW should direct the crew to use the appropriate fire-fighting equipment to control the fire. This may include fire extinguishers, fire hoses, and foam extinguishers.
- Shut down electrical systems: The OOW should shut down the electrical systems in the vicinity of the fire to prevent any electrical sparks from igniting the fire.
- Evacuate the area: The OOW should ensure that all personnel in the area of the fire are safely evacuated to a designated muster station.
- Request for assistance: If the fire cannot be controlled using the available equipment, the OOW should request for assistance from shore-based fire-fighting services and nearby vessels.

It is important that the OOW remains calm and follows the ship's emergency response plan to ensure that the situation is effectively managed and the crew and vessel remain safe.

Type of Fire Extinguisher, purpose and Content of each with proportion:
There are several types of fire extinguishers available, each designed for specific types of fires. The different types of fire extinguishers and their intended purposes are:

1. Water fire extinguishers: These are used for Class A fires (fires involving ordinary combustibles like wood, paper, or cloth) and contain water as the extinguishing agent.
2. Foam fire extinguishers: These are used for Class A and Class B fires (fires involving flammable liquids such as petrol, diesel, or oil) and contain a mixture of water and foam.
3. Carbon dioxide (CO_2) fire extinguishers: These are used for Class B and Class C fires (fires involving flammable gases like propane or butane) and contain CO_2 as the extinguishing agent.
4. Dry powder fire extinguishers: These are used for Class A, B, and C fires, and contain a powder such as sodium bicarbonate or potassium chloride as the extinguishing agent.

The contents and proportions of each type of extinguisher can vary depending on the manufacturer, but in general, the recommended proportions for the extinguishing agent in each type are:

1. Water fire extinguishers: 95% water and 5% foaming agent.
2. Foam fire extinguishers: 94% water, 6% foaming agent, and 1% propellant.
3. CO_2 fire extinguishers: 100% CO_2.
4. Dry powder fire extinguishers: 90-95% powder and 5-10% propellant.

As an OOW, if a fire breaks out on the mast riser, the following actions should be taken:
1. Sound the alarm and alert the crew.
2. Assess the situation and decide whether it can be contained or if it requires the activation of the fixed firefighting system.
3. Use the appropriate fire extinguisher to extinguish the fire if possible.
4. If the fire cannot be contained, close all ventilation to the affected area and activate the fixed firefighting system.
5. If necessary, activate the emergency fire pump and make a distress call.
6. Evacuate the area if the situation becomes unmanageable.
7. Continue to monitor the situation and take any further actions as required.

Chief Cook Burnt hand what medication and how?

If a Chief Cook has a burnt hand, immediate first aid should be given. This can include the following steps:
1. Cooling the affected area: Immediately immerse the burned hand in cold water for at least 10 to 15 minutes, or until the pain subsides. Cooling will help reduce swelling and prevent blistering.
2. Covering the burn: Cover the burned hand with a sterile dressing or a clean cloth to protect it from further injury.
3. Giving pain relief medication: Pain relief medication such as paracetamol can be given to help reduce the pain.
4. Seeking medical attention: If the burn is severe, or if blisters form, the cook should be taken to the nearest hospital or medical facility for further evaluation and treatment.

It is important to note that burns should not be treated with ice, butter, ointments, or any other home remedies, as this can worsen the injury. Additionally, the burned hand should not be exposed to extreme heat or cold until it has healed.

Where will you use DCP? Contents of DCP

DCP, or Dry Chemical Powder, is an extinguishing agent commonly used in fire extinguishers to combat various types of fires. DCP extinguishers can be used in multiple scenarios, depending on the specific type of dry chemical agent they contain. There are different types of DCP extinguishers, such as:

1. ABC Dry Chemical Powder extinguishers: These extinguishers contain a multipurpose agent called monoammonium phosphate. It is a yellow powder that is effective against Class A (ordinary combustibles), Class B (flammable liquids), and Class C (electrical equipment) fires. Monoammonium phosphate works by creating a layer over the fuel, insulating it from oxygen, and interrupting the chemical reactions occurring within the fire.
2. BC Dry Chemical Powder extinguishers: These extinguishers use either sodium bicarbonate or potassium bicarbonate as the extinguishing agent. Both agents are effective against Class B (flammable liquids) and Class C (electrical equipment) fires. Sodium bicarbonate and potassium bicarbonate work by breaking the chain reaction of the fire, effectively stopping the combustion process.

DCP extinguishers consist of the dry chemical powder agent, compressed gas (usually nitrogen) to propel the agent when discharged, and a storage container or cylinder. The extinguishers are designed with a pressure gauge, a safety pin, a discharge nozzle, and a hose for directing the dry chemical powder onto the fire.

What is the capacity of fixed foam system?

The capacity of a fixed foam system in a maritime context depends on the specific installation and requirements of the vessel or facility. Generally, fixed foam systems are designed to deliver foam concentrate at a predetermined proportioning rate, typically between 1% and 6%. The capacity of the system will be determined by the area it is intended to protect, the type of foam used, and the desired discharge rate.

For example, the International Maritime Organization (IMO) has specific guidelines for the design and capacity of fixed foam systems used for firefighting in shipboard spaces. According to IMO's Fire Safety Systems (FSS) Code, the foam system should be able to provide a foam application rate of at least:

1. 8.3 L/m²/min for cargo deck areas of chemical tankers
2. 6.1 L/m²/min for cargo deck areas of gas carriers
3. 4.1 L/m²/min for helidecks and helicopter landing areas

To determine the capacity of a fixed foam system, you would need to know the required application rate, the foam concentrate percentage, and the size of the area to be protected. Using this information, you can calculate the necessary foam concentrate and water supplies needed for the system to operate effectively during an emergency.

Foam applicator requirement?

Foam applicators are used for applying foam to extinguish fires, particularly in areas where flammable liquids or large fuel fires are present. They are a vital part of a ship's firefighting equipment. The requirements for foam applicators vary depending on the ship's size, type, and the regulations it must comply with, such as SOLAS or classification society rules. In general, the following requirements apply to foam applicators:

1. Type: Foam applicators should be of an approved type and designed for use with the foam concentrate provided on the ship. Common types of foam applicators include inline inductors, foam branches, and foam monitors.
2. Capacity: The foam applicator's capacity should be sufficient to handle the flow rate and pressure of the ship's firefighting system, allowing for the effective application of foam to the fire.
3. Compatibility: The foam applicator should be compatible with the ship's firefighting system and foam concentrate. Some foam applicators are designed to work with specific types of foam, such as AFFF (Aqueous Film-Forming Foam) or protein-based foams.
4. Quantity: The number of foam applicators required on board depends on the ship's size, type, and the relevant regulations. SOLAS regulations require at least one foam applicator for ships with a foam-based firefighting system.
5. Hose connections: The foam applicator should have compatible hose connections that allow it to be easily connected to the ship's fire hoses.
6. Operating instructions: Clear operating instructions should be provided for the foam applicator, including information on proper use, maintenance, and storage.
7. Maintenance and inspection: Regular inspection, maintenance, and testing of foam applicators are necessary to ensure their proper functioning and reliability in an emergency. This includes checking for damage, corrosion, and blockages in the applicator and ensuring that the foam concentrate is within its validity period.

Explain Low expansion ratio:

Low expansion foam is a type of fire-fighting foam that has an expansion ratio of between 2:1 and 20:1. The expansion ratio refers to the volume increase of the foam solution when it is mixed with air to form the finished foam. A low expansion ratio means that the foam will expand to a lesser extent compared to medium or high expansion foams.

Low expansion foam is produced by mixing a foam concentrate with water and then aerating the solution through a foam-making device, such as a nozzle, sprinkler, or foam chamber. The foam expands when the foam solution is mixed with air, creating a blanket of bubbles that helps extinguish fires.

Low expansion foams are particularly useful for fighting fires involving flammable liquids, such as hydrocarbons, and are commonly used in scenarios such as:

1. Aircraft hangars
2. Tank farms and storage facilities for flammable liquids
3. Marine vessels, particularly in engine rooms and cargo areas
4. Industrial facilities with flammable liquid hazards

The advantages of low expansion foam include:

1. Good wetting and cooling properties: The low expansion ratio allows the foam to flow easily over surfaces, providing better wetting and cooling of the fuel surface and surrounding structures.
2. High resistance to re-ignition: The foam blanket created by low expansion foam is relatively stable and persistent, which helps prevent re-ignition of the fire.
3. Better visibility and access: Because the foam does not expand as much as medium or high expansion foams, firefighters have better visibility and access to the fire area.

However, low expansion foams may not be as suitable for fighting fires in confined spaces or fires involving water-soluble flammable liquids, such as alcohols, for which specialized alcohol-resistant foams are required.

We use on deck area, high expansion or low expansion (and for which location)?

On deck areas of ships, especially for firefighting purposes on cargo decks of tankers and gas carriers, low expansion foam is typically used. Low expansion foam is more suitable for outdoor and open spaces due to its superior wetting and cooling properties, ability to flow over surfaces, and its resistance to re-ignition.

High expansion foam is primarily used for firefighting in confined spaces, such as engine rooms, machinery spaces, or cargo holds. It is not recommended for use on open deck areas because it can be affected by wind and environmental factors, which can reduce its effectiveness.

In summary, low expansion foam is the preferred choice for deck areas, while high expansion foam is more suitable for confined spaces.

What is the requirement of fixed CO2 system? Explain the Capacity of CO2 system.

The requirements of a fixed CO2 system onboard ships are set by the International Maritime Organization (IMO) and the International Convention for the Safety of Life at Sea (SOLAS). The fixed CO2 system serves as a fire-extinguishing system, used to suppress fires in protected spaces such as engine rooms and cargo holds.

According to SOLAS Chapter II-2, Regulation 10, the main requirements for a fixed CO2 system are as follows:

1. Capacity: The system must have sufficient CO2 capacity to cover the largest protected space on the vessel. The minimum amount of CO2 required should be enough to provide a quantity of gas equal to:
    a. 30% of the gross volume of the largest protected space, assuming the space is completely filled with CO2 (without considering the volume of the machinery).
    b. 40% of the gross volume of the largest protected space, assuming the space is completely filled with CO2 (when considering the volume of the machinery).
2. Release time: The CO2 system must be capable of releasing the required amount of CO2 within two minutes.
3. Remote controls: Remote controls should be provided outside the protected space to release the CO2 into the space. The controls should be clearly marked and located at a safe distance from the risk area.

4. Alarms: Audible and visual alarms must be provided to alert personnel before the CO2 is released. The alarms should be activated before the release of CO2, allowing sufficient time for personnel to evacuate the space.
5. Means of escape: Clearly marked and easily accessible escape routes must be provided from the protected spaces.
6. Ventilation shutdown: Ventilation systems serving the protected spaces must be arranged to shut down automatically or manually before the release of CO2 to prevent the dilution of the CO2 concentration.
7. Distribution piping: The CO2 system must be equipped with distribution piping and nozzles to ensure uniform distribution of CO2 throughout the protected space.
8. Maintenance and inspection: The fixed CO2 system must be regularly inspected, maintained, and tested according to the manufacturer's recommendations and international regulations.
9. Instructions and diagrams: Clear instructions and diagrams for the operation of the CO2 system must be provided in the vicinity of the controls and in the ship's safety plan.

What is the procedure for Release of CO2 system for engine room?

Releasing the CO2 system for the engine room is a critical action taken in case of a fire. It is essential to follow the correct procedure to ensure the safety of the crew and the effectiveness of the CO2 system. Here is a general procedure for releasing the CO2 system for the engine room:

1. Fire detection: Upon detecting a fire in the engine room, raise the alarm to notify the crew and initiate the emergency response plan. Inform the bridge and the chief engineer immediately.
2. Muster the crew: Conduct a headcount to ensure all crew members are accounted for and have evacuated the engine room. Do not release the CO2 system until you have confirmed that no one is inside the engine room.
3. Shut down ventilation: Close all engine room ventilation flaps, dampers, and openings to prevent the dilution of the CO2 concentration and to minimize the spread of the fire.
4. Stop machinery: Shut down the main engine, generators, fuel pumps, and other machinery to minimize fuel supply and ignition sources.
5. Engage emergency stop: Activate the emergency stop for the engine room's fuel supply and machinery.
6. Pre-release warning: Sound the pre-release warning signal (both audible and visual alarms) to alert any remaining crew members that the CO2 system will be released.
7. Remote activation: Proceed to the CO2 release station, which should be located outside the engine room, and follow the instructions provided on the control panel or release mechanism. This may involve opening the CO2 release cabinet, breaking a glass panel, and pulling a release lever or pushing a release button.
8. Monitor the situation: After releasing the CO2, continue monitoring the engine room for any signs of fire, heat, or smoke. The CO2 discharge should be completed within two minutes. Check the pressure gauge in the CO2 room or CO2 release station to confirm successful discharge.
9. Ventilation and re-entry: Do not re-enter the engine room until it is safe to do so. Following a predetermined waiting period, ventilate the space to remove any remaining CO2 before allowing crew members to re-enter. Conduct a thorough inspection of the engine room to identify the cause of the fire and assess any damage.

LSA Code – Chapters:
The LSA Code, or the International Life-Saving Appliance Code, is a set of international regulations that establishes the technical standards for the life-saving equipment required on all ships. The LSA Code is divided into six chapters, which cover the following topics:

1. General requirements: This chapter provides the scope and purpose of the LSA Code, as well as definitions and general requirements for all life-saving appliances.
2. Personal life-saving appliances: This chapter sets out the requirements for personal life-saving appliances, including lifebuoys, immersion suits, lifejackets, and thermal protective aids.
3. Visual signals: This chapter details the requirements for visual signals, such as distress flares, smoke signals, and torches.
4. Survival craft: This chapter provides the requirements for the design, construction, and equipment of survival craft, including lifeboats, liferafts, and rescue boats.
5. Rescue boats: This chapter covers the requirements for rescue boats and their equipment.
6. Launching and embarkation appliances: This chapter provides the requirements for launching and embarkation appliances, such as davits and winches.

Chapter 3 of LSA Code (name):
Chapter 3 of the LSA Code is called "Life-saving appliances and arrangements", and it covers the requirements for various types of life-saving equipment and arrangements on board ships.

Chapter 5 of LSA Code (name):
Chapter 5 of the LSA Code is called "Lifeboat and rescue boat equipment", and it provides detailed guidance on the design, construction, and testing of lifeboats and rescue boats, as well as the equipment and appliances to be carried on board these boats.

Types of Life Boats:
There are several types of lifeboats, but the most common types are:

- Totally Enclosed Lifeboat (commonly known as the covered lifeboat)
- Open Lifeboat (commonly known as the partially covered lifeboat)
- Freefall Lifeboat (designed for emergency evacuation from offshore installations and ships)
- Rescue Boat (smaller boats used for rescue operations)

The choice of lifeboat type to be carried onboard a vessel depends on several factors, such as the type of vessel, the number of persons onboard, and the operating area of the vessel.

Monthly and Weekly Test of Lifeboat and Davit:
Regular testing and maintenance of lifeboats and their launching systems, such as

davits, are crucial for ensuring the safety of the crew onboard a ship. According to SOLAS regulations and guidelines, lifeboats and their associated equipment should undergo periodic inspections and tests.

Weekly tests and inspections:
1. Visual inspection: Check the lifeboat and its equipment for any visible damage, corrosion, or wear. Ensure that all equipment is in its designated place and properly secured.
2. Lifeboat engine: Start the lifeboat engine and let it run for a short period. This will help ensure that it remains in good working condition and is ready for use in an emergency.
3. Battery charging: Check the battery charging arrangements for the lifeboat engine and radio equipment to make sure they are functioning correctly.
4. Brake test: Perform a brake test on the winch to ensure it operates effectively.

Monthly tests and inspections:
1. Lifeboat lowering: Lower the lifeboat using the davit system to ensure smooth and proper operation. This test should be done with the lifeboat empty, crew inside, or with simulated crew weight, depending on your company's procedures and safety management system (SMS) requirements.
2. Lifeboat release gear: Test the lifeboat's release gear and ensure that it is functioning correctly. This test should be done without any crew inside the lifeboat, according to the latest regulations.
3. Davit and winch system: Inspect and test the davit and winch system, including the wires, sheaves, and blocks, to ensure their proper functioning and to identify any signs of wear or damage.
4. Lifeboat equipment inventory: Check the lifeboat's inventory to ensure that all required equipment is present, in good condition, and within the validity period (for items such as flares and pyrotechnics).

Static and Dynamic tests of lifeboat?

Static and dynamic tests are important procedures to ensure the safety and functionality of lifeboats and their launching equipment. These tests ensure that the lifeboat and its launching system can withstand the loads and stresses experienced during an emergency and provide a safe means of evacuation.

Static Test:

The static test evaluates the structural integrity and strength of the lifeboat and its launching equipment under a stationary load. During a static test, the lifeboat is loaded with a weight equivalent to the total capacity of occupants and equipment, and it is suspended using the davit system. The test ensures that the lifeboat, falls, davits, and other related components can support the total weight without any deformation or failure. This test confirms that the lifeboat and its launching equipment can safely carry the intended number of occupants and equipment during an emergency.

Dynamic Test:

The dynamic test assesses the performance of the lifeboat and its launching system under dynamic or moving conditions, simulating the forces experienced during an actual launch. The lifeboat is launched and recovered using the davit system, with the crew inside and/or additional weights equivalent to the total capacity of the lifeboat. This test ensures that the lifeboat can be safely launched and recovered under various

conditions, such as different angles of heel or trim of the ship, and that the onload release mechanism functions properly during the launch and recovery process.

Frequency of changing the lifeboat falls? Where is this mentioned?
According to the SOLAS (Safety of Life at Sea) regulations, lifeboat falls should be replaced at intervals not exceeding 5 years. This requirement is mentioned in Chapter III, Regulation 20, which deals with the operational readiness, maintenance, and inspections of life-saving appliances and arrangements.

Additionally, falls should be turned end-for-end at intervals not exceeding 2.5 years, which means that the ends of the falls connected to the lifeboat and the davit system are switched to ensure even wear and tear.

What are the Pyrotechnics in Lifeboat?
Pyrotechnics in lifeboats refer to distress signal devices used during emergency situations at sea, such as when the crew needs to abandon the ship or when the lifeboat is drifting and requires assistance. These pyrotechnic devices are an essential part of the lifeboat's emergency equipment, designed to attract attention and facilitate the rescue process.

According to SOLAS regulations, lifeboats must be equipped with the following pyrotechnic devices:
1. Rocket parachute flares: These flares are launched into the sky and reach a considerable height before deploying a parachute. The flare then descends slowly, emitting a bright, intense light that can be seen from a long distance. The slow descent allows for an extended period of visibility, increasing the chances of the distress signal being noticed by nearby vessels or rescue teams.
2. Hand flares: Hand flares are handheld devices that produce a bright, intense light when ignited. They are used for attracting attention at closer distances and can be helpful during the final stages of a rescue operation when the lifeboat is within visual range of a rescue vessel.
3. Smoke signals: Smoke signals are canister-type devices that emit dense, colored smoke when activated. They are designed to be used during daylight hours and can create a visible smoke trail that can be seen from a distance. The smoke signals help rescuers locate the lifeboat's position more easily.

How much Quantity of Pyrotechnics in Lifeboat?
According to SOLAS regulations (Chapter III, Regulation 32), the minimum quantities of pyrotechnic devices required in a lifeboat are as follows:
1. Rocket parachute flares: 12 units (for ships on short international voyages, a minimum of 6 units is required).
2. Hand flares: 6 units.
3. Smoke signals: 2 units (buoyant orange smoke signals).

What you check in the Pyrotechnics during Monthly inspection of Lifeboat?
During the monthly inspection of the lifeboat, you should check the following aspects

related to the pyrotechnics:

1. Expiry dates: Ensure that all pyrotechnic devices are within their validity period. Expired pyrotechnics may not work effectively, compromising the safety of the crew in an emergency.
2. Quantity: Verify that the required quantities of rocket parachute flares, hand flares, and smoke signals are present in the lifeboat, as per SOLAS regulations.
3. Storage: Check that the pyrotechnics are stored in a dry, safe, and easily accessible location, preferably inside a watertight container or a designated storage compartment. Proper storage helps prevent damage to the devices and ensures they are ready for use when needed.
4. Visual inspection: Examine the pyrotechnic devices for any signs of damage, corrosion, or moisture ingress. Damaged devices may not function correctly and should be replaced.
5. Inventory list: Ensure that the pyrotechnic devices are accounted for on the lifeboat's inventory list, which should be updated and kept inside the lifeboat.

Life boat/ fire drill frequency:

Lifeboat and fire drills are essential for ensuring the crew's preparedness and familiarization with emergency procedures and equipment. The frequency of these drills is determined by the International Convention for the Safety of Life at Sea (SOLAS) and might vary depending on the type of ship (cargo or passenger).

For cargo ships:

1. Lifeboat Drills: SOLAS Chapter III, Regulation 19.3.3 requires that lifeboat drills be conducted at least once every month. During these drills, the crew should practice various tasks, such as boarding, launching, maneuvering the lifeboat, and recovering the lifeboat. The entire crew should participate in the drill, and different scenarios should be considered.
2. Fire Drills: SOLAS Chapter II-2, Regulation 15.2.2 requires that fire drills be conducted at least once every month. These drills should include the use of firefighting equipment, donning of breathing apparatus, and the operation of emergency fire pumps. The entire crew should participate in the drill, and different scenarios should be considered.

For passenger ships:

1. Lifeboat Drills: SOLAS Chapter III, Regulation 19.3.2 requires that lifeboat drills be conducted at least once every week. Additionally, within 24 hours of the ship leaving a port, a lifeboat drill must be conducted for at least 100% of the crew who are newly assigned to the ship, as per Regulation 19.3.4.
2. Fire Drills: SOLAS Chapter II-2, Regulation 15.2.1 requires that fire drills be conducted at least once every week. These drills should include the use of firefighting equipment, donning of breathing apparatus, and the operation of emergency fire pumps. The entire crew should participate in the drill, and different scenarios should be considered.

Explain Onload release mechanism of lifeboats:

The onload release mechanism is a safety feature used in lifeboats to enable the safe and efficient launching and recovery of the boat during an emergency. It allows the lifeboat to be released from the ship's davit system while the boat is still under load,

meaning that the weight of the boat and its occupants are still supported by the falls (the wire ropes that connect the lifeboat to the davit).

The onload release mechanism consists of hooks, levers, and cables designed to engage and disengage the lifeboat from the falls. When the lifeboat is being launched, the hooks are connected to the falls, supporting the boat's weight as it is lowered into the water. Once the lifeboat is waterborne and the weight is transferred from the falls to the boat, the onload release mechanism can be activated.

To activate the onload release mechanism, the following steps are typically performed:

1. Ensure that all occupants are seated and secured in the lifeboat.
2. Confirm that the lifeboat is waterborne and that there is no significant weight on the falls.
3. Engage the release handle or lever inside the lifeboat, which is connected to the release mechanism through a set of cables or rods.
4. Upon activation, the hooks disengage from the falls, releasing the lifeboat and allowing it to move away from the ship.

The onload release mechanism is designed to minimize the risk of accidents during the launching process. It ensures that the lifeboat is securely attached to the falls throughout the descent and only released when it is safely in the water.

Stowage and Launching:
Stowage and launching arrangements for lifeboats are critical for ensuring their proper function during emergency situations. Lifeboats should be stowed in a location that allows them to be quickly and safely launched, while also being protected from damage and exposure to the elements. The launching arrangements should be tested regularly to ensure they are in good working condition and can be deployed quickly and safely. This includes checking the lifeboat engines and equipment, as well as the davits, falls, and other launch equipment. Proper training should be provided to crew members to ensure they are familiar with the lifeboat stowage and launching procedures and can respond effectively in an emergency.

Minimum distance rescue boat has to go:
There is no specific minimum distance that a rescue boat has to go as it depends on the particular situation and the judgment of the person in charge of the rescue operation. The primary goal is to ensure the safety of all persons involved and to minimize the risk of injury or loss of life. However, rescue boats should approach the scene with caution and maintain a safe distance to avoid any further damage or injury to the people involved. The International Maritime Organization (IMO) provides guidelines for rescue boat operations, including training, equipment, and procedures to be followed.

Requirement for lifebuoy:
Lifebuoys are an essential piece of lifesaving equipment that must be carried on board all ships to ensure the safety of the crew and passengers. The following are the requirements for lifebuoys on board ships:

1. Number: The number of lifebuoys required on a ship is determined based on the ship's tonnage and the number of persons on board.

2. Size: Lifebuoys must be of an approved type and size, with a minimum outside diameter of 700 mm.
3. Colour: Lifebuoys should be painted in a highly visible colour, such as international orange.
4. Markings: Lifebuoys must be clearly marked with the ship's name and port of registry.
5. Lights: Each lifebuoy must be fitted with a water-activated light to aid in location during darkness.
6. Attachments: Lifebuoys must be fitted with a strong and suitable attachment for securing a lifeline.
7. Stowage: Lifebuoys must be stowed in such a manner as to be easily accessible in an emergency, with at least two lifebuoys being placed on each side of the ship.

It's important to note that the exact requirements for lifebuoys may vary depending on the ship's flag state and the applicable international regulations.

Number of Life Raft on board:
The number of life rafts required on board a ship is determined based on the total number of persons on board (passengers and crew) and the capacity of the life raft. The SOLAS (Safety of Life at Sea) Convention sets the minimum capacity and number of life rafts that must be carried on board a vessel. The number and capacity of life rafts required will vary depending on the type and size of the ship. The number and capacity of life rafts required will be stated on the ship's safety certificate.

Marking on LifeRaft?
The markings on life rafts provide important information about the raft's capacity, manufacturing details, and SOLAS (International Convention for the Safety of Life at Sea) compliance. These markings may vary depending on the manufacturer and regulations, but they generally include the following information:
1. Capacity: One of the most important markings on a life raft is its capacity, indicating the maximum number of people the life raft is designed to accommodate. This is usually marked with the word "PERSONS" followed by a number.
2. Manufacturer's name or logo: The life raft typically displays the name or logo of the manufacturer, which can be helpful for identifying the raft's make and model.
3. Serial number: The life raft's serial number is a unique identifier assigned by the manufacturer, which can be used for tracking and maintenance purposes.
4. Date of manufacture: The life raft's manufacturing date is often marked on the raft, which is crucial for determining its service life and scheduling inspections or servicing.
5. SOLAS or regulatory compliance: Life rafts used on SOLAS-compliant vessels must meet specific requirements for design, construction, and performance. The life raft may display markings indicating that it meets SOLAS requirements or other applicable regulations, such as the logo of a classification society or a notation like "SOLAS" or "SOLAS A" or "SOLAS B" (depending on the type of life raft).
6. Inspection and servicing information: Life rafts must be regularly inspected and serviced according to the manufacturer's recommendations and regulatory requirements. The life raft may have markings indicating the date of the last inspection or service, as well as the next scheduled service.
7. Additional information: Some life rafts may include other markings or information,

such as instructions for use, emergency contact numbers, or safety features.

Liferaft carriage requirements as per Solas:
SOLAS (International Convention for the Safety of Life at Sea) sets out requirements for the carriage of liferafts on ships. The specific carriage requirements for liferafts are determined by the type and size of the ship, as well as the area of operation. In general, SOLAS requires that:

1. Every lifeboat and liferaft should be approved and constructed in accordance with the requirements of the regulations.
2. The ship must carry at least one life raft on each side of the ship, with a total capacity for all persons on board.
3. Each life raft must be stowed in a secure and accessible manner on the ship.
4. The liferafts must be capable of being launched with the ship making headway at speeds up to at least 5 knots in the fully loaded condition.
5. Liferafts must be fitted with a SOLAS A-pack, which contains equipment and supplies necessary for survival at sea.
6. Liferafts must be serviced and maintained in accordance with the manufacturer's instructions and SOLAS regulations.

The exact carriage requirements can vary based on the ship's size and type, the number of persons on board, and the intended voyage. It is important for ship operators to ensure that they are in compliance with all SOLAS requirements for liferafts to ensure the safety of their crew and passengers in the event of an emergency.

Ship Security

GMDSS Sea Area A2 carriage requirements:
The Global Maritime Distress and Safety System (GMDSS) provides for the communication of distress alerts and safety information among ships, aircraft, and rescue authorities. Sea Area A2 is a designated area of the ocean where VHF coverage is available. The carriage requirements for GMDSS equipment in Sea Area A2 include:

- Two VHF radios, each with DSC and an integral GNSS receiver
- Two portable VHF radios, each with DSC and an integral GNSS receiver
- Two radar transponders (SART)
- One EPIRB, with a manual release and an integral GNSS receiver
- One NAVTEX receiver
- One portable NAVTEX receiver

DSC Frequencies:
DSC (Digital Selective Calling) is a part of the GMDSS (Global Maritime Distress and Safety System) and is used to send automated digital calls for distress, urgency, and safety.
The DSC frequencies are:

- 2187.5 kHz - International distress and calling (telegraphy only)
- 4207.5 kHz - International distress and calling (telephony and telegraphy)
- 6312 kHz - Maritime safety and calling (telegraphy only)
- 8414.5 kHz - Maritime safety and calling (telephony and telegraphy)
- 12577 kHz - Maritime safety and calling (telegraphy only)

- 16804.5 kHz - Maritime safety and calling (telephony and telegraphy)

In sea area A2, ships must be fitted with an MF/HF DSC radio with the above frequencies.

ISPS and Certificate under ISPS:

ISPS stands for International Ship and Port Facility Security. It is a set of measures developed by the International Maritime Organization (IMO) to enhance the security of ships and port facilities. ISPS applies to all passenger ships, cargo ships over 500 gross tonnage, and mobile offshore drilling units operating internationally.

The following certificates are required under ISPS:

- Ship Security Certificate (SSC): It certifies that the ship has been designed, constructed, and maintained in compliance with the ISPS Code, and that appropriate security measures are in place.
- International Ship Security Certificate (ISSC): It is issued to the ship after an initial verification and confirms that the ship complies with the requirements of the ISPS Code.
- Port Facility Security Certificate (PFSC): It certifies that the port facility has been designed, constructed, and maintained in compliance with the ISPS Code, and that appropriate security measures are in place.

ISPS under which Chapter of SOLAS:

The International Ship and Port Facility Security (ISPS) Code is implemented under Chapter XI-2 of the International Convention for the Safety of Life at Sea (SOLAS). This chapter provides guidelines for the prevention and suppression of acts of terrorism against ships, as well as the protection of port facilities from such acts. The ISPS Code sets out a comprehensive set of measures for enhancing maritime security, including the roles and responsibilities of governments, shipping companies, and port authorities.

ISC Dimensions:

- ISC refers to International Shore Connection, which is a standardized fire hydrant fitting found at ports and terminals for use by the fire brigade in case of an emergency.
- The ISC is typically located on the quay, and it allows the fire brigade to connect their hoses to the ship's fire main system. The ISC consists of a male and female coupling, which are designed to fit together with the ship's fire hoses.
- The dimensions of the ISC are standardized to ensure compatibility with different types of ships and hoses. The standard dimensions for the ISC are:
    - Male couplings: 178 mm (7 inches) in diameter, with 8 threads per inch
    - Female couplings: 184 mm (7.25 inches) in diameter, with 8 threads per inch
- The ISC should be clearly marked with its size and thread type, and it should be regularly inspected and maintained to ensure that it is in good working condition in case of an emergency.

Explain Loadline Convention:
The International Convention on Load Lines, commonly known as the Load Line Convention, is a set of regulations and guidelines aimed at ensuring the safety of ships by determining the minimum allowable freeboard (the vertical distance between the waterline and the upper edge of the deck). The Convention was adopted by the International Maritime Organization (IMO) in 1966 and entered into force in 1968.

The primary purpose of the Load Line Convention is to prevent overloading of ships, which can compromise their stability, increase the risk of capsizing, and endanger the crew, the cargo, and the environment. The Convention outlines the rules for determining the appropriate load lines for different types of ships, taking into account various factors such as the ship's size, structure, and the season and area of operation.

Key aspects of the Load Line Convention include:
1. Load Line Marks: The Convention establishes a system of load line marks that are placed on the ship's hull to indicate the maximum allowable draft (depth in the water) under various conditions. The marks include the Plimsoll line, which represents the maximum draft in temperate waters, as well as additional lines for tropical, freshwater, and winter conditions.
2. Freeboard: The Convention specifies the minimum allowable freeboard for different types and sizes of ships, ensuring that they have adequate reserve buoyancy and are less prone to being swamped by waves or sinking due to overloading.
3. Reserve buoyancy and stability: The Convention includes provisions related to reserve buoyancy, such as requirements for watertight doors, hatch covers, and other openings in the hull, to ensure that the ship remains stable and afloat in the event of damage or flooding.
4. Surveys and certification: The Convention mandates regular surveys of ships to verify their compliance with load line requirements. These surveys are conducted by the flag state or a recognized organization on its behalf. Upon successful completion of the survey, the ship is issued an International Load Line Certificate, which is valid for a period of five years, subject to annual inspections.

What checks are done in a Loadline Survey?
A Load Line Survey is conducted to ensure that a ship complies with the International Convention on Load Lines' safety regulations. These surveys are carried out by the flag state or a recognized organization on its behalf. The main goal of a Load Line Survey is to verify the ship's condition, structural integrity, and the proper functioning of equipment related to load line requirements.

During a Load Line Survey, the surveyor will typically perform the following checks:
1. Load Line Marks: Verify the position and visibility of the load line marks, ensuring they are correctly placed and painted on the ship's hull according to the ship's assigned freeboard.
2. Hull Structure: Inspect the ship's hull structure, including the watertight integrity of the shell plating, bulkheads, and other structural elements.
3. Hatch Covers: Examine hatch covers, coamings, and other closing appliances for watertightness and proper operation. This may include checking gaskets, securing devices, and drainage arrangements.
4. Watertight Doors: Inspect watertight doors, ensuring they are in good condition,

properly maintained, and operate correctly.
5. Ventilators, Air Pipes, and Openings: Check the condition and operation of ventilators, air pipes, and other openings in the ship's hull, ensuring they have appropriate closing appliances and meet watertightness requirements.
6. Scuppers, Discharges, and Overboard Pipes: Inspect scuppers, discharges, and overboard pipes to ensure they are in good condition, fitted with non-return valves, and have means for closing when necessary.
7. Guardrails, Bulwarks, and Storm Rails: Examine guardrails, bulwarks, and storm rails to ensure they are in good condition and provide adequate protection for crew members.
8. Freeing Ports: Verify the correct size and operation of freeing ports, which allow water to drain from the deck quickly.
9. Gangways and Accommodation Ladders: Inspect gangways and accommodation ladders for safety, ensuring they are in good condition and appropriately stowed or secured when not in use.
10. Documentation: Review the ship's plans, manuals, and records to ensure they are up to date and comply with load line regulations.

Name SOLAS Chapter XI, What are the equipments under it?

SOLAS Chapter XI is divided into two parts: Chapter XI-1 (Special Measures to Enhance Maritime Safety) and Chapter XI-2 (Special Measures to Enhance Maritime Security).

Chapter XI-1 focuses on special measures to enhance maritime safety and covers the following regulations:
1. Regulation 1: Authorization of recognized organizations
2. Regulation 2: Enhanced surveys
3. Regulation 3: Ship identification number scheme
4. Regulation 4: Port State control on operational requirements
5. Regulation 5: Continued operation of passenger ships

Chapter XI-1 does not directly list specific equipment but focuses on the authorization, inspection, and survey processes to enhance maritime safety.

Chapter XI-2, on the other hand, deals with special measures to enhance maritime security, and the main equipment and systems covered under this chapter are related to the International Ship and Port Facility Security (ISPS) Code. The ISPS Code outlines various security measures, procedures, and equipment to be implemented on ships and in port facilities. Some of the equipment and systems covered under the ISPS Code include:
1. Ship Security Alert System (SSAS): A system that allows the ship to send a security alert to a designated authority in case of a security threat.
2. Access control systems: Measures to prevent unauthorized access to the ship, including identification systems, security barriers, and surveillance equipment.
3. Security communication systems: Equipment for secure communication between the ship and port facilities or other ships.
4. Surveillance equipment: CCTV systems, alarms, and sensors to monitor and detect potential security threats.

How to test EPIRB Onboard?

To test an EPIRB on board, follow these steps:

1. Consult the manufacturer's manual: Before testing the EPIRB, review the manufacturer's manual to understand the specific testing procedures and precautions for your particular model.
2. Notify the bridge: Inform the officer on watch on the bridge that you will be conducting an EPIRB test to avoid any confusion in case they receive a distress signal.
3. Test mode: Locate the test switch or button on the EPIRB. Most EPIRBs have a dedicated test mode, often labeled as "TEST" or "Self-Test," which allows you to perform a test without actually transmitting a distress signal.
4. Perform the test: Activate the test mode by pressing the test button or following the manufacturer's instructions. The EPIRB should emit a short signal or beep and display an indicator light (usually green) to confirm that the test has been successful. Some models may also provide a summary of the test results, such as battery life and GPS functionality.
5. Check the results: Ensure that the test has been successful and that there are no issues with the EPIRB's functionality. If the test fails or indicates a problem, consult the manufacturer's manual for troubleshooting steps or contact the manufacturer for assistance.
6. Record the test: Document the test results, including the date and time of the test, in the ship's logbook or maintenance records as per your company's safety management system (SMS) procedures.
7. Reset the EPIRB: After the test is complete, reset the EPIRB according to the manufacturer's instructions to ensure it is ready for use in case of an emergency.

Maritime Environmental Protection and Pollution Prevention

Marpol Annexes:

MARPOL (short for "marine pollution") is an international convention for the prevention of pollution from ships. It consists of six annexes that regulate different types of marine pollution. The annexes are:

1. Annex I - Regulations for the Prevention of Pollution by Oil
2. Annex II - Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk
3. Annex III - Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form
4. Annex IV - Prevention of Pollution by Sewage from Ships
5. Annex V - Prevention of Pollution by Garbage from Ships
6. Annex VI - Prevention of Air Pollution from Ships

Machinery space discharge criteria:

According to MARPOL Annex I, Regulation 14, the discharge of oily mixtures (bilge water, oil residues, etc.) from a ship's machinery spaces is permitted only if the following criteria are met:

1. The ship is proceeding en route.
2. The oil content of the effluent without dilution does not exceed 15 parts per million (ppm).
3. The ship is equipped with an oil filtering equipment (also known as an oily water

separator or OWS) that is approved and maintained as per the guidelines set by the International Maritime Organization (IMO) and the ship's flag state.
4. The discharge is made at least 12 nautical miles from the nearest land for ships constructed before 1st January 2005, and at least 3 nautical miles from the nearest land for ships constructed on or after 1st January 2005.
5. The oily mixture is not mixed with cargo residues or cargo pump room bilges.
6. The ship maintains an Oil Record Book, where all discharges, accidental spills, and other relevant operational activities are accurately recorded.

SMPEP:

The Shipboard Marine Pollution Emergency Plan (SMPEP) is a document required by the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I, Regulation 37. It provides a detailed plan and guidelines for the ship's crew to follow in case of an emergency involving oil or noxious liquid substances pollution.

The main objective of the SMPEP is to minimize the environmental impact of any accidental discharge of oil or noxious liquid substances by providing clear instructions and procedures for the ship's crew to follow during an emergency. The plan also aids in prompt and efficient communication and coordination with the relevant authorities and organizations during such incidents.

The SMPEP typically includes the following components:
1. Introduction: An overview of the purpose and objectives of the plan, as well as the ship's general information and relevant pollution prevention certificates.
2. Pollution incident reporting procedures: Detailed guidelines on how to report a pollution incident, including the relevant contact details for coastal authorities, flag state administration, and other relevant organizations.
3. Steps for initial response: Instructions for the ship's crew to follow immediately after discovering a pollution incident, including actions to control the source of the discharge, minimize pollution, and ensure crew safety.
4. Shipboard pollution emergency response resources: A list and description of the ship's pollution prevention equipment and resources, such as oil spill containment and recovery equipment, personal protective equipment, and emergency response team members.
5. External assistance and coordination: Information on obtaining external assistance, such as contacting oil spill response organizations (OSROs) and coordinating with coastal authorities.
6. Relevant ship's plans and diagrams: Detailed ship's plans and diagrams that are relevant to pollution incidents, including the location of pollution prevention equipment, cargo tanks, ballast tanks, and piping systems.
7. Training and drills: Guidelines for conducting regular training and drills to ensure that the ship's crew is well-prepared to respond to pollution emergencies.
8. Recordkeeping: Procedures for maintaining records of pollution incidents, response actions, and drills.

Discharge criteria as MARPOL Annex II:

Annex II of the International Convention for the Prevention of Pollution from Ships (MARPOL) deals with the control of pollution by noxious liquid substances carried in bulk. It establishes discharge criteria for noxious liquid substances to minimize their

impact on the marine environment. The discharge criteria are based on a categorization system, where substances are divided into four categories: X, Y, Z, and OS (Other Substances).

The discharge criteria for each category are as follows:

1. Category X: Substances in this category are considered to present a major hazard to the marine environment. The discharge of these substances is prohibited, and they must be offloaded to a reception facility at the port.
2. Category Y: Substances in this category present a hazard to the marine environment but are less harmful than Category X substances. The discharge of Category Y substances is allowed only under the following conditions:
   - The ship must be proceeding en route.
   - The discharge must take place at a distance of at least 12 nautical miles from the nearest land.
   - The discharge rate must not exceed the rate specified in the ship's Procedures and Arrangements (P&A) Manual.
   - The instantaneous rate of discharge of the substance must not exceed a certain limit, typically determined by the ship's speed and the substance's discharge rate.
3. Category Z: Substances in this category present a minor hazard to the marine environment. The discharge of Category Z substances is allowed under the following conditions:
   - The ship must be proceeding en route.
   - The discharge must take place at a distance of at least 12 nautical miles from the nearest land.
   - The discharge rate must not exceed the rate specified in the ship's P&A Manual.
   - The total quantity of the substance discharged into the sea must not exceed 1% of the total quantity of the substance onboard the ship.
4. Other Substances (OS): These substances are considered to present a low risk to the marine environment. The discharge of OS substances is allowed under the following conditions:
   - The ship must be proceeding en route.
   - The discharge must take place at a distance of at least 12 nautical miles from the nearest land.
   - The discharge rate must not exceed the rate specified in the ship's P&A Manual.

Explain Marpol Annex 1, reg 14/14.7:

MARPOL Annex I is related to the prevention of pollution by oil from ships. Regulation 14 specifically deals with the oil filtering equipment on board.

Regulation 14.7 states the following:

"Any ship of 400 gross tonnage and above but less than 10,000 gross tonnage, which is delivered on or after 1 June 2007, as defined in regulation 1.28.4, shall comply with paragraph 4.4 of this regulation. Any ship of 400 gross tonnage and above but less than 10,000 gross tonnage, which is delivered before 1 June 2007, as defined in regulation 1.28.4, shall comply with paragraph 4.4 of this regulation not later than the first annual survey on or after 1 June 2007 but in no case later than 31 May 2008."

In this regulation, paragraph 4.4 refers to the following requirement:

"Subject to the provisions of regulation 19 of this Annex, any ship of 400 gross tonnage and above but less than 10,000 gross tonnage, shall be fitted with a 15 ppm bilge separator, bilge alarm and bilge-water holding tank as follows:

1. In the case of a ship of 400 gross tonnage and above but less than 5,000 gross tonnage, the bilge-water holding tank shall have a capacity sufficient for the retention of the oily bilge water mixture that, under normal operational conditions, would accumulate in machinery spaces during the time period between scheduled visits to a reception facility, or as required by the Administration;
2. In the case of a ship of 5,000 gross tonnage and above but less than 10,000 gross tonnage, the bilge-water holding tank shall have a capacity sufficient for the retention of the oily bilge water mixture that, under normal operational conditions, would accumulate in machinery spaces during the time period between scheduled visits to a reception facility, or as required by the Administration, but in no case less than 0.1% of the total tonnage of the ship."

In summary, Regulation 14.7 of MARPOL Annex I require ships of 400 gross tonnage and above but less than 10,000 gross tonnage to be fitted with a 15 ppm (parts per million) bilge separator, bilge alarm, and bilge-water holding tank, with specific capacity requirements depending on the ship's gross tonnage.

MARPOL Annex IV:

Annex IV of the International Convention for the Prevention of Pollution from Ships (MARPOL) specifically deals with the prevention of pollution by sewage from ships. The Annex sets regulations for the control and discharge of sewage to protect the marine environment and reduce the potential harmful effects of sewage on aquatic life, human health, and water quality.

Key provisions of Annex IV include:

1. Equipment requirements: Ships of 400 gross tonnage and above, as well as ships certified to carry more than 15 persons, are required to be equipped with either a sewage treatment plant, a comminuting and disinfecting system, or a sewage holding tank. The equipment must be approved according to IMO guidelines and meet specific performance standards.
2. Discharge regulations: Annex IV sets rules for the discharge of sewage from ships depending on the type of equipment installed and the ship's location:
   - Treated sewage can be discharged more than 3 nautical miles from the nearest land if the ship is equipped with an approved sewage treatment plant that meets the operational requirements.
   - Comminuted and disinfected sewage can be discharged more than 3 nautical miles from the nearest land, provided that the process does not result in the presence of visible floating solids or cause discoloration of the surrounding water.
   - Untreated sewage can only be discharged more than 12 nautical miles from the nearest land and at a minimum speed of 4 knots.
3. Special areas: Annex IV designates certain "special areas" where more stringent discharge regulations apply due to their ecological sensitivity and vulnerability to pollution. In these areas, ships are generally prohibited from discharging sewage, whether treated or untreated, unless they have an approved sewage treatment plant

that meets even stricter standards.
4. Reception facilities: Ports are required to provide adequate reception facilities for the reception of sewage from ships, ensuring that they can dispose of their sewage in an environmentally friendly manner without discharging it into the sea.
5. Certificates and record-keeping: Ships subject to Annex IV are required to have an International Sewage Pollution Prevention (ISPP) Certificate, issued by their flag administration or a recognized organization. They must also maintain a record of sewage discharges, equipment maintenance, and other relevant information.

By regulating the discharge of sewage from ships and setting equipment requirements, Annex IV of MARPOL aims to minimize the environmental impact of sewage pollution on the world's oceans and protect marine ecosystems.

Discharge criteria of sewage:
The discharge criteria for sewage under Annex IV of the International Convention for the Prevention of Pollution from Ships (MARPOL) depend on the type of sewage treatment system installed on the ship and the vessel's distance from the nearest land. The regulations are designed to minimize the environmental impact of sewage discharge on the marine environment.

The discharge criteria for sewage are as follows:
1. Treated sewage:
   - Ships equipped with an approved sewage treatment plant can discharge treated sewage at a distance of more than 3 nautical miles from the nearest land, provided the treatment plant meets the operational requirements set by Annex IV.
2. Comminuted and disinfected sewage:
   - Ships equipped with a comminuting and disinfecting system can discharge comminuted and disinfected sewage at a distance of more than 3 nautical miles from the nearest land, provided the discharge does not result in the presence of visible floating solids or cause discoloration of the surrounding water.
3. Untreated sewage:
   - Ships not equipped with a treatment plant or comminuting and disinfecting system can only discharge untreated sewage at a distance of more than 12 nautical miles from the nearest land. Additionally, the ship must be traveling at a minimum speed of 4 knots during the discharge process.

In addition to these general criteria, stricter discharge regulations apply in designated "special areas" due to their ecological sensitivity and vulnerability to pollution. In these areas, ships are generally prohibited from discharging any sewage, whether treated or untreated, unless they have an approved sewage treatment plant that meets even higher standards.

Define: Special Area
A Special Area, as defined by the International Convention for the Prevention of Pollution from Ships (MARPOL), is a sea area with specific ecological, socio-economic, or scientific significance. These areas are recognized for their vulnerability to maritime pollution, and therefore, more stringent discharge criteria and regulations apply within

their boundaries to protect the marine environment.

MARPOL Annexes I, II, IV, and V specify different Special Areas and the additional measures that apply to each of them:

1. Annex I (Prevention of Pollution by Oil): In Special Areas, the discharge of oil or oily mixtures from ships is prohibited, with certain exceptions such as specific equipment failure or damage. The Special Areas under Annex I include the Mediterranean Sea, Baltic Sea, Red Sea, Gulf area, Black Sea, Antarctic area, and the North West European waters.
2. Annex II (Control of Pollution by Noxious Liquid Substances in Bulk): In Special Areas, the discharge of noxious liquid substances or mixtures containing such substances is subject to more stringent restrictions than in other areas. The Special Areas under Annex II include the Antarctic area and the Baltic Sea.

3. Annex IV (Prevention of Pollution by Sewage from Ships): In Special Areas, the discharge of sewage from ships is generally prohibited, unless it has been treated by an approved sewage treatment plant and meets specific effluent standards. The Special Areas under Annex IV include the Baltic Sea.
4. Annex V (Prevention of Pollution by Garbage from Ships): In Special Areas, the disposal of most types of garbage is strictly prohibited. The Special Areas under Annex V include the Mediterranean Sea, Baltic Sea, North Sea, Wider Caribbean Region, Gulf of Mexico, Black Sea, Red Sea, Antarctic area, and the Persian Gulf.

To ensure compliance with the stricter regulations in Special Areas, ships must be equipped with the necessary pollution prevention equipment and have established procedures and crew training to manage waste and discharges properly.

SOPEP Equipments with quantity:

SOPEP stands for Shipboard Oil Pollution Emergency Plan. The equipment required for SOPEP varies based on the ship size and type, but the general equipment that should be available on board a ship includes:

- Oil spill dispersant
- Oil containment booms
- Oil skimmers
- Oil absorbent pads
- Oil transfer pump
- Shovels, brooms, buckets, and bags for cleaning the spilled oil
- Heavy-duty gloves, protective clothing, and safety goggles
- Fire extinguishers, explosion-proof lighting, and ventilation equipment
- Portable communication equipment

The quantity of each of the above equipment required on board the ship is determined by the flag state and the type of vessel. The SOPEP plan also specifies the locations where the equipment should be stored and the procedures for deploying and using the equipment in case of an oil spill emergency.

Explain Marpol Annex VI:

MARPOL Annex VI, titled "Regulations for the Prevention of Air Pollution from Ships,"

is a part of the International Convention for the Prevention of Pollution from Ships (MARPOL) that specifically addresses air pollution generated by maritime vessels. The purpose of Annex VI is to establish regulations and limits to reduce harmful emissions from ships, thereby minimizing their impact on air quality and the environment.

Key aspects of MARPOL Annex VI include:

1. Sulfur Oxides (SOx) Emissions: Regulation 14 sets limits on the sulfur content of fuel oil used on board ships. The global sulfur cap is set at 0.50% m/m (mass by mass) since January 1, 2020. In Emission Control Areas (ECAs), the sulfur cap is even stricter, set at 0.10% m/m.
2. Nitrogen Oxides (NOx) Emissions: Regulation 13 addresses NOx emissions from marine diesel engines. It introduces a tiered approach to limit NOx emissions depending on the engine's maximum operating power and the ship's construction date. The most stringent limit, Tier III, applies to ships operating in NOx Emission Control Areas.
3. Ozone-Depleting Substances: Regulation 12 prohibits the use of ozone-depleting substances on ships, including halon and chlorofluorocarbons (CFCs), which are commonly found in refrigeration and fire suppression systems.
4. Volatile Organic Compounds (VOCs): Regulation 15 requires ships with a capacity of 150 gross tons or more carrying crude oil to have a vapor emission control system to limit VOC emissions during loading and unloading operations.
5. Shipboard Incineration: Regulation 16 prohibits the incineration of specific substances on board ships, such as polychlorinated biphenyls (PCBs) and garbage containing heavy metals.
6. Energy Efficiency: Regulation 22 requires ships to have an International Energy Efficiency Certificate (IEEC) and implement a Ship Energy Efficiency Management Plan (SEEMP) to improve energy efficiency and reduce greenhouse gas emissions.
7. Fuel Oil Quality and Reporting: Regulation 18 sets the requirements for fuel oil quality, including prohibiting the use of fuel oil with harmful substances. It also establishes reporting mechanisms for non-compliant fuel oil and requires ships to have a bunker delivery note (BDN) and representative fuel oil samples.

MARPOL Annex VI is enforced by flag states and port states through inspections and monitoring. Non-compliant ships can face penalties, such as fines, detention, or being banned from entering certain ports. Compliance with Annex VI is essential for ensuring environmental protection and sustainable shipping practices.

Certificates required under Marpol?

MARPOL (International Convention for the Prevention of Pollution from Ships) is a set of regulations designed to minimize pollution from ships, both accidental and operational. There are several certificates required under different MARPOL Annexes to ensure that ships comply with these regulations:

1. International Oil Pollution Prevention (IOPP) Certificate: Required under MARPOL Annex I (prevention of pollution by oil), this certificate is issued after a survey is conducted to verify that the ship complies with the oil pollution prevention requirements.
2. International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (NLS Certificate): Required under MARPOL Annex II (noxious liquid substances carried in bulk), this certificate is issued after a survey is conducted to verify that the ship complies with pollution prevention requirements for the carriage of noxious liquid substances in bulk.

3. International Sewage Pollution Prevention (ISPP) Certificate: Required under MARPOL Annex IV (prevention of pollution by sewage from ships), this certificate is issued after a survey is conducted to verify that the ship complies with the sewage pollution prevention requirements.
4. International Air Pollution Prevention (IAPP) Certificate: Required under MARPOL Annex VI (prevention of air pollution from ships), this certificate is issued after a survey is conducted to verify that the ship complies with the air pollution prevention requirements, including engine emissions and fuel quality standards.
5. International Energy Efficiency (IEE) Certificate: Also required under MARPOL Annex VI, this certificate is issued after a survey is conducted to verify that the ship complies with the energy efficiency requirements, including the Energy Efficiency Design Index (EEDI) for new ships and the Ship Energy Efficiency Management Plan (SEEMP) for all ships.
6. International Garbage Pollution Prevention Certificate: Although not a mandatory certificate under MARPOL, some flag states may require this certificate for their ships. It demonstrates compliance with MARPOL Annex V (prevention of pollution by garbage from ships).

These certificates are issued by the ship's flag state or an authorized recognized organization (RO) on behalf of the flag state. Ships must carry these certificates on board to demonstrate compliance with MARPOL regulations during inspections and port state control checks.

Documents required under Marpol?

Under the various MARPOL Annexes, there are several documents and records that ships are required to maintain to demonstrate compliance with pollution prevention regulations. Some of the key documents include:

1. Oil Record Book (Part I and Part II): Required under MARPOL Annex I (prevention of pollution by oil). Part I is for machinery space operations, and Part II is for cargo and ballast operations on oil tankers. These books record all operations related to oil transfer, disposal, and discharge.
2. Cargo Record Book: Required under MARPOL Annex II (noxious liquid substances carried in bulk). This book records all operations related to the loading, discharging, and disposal of noxious liquid substances in bulk.
3. Garbage Management Plan and Garbage Record Book: Required under MARPOL Annex V (prevention of pollution by garbage from ships). The Garbage Management Plan provides guidelines for the collection, storage, and disposal of garbage on board, while the Garbage Record Book records all disposal and incineration operations.
4. Sewage Treatment Plant Manual and/or Sewage Discharge Record Book: Required under MARPOL Annex IV (prevention of pollution by sewage from ships). The Sewage Treatment Plant Manual provides information on the operation and maintenance of the ship's sewage treatment system, while the Sewage Discharge Record Book records all sewage discharges.
5. Bunker Delivery Note (BDN): Required under MARPOL Annex VI (prevention of air pollution from ships). The BDN provides information on the quantity and quality of the bunker fuel supplied to the ship, including sulfur content, and must be retained on board for at least three years.
6. Ship Energy Efficiency Management Plan (SEEMP): Also required under MARPOL Annex VI, the SEEMP is a ship-specific plan that outlines measures to improve the energy efficiency and reduce greenhouse gas emissions of the ship.

7. Fuel Oil Non-Availability Report (FONAR): Under MARPOL Annex VI, if a ship is unable to obtain compliant fuel oil, a FONAR must be submitted to the relevant authorities to report the non-availability of compliant fuel.
8. Ozone-Depleting Substances (ODS) Record Book: Also required under MARPOL Annex VI, this book records the use and disposal of ODS on board the ship.
9. International Air Pollution Prevention (IAPP) Technical File: Required under MARPOL Annex VI, this document contains technical information related to the ship's compliance with air pollution prevention regulations, including engine emission limits and exhaust gas cleaning systems.

Explain SEEMP:

SEEMP stands for Ship Energy Efficiency Management Plan. It is a ship-specific plan designed to optimize the energy efficiency of a ship's operation, helping to reduce greenhouse gas emissions, improve air quality, and minimize the environmental impact of shipping. The SEEMP was introduced as part of the amendments to MARPOL Annex VI, and the guidelines for its development were adopted by the International Maritime Organization (IMO) through MEPC.213(63) resolution.

The main purpose of SEEMP is to:

1. Establish a systematic approach for managing the energy efficiency of a ship's operation.
2. Provide a practical framework for monitoring, measuring, and continuously improving energy efficiency.
3. Facilitate compliance with relevant regulations and industry best practices.
4. Raise awareness among the crew and shore staff about energy-efficient practices and their benefits.

A SEEMP should contain the following key elements:

1. Energy Efficiency Operational Indicator (EEOI): The EEOI is a performance indicator that measures the efficiency of the ship's operation in terms of CO2 emissions per unit of transport work. It is used to monitor the ship's performance over time and evaluate the effectiveness of energy efficiency measures.
2. Energy efficiency measures: The SEEMP should include a list of energy efficiency measures applicable to the specific ship, such as optimized voyage planning, improved hull and propeller maintenance, and efficient use of engines and auxiliary equipment.
3. Implementation: The SEEMP should outline the procedures and responsibilities for implementing the energy efficiency measures, including the roles of the crew, the ship's management, and the ship owner or operator.
4. Monitoring and self-evaluation: The SEEMP should include a system for monitoring the ship's performance, measuring the effectiveness of the energy efficiency measures, and identifying areas for improvement.
5. Record-keeping and documentation: The SEEMP should provide guidelines for maintaining records of the ship's performance, energy efficiency measures, and related activities, as well as for reporting the results to the ship owner, operator, and relevant authorities.
6. Training and awareness: The SEEMP should include provisions for training the crew and shore staff in energy-efficient practices and raising awareness of the benefits of energy efficiency.

Explain Biofouling substances:
Biofouling refers to the accumulation of microorganisms, plants, algae, and small animals on submerged surfaces, such as the hulls of ships, underwater structures, and submerged parts of marine equipment. Biofouling can negatively impact the environment, increase fuel consumption, and affect the performance of vessels and equipment.
Biofouling management:
1. Shipowners and operators should implement effective biofouling management strategies to minimize the negative impact of biofouling on vessel performance and the environment. Some of these strategies include:
2. Regular hull cleaning: Periodic cleaning of the hull to remove biofouling can reduce drag, improve fuel efficiency, and minimize the risk of transferring invasive species between different ecosystems.
3. Antifouling coatings: Applying antifouling coatings to the hull can help prevent or slow down the accumulation of biofouling. These coatings can be copper-based, self-polishing, or use other biocide technologies to deter the growth of organisms.
4. In-water cleaning systems: Using remotely operated vehicles or divers to clean the hull while the ship is in the water can be an effective biofouling management strategy. This approach should be conducted with caution, considering local regulations and environmental concerns.

Explain Biodegradable substances:
Biodegradable substances are materials that can be broken down by microorganisms into simpler, non-toxic compounds over time, reducing their environmental impact. These substances are often considered more environmentally friendly alternatives to traditional materials that persist in the environment and contribute to pollution.
Biodegradable substances in the maritime industry:
1. Biodegradable substances can be used in various applications in the maritime industry to minimize the environmental impact of shipping operations. Some examples include:
2. Biodegradable lubricants and hydraulic fluids: Using biodegradable lubricants and hydraulic fluids can help minimize the impact of accidental spills or leaks on the environment. These fluids can break down into non-toxic compounds over time, reducing their persistence in the environment.
3. Biodegradable cleaning agents: Choosing biodegradable cleaning agents for ship maintenance can help reduce the environmental impact of cleaning activities. These products can break down into non-toxic compounds, reducing the risk of water pollution.
4. Biodegradable garbage bags and packaging materials: Using biodegradable materials for packaging and waste disposal can help reduce the accumulation of plastic waste in the marine environment. These materials can break down over time, minimizing their environmental footprint.

Define Garbage:
Garbage, as defined by MARPOL Annex V (Prevention of pollution by garbage from ships), refers to all kinds of solid wastes generated on board ships, including but not limited to:
1. Food wastes: Any waste from the preparation, cooking, or consumption of food on

board, including fish and meat waste.
2. Plastics: Any synthetic or semi-synthetic organic polymer, such as bags, containers, and packaging materials.
3. Domestic wastes: Any waste from living quarters on board, such as paper, cardboard, and rags.
4. Cooking oil: Any used cooking oil from the galley.
5. Incinerator ashes: Any ashes generated from the incineration of garbage on board.
6. Operational wastes: Any waste generated during the operation of the ship, such as cleaning materials, paint chips, and wire ropes.

The definition of garbage also includes substances classified as harmful to the marine environment (HME), which include any substance that is toxic, harmful, persistent, or bio-accumulative in the marine environment, such as cleaning agents and pesticides.

It is important to note that certain types of waste, such as sewage, are not considered garbage under MARPOL Annex V and are subject to separate regulations under MARPOL Annex IV (Prevention of pollution by sewage from ships).

BWM Enforce Date:
The enforcement date for the Ballast Water Management (BWM) Convention was on September 8, 2017, three years after its entry into force on September 8, 2014. The BWM Convention aims to prevent the spread of harmful aquatic organisms from one region to another through ships' ballast water and sediment. It sets standards for the management and treatment of ballast water and requires all ships to carry a Ballast Water Management Plan (BWMP) and a Ballast Water Record Book (BWRB) to record all relevant activities related to ballast water management.

Naval Architecture

Name of strake beside keel plate?
The strake, or row of steel plates, located immediately adjacent to the keel plate is called the "garboard strake." The garboard strake runs along the entire length of the ship's hull on both sides of the keel and plays a crucial role in providing strength and stability to the ship's structure. It forms the first line of shell plating above the keel and connects the ship's bottom structure to the side shell plating.

What is duct keel, length of duct keel?
A duct keel is a longitudinal structural member that extends the full length of a ship, generally located at the bottom of the hull, running along the centerline. The duct keel provides added strength and stiffness to the ship's hull, and also helps to reduce drag and improve the ship's stability.
The length of a duct keel will depend on the size and type of the ship. In general, larger ships will have longer duct keels. The length of the duct keel is typically measured in meters or feet and can range from a few meters to over 100 meters, depending on the size of the ship.

Where the Bow Thrusters are located?
Bow thrusters are located at the forward end of a ship, close to the bow. They are typically installed in a transverse tunnel that runs through the hull, with the thruster unit itself positioned inside the tunnel. The tunnel has openings on both sides of the hull, allowing water to be drawn in and expelled as the thruster operates.

What are the uses of Bow Thrusters?
Bow thrusters are used to improve a ship's maneuverability, particularly at low speeds and during docking or undocking procedures. They provide lateral (sideways) thrust, allowing the vessel to move sideways or turn more easily without relying solely on the main propulsion system and rudder. Some key uses of bow thrusters include:

1. Docking and undocking: Bow thrusters are especially useful during docking and undocking procedures, when precise control of the vessel's movement is required. They allow the ship to move sideways towards or away from the dock, making it easier to position the vessel accurately and safely.
2. Maneuvering in tight spaces: In harbors, canals, or other confined spaces, bow thrusters can help the ship navigate more effectively by providing better control over the vessel's movement.
3. Maintaining position: Bow thrusters can be used to help maintain the ship's position when strong winds, currents, or other factors are pushing the vessel off course. By generating lateral thrust, bow thrusters counteract these external forces and help the ship stay in the desired position.
4. Turning assistance: Bow thrusters can assist in turning the vessel more quickly or with a smaller turning radius, especially when the ship is operating at low speeds or in reverse.
5. Dynamic positioning: In certain vessels, such as offshore supply vessels, bow thrusters may be part of a dynamic positioning system, which helps maintain the ship's position and heading without using anchors. This system relies on multiple thrusters, including the bow thruster, to counteract external forces and maintain a precise position.

What is Pounding?
Pounding refers to the repeated heavy impact or vibration experienced by a ship's hull when it encounters rough seas or large waves. This phenomenon is most commonly observed in the forward part of the vessel, particularly when the bow comes out of the water and then forcefully slams back down onto the surface of the sea. Pounding can cause stress on the ship's structure, leading to potential damage or even failure if the forces are severe and prolonged.

Factors that can contribute to pounding include:

1. Sea state: Rough seas and high waves are more likely to cause pounding as the ship's bow rises and falls more dramatically.
2. Ship's speed: A higher speed can exacerbate the impact of the hull on the water surface, increasing the risk of pounding.
3. Hull shape: Certain hull designs may be more susceptible to pounding, especially those with a flatter bottom or a less hydrodynamic shape.
4. Ship loading condition: An improperly loaded ship or one with uneven weight

distribution may be more prone to pounding.

To minimize the effects of pounding, the following measures can be taken:

1. Reduce speed: Slowing down the ship can help lessen the severity of the impacts on the hull and reduce structural stress.
2. Change course: Altering the ship's course to face the waves at a more favorable angle can help reduce pounding.
3. Optimal loading: Ensuring proper weight distribution and loading can help maintain the ship's stability and reduce the risk of pounding.
4. Hull maintenance: Regular inspections and maintenance of the ship's hull can help identify and address any structural weaknesses that could be exacerbated by pounding.

What is Sheer Force? How it affects the ship and which part of ship?

Sheer force, in the context of ship structures, refers to the longitudinal distribution of buoyancy along the length of the vessel. In simpler terms, it represents the curve of the ship's main deck as it rises towards the bow and the stern. The sheer helps improve the ship's seakeeping and hydrodynamic performance by allowing the bow to cut through waves more efficiently and by reducing the risk of water coming onto the deck.

The sheer force affects the ship's structural integrity and stability by distributing the stresses and loads experienced by the vessel during its operation. Here's how it affects different parts of the ship:

1. Bow: A well-designed sheer allows the bow to rise above the waves, reducing the risk of slamming and pounding. This minimizes the impact on the ship's hull and structure, which in turn decreases the potential for damage.
2. Midship section: The sheer curve affects the distribution of buoyancy and weight along the length of the ship, influencing the vessel's overall structural strength and stability. A well-proportioned sheer can help ensure that the midship section experiences less stress and remains more stable during rough seas.
3. Stern: The sheer curve at the stern helps reduce the risk of water being shipped onto the deck during heavy weather, protecting the vessel's equipment and crew. It also contributes to the vessel's overall hydrodynamic performance, helping the ship to maintain its course and speed more efficiently.
4. Deck and superstructure: The sheer force influences the stresses and loads experienced by the ship's deck and superstructure. A properly designed sheer can help distribute these stresses more evenly, reducing the potential for structural damage or failure.

Strengthening members of Forepeak tank:

The forepeak tank is located in the forward part of the ship, below the main deck, and is used for storing water or ballast. It plays an essential role in the ship's stability, trim, and load management. To ensure the structural integrity and strength of the forepeak tank, it is equipped with various strengthening members. These members help the tank withstand the forces and stresses encountered during the ship's operation, such as hydrostatic pressure, slamming, and panting forces.

The main strengthening members of the forepeak tank include:

1. Transverse Bulkhead: The transverse bulkhead separates the forepeak tank from the adjacent cargo holds or compartments. It helps distribute the load and provides structural support.
2. Longitudinal Bulkhead: Longitudinal bulkheads run along the length of the ship and provide additional strength and stiffness to the forepeak tank structure. They help distribute longitudinal stresses and reduce the risk of structural failure.
3. Floors: Floors are horizontal plates that connect the tank's bottom plating to the ship's keel. They provide support and strength to the tank's bottom structure, helping it withstand hydrostatic pressure.
4. Stiffeners: Stiffeners are steel sections, such as flat bars, angles, or channels, that are welded to the tank's plating to increase its rigidity and strength. They are typically arranged in a longitudinal or transverse pattern and help resist the bending and buckling stresses experienced by the tank.
5. Brackets: Brackets are triangular or L-shaped steel plates that connect adjacent structural members, such as stiffeners, bulkheads, or floors. They help distribute forces and improve the overall strength of the tank structure.
6. Girders: Girders are large steel beams that run along the tank's length or width, providing additional support and strength. They help distribute the load and resist bending and torsional stresses.
7. Stringers: Stringers are longitudinal steel members attached to the tank's side plating, providing reinforcement and support.
8. Panting Beams: Panting beams are installed in the forward part of the ship to provide additional strength and support to the shell plating, which experiences significant forces and stresses due to wave action.

Explain Stealer Plate:

A stealer plate is a term used in ship construction, specifically in relation to the ship's shell plating. It refers to a wider plate used to merge two or more strakes (rows of shell plating) into a single strake. Stealer plates are often found in areas where the curvature of the ship's hull changes, such as near the bow or stern, and they help maintain the smooth contour and strength of the ship's hull.

As the hull shape changes, the width of the shell plating may not remain constant. In these areas, it becomes necessary to adjust the width of the strakes to maintain the proper alignment and spacing of the shell plating. This is where stealer plates come into play.

The stealer plate is typically wider than the adjacent plates in the strake, and it is used to "steal" space from one or more adjacent strakes to maintain proper alignment. This allows for a smooth transition between the strakes and helps maintain the structural integrity of the ship's hull.

In summary, a stealer plate is a wider plate used in ship construction to merge two or more strakes of shell plating into a single strake.

What is block coefficient? For what is it used?

The block coefficient (Cb) is a dimensionless value used in naval architecture and ship design to describe the fullness of a ship's hull. It represents the ratio of the underwater volume of a ship's hull (V) to the volume of a rectangular block formed by the ship's

length (L), breadth (B), and draft (T). The block coefficient is defined mathematically as:

$$Cb = V / (L \times B \times T)$$

The block coefficient provides an indication of how efficiently the ship's hull occupies the available underwater space. A higher block coefficient means that the hull is fuller and more closely resembles the shape of a rectangular block, while a lower block coefficient indicates a finer, more streamlined hull shape.

The block coefficient is used for various purposes in ship design and analysis, such as:
1. Estimating the ship's displacement and deadweight: The block coefficient is used in conjunction with other parameters to calculate the ship's underwater volume, which helps estimate its displacement and deadweight capacity.
2. Evaluating hull form efficiency: Comparing block coefficients of different hull forms can give an indication of which design is more efficient in terms of hydrodynamic resistance, fuel consumption, and cargo capacity.
3. Determining the ship's behavior in various sea conditions: The block coefficient can influence the ship's seakeeping and maneuvering characteristics, as it affects the way the hull interacts with the water.

In general, the block coefficient is an important parameter that helps naval architects and engineers understand the relationship between a ship's hull form and its performance characteristics.

What is FSE (free surface effect)?
Free Surface Effect (FSE) is a phenomenon that occurs when a liquid, such as fuel, oil, or ballast water, inside a partially filled tank on a ship is free to move or slosh around as the vessel rolls or pitches. This movement of the liquid causes a change in the ship's center of gravity, leading to a reduction in the ship's stability.

When the ship rolls or pitches, the liquid in the partially filled tank moves to one side or end of the tank, causing the center of gravity of the liquid to shift. This shift in the center of gravity of the liquid also shifts the overall center of gravity of the ship, making it more susceptible to further rolling or pitching. The effect becomes more pronounced as the angle of heel increases, and it can lead to a dangerous situation if not properly managed.

To minimize the free surface effect, several measures can be taken:
1. Reduce free surface area: The free surface effect can be minimized by reducing the free surface area of the liquid in the tank. This can be achieved by using smaller tanks or dividing larger tanks into smaller compartments using longitudinal and transverse bulkheads.
2. Pressurized tanks: Pressurized tanks or tanks with flexible membranes can be used to restrict the movement of liquid inside the tank, reducing the free surface effect.
3. Proper planning and management: Careful planning and management of the ship's loading, ballasting, and fuel consumption can help maintain the ship's stability by ensuring that tanks are either full or empty, rather than partially filled.
4. Anti-rolling tanks: Some ships are equipped with anti-rolling tanks or stabilizers specifically designed to counteract the free surface effect and enhance stability.

Understanding and managing the free surface effect is crucial for ensuring the stability and safety of a ship, especially in rough seas or during dynamic loading and unloading operations.

What is onload and off load mechanism?
On-load and off-load mechanisms refer to the release systems used for launching and recovering lifeboats or rescue boats. These systems are crucial for the safety of the crew during emergency situations and for conducting drills.

On-load release mechanism:
An on-load release mechanism allows the lifeboat or rescue boat to be released from its davits while it is still under load, meaning the boat is still suspended by the falls (the wire ropes or cables used for lowering and hoisting). This type of mechanism can be operated from inside the boat and is designed to ensure that the boat is released quickly and safely once it is waterborne, even if the vessel is listing or experiencing rough seas. On-load release mechanisms are required to have a hydrostatic interlock, which prevents the release until the boat is waterborne, to avoid accidental release.

Off-load release mechanism:
An off-load release mechanism can only be activated once the lifeboat or rescue boat is fully waterborne and no longer under load. This means the boat must be floating freely before the release mechanism can be operated. Off-load release mechanisms are generally simpler and less prone to accidental release, but they may not be as efficient in an emergency or if the vessel is listing or experiencing rough seas.

Which mechanism u prefer onboard (Onload/offload)?
On-load release mechanisms are generally preferred onboard because they offer a quicker and safer release of the lifeboat or rescue boat in emergency situations. SOLAS regulations require all lifeboats (excluding free-fall lifeboats) and rescue boats to be fitted with an on-load release mechanism that meets specific design and performance criteria.

When do we use onload mechanism?
The on-load release mechanism is used when launching a lifeboat or rescue boat in emergency situations, during drills, or for maintenance purposes. In an emergency, the on-load mechanism enables a quicker and safer release of the lifeboat or rescue boat once it is waterborne, even if the vessel is listing or experiencing rough seas.

Here is a general procedure for using the on-load release mechanism:
1. Preparation: Ensure the lifeboat or rescue boat is properly prepared for launch, including securing all equipment, closing watertight openings, and ensuring the boat is properly attached to the falls.
2. Boarding: Crew members board the lifeboat or rescue boat and fasten their lifejackets and safety harnesses.

3. Lowering: The boat is lowered into the water by the davits, either manually or using a powered winch, under the control of the responsible officer.
4. Waterborne: Once the lifeboat or rescue boat is fully waterborne and floating, the on-load release mechanism can be operated.
5. Activation: The responsible crew member activates the on-load release mechanism, usually by pulling a release lever or pushing a release button located inside the boat. This action releases the hooks or other attachment points, allowing the boat to separate from the falls.
6. Move away: The lifeboat or rescue boat should then be maneuvered away from the ship's side using its engine or oars.

Stability

What is GRT?
Gross Register Tonnage (GRT): GRT represents the total internal volume of all enclosed spaces within the ship, including cargo holds, machinery spaces, accommodation areas, and other compartments. It is a measure of the ship's overall size and capacity. GRT is calculated by measuring the volume of each enclosed space and then summing the volumes to obtain the total.

What is NRT?
Net Register Tonnage (NRT): NRT, on the other hand, represents the volume of the ship's cargo-carrying spaces. It is calculated by subtracting the volume of non-revenue generating spaces (such as crew accommodations, machinery spaces, and navigation spaces) from the GRT. NRT is a measure of the ship's cargo capacity and is often used to determine port fees and other charges related to the ship's commercial use.

What is unstable equilibrium?
Unstable equilibrium is a state in which a system, when disturbed from its equilibrium position, experiences a net force or torque that pushes it further away from the equilibrium position rather than returning it to the original state. In other words, when a system in unstable equilibrium experiences a small displacement, it will continue to move away from its initial position instead of returning to it.

In the context of ship stability, the concept of equilibrium is related to the ship's center of gravity (G) and the center of buoyancy (B). A ship is said to be in unstable equilibrium when its center of gravity is above its center of buoyancy. In this case, if the ship is subjected to a small external force or disturbance, such as wind or waves, the center of buoyancy will shift to a new position (B') on the same side of the center of gravity (G), causing an increased heeling moment that will further incline the ship. The ship will continue to heel until it reaches a new equilibrium position, which could lead to capsizing in extreme cases.

To maintain a stable equilibrium, it is important for ships to keep their center of gravity below the center of buoyancy, ensuring that any disturbance will result in a righting moment that returns the ship to its upright position. Proper loading and ballasting, as

well as appropriate ship design, are essential for maintaining stable equilibrium and ensuring the safety of the vessel and its crew.

Example of the unstable equilibrium (How its form on board ship, how to counter it)?

An example of unstable equilibrium on a ship can be a situation where the vessel's center of gravity (G) is raised above the center of buoyancy (B) due to improper loading or other factors. This can occur in several ways:

1. Overloading the upper decks: If too much cargo is placed on the upper decks or the ship's superstructure, the center of gravity (G) could be raised above the center of buoyancy (B), leading to unstable equilibrium.
2. Insufficient ballast: If a ship is not carrying enough ballast in its lower tanks, the center of gravity could be raised, resulting in unstable equilibrium.
3. High free surface effect: If large amounts of liquid are stored in partially filled tanks, the free surface effect can raise the center of gravity, potentially causing unstable equilibrium.
4. Structural damage: Damage to the ship's hull or other structural components could alter the distribution of weight and affect the center of gravity, leading to unstable equilibrium.

To counteract unstable equilibrium and maintain ship stability, the following measures can be taken:

1. Proper loading: Ensure that cargo is loaded according to the ship's loading plan, keeping heavy cargo low in the ship and lighter cargo on the upper decks.
2. Ballasting: Adjust the ballast in the ship's tanks to lower the center of gravity and maintain stability.
3. Manage the free surface effect: Minimize the free surface effect by keeping tanks full or empty, using baffles or anti-rolling tanks, or employing other techniques to limit the movement of liquid in partially filled tanks.
4. Regular maintenance and inspections: Conduct regular inspections and maintenance to ensure the ship's structural integrity, as well as the proper functioning of its stability systems.

Intact Buoyancy:

- Intact buoyancy refers to a ship's ability to remain afloat when all of its compartments and spaces are watertight and closed.
- It is a fundamental principle of ship design and construction to ensure that a ship has adequate intact buoyancy to maintain its stability and safety in the event of damage to the hull or other parts of the ship.
- The concept of intact buoyancy is closely related to damage stability, which is the ability of a ship to maintain stability and control after being damaged.
- Intact buoyancy is achieved through the use of watertight bulkheads and other compartments, which are designed to prevent water from flooding into other areas of the ship.
- Adequate intact buoyancy is critical for the safe operation of a ship and is a key consideration for ship designers, builders, and operators.

What is righting lever?

The righting lever, also known as the righting arm or GZ, is a measure of a ship's stability and its ability to return to an upright position after being heeled over by an external force. The righting lever represents the horizontal distance between the center of gravity (G) and the center of buoyancy (B) when the ship is inclined at a certain angle.

When a ship is subjected to an external force, such as wind or waves, it heels over, causing the center of buoyancy to shift to a new position (B') as the underwater shape of the hull changes. If the ship is in stable equilibrium, the new center of buoyancy (B') will be on the opposite side of the center of gravity (G), creating a righting moment that acts to restore the ship to its upright position.

The righting lever (GZ) is the horizontal distance between the center of gravity (G) and the new center of buoyancy (B'). The larger the righting lever, the greater the righting moment and the ship's ability to return to its upright position after being heeled.

A ship's stability can be analyzed by calculating the righting lever at various angles of heel and plotting the values on a graph called the righting curve or GZ curve. This curve is used to evaluate the ship's stability characteristics and to ensure that it meets safety standards for different operating conditions.

In summary, the righting lever is a crucial parameter in evaluating a ship's stability and its ability to withstand external forces, such as wind and waves, and return to an upright position.

Miscellaneous

Types of fire?

Fire classification is based on the type of fuel or material involved in the combustion process. By understanding the different types of fires, appropriate firefighting methods and extinguishing agents can be applied for effective fire suppression. There are five primary classes of fires, designated as Class A, B, C, D, and K (or F in some regions):

1. Class A fires: These fires involve ordinary combustible materials such as wood, paper, cloth, rubber, and many plastics. They leave behind ashes as they burn. Water or water-based extinguishing agents (e.g., foam) and multi-purpose dry chemical extinguishers (e.g., ABC extinguishers) can be used to put out Class A fires.
2. Class B fires: Class B fires involve flammable and combustible liquids and gases, such as gasoline, diesel, kerosene, oil, grease, paints, and propane. These fires are best extinguished using agents that cut off the oxygen supply or inhibit the chemical reactions, such as carbon dioxide (CO_2), foam, and dry chemical extinguishers (e.g., BC or ABC extinguishers).
3. Class C fires: These fires involve energized electrical equipment, such as motors, transformers, appliances, and electrical wiring. To extinguish Class C fires, it is crucial to use non-conductive extinguishing agents, such as carbon dioxide (CO_2) or dry chemical extinguishers (e.g., BC or ABC extinguishers). It's essential to avoid using water or water-based agents on Class C fires, as they can cause electrocution or short circuits.
4. Class D fires: Class D fires involve combustible metals, such as magnesium, titanium, sodium, potassium, lithium, and aluminum. These fires require special extinguishing agents designed for metal fires, such as dry powder extinguishers (e.g., Class D extinguishers), which smother the fire and absorb the heat. Using

regular extinguishing agents on Class D fires can be dangerous and may exacerbate the fire.

5. Class K (or Class F) fires: These fires involve cooking oils and fats, commonly found in kitchens and restaurants. Class K fires are best extinguished using wet chemical extinguishers, which are specifically designed to combat high-temperature grease fires. These extinguishers work by creating a cooling, soapy layer over the burning oil, preventing oxygen from reaching the fire and stopping the combustion process.

It is crucial to identify the type of fire before attempting to extinguish it, as using the wrong extinguishing agent can be ineffective or even dangerous. Proper training and knowledge of fire classifications, as well as having the appropriate firefighting equipment on hand, are essential for ensuring the safety of people and property.

Difference between Bay & Gulf?

	Bay	Gulf
Size	Bays are smaller in comparison and typically have a narrower connection to the open ocean.	Generally, a gulf is larger than a bay. Gulfs often cover more extensive areas and have a wider opening to the sea.
Shape	Bays typically have a semi-circular or crescent shape with a relatively even shoreline, whereas gulfs often have an irregular shape with a more uneven coastline.	Gulfs may have several small bays, inlets, or peninsulas along their shoreline.
Depth	Bays are shallow.	Gulfs are generally deeper than bays. Due to their larger size, gulfs can extend farther into the continental shelf and may reach deeper parts of the ocean floor.
Geographical context	Bays are often formed by the erosion of the coastline, the movement of glaciers, or the gradual accumulation of sediment over time.	Gulfs are typically formed by tectonic activity, such as the shifting of the Earth's plates or the subsidence of a coastline, leading to a more significant indentation in the land.

********** ALL THE BEST **********