2024 January

1. Describe the method of testing EACH of the following:
   (a) a bilge high level alarm switch; (3)
   (b) a diesel engine cooling water high temperature alarm probe; (3)
   (c) an oil mist detector. (4)

Testing Safety Equipment:

Here's how to test each piece of equipment:

(a) Bilge High Level Alarm Switch:

1. **Manual Test:** Most bilge high level switches have a built-in mechanism for manual testing. This is usually a lever or float that simulates a high water level. Activate the lever and check if the alarm sounds or activates the bilge pump (depending on the system).

2. **Water Simulation (if safe):** With the power off and bilge pump disabled (for safety), slowly introduce clean water into the bilge well until the switch reaches its activation point. The alarm should sound or trigger the bilge pump. **Caution:** Only do this if it's safe and there's no risk of overflowing the bilge or electrical components getting wet.

Important: Always refer to the manufacturer's instructions for the specific testing procedure for your bilge switch model.

(b) Diesel Engine Cooling Water High Temperature Alarm Probe:

1. **Mimic High Temperature (Simulate):** Most probes have a specific resistance value that triggers the alarm when coolant temperature exceeds a limit. Consult the manufacturer's manual for the resistance value. Use a resistor with that value to simulate a high temperature and check if the alarm activates.

2. **Scan Tool (if available):** Modern engines might have a diagnostic port that allows connecting a scan tool. This tool can read sensor data, including coolant temperature, and might have a test function to simulate high temperature and trigger the alarm.

Caution: Never tamper with the probe itself or the engine coolant system while the engine is running.

(c) Oil Mist Detector:

1. **Test Can (Manufacturer-supplied):** Some manufacturers provide a test can containing a safe oil mist simulant. Spray a small amount of the simulant near the detector according to the manufacturer's instructions. The detector should activate and sound an alarm.

2. **Functional Test (Controlled Environment):** In a controlled environment (not near the engine), briefly introduce a small amount of a safe, approved oil mist near the detector. The alarm should activate.

Important: Never use actual engine oil or any flammable liquids for testing. Always consult the manufacturer's instructions for the specific testing procedure for your oil mist detector model.

Jan 2024

2024 January

2. State the action to be taken by the watch keeping engineer in the event of EACH of the following:

(a) flooding; (6)

(b) failure of main propulsion machinery. (4)

nov 2020

Nov 2020

1. State the action to be taken by the watch keeping engineer in the event of EACH of the following:

(a) flooding; (6)

(b) failure of main propulsion machinery. (4)

Watchkeeping Engineer's Actions in Emergencies:

(a) Flooding:

The watchkeeping engineer's actions in case of flooding are crucial for crew safety and vessel stability. Here's what they should do:

1. **Raise the Alarm:** Immediately sound the emergency alarm and notify the bridge of the flooding location and severity.

2. **Assess the Situation:** Locate the source of the flooding and try to isolate it by closing watertight doors and valves.

3. **Activate Pumps:** Start the bilge pumps and any other pumps appropriate for the flooded area.

4. **Control the Spread:** Take steps to prevent the flood from spreading to other compartments. This might involve shoring up doorways or using temporary patching.

5. **Standby for Instructions:** The Chief Engineer or Captain will take over the overall damage control effort. The watchkeeping engineer should be prepared to follow their instructions.

Remember: Crew safety is paramount. If the flooding is severe or the source cannot be contained, prioritize evacuating the engine room and following ship evacuation procedures.

(b) Failure of Main Propulsion Machinery:

A main propulsion failure can severely impact the vessel's maneuverability. Here's how the watchkeeping engineer should respond:

1. **Safely Shut Down Engine:** Following established procedures, safely shut down the main engine to prevent further damage.

2. **Assess the Situation:** Try to diagnose the cause of the failure using instrumentation and alarms.

3. **Inform the Bridge:** Immediately notify the bridge of the engine failure and its potential impact on maneuverability.

4. **Attempt Standby Power (if available):** If the vessel has auxiliary engines or emergency propulsion systems, attempt to bring them online according to procedures.

5. **Standby for Instructions:** The Chief Engineer will assess the situation and determine the next course of action. The watchkeeping engineer should be prepared to assist with troubleshooting or repairs.

Important: During a main propulsion failure, prioritize the safety of the crew and vessel. Communicate effectively with the bridge and follow established emergency procedures.

Jan 2021

29 January 2021

1. Outline the FOUR duties of workers as laid down in the Code of Safe Working Practices for Merchant Seamen. (10)

The Code of Safe Working Practices for Merchant Seamen outlines several worker duties, but here are four key ones:

1. **Take Reasonable Care for Your Own Safety and Others:** This means being aware of your surroundings, following safety procedures, using personal protective equipment (PPE) properly, and avoiding actions that could endanger yourself or others.

2. **Cooperate with Health and Safety Measures:** This includes complying with safety instructions, participating in safety drills, reporting hazards or unsafe work practices, and working collaboratively with colleagues and superiors to maintain a safe working environment.

3. **Report Identified Hazards and Deficiencies:** When you encounter a potential safety risk, damaged equipment, or malfunctioning systems, it's your duty to report them immediately to the appropriate officer or designated personnel. This allows for prompt corrective action and minimizes potential accidents.

4. **Proper Use of Equipment and Handling of Hazardous Materials:** Workers are responsible for using tools, machinery, and other equipment according to their designated purpose and following safe operating procedures. This also includes handling hazardous materials with due care, following established protocols, and wearing appropriate PPE when necessary.

Aug 2020

Aug 2020

1. With reference to risk assessment and the Code of Safe Working Practices for Merchant Seamen:

(a) explain the purpose of a risk assessment; (4)

(b) state the person responsible for carrying out the risk assessment; (3)

(c) outline what should be considered when carrying out a risk assessment. (3)

Risk Assessment and Merchant Seaman Safety:

(a) Purpose of a Risk Assessment:

In the context of the Code of Safe Working Practices for Merchant Seamen, a risk assessment serves two main purposes:

1. **Proactive Safety Management:** It helps identify potential hazards associated with various tasks and activities performed on board a merchant ship. By proactively identifying risks, measures can be taken to mitigate them before an accident or injury occurs.

2. **Complying with Regulations:** The Code and other maritime safety regulations mandate conducting risk assessments. This ensures a systematic approach to safety onboard and demonstrates a commitment to crew safety.

(b) Responsibility for Risk Assessment:

The responsibility for carrying out risk assessments can vary depending on the specific task and complexity. Here's a breakdown:

- **Master/Chief Engineer:** Hold overall responsibility for shipboard safety and ensuring risk assessments are conducted for all onboard activities.

- **Department Heads (Chief Engineer, Deck Officer):** Responsible for overseeing risk assessments within their departments (engine room, deck operations).

- **Individual Workers:** Have a responsibility to be aware of risks associated with their tasks and to follow established safety procedures outlined in the risk assessments.

(c) Considerations During Risk Assessment:

When conducting a risk assessment, several factors need to be considered, aligned with the Code's principles:

1. **Task Analysis:** Break down the specific task or activity into its individual steps. Identify potential hazards associated with each step.

2. **Likelihood and Severity of Harm:** For each hazard, assess the likelihood of it occurring and the potential severity of the harm it could cause (minor injury, serious injury, fatality).

3. **Existing Controls:** Evaluate existing safety measures already in place to mitigate the risks. This could include personal protective equipment (PPE), safe work practices, alarms, or engineering controls.

4. **Residual Risk:** After considering existing controls, assess the remaining level of risk. This helps determine if additional control measures are needed.

5. **Documentation and Review:** The risk assessment findings should be documented, including identified hazards, control measures, and residual risk levels. The assessment should be reviewed periodically and updated as necessary, especially after changes in equipment, procedures, or work environment.

By following these steps, a comprehensive risk assessment can be conducted, promoting a safer working environment for merchant seamen.

March 2021

March 21

1. With reference to the Code of Safe Working Practices for Merchant Seafarers and entering enclosed or confined spaces, state EACH of the following:

   (a) the reasons why the atmosphere of any enclosed space is potentially dangerous; (4)

   (b) the precautions to be taken before a potentially dangerous space is entered. (6)

Enclosed Spaces and Safety for Merchant Seafarers:

(a) Reasons for Potential Danger in Enclosed Spaces:

The Code of Safe Working Practices for Merchant Seafarers emphasizes the inherent risks of entering enclosed or confined spaces. Here's why:

- **Oxygen Deficiency:** Enclosed spaces can have reduced oxygen levels due to various factors. Consumption by rusting, decaying organic matter, or displacement by other gases can lead to oxygen depletion below the safe level (around 19.5%). Oxygen deficiency can cause dizziness, unconsciousness, and even death.

- **Toxic Atmosphere:** Enclosed spaces can accumulate harmful gases or fumes from fuel spills, cleaning chemicals, cargo residues, or engine exhaust. These can be invisible and odorless, making them difficult to detect. Exposure can lead to respiratory problems, poisoning, or even death.

- **Flammable or Explosive Atmospheres:** Enclosed spaces can harbor flammable gasses, vapors, or dust from fuels, paints, or cargo. Ignition sources like sparks from tools or electrical equipment can trigger fires or explosions.

- **Other Hazards:** Limited ventilation, extreme temperatures (hot or cold), and flooding are additional dangers that can arise in enclosed spaces and pose risks to worker safety.

(b) Precautions Before Entering Enclosed Spaces:

The Code outlines strict safety measures before entering an enclosed space:

1. **Permit to Work:** A formal permit system should be established, requiring a risk assessment and outlining specific entry procedures, ventilation requirements, and emergency protocols.

2. **Ventilation:** Adequate ventilation is crucial to ensure a safe atmosphere. This might involve mechanical ventilation systems or natural ventilation by opening hatches for a designated period. Tests should be conducted to confirm oxygen levels and absence of harmful gases before entry.

3. **Atmospheric Monitoring:** Portable gas detectors should be used to monitor oxygen levels, presence of flammable or toxic gases, and ensure a safe atmosphere for entry.

4. **Isolation:** Isolate the space from surrounding machinery or processes that could introduce hazardous substances. Lock out and tag out any equipment that could pose a risk during entry.

5. **Personal Protective Equipment (PPE):** Workers entering the space must wear appropriate PPE based on the identified risks. This could include breathing apparatus, respirators, chemical suits, safety harnesses, and proper footwear.

6. **Communication and Standby:** Clear communication protocols should be established between workers inside the space and a designated standby person outside. The standby person should be trained in rescue procedures and have access to communication equipment to raise the alarm in case of an emergency.

7. **Training:** Workers should receive adequate training on enclosed space entry procedures, risk assessment, use of monitoring equipment, and emergency rescue techniques.

Following these precautions as outlined in the Code of Safe Working Practices is essential to minimize the risks associated with entering enclosed spaces and ensure the safety of merchant seafarers.

Feb 2021

1. With reference to routine inspections of machinery located in remote unmanned spaces:

   (a) state FOUR precautions that should be taken to ensure the safety of personel; (4)

   (b) state FOUR notices that should be posted at the entrance of unmanned machinery spaces; (4)

   (c) define the meaning of the term *Machinery Space*. (2)

Safeguarding Personnel in Machinery Spaces:

(a) Precautions for Personnel Safety:

1. **Permit to Work System:** Implement a formal permit system for all work within the machinery space. This ensures a risk assessment is conducted, outlining procedures, ventilation requirements, and emergency protocols for specific tasks.

2. **Lockout/Tagout Procedures:** Enforce lockout/tagout procedures to isolate equipment from energy sources (electrical, mechanical, hydraulic) before any maintenance work begins. This prevents accidental startup and potential injuries.

3. **Personal Protective Equipment (PPE):** Workers must wear appropriate PPE based on the specific tasks and identified hazards. This could include safety glasses, gloves, ear protection, respirators, and fire-resistant clothing depending on the situation.

4. **Adequate Ventilation:** Maintain proper ventilation within the machinery space to remove heat, fumes, and hazardous gases. This can be achieved through natural ventilation or by using mechanical ventilation systems.

(b) Notices for Unmanned Machinery Spaces:

1. **"Unmanned Machinery Space - Entry Prohibited":** Clearly mark the entrance to indicate the space is unmanned and access is restricted.

2. **"Warning - Potential Hazards":** List potential hazards within the space, such as high temperatures, moving machinery, or flammable materials.

3. **"Emergency Contact Procedures":** Provide clear instructions on who to contact and how to raise an alarm in case of an emergency.

4. **"Ventilation Status":** Indicate the ventilation status of the space (operating, not operating, under maintenance).

(c) Definition of Machinery Space:

A machinery space is a designated compartment onboard a ship that houses the main propulsion engine(s), auxiliary engines, boilers, generators, pumps, and other essential machinery for the vessel's operation. Access to these spaces may be restricted due to the presence of moving machinery, electrical hazards, high temperatures, or potentially hazardous atmospheres.

oct 2020

30 October 2020

1. Describe the method of testing EACH of the following:

(a) a bilge high level alarm switch; (3)

(b) a diesel engine cooling water high temperature alarm probe; (3)

(c) an oil mist detector. (4)

Testing Procedures for Marine Safety Equipment:

Here's a breakdown of how to test each piece of equipment safely:

(a) Bilge High Level Alarm Switch:

1. Manual Test (Preferred): Most bilge high level switches have a built-in mechanism for manual testing. This is usually a lever or float that simulates a high water level. Locate the switch and follow these steps:

- **Power Off & Bilge Pump Disabled:** Ensure the bilge pump is disabled (for safety) and turn off the power to the bilge pump circuit.
- **Activate the Lever:** Locate the lever or float on the switch and manually activate it. This simulates a high water level.
- **Alarm Activation:** The alarm should sound or the bilge pump should attempt to activate (depending on the system).

2. Water Simulation (Use Caution): This method should only be used if it's safe and there's no risk of overflowing the bilge or electrical components getting wet.

- **Power Off & Bilge Pump Disabled:** As with the manual test, ensure the power is off and the bilge pump is disabled.
- **Introduce Clean Water Slowly:** Slowly introduce a small amount of clean water into the bilge well until the switch reaches its activation point.
- **Alarm or Pump Activation:** The alarm should sound or the bilge pump should start operating (depending on the system).

Important: Always refer to the manufacturer's instructions for the specific testing procedure for your bilge switch model.

(b) Diesel Engine Cooling Water High Temperature Alarm Probe:

1. Mimic High Temperature (Electrical Simulation): Most probes have a specific resistance value that triggers the alarm when coolant temperature exceeds a limit. Here's how to simulate it:

- **Consult Manual:** Find the manufacturer's manual for the specific probe model to identify the resistance value associated with high temperature.
- **Resistor with Matching Value:** Obtain a resistor with the same resistance value as the high-temperature trigger point.
- **Simulate High Temperature:** Connect the resistor across the probe's terminals (refer to the manual for proper connection points). This mimics the electrical signal of high temperature.
- **Alarm Activation:** The alarm system should activate if the connection is done correctly.

2. Scan Tool (if available): Modern engines might have a diagnostic port that allows connecting a scan tool. This tool can read sensor data, including coolant temperature, and might have a test function to simulate high temperature and trigger the alarm.

Caution: Never tamper with the probe itself or the engine coolant system while the engine is running. Always follow the manufacturer's instructions for safe testing procedures.

(c) Oil Mist Detector:

1. Test Can (Manufacturer-supplied): Some manufacturers provide a test can containing a safe oil mist simulant. Here's how to use it:

- **Consult Manual:** Refer to the manufacturer's instructions for the specific oil mist detector model for proper testing procedures.
- **Safe Oil Mist Simulant:** Locate the test can provided by the manufacturer, which should contain a safe oil mist simulant.
- **Short Spray Near Detector:** Briefly spray a small amount of the simulant near the detector's intake according to the manufacturer's instructions.
- **Alarm Activation:** The detector should activate and sound an alarm if the test is performed correctly.

2. Functional Test (Controlled Environment): In a controlled environment (not near the engine) where there's no risk of fire or contamination:

- **Safe, Approved Oil Mist:** Obtain a small amount of a safe, approved oil mist simulant specifically designed for testing oil mist detectors.
- **Introduce Controlled Mist:** Briefly introduce a small amount of the approved oil mist near the detector's intake.
- **Alarm Activation:** The detector should activate and sound an alarm if the test is done correctly.

Important: Never use actual engine oil or any flammable liquids for testing. Always consult the manufacturer's instructions for the specific testing procedure for your oil mist detector model.

aug 2021

Aug 2021

1. With reference to the International Safety Management code, describe EACH of the following:

   (a) the Safety Management System (SMS); (5)

   (b) the role of the Designated Person (DP). (5)

International Safety Management Code (ISM) and Key Roles:

The International Safety Management (ISM) Code is an international regulation established by the International Maritime Organization (IMO) to ensure the safety of ship operation and pollution prevention. Here's a breakdown of two key elements within the ISM Code:

(a) Safety Management System (SMS):

The SMS is a comprehensive framework that a shipping company must implement to manage safety risks onboard their vessels. It's a documented system with policies, procedures, and practices aimed at:

- **Accident Prevention:** Identifying potential hazards associated with ship operation and implementing measures to prevent accidents and injuries.

- **Pollution Prevention:** Minimizing the risk of pollution from the ship, including operational discharges, spills, and waste disposal.

- **Continuous Improvement:** The SMS is a dynamic system that requires regular review, evaluation, and improvement based on experience and identified shortcomings.

The core components of an SMS typically include:

- Safety Policy: A company-wide statement outlining the commitment to safety and pollution prevention.
- Procedures: Detailed instructions for safe operation of the ship, covering various aspects like navigation, cargo handling, maintenance, and emergency response.
- Training: Programs to ensure crew members are adequately trained and competent in their roles and emergency procedures.
- Reporting: A system for reporting incidents, accidents, near misses, and unsafe situations.
- Recordkeeping: Maintaining documentation related to the SMS, including policies, procedures, training records, and incident reports.

(b) Designated Person (DP):

The Designated Person (DP), also known as the Designated Person Ashore (DPA), plays a crucial role in the effective implementation of the SMS. They are a shore-based company representative with the authority and resources to ensure the company's safety policies are followed onboard their vessels. Key responsibilities of the DP include:

- **Maintaining SMS:** The DP is responsible for ensuring the SMS is kept up-to-date, reflecting changes in regulations, company practices, or identified risks.
- **Monitoring Ship Compliance:** The DP monitors the company's ships to ensure they are adhering to the SMS requirements. This might involve reviewing reports, conducting audits, and maintaining communication with the ship's officers.
- **Providing Resources:** The DP ensures the company provides necessary resources for safe ship operation. This could include funding for training, spare parts for maintenance, or technical assistance in case of emergencies.
- **Reporting to Management:** The DP keeps the company's management informed about safety issues, accidents, or any concerns regarding the SMS implementation onboard ships.
- **Liaison with Authorities:** The DP may act as a liaison between the company, shipboard personnel, and maritime authorities regarding safety matters.

The DP role is critical in bridging the gap between shore-based management and shipboard operations, ensuring a strong safety culture and effective implementation of the SMS for a safer maritime environment.

april 2021

April 2021

1. Explain EACH of the following:

   (a) Merchant Shipping Notices; (4)

   (b) Marine Guidance Notes; (3)

   (c) Marine Information Notes. (3)

june 2021

June 2021

1. Explain EACH of the following:

   (a) Merchant Shipping Notices; (4)

   (b) Marine Guidance Notes; (3)

   (c) Marine Information Notes. (3)

These terms refer to different categories of information distributed by maritime authorities, typically the UK Maritime and Coastguard Agency (MCA), to provide guidance and regulations for the shipping industry. Here's a breakdown of each:

(a) Merchant Shipping Notices (MSNs):

- **Function:** MSNs are legally binding documents that convey mandatory information related to UK merchant shipping legislation.
- **Content:** They typically contain details of new or revised Statutory Instruments (SIs) that regulate various aspects of ship operation, safety, pollution prevention, and crew welfare.
- **Target Audience:** Primarily aimed at ship owners, operators, and masters of merchant vessels.
- **Compliance:** Following the regulations outlined in MSNs is mandatory for all ships operating under the UK flag or within UK territorial waters.

(b) Marine Guidance Notes (MGNs):

- **Function:** MGNs offer non-mandatory advice and best practices to the shipping industry on various topics related to safety, pollution prevention, and efficient ship operation.
- **Content:** They provide detailed guidance on interpreting regulations outlined in MSNs and SIs, recommend safe working practices, and offer advice on how to comply with international maritime regulations (e.g., IMO regulations).
- **Target Audience:** Similar to MSNs, MGNs are primarily directed towards ship owners, operators, and masters. However, they may also be useful for crew members, naval architects, and maritime training institutions.
- **Compliance:** While not mandatory, following the recommendations in MGNs demonstrates a commitment to best practices and can be used as evidence of due diligence in case of an incident.

(c) Marine Information Notes (MINs):

- **Function:** MINs provide short-term, time-sensitive information relevant to the shipping industry.
- **Content:** They might contain details on upcoming regulatory changes, announcements of training courses, information on new safety equipment, or temporary notices related to navigational hazards or port restrictions.
- **Target Audience:** Similar to MSNs and MGNs, MINs are directed towards ship owners, operators, and masters. However, specific information may be relevant to certain crew members or departments onboard.
- **Action:** The information in MINs typically requires some form of action from the recipient, such as attending a training course, updating navigational charts, or implementing new safety procedures. Due to their time-sensitive nature, MINs usually have a cancellation date specified.

sept 2020

Sept 2020

1. With reference to the SOLAS requirements for conducting regular emergency musters and drills:

   (a) state the accepted emergency signal for calling crew and passengers to lifeboat muster stations; (2)

   (b) state when emergency drills must be carried out; (4)

   (c) list FOUR types of emergency drill that must be conducted on a regular basis. (4)

SOLAS Requirements for Emergency Drills:

(a) Emergency Signal for Muster Stations:

The SOLAS-approved international signal for calling crew and passengers to lifeboat muster stations is a series of short blasts on the ship's whistle followed by one long blast. This is universally recognized as the signal for emergencies requiring muster at lifeboat stations.

(b) Frequency of Emergency Drills:

SOLAS mandates that emergency drills must be carried out at regular intervals to ensure crew familiarity with procedures and equipment in case of an actual emergency. The specific frequency depends on the type of drill:

- **At least once a week:** Abandon ship drills and fire drills for passenger ships carrying 24 or more passengers for more than 24 hours.
- **At least once a month:** Abandon ship drills and fire drills for all crew members on all passenger ships and cargo ships.
- **At least once every three months:** Drills for other emergencies, such as lifeboat operation, firefighting techniques, and emergency steering.

(c) Four Types of Regular Emergency Drills:

1. **Abandon Ship Drill:** This drill simulates the process of abandoning the ship in an emergency situation. Crew members practice their roles in assisting passengers and operating lifeboats and liferafts.

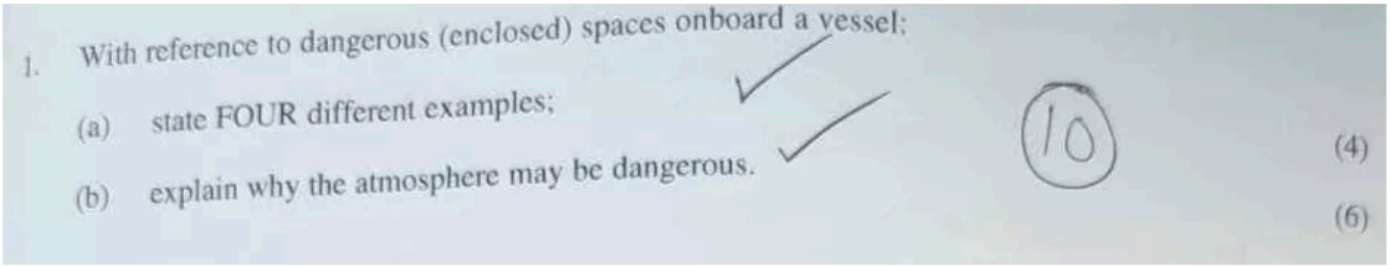
2. **Fire Drill:** This drill simulates a fire onboard. Crew members practice using firefighting equipment, search and rescue techniques, and evacuation procedures.

3. **Lifeboat Operation Drill:** This drill focuses on the proper operation of lifeboats and liferafts, including launching, lowering, boarding, and operating the emergency equipment onboard.

4. **Emergency Steering Drill:** This drill ensures the crew can maintain control of the ship in case of a failure in the main steering gear. It involves practicing alternative steering methods from the bridge or directly from the steering gear compartment.

aug 2023

AUG 2023



1. With reference to dangerous (enclosed) spaces onboard a vessel:

(a) state FOUR different examples; (4)

(b) explain why the atmosphere may be dangerous. (6)

10

Dangerous Enclosed Spaces on a Vessel:

(a) Four Examples:

Enclosed spaces on a vessel can pose significant risks due to the potential for a dangerous atmosphere. Here are four common examples:

1. **Cargo Holds:** These compartments store various cargo, and the atmosphere can be dangerous due to:
    - **Oxygen Depletion:** Cargo like grain or coal can consume oxygen through respiration, leading to a deficiency that can cause suffocation.
    - **Toxic Fumes:** Certain cargo, like chemicals or pesticides, may emit hazardous fumes that can be invisible and odorless, leading to poisoning.
2. **Ballast Tanks:** These tanks hold seawater to maintain a vessel's stability. Dangers include:
    - **Oxygen Depletion:** Stagnant water can become depleted of oxygen due to microbial activity, leading to suffocation.
    - **Flammable or Toxic Gases:** Residual cargo residues or vapors from cleaning chemicals can linger and create an explosive or toxic atmosphere.
3. **Fuel Tanks:** These compartments store fuel oil for the ship's engine. The main dangers are:
    - **Flammable Atmosphere:** Fuel vapors can accumulate, creating a high risk of fire or explosion if ignited by sparks from electrical equipment or tools.
    - **Toxic Fumes:** Fuel oil contains harmful hydrocarbons that can be toxic if inhaled.

4. **Pump Rooms:** These spaces house pumps for various purposes like bilge pumping, ballast water transfer, and fuel transfer. Risks include:
    - **Oxygen Depletion:** Similar to ballast tanks, stagnant water can deplete oxygen levels.
    - **Flammable or Toxic Vapors:** Leakage from pumps or piping can introduce flammable fuel vapors or toxic fumes from bilge water contamination.

(b) Reasons for a Dangerous Atmosphere:

Several factors can contribute to a dangerous atmosphere in enclosed spaces onboard a vessel:

- **Oxygen Depletion:** Consumption of oxygen by organic material (cargo, stagnant water), rusting processes, or displacement by other gases can lead to oxygen deficiency, causing dizziness, unconsciousness, and even death.
- **Toxic Gases:** Fumes from cargo residues, cleaning chemicals, fuel spills, or engine exhaust can be present in enclosed spaces. These can be invisible and odorless, making them difficult to detect, and can cause respiratory problems, poisoning, or death.
- **Flammable Atmospheres:** Accumulation of flammable gases or vapors from fuels, paints, or certain cargo can create a high risk of fire or explosion if ignited by a spark source.

It's crucial to be aware of these dangers and follow strict safety procedures before entering any enclosed space onboard a vessel to minimize the risk of accidents and fatalities.

oct 2018

Oct 2018

1. With reference to noise levels in ships:

(a) describe the recommended maximum periods of time for personnel employed on watchkeeping duties within enclosed machinery spaces; (6)

(b) explain why these recommendations have been made; (2)

(c) state the permitted noise level at which hearing protection is:

(i) recommended; (1)

(ii) mandatory. (1)

Noise Levels and Hearing Protection on Ships:

(a) Recommended Watchkeeping Duration in Machinery Spaces:

Due to the high noise levels in enclosed machinery spaces, exposure limits are recommended to protect crew hearing. Specific durations may vary depending on regulations and flag state, but here's a general guideline:

- **Continuous Exposure:** It's generally recommended to minimize continuous exposure to noise levels exceeding 85 decibels (dB(A)) within enclosed machinery spaces.
- **Maximum Exposure Periods:** For higher noise levels, exposure times should be limited. For example, some regulations might recommend a maximum of 4 hours at 88 dB(A), 2 hours at 91 dB(A), and so on, with mandatory breaks in quieter areas.

(b) Rationale for Recommended Exposure Limits:

These recommendations are made to prevent Noise-Induced Hearing Loss (NIHL), a permanent condition caused by prolonged exposure to loud noises. NIHL can lead to:

- **Hearing Threshold Shifts:** Difficulty hearing faint sounds or conversations.
- **Tinnitus:** A ringing or buzzing sensation in the ears.
- **Hyperacusis:** Increased sensitivity to certain sounds, causing discomfort.

NIHL can significantly impact a seafarer's ability to perform their duties safely and effectively. Hearing is crucial for situational awareness, communication, and following instructions during emergencies.

(c) Permitted Noise Levels for Hearing Protection:

Hearing protection is essential in noisy environments to minimize the risk of NIHL. Here's a breakdown of when it's recommended and mandatory:

(i) Recommended Use:

- **80 dB(A) and Above:** Hearing protection is recommended even at moderate noise levels of 80 dB(A) and above as a preventative measure to minimize long-term hearing damage from continuous exposure.

(ii) Mandatory Use:

- **85 dB(A) and Above:** Wearing hearing protection becomes mandatory for most regulations and flag states when noise levels reach or exceed 85 dB(A) for a sustained period. This ensures adequate protection for crew members working in these environments.

It's important to note that these are general guidelines. Always refer to the specific regulations and recommendations set by the maritime authority or flag state governing the vessel's operation.

feb 2021

Feb 2021

3. With reference to the engine log books, explain the reasons for recording EACH of the following, stating a possible cause should the readings be outside the normal parameters:

(a) LO Sump level; (4)

(b) cooling water inlet temperature; (3)

(c) inlet manifold air pressure; (3)

Engine Log Book Entries and Their Importance:

Engine log books play a vital role in monitoring engine health and identifying potential problems early on. Here's why each specific parameter is recorded and a possible cause if the readings fall outside the normal range:

(a) LO (Lubricating Oil) Sump Level:

Reason for Recording: The LO sump level is crucial for proper engine lubrication. Recording it regularly allows for:

- **Monitoring Oil Consumption:** A gradual decrease might indicate oil consumption through burning or leaks.
- **Maintaining Adequate Lubrication:** An excessively low level could lead to insufficient lubrication and potential engine damage due to friction.
- **Preventing Overfilling:** An excessively high level can cause foaming, reduced oil pressure, and potential seal damage.

Possible Cause if Outside Normal Range:

- **Low Level:** Oil leaks, worn piston rings, excessive oil burning.
- **High Level:** Overfilling during oil change, fuel dilution due to injector issues.

(b) Cooling Water Inlet Temperature:

Reason for Recording: Engine coolant temperature needs to be maintained within a specific range for optimal performance and to prevent overheating. Recording it helps to:

- **Ensure Proper Engine Cooling:** An excessively high temperature indicates insufficient cooling or potential issues with the cooling system (e.g., blocked passages, malfunctioning pump, thermostat failure).
- **Prevent Engine Damage:** Overheating can lead to warping of engine components, seized pistons, and even engine failure.

Possible Cause if Outside Normal Range:

- **High Temperature:** Low coolant level, blocked radiator or heat exchanger, faulty water pump, malfunctioning thermostat.
- **Low Temperature:** Stuck-open thermostat (rare).

(c) Inlet Manifold Air Pressure:

Reason for Recording: The air pressure entering the engine's intake manifold is essential for optimal combustion. Recording it helps to:

- **Monitor Engine Performance:** Proper air pressure ensures efficient fuel burn and engine power output.
- **Identify Airflow Issues:** Deviations from the normal range could indicate problems with the air intake system.

Possible Cause if Outside Normal Range:

- **Low Pressure:** Air leaks in the intake system, clogged air filter, malfunctioning turbocharger (if applicable).
- **High Pressure:** Restricted exhaust system (rare).

By diligently recording and monitoring these key engine parameters, engineers can identify potential problems early on, take corrective actions, and prevent major engine failures or performance issues.

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9. List FIVE safety devices that may be fitted to the main swichboard of a vessel, stating reasons for fitting each device. (10)

Here are five safety devices that may be fitted to the main switchboard of a vessel, along with the reasons for fitting each:

1. **Circuit Breakers:** These are the most common safety devices found on a switchboard. They automatically interrupt the flow of current if it exceeds a predetermined safe limit. This prevents overheating and potential fire damage to electrical circuits and equipment.

2. **Fuses:** While less common than circuit breakers on modern vessels, fuses can still be found in some switchboards. They act as a sacrificial element, melting and interrupting the circuit if the current exceeds their rating. This provides a simpler and more disposable form of overload protection.

3. **Overcurrent Relays:** These relays monitor the current flowing through a circuit. If the current exceeds a set threshold for a specific time, the relay trips, opening a circuit breaker and disconnecting the faulty circuit. This provides more sophisticated overload protection compared to simple fuses and allows for adjustable trip settings based on the specific circuit requirements.

4. **Ground Fault Circuit Interrupters (GFCIs):** These devices are particularly important for circuits supplying power to wet or potentially damp areas onboard the vessel. They detect imbalances in current flow between the live and neutral conductors, which can indicate a leakage to ground. GFCIs then quickly interrupt the circuit to prevent electrical shock hazards.

5. **Undervoltage and Overvoltage Protection Relays:** These relays monitor the voltage levels within the electrical system. If the voltage falls below a minimum safe operating level (undervoltage) or rises above a maximum safe level (overvoltage), the relay trips, disconnecting the circuit. This protects sensitive equipment from damage due to voltage fluctuations.

These are just a few examples, and the specific safety devices fitted to a main switchboard will vary depending on the size and type of vessel, along with regulatory requirements.

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1. Outline the procedures and arrangements to be put into place before a permit to work is issued for entry into a confined space. (10)

Procedures and Arrangements for Confined Space Entry Permit:

Before issuing a permit for entry into a confined space, a thorough risk assessment and preparation process must be undertaken. Here's an outline of the key steps:

1. Confined Space Identification and Risk Assessment:

- Identify all confined spaces onboard the vessel based on size, access limitations, and potential hazards (oxygen deficiency, flammable atmospheres, toxic fumes).
- Conduct a risk assessment for each confined space, considering:
    - Potential hazards present (flammable, toxic, or oxygen-deficient atmosphere)
    - Required work activities and associated risks
    - Ventilation requirements

2. Permit System Establishment:

- Develop a formal permit system with a designated permit issuer (authorized person) and clear procedures for obtaining a permit.
- The permit should contain details such as:
    - Confined space identification
    - Date and time of permit issuance and expiry
    - Work activities to be undertaken
    - Names of authorized entrants and standby person
    - Atmospheric monitoring plan (testing for oxygen, flammables, toxic gases)
    - Ventilation requirements (natural or mechanical)
    - Personal protective equipment (PPE) required (respirators, safety harnesses)
    - Emergency procedures and rescue plan

3. Pre-Entry Preparations:

- **Isolation:** Isolate the confined space from surrounding machinery or processes that could introduce hazardous substances. Lock out and tag out any equipment that could pose a risk during entry.
- **Ventilation:** Establish adequate ventilation to ensure a safe atmosphere for entry. This could involve natural ventilation by opening hatches for a designated period or utilizing mechanical ventilation systems.
- **Atmospheric Monitoring:** Before entry, conduct atmospheric testing using portable gas detectors to confirm oxygen levels are within safe limits (usually above 19.5%) and there are no hazardous concentrations of flammable or toxic gases.
- **Communication Plan:** Establish clear communication protocols between workers inside the confined space and a designated standby person outside. Ensure the standby person is trained in rescue procedures and has access to communication equipment to raise an alarm in case of an emergency.
- **Briefing:** Brief all authorized entrants and the standby person about the permit details, including the specific hazards, emergency procedures, and communication protocols.

4. Permit Issuance:

- Once all the above preparations are complete, the authorized person can issue the permit to the party leader (entrant in charge) after verifying their understanding and competence.

5. Work Execution and Monitoring:

- The entrant in charge is responsible for ensuring all permit conditions are met throughout the work process.
- Continuous atmospheric monitoring is crucial during the work, and the standby person should monitor the situation outside the space.

- If any unsafe conditions arise (e.g., changes in atmosphere, equipment malfunction), work must be stopped immediately, and all personnel must evacuate the space.

6. Permit Cancellation:

- Upon completion of the work, the permit must be returned to the authorized person for cancellation, indicating a safe exit of all personnel.

Following these procedures and arrangements ensures a safe working environment for personnel entering confined spaces onboard a vessel. Remember, this is a general outline, and specific regulations or company procedures may have additional requirements.