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**ΠΤΥΧΙΑΚΗ ΕΡΓΑΣΙΑ ΜΕ ΤΙΤΛΟ:  
OCCUPATIONAL ACCIDENT  
PREVENTION ON BOARD**



**ΤΟΥ ΣΠΟΥΔΑΣΤΗ: ΚΟΣΜΙΔΗ ΓΕΩΡΓΙΟΥ  
Α.Γ.Μ.: 3055  
ΕΠΙΒΛΕΠΟΥΣΑ ΚΑΘΗΓΗΤΡΙΑ: ΠΑΠΑΛΕΩΝΙΔΑ  
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<i>3</i>				
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**Ο ΔΙΕΥΘΥΝΤΗΣ ΣΧΟΛΗΣ: ΤΣΟΥΛΗΣ ΝΙΚΟΛΑΟΣ**

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## ABSTRACT

In this dissertation there has been an effort to analyze occupational hazards and the prevention of the accidents that happen at the time of work. Most important causes of occupational accidents are not proper safety awareness and lack of experience. Therefore some international organizations have created codes and guidelines so they could improve these two important factors. **IMO** (International Maritime Organization) created the **ISM code** (International Safety Management code) and **ILO** (International Labour Organization) created “**Accident prevention on board ship at sea and in port**”. This dissertation is based on these and assumes the role of a “consultant” as it were, or a “guide” to new and experienced seafarers on how to avoid these accidents.

Chapter 1 demonstrates the means of safe access to ship such as accommodations and pilot ladders. Chapter 2 analyzes the personal protective equipment (PPE) for each part of the human body. Chapter 3 points out how to work aloft and outboard safely. Chapter 4 is all about the safe movement on board. Chapter 5 indicates the hazards of the work in machinery spaces. And the last chapter gives away slip, trip and fall accident prevention as well as the dangers of the snap-back zones.

## CHAPTER 1: SAFE ACCESS TO SHIP

### 1.1 Means of access to ship.

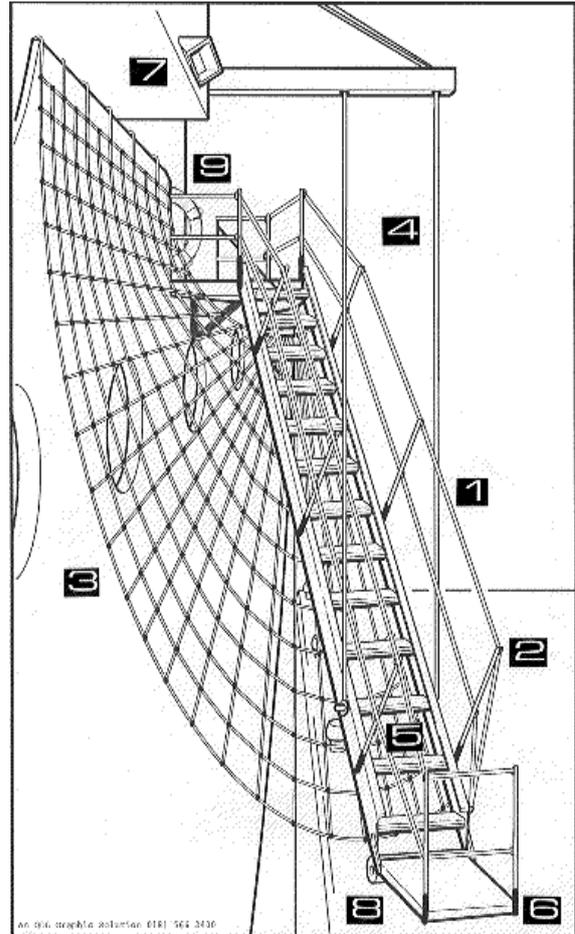
The Master is responsible for ensuring that there are safe means of access between any ship and any quay, pontoon or similar structure or another ship alongside which the ship is secured. The equipment must be well maintained, in sound condition, rigged correctly and be kept safe throughout the stay of the ship. The access equipment and the approaches to it are to be well lit. Appropriate safety and warning signs are to be posted at the access to the ship. Access equipment is to be kept free of snow, ice, cargo, oil and grease residues.

In the interests of security, wherever possible, access to the ship is to be limited to one point at the gangway or accommodation ladder. It is to be manned at all times by a crew member in radio contact with the Officer-of-the-Watch. Reference is to be made to the paper copy Ship Security Plan.

To ensure the safety of visitors, a safety information sheet is to be issued to all persons visiting the vessel. This will give information regarding alarm signals and emergency instructions. All personnel, both ship and shore staff, must only use the designated means of access.

A checklist is to be prepared for keeping at the vessel access point, listing the following items to be confirmed:

- 1) Rope guardrails tight.
- 2) Stanchions free of distortion and all in place.
- 3) Safety net positioned between ladder and ship.
- 4) Hoisting arrangements clear of head height.
- 5) Steps free of oil, grease and ice.
- 6) Bottom platform level (where fitted).
- 7) Lighting arrangements positioned effectively.
- 8) Base clear of obstructions.
- 9) Lifebuoy with light/line with float available.



The purpose of a safety net is to minimize the risk of injury arising from falling between the ship and quayside, between two ships, or falling onto a quay or jetty. For a standard accommodation ladder parallel to the ship's side, the net should be rigged so it will prevent someone falling between the ship and quay. Rigging the net so it encloses also the outboard and top rails, will also enhance safety.

A lifebuoy fitted with a self-activating light and also a separate buoyant line attached to a quoit or similar device is to be provided ready for use at the point of access to the vessel.

**Gangways and accommodation ladders** are normally used as the main types of accesses; however certain types of vessel such as car carriers and Ro-Ro's may have special access points. These are to be treated with similar precautions and handling as conventional access means but may have special additional requirements unique to the class of vessel.

Fire Plan – This is placed in the vicinity of the gangway and contains information that may be useful in an emergency e.g. cargo stowage plan, stability details, crew list, General Arrangement plan and a plan highlighting the location of vessel's safety equipment etc.



*Fire Plan*

The watchman must keep in mind that he is the first point of contact on the vessel for the boarding person. If a vessel is alongside a berth affected by tidal conditions, constant reassessment of the situation should be carried out. In addition the watchman must have access to the times of high and low waters and be aware of any cargo operations which may affect the vessel's trim. If a watchman is not present at the gangway and an incident occurs, the vessel's crew may carry on with their duties unaware of the situation.



*Means of access incorrectly rigged*

Gangways must not be rigged at an angle of more than 30 degree and accommodation ladders no more than 55 degree from below the horizontal unless specifically designed for greater angles. Where a gangway or accommodation ladder rests on top of a bulwark or strengthened handrails, a bulwark ladder must be provided. Any gap between the gangway or accommodation ladder and bulwark

ladder is to be fenced to a height of at least 1 meter. Handrails are to be fitted to at least one side of the bulwark ladder to ensure safe passage to and from the gangway.

All ship's access equipment must be inspected at least annually and maintained according to the manufacturer's instructions and the vessel's planned maintenance system. All moving parts and wire falls are to be adequately lubricated with the correct oil or grease. Any damages to wires or ropes are to be investigated carefully and, if deemed necessary, renewed. A careful check is to be made for any signs of cracking or corrosion.



*Gangway in need of maintenance*

When the access equipment is provided by the shore it is still the Master's responsibility to ensure as far as practicable that the access is safe. Any defects of shore equipment must be reported to the shore authority for immediate action or repair.

A **portable ladder** should not be used for access to a vessel unless a safer means of access is not reasonably practical. Portable ladders should be of good construction, adequate strength and properly maintained.

When a ladder is in use:

- the top should rise at least 1 m above the landing place;
- each upright should rest properly on a firm and level footing; and
- It should be properly secured against slipping, falling or sideways shifting.

The ladder should be used at an angle of between 60 and 75 degrees from the horizontal.

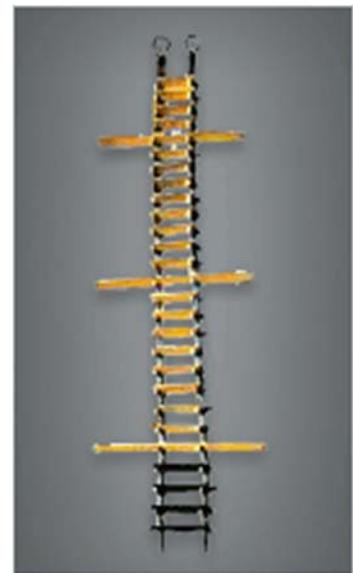
**Rope ladders** must only be used as a means of access if there is no other safe alternative. They must never be used as an easy substitute. Rope ladders must provide an adequate slip resistant foothold and must be secured so that they are firmly held against twist, turn or tilt.

## 1.2 Pilot Ladders.

**Pilot ladders** should not be used for access by port officials, port state control officers and agents who have need to board the vessel. The Master should make access arrangement "promptly" which is deemed to be immediately after arrival and mooring.

The steps of the pilot ladders should comply with the following requirements:

- if made of hardwood, they should be made in one piece, free of knots;
- if made of material other than hardwood, they should be of equivalent strength, stiffness and durability to the satisfaction of the Administration;
- the four lowest steps may be of rubber of sufficient strength and stiffness or other material to the satisfaction of the Administration;
- they should have an efficient non-slip surface;
- they should be not less than 400 mm between the side ropes, 115 mm wide and 25 mm in depth, excluding any non-slip device or grooving;
- they should be equally spaced not less than 310 mm or more than 350 mm apart; and
- They should be secured in such a manner that each will remain horizontal.



*Pilot ladder*

Pilot ladders with more than five steps should have spreader steps not less than 1.8 m long provided at such intervals as will prevent the pilot ladder from twisting. The lowest spreader step should be the fifth step from the bottom of the ladder and the interval between any spreader step and the next should not exceed nine steps.

The side ropes of the pilot ladder should consist of two uncovered ropes not less than 18 mm in diameter on each side and should be continuous, with no joints and have a breaking strength of at least 24 Kilo Newtons per side rope. The two side ropes should each consist of one continuous length of rope, the midpoint half-length being located on a thimble large enough to accommodate at least two passes of side rope.

## CHAPTER 2: PERSONAL PROTECTIVE EQUIPMENT

Almost any kind of work on board a ship requires the use of the personal protective equipment (PPE) which is intended to be worn or held by a person who is at work and which protects him or her against one or more risks to his or her health and safety.

PPE must be provided to the crew by ship owners and the master and replaced in case there is no more proper use possible. Personal protective equipment should be of a type and standard as approved by the appropriate authority.

All seafarers should be trained in the use of personal protective equipment and advised of its limitations. Persons using such items should check them each time before use.

### 2.1 Head Protection.

**Helmet or Hard Hat:** The most important part of the human body is the head. It needs utmost protection which is provided by a hard plastic helmet on the ship. A chin strap is also provided with the helmet which keeps the helmet on place when there is a trip or fall.

Types of Head hazards:

- Impact
- Electric shock
- Drips

Elimination or Control of Hazards:

- Safe Work Practices
- Grounded equipment/shock resistant tools
- Signs posted warning of hazards



*Warning sign*

## 2.2 Eye and Face Protection.

Eyes are the most sensitive part of the human body and in daily operations on ship chances are very high for having an eye injury. Personal protective equipment for the eyes and face is designed to prevent or lessen the severity of injuries to workers. Below are some of the many protective equipment for the eyes and face:

- **Safety glasses**
- **Goggles**
- **Face shields**
- **Welding helmets**

Types of eye/face hazards:

- Impact
- Heat
- Chemicals
- Dust
- Light and/or radiation

Elimination or Control of Hazards:

- Machine Guards
- Work area barriers
- Ventilation
- Lighting
- Signs and warnings
- Eyewash stations
- Safe Work Practices



*Safety Glasses*



*Face Shield*

## 2.3 Hand Protection

All seafarers should wear appropriate hand protection when engaged at work, because almost 20% of all disabling accidents on the job involve the hands.

Types of Hand PPE:

- **Gloves:**
  - *Metal mesh gloves*
    - resist sharp edges and prevent cuts
  - *Leather gloves*
    - shield your hands from rough surfaces
  - *Vinyl and neoprene gloves*
    - protect your hands against toxic chemicals
  - *Rubber gloves*
    - protect you when working around electricity
  - *Metal mesh gloves*
    - resist sharp edges and prevent cuts
  - *Leather gloves*
    - shield your hands from rough surfaces
  - *Vinyl and neoprene gloves*
    - protect your hands against toxic chemicals
  - *Rubber gloves*
    - protect you when working around electricity
- **Forearm Cuffs**
  - used to protect your forearm

- **Thumb Guards and Finger Cots**
  - protect only your thumb or fingers
- **Mittens**
  - protect your hands while working around very cold or hot materials
- **Hand Pads**
  - Hand pads protect your hands while working around very hot materials

Types of Hand Hazards:

- Traumatic Injuries
- Contact Injuries
- Repetitive Motion Injuries

Elimination or Control of Hazards:

- Engineering Controls
- Procedures
- Housekeeping and Hygiene



*Most common safety gloves*

## 2.4 Foot Protection

Maximum of the internal space of the ship is utilized by cargo and machinery, which is made of hard metal and which make it clumsy for crew to walk around.

Safety shoes ensure that nothing happens to the crew member's feet while working or walking onboard.

Types of Foot PPE:

- **Safety Shoes and Boots**

- *Steel toe footwear*
  - protects your toes from falling objects and from being crushed
- *Metatarsal footwear*
  - special guards that run from your ankle to your toes and protect your entire foot
- *Reinforced sole footwear*
  - metal reinforcement that protects your foot from punctures
- *Latex/Rubber footwear*
  - resists chemicals and provides extra traction on slippery surfaces
- *PVC footwear*
  - protects your feet against moisture and improves traction
- *Butyl footwear*
  - protects against most ketones, aldehydes, alcohols, acids, salts, and alkalies
- *Vinyl footwear*
  - resists solvents, acids, alkalies, salts, water, grease, and blood
- *Nitrile footwear*
  - resists animal fats, oils, and chemicals
- *Electrostatic dissipating footwear*
  - conducts static electricity to floors that are grounded
- *Electrical hazard footwear*
  - insulated with tough rubber to prevent shocks and burns from electricity
- *Disposable footwear*
  - includes shower slippers, clear polyethylene and non-woven booties used in dust free work areas

Types of Foot Hazards:

- Impact Injuries
- Injuries from Spills and Splashes
- Compression Injuries
- Electrical Shocks
- Extremes in Cold, Heat, and Moisture
- Slipping



*Steel Toe Footwear*

Elimination or Control of Hazards:

- Housekeeping
- Signs

## 2.5 Hearing Protection

Engine room of the ship produces 110-120 dB of sound which is very high for human ears. Also some of the deck equipment have high level of noise.

Types of hearing PPE:

- Ear muffs
- Ear plugs

Types of noise hazards:

- Headache
- Irritation
- Partial or full hearing loss



*Ear Muffs*

## 2.6 Body Protection

Types of Body PPE:

- Coveralls
- Fire resistant insulated coats and pants

Types of Body Hazards:

- Temperature stress
- Chemical Contact
- Radiation

Elimination or Control of Hazards:

- Signage
- Physical Barriers



*Common Coveralls*

## 2.7 Respiratory Protective Equipment

Appropriate respiratory protective equipment should be provided for work activities may result in harmful substances contaminating the air in the form of dust, mist, vapors, gas or fume. Workers may also need to work in areas where oxygen levels are or may become low, such as enclosed space.

Types of RPE:

- Respirators ( filtering devices )
- Breathing Apparatus



*Safety Mask Respirator*

There are two situations where emergency use of the RPE is needed: emergency escape and emergency rescue. The face-piece incorporated in respirators and breathing apparatus must be fitted correctly to prevent leakage.

## 2.8 Protection from falls



**Safety harness:** Routine ship operation includes maintenance and painting of high and elevated surfaces which require crew members to reach areas that are not easily accessible. To avoid a fall from such heightened area, safety harness is used. Safety harness is donned by the operator at one end and tied at a strong point on the other end.

## 2.9 What does the law say?

The relevant regulations are the Personal Protective Equipment at Work Regulations 1992.

Regulation states:

Every employer shall ensure that suitable personal protective equipment is provided to his employees who may be exposed to a risk to their health or safety while at work except where and to the extent that such risk has been adequately controlled by other means which are equally or more effective.

The accompanying guidance states:

Employers should, therefore, provide appropriate personal protective equipment (PPE) and training in its usage to their employees wherever there is a risk to health and safety that cannot be adequately controlled by other means.

By virtue of Section 9 of the Health and Safety at Work etc. Act 1974, no charge can be made to the worker for the provision of PPE which is used only at work.

## CHAPTER 3: WORKING ALOFT AND OVER THE SIDE

Personnel working at a height may not be able to give their full attention to the job and, at the same time, guard themselves against falling.

Proper precautions should therefore always be taken to ensure personal safety when work has to be done aloft or when working over the side. It must be remembered that the movement of a ship in a seaway and extreme weather conditions even when alongside, will add to the hazards involved. A stage or ladder should also be used when work is to be done beyond normal reach.

Personnel with less than 12 months experience at sea, should not work aloft unless accompanied by an experienced person or otherwise adequately supervised.

Personnel working aloft should wear a safety harness with lifeline or other arresting device at all times. A safety net should be rigged where necessary and appropriate. Where work is done over the side, buoyancy garments should be worn and a lifebuoy with sufficient line attached should be kept ready for immediate use. Personnel should be under observation by a person on deck.

Special consideration should be given to the problems of working near the ship's whistle, funnel, radio aerials and radar scanners. All relevant officers should be informed before work commences and all relevant equipment should be isolated, shut down or appropriate procedures adopted. Warning notices should be posted as appropriate. Officers should be informed when the work is completed.

Warning notices that seafarers are working aloft should be posted on deck and elsewhere as appropriate. Tools should not be carried in pockets but secured in belt tool carriers and they

should be kept secured to the belt with a lanyard or string during the work. Tools and stores should be sent up and lowered by line in suitable containers.

### 3.1 Portable ladders

A portable ladder should only be used where no safer means of access is reasonably practicable. The ladder should be checked regularly by a competent person.

Wooden ladders should not be painted or treated so as to hide defects and cracks. When not in use they should be stowed safely in a dry ventilated space away from any heat source.

Portable ladders should be pitched between 60° and 75° from the horizontal, on a firm base, properly secured against slipping or shifting sideways and placed to allow a clearance of at least 150 mm behind the rungs. Where practicable the ladder should extend to at least 1 m above any upper landing place unless there are other suitable handholds.



*Aluminum Step Ladder*

A safety harness secured above the person should be used when working aloft.

- A ladder should be effectively secured so that it cannot move.
- Seafarers using a ladder should:
  1. have both hands free for climbing up and down;
  2. face a rigid ladder when climbing up and down;
  3. Not carry tools or equipment.

### 3.2 Cradles and stages

As a guide, cradles should be at least 400 mm wide and fitted with guard rails or stanchions with taut ropes to a height of one meter from the floor. Toe boards add safety.

Planks and materials used for the construction of ordinary plank stages must be carefully examined to ensure adequate strength and freedom from defect.

Wooden components of staging should be stowed in a dry, ventilated space and not subjected to heat.

Ancillary equipment, lizards, blocks and gantlines should be thoroughly examined before use. When a stage is rigged over the side, the two gantlines used in its rigging should be at least long enough to trail into the water to provide additional lifelines should the operator fall. A lifebuoy and line should be kept ready close by.

Gantlines used for working aloft should not be used for any other purpose and should be kept clear of sharp edges when in use.

When seafarers working on a stage are required to lower the stage themselves, all movements of the stage should be small and carefully controlled.

Stages and staging which are not suspended should always be secured against movement. Hanging stages should be restricted against movement where practicable.

### 3.3 Bosun's chair

A hook should not be used to secure a bosun's chair unless it is a type which cannot be accidentally dislodged.

A chair used with a gantline should be secured with a double sheet bend and the loose end should be tucked into the rope lay of the standing part.



*Bosun's Chair*

A chair, and all associated equipment such as gantlines, should be carefully inspected before use and a load test applied before hoisting takes place. If it is necessary to hoist a person aloft, it should be done only by hand and never by mechanical means, such as a winch.

Seafarers should be reminded that when securing the hitch in a chair the practice of holding both parts of the gantline with one hand and making the lowering hitch with the other is dangerous.

### 3.4 Ropes

The safety of seafarers working aloft depends to a large extent on the condition of the ropes used in the operations. Such ropes must be given considerable care and attention.

Ropes should be stowed in a special locker and used for no other purpose than for working aloft. Nothing else should be stowed in the locker; stores such as detergents and paints may damage ropes. The locker should be dry and not subject to excessive heat.

All ropes should be thoroughly inspected each time before use and daily when in use. It should be remembered that although the surface of a rope may indicate that it is in good condition, it may have deteriorated inside.

## CHAPTER 4: SAFE MOVEMENT

We must be alert and take care as we move around the ship. Be aware of the following points as they are often overlooked:

- watch out for tripping hazards, and protrusions such as pipes and framing
- always bear in mind the possibility of a sudden or heavy roll of the ship
- wear suitable footwear that will protect toes against accidental stubbing and falling loads, and provide a good hold on deck and give firm support while using ladders – extra care should be taken when using ladders while wearing sea boots
- it is dangerous to swing on or vault over stair rails, guardrails or pipes; and to jump off hatches
- manholes and other deck accesses should be kept closed when not being used; guardrails should be erected and warning signs posted when they are open
- spillage of oil, grease or soapy water should be cleared up as soon as practicable
- areas made slippery by snow, ice or water should be treated with sand or some other suitable substance
- the presence of temporary obstacles should be indicated by appropriate warning signs
- litter and loose objects, e.g. tools, should be cleared up
- wires and ropes should be coiled and stowed
- lifelines should be rigged securely across open decks in rough weather
- ladders should be secured and ladder steps in good condition; care should be taken when using ladders and gangways providing access to or about the vessel, particularly when wearing gloves

- Never obstruct the means of access to fire fighting equipment, emergency escape routes and watertight doors.

#### **4.1 Passageways and walkways.**

Where necessary for safety, walkways on decks should be clearly marked, e.g. by painted lines or other means. Where a normal transit area becomes unsafe to use for any reason, the area should be closed until it can be made safe again.

Transit areas should where practicable have slip-resistant surfaces. Where an area is made slippery by snow, ice or water, sand or some other suitable substance should be spread over the area. Spillages such as oil or grease should be cleaned up as soon as possible.

When rough weather is expected, life-lines should be rigged securely across open decks. Gratings in the deck should be properly maintained and kept closed when access to the space below is not required.

Permanent fittings that may cause hazards to movement, e.g. pipes, single steps, framing, door arches, top and bottom rungs of ladders, should be made conspicuous by use of contrasting coloring, marking, lighting or signing. Temporary obstacles can also be hazardous and, if they are to be there for some time, they should be marked by appropriate warning signs.

When at sea, any gear or equipment stowed to the side of a passageway or walkway should be securely fixed or lashed against the movement of the ship.

Litter and loose objects, e.g. tools, should not be left lying around. Wires and ropes should be stowed and coiled so as to cause least obstruction.

## **4.2 Watertight doors.**

All members of the crew who would have occasion to use any watertight doors should be instructed in their safe operation.

Particular care should be taken when using power operated watertight doors that have been closed from the bridge. If opened locally under these circumstances the door will re-close automatically with a force sufficient to crush anyone in its path as soon as the local control has been released.

The local controls are positioned on each side of the door so that a person passing through may open the door and then reach to the other control to keep the door in the open position until transit is complete. As both hands are required to operate the controls no person should attempt to carry any load through the door unassisted.

Notices clearly stating the method of operation of the local controls should be prominently displayed on both sides of each watertight door.

No one should attempt to pass through a watertight door when it is closing and/or the warning bell is sounding.

## **4.3 Lighting.**

The level of lighting should be such as to enable obvious damage to, or leakage from, packages to be seen. When there is a need to read labels or container plates or to distinguish colours the level of lighting should be adequate to allow this, or other means of illumination should be provided.

Lighting should be reasonably constant and arranged to minimize glare and dazzle, the formation of deep shadows and sharp contrasts in the level of illumination between one area and another.

Where visibility is poor, e.g. due to fog, clouds of dust, or steam, which could lead to an increase in the risks of accidents occurring, the level of lighting should be increased above the recommended minimum.

Lighting facilities should be properly maintained. Broken or defective lights should be reported to the responsible person and repaired as soon as practicable.

Before leaving an illuminated area or space a check should be made that there are no other persons remaining within that space before switching off or removing lights.

Unattended openings in the deck should either be kept illuminated or be properly or safely closed before lights are switched off.

#### **4.4 Drainage.**

Decks that need to be washed down frequently or are liable to become wet and slippery, should be provided with effective means of draining water away. Apart from any open deck these places include the galley, the ship's laundry and the washing and toilet accommodation.

Drains and scuppers should be regularly inspected and properly maintained. Where drainage is by way of channels in the deck, these should be suitably covered.

#### **4.5 Protection around cargo hatches and other deck openings**

People may fall or trip on hatchways. Hatchways open for handling cargo or stores should be closed as soon as work stops, except during short interruptions where they cannot be closed without prejudice to safety or mechanical efficiency because of the heel or trim of the ship.

The guard-rails or fencing should have not sharp edges and should be properly maintained. Where necessary, locking devices and suitable stops or toe-boards should be provided. Each course of rails should be kept substantially horizontal and taut throughout their length.

Every cargo hatchway should be protected by means of a coaming or fencing to a height of at least 1 m above the deck.

#### **4.6 Access to holds and other spaces**

Safe access should be provided into each hold or space below deck. Rope ladders should not be used to access holds.

All ladders and access arrangements should be inspected at frequent intervals by a competent officer, especially before and after working cargo in the space in question. When any ladders, handgrips, footholds or cleats are found to be unsafe, access should be locked or blocked off and warning notices prohibiting access should be posted at every approach until repairs have been carried out.

The competent officer should ensure that any defects are corrected as soon as practicable.

## CHAPTER 5: WORK IN MACHINERY SPACES

In the Engine Room is stationed almost all the necessary equipment required for the operation of the vessel, therefore there are a lot of hazards for the crew to face, such as high noise levels, high temperature and more. So we should take care of the following points to stay safe.

All operations in machinery spaces should be performed by a competent person under the supervision of a responsible officer or senior rating.

Dangerous parts of ships machinery to be isolated if they cannot be eliminated. A secure guard fitted to safeguard personnel would fulfil this obligation.

All steam pipes, exhaust pipes and fittings that by their location and temperature present a hazard, should be adequately lagged or otherwise shielded. The insulation of hot surfaces should be properly maintained particularly in the vicinity of oil systems.

### 5.1 High noise levels

Personnel required to work in machinery spaces, which have high noise levels, should wear suitable hearing protectors.

Where a high noise level in a machinery space, or the wearing of ear protectors, may mask an audible alarm, a visual alarm should be provided, where practicable, to attract attention and indicate that an audible alarm is sounding. This should preferably take the form of a light or lights with rotating reflectors. Guidance may be found in the IMO Code on alarms and indicators.

## 5.2 Oil leakages, tanks and bilges

The source of any oil leakage should be located and repaired as soon as practicable.

Waste oil should not be allowed to accumulate in the bilges or on tank tops. Any leakage of fuel, lubricating and hydraulic oil should be disposed of in accordance with Part 120 of the Marine Protection Rules at the earliest opportunity. Tank tops and bilges should, wherever practicable, be painted a light color and kept clean and well-illuminated in the vicinity of pressure oil pipes so that leaks may be readily located.

Great caution is required when filling any settling or other oil tank to prevent it overflowing, especially in an engine room where exhaust pipes or other hot surfaces are directly below. Manholes or other openings in the tanks should always be secured so that if a tank is overfilled the oil will be directed to a safe place through the overflow arrangements.

Particular care should be taken when filling tanks that have their sounding pipes in the machinery spaces to ensure that weighted cocks are closed. In no case should a weighted cock on a fuel or lubricated oil tank sounding pipe or on a fuel, lubricating or hydraulic oil tank gauge be secured in the open position.

Engine room bilges should at all times be kept clear of rubbish and other substances so that mud-boxes are not blocked and the bilges may be readily and easily pumped.

Remote controls fitted for stopping machinery or pumps or for operating oil-tank quick-closing valves in the event of fire, should be tested regularly to ensure that they are functioning satisfactorily. This also applies to the controls on fuel storage daily service tanks (other than double bottoms) and lubricating oil tanks.

### **5.3 Cleaning and spare gear**

Cleaning solvents should always be used in accordance with manufacturers' instructions and only in an area that is well ventilated.

Spare gear should be properly stowed and items of machinery under overhaul safely secured so that they do not break loose and cause injury or damage in heavy weather.

### **5.4 Boilers**

Operating instructions should be displayed at each boiler. Information provided by the manufacturers of the oil-burning equipment should be displayed in the boiler room.

The correct flashing up procedure should always be followed to avoid danger of a blowback when lighting boilers.

The avenues of escape from the boiler fronts and firing spaces should be kept clear.

Where required to be fitted, the gauge glass cover should always be in place when the glass is under pressure. If a gauge glass or cover needs to be replaced or repaired, the gauge should be shut off and drained before the cover is removed.

### **5.5 Unmanned machinery spaces**

Personnel should never enter or remain in an unmanned machinery space alone, unless they have received permission from, or been instructed by the engineer officer in charge at the time. They may only be sent to carry out a specific task which they may be expected to complete in a comparatively short time.

Before entering the space, at regular intervals while in the space and on leaving the space, they must report by telephone, or other means provided, to the duty deck officer. Before they enter the space the method of reporting should be clearly explained. Consideration should be given to using a “permit-to-work”.

If it is the engineer officer in charge who enters the machinery space alone, they, too, should report to the deck officer.

Notice of safety precautions to be observed by personnel working in unmanned machinery spaces should be clearly displayed at all entrances to the space. Warning should be given that in unmanned machinery spaces there is a likelihood of machinery suddenly starting up.

Unmanned machinery spaces should be adequately illuminated at all times.

When machinery is under bridge control, the bridge should always be advised when a change in machinery setting is contemplated by the engine room staff, and is resumed.

## **5.6 Refrigeration machinery**

Information should be available on each vessel relating to the operation and maintenance of the refrigeration plant, the particular properties of the refrigerator and the precautions for its safe handling.

No one should enter a refrigerated compartment without first informing a responsible officer.

The compartment in which refrigeration machinery is fitted should be adequately ventilated and illuminated. Where fitted, both the supply and exhaust fans to and from

compartments in which refrigeration machinery is situated should be kept running at all times. Inlets and outlets should be kept unobstructed.

Where there is any doubt as to the adequacy of the ventilation, a portable fan or other suitable means should be used to assist in the removal of toxic gases from the immediate vicinity of the machine.

Should it be known or suspected that the refrigerant has leaked into any compartments, no attempt should be made to enter those compartments until a responsible officer has been advised of the situation.

If it is necessary to enter the space, it should be ventilated to the fullest extent practicable and the personnel entering should wear approved breathing apparatus. A person should be stationed in constant attendance outside the space, also with breathing apparatus.

### **5.7 What does the law say?**

Each machinery space must be designed to minimize the exposure of personnel to noise in accordance with IMO A.468 (XII). No person may encounter a 24-hour effective noise level greater than 82 dB (A) when noise is measured using a sound-level meter and an A-weighting filter. Each entrance to a machinery space with a noise level greater than 85 dB(A) must have a warning sign stating that each person entering the space must wear ear protection.

## CHAPTER 6: SLIPS, TRIPS & FALLS / SNAP-BACK ZONES

### 6.1 Slips, trips & falls

Slips and trips are the most common cause of injury at work. On average, they cause 40 percent of all reported major injuries and can also lead to other types of serious accidents, for example falls from height. Slips and trips are also the most reported injury to members of the public.



#### *6.1.1 Slips*

Slips happen where there is too little friction or traction between the footwear and the walking surface.

Common causes of slips are:

- wet or oily surfaces
- occasional spills
- weather hazards
- loose, unanchored rugs or mats
- flooring or other walking surfaces that do not have same degree of traction in all areas
- object on ladder
- unmarked edge

### 6.1.2 Trips

Trips happen when your foot collides (strikes, hits) an object causing you to lose the balance and, eventually fall.

Common causes of tripping are:

- obstructed view
- poor lighting
- clutter in your way
- wrinkled carpeting
- uncovered cables
- bottom drawers not being closed
- uneven (steps, thresholds) walking surfaces not marked
- goods stored incorrectly
- fixed objects in walkway
- bight in mooring rope



### 6.1.3 Falls

There are two types of falls: falls on the same level, resulted by slips or trips, and falls from height. Majority of fall accidents happens on the same level.

Common causes of falls are:

- edges not marked
- missing rails/chains
- drop in floor level

### ***6.1.4 Accident prevention***

There are many simple ways to control slips and trips risks and prevent accidents in your workplace. Here are a few examples.

#### ***Stop floors becoming contaminated***

- Use entrance matting.
- Fix leaks from machinery or buildings.
- Make sure plant and equipment are maintained.
- Design tasks to minimize spillages.

#### ***Use the right cleaning methods***

- Make sure that your cleaning method is effective for the type of floor you have.
- Don't introduce more slip or trip risks while cleaning is being done.
- Leave smooth floors dry after cleaning.
- Remove spillages promptly.
- Have effective arrangements for both routine cleaning and dealing with spills.
- Use the appropriate detergent mixed at the correct concentration.

#### ***Consider the flooring and work environment***

- Check for loose, damaged and worn flooring and replace as needed.
- Add hazard markings: yellow/ black or red/ white stripes painted on points of potential danger

- Floors likely to get wet or have spillages on them should be of a type that does not become unduly slippery.
- Make sure lighting is sufficient and that slopes or steps are clearly visible.
- Keep walkways and work areas clear of obstructions.



*Hazard Marking*

### ***Get the right footwear***

- Where floors cannot be kept clean and dry, slip-resistant footwear can help prevent slip accidents.
- Trial footwear first to make sure it is suitable for the environment and for those who will be wearing it, comfort and fit.
- If footwear is supplied as personal protective equipment (PPE), it must be supplied free of charge to employees.

### ***Think about people and organizational factors***

- Consider how work is organized and managed, e.g. to avoid rushing, overcrowding, trailing cables.
- Make sure employees are involved in the decisions that affect them, e.g. choice of PPE footwear or a change in cleaning methods.

### 6.1.5 What does the law say?

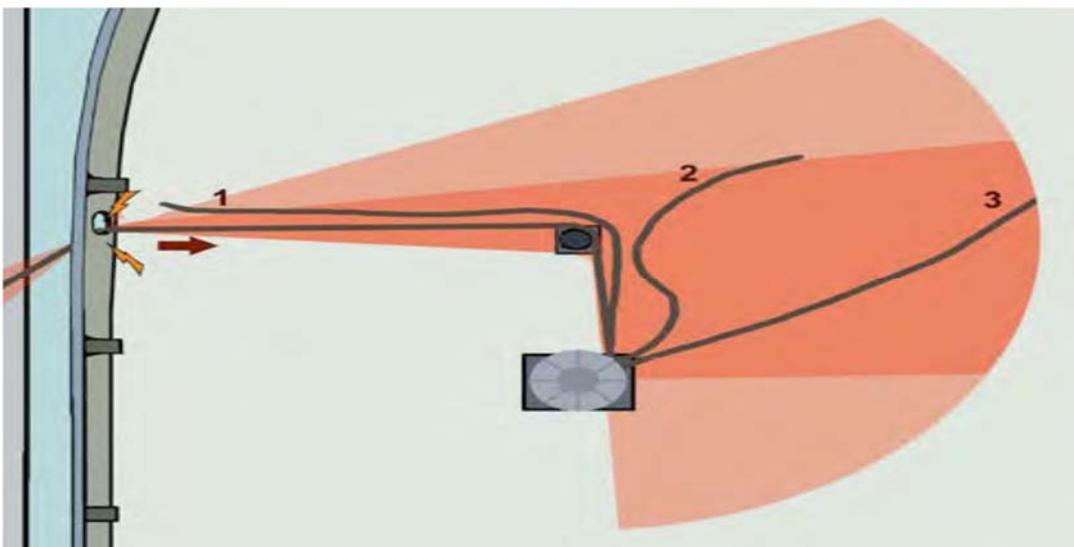
**The Health and Safety at Work etc. Act 1974 (HSW Act)** requires employers to ensure the health and safety of all employees and anyone who may be affected by their work, so far as is reasonably practicable. This includes taking steps to control slip and trip risks.

Employees have a duty not to put themselves or others in danger, and must use any safety equipment provided.

**The Management of Health and Safety at Work Regulations 1999** require employers to assess risks (including slip and trip risks) and, where necessary, take action to address them.

**The Workplace (Health, Safety and Welfare) Regulations 1992** require floors to be suitable, in good condition and free from obstructions. People should be able to move around safely.

## 6.2 SNAP-BACK ZONES



All mooring lines under tension will stretch, particularly those made from synthetic material. Should the line break, stored energy will be released as it reverts to its original length. The two ends of the line will recoil or “snap-back” towards and past the points to which they are secured. Anyone standing within the snap-back zone at either end of the line risks serious injury or death.

Important factors during a snap-back zone situation:

- Equipment
- Work processes
- Crew qualifications
- Crew concentration
- Ship’s safety culture
- Weather

Preventing accidents is about reducing the risks of those factors. The only parameter that is hard to overcome in this respect is the weather.

### **6.2.1 How to avoid snap-back accidents:**

1. Always wear the correct personal protective equipment (PPE), which is an important part of proper preparation considering that PPE is the last line of defense.
2. Always consider whether you are in a snap back zone and never stand on either an open line or a closed bight of line. Keep an eye out for all members of the team. If you think they are in an unsafe position, alert them.
3. All operations need to be carried out calmly without rushing about. Rushing leads to slips, trips and falls.

4. Never lose sight of what is going on around you and have an escape route from any likely danger (that is, avoid being trapped against the bulwark or other obstacle when a line parts).
5. Always put an eye onto a bollard or bitts by holding the eye either on its side or by a messenger line to avoid getting fingers trapped against the bollard if the line suddenly snaps tight.
6. Never heave blindly on a line when no one is watching what is happening at the other end.
7. Never try to be heroic by jumping onto a line that is clearly running over the side and out of control as you are likely to go overboard with it.
8. Never run more than one line around a fairlead sheave as the lines chafe through quicklier and the sheave is really only strong enough to take the load of a single line under tension.
9. Never use any equipment that is obviously faulty. If you notice damage, then it should be reported and an alternative arrangement for the mooring line used.
10. Never let go of a mooring line under heavy load without determining first why the load is so heavy and then taking the proper precautions if it must be let go

### **6.2.2 Running out lines**

When the ship arrives at the berth, the mooring lines must be ready for running ashore. Running out lines often involves major risks to the crew, especially from getting caught in lines.

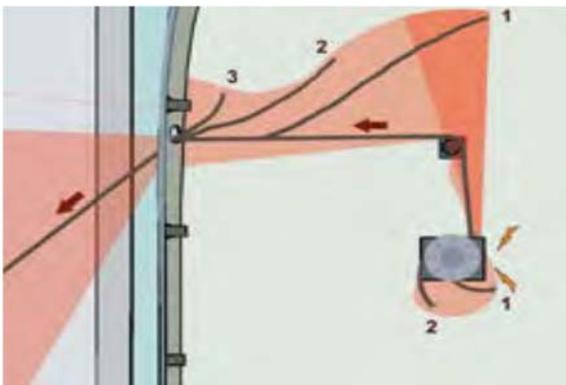
Be sure that someone keeps an eye on the mooring lines and on what is going on both on board and over the side, so that any problems are spotted before they become serious.

### 6.2.3 Painting snap back zones

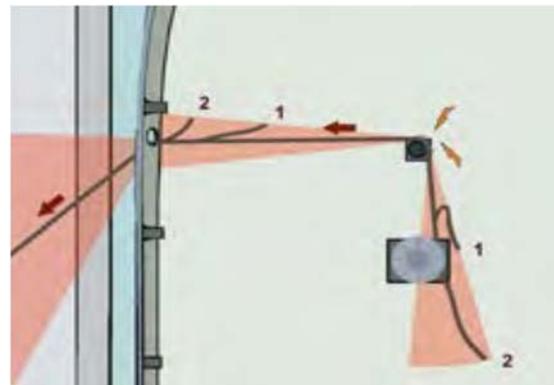
Painting the snap back zones on deck is a good idea if the vessel always moors alongside in the same way and uses the same set-up. This is especially so for ferries always plying between the same terminals. But the markings must never stand alone.

### 6.2.4 Using the drum/capstan

Keep a safe distance when using a drum or capstan. There is a great risk of hands and fingers getting caught between drum and line. No more than four turns should be taken over the warping drum end. If too many are applied, then the line cannot be released in a controlled manner.



*When the line parts at the capstan*



*When the line parts at the roller*

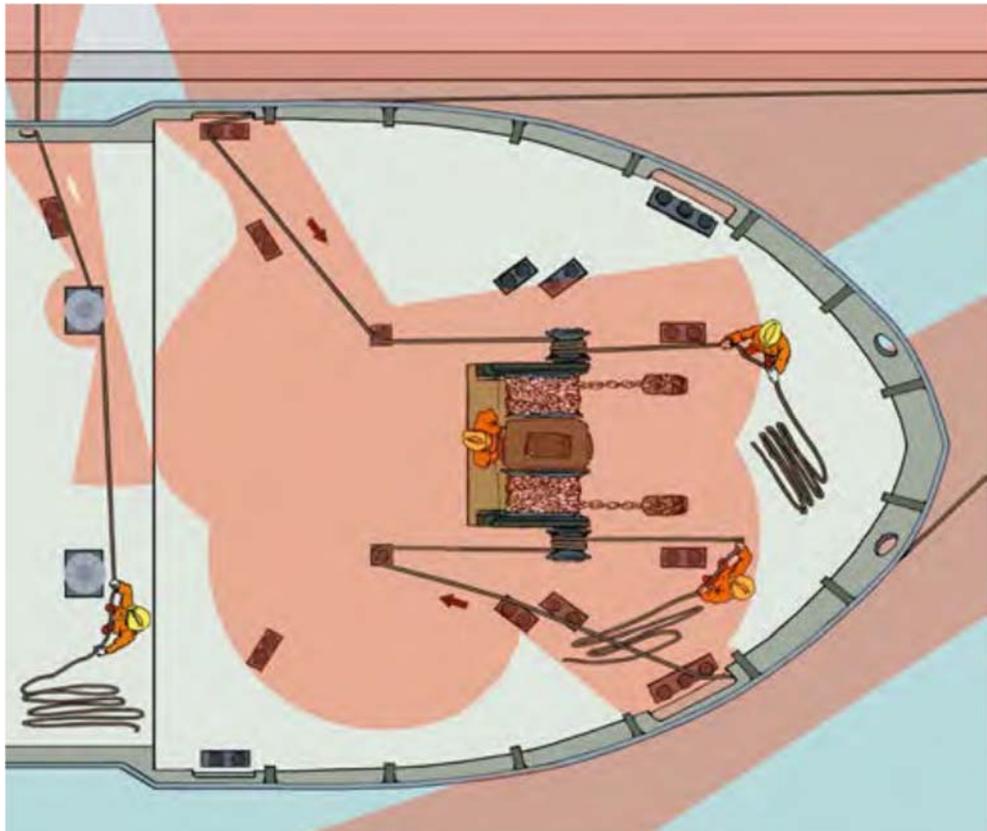
### 6.2.5 Using stoppers

Too many accidents have happened while using stoppers. The operation where you connect the stopper to the line should be done very quickly since the whole tension is transferred to the stopper and things can quickly go wrong if too many snags arise.

If too many turns have been made on the drum or the line has burnt itself into paint, this can cause precisely the kind of delay that makes the stopper part and an accident happens.

Heaving in a loose line makes the other lines slack off, thus transferring the whole load onto the stopper which then parts as a result.

If the stopper is placed too close to the bitts, the tension can disappear when taking the line off the barrel. If that happens, the operation will have to start all over again.



*Situation in which it is impossible to work the lines safely*

### **6.2.6 Spooling**

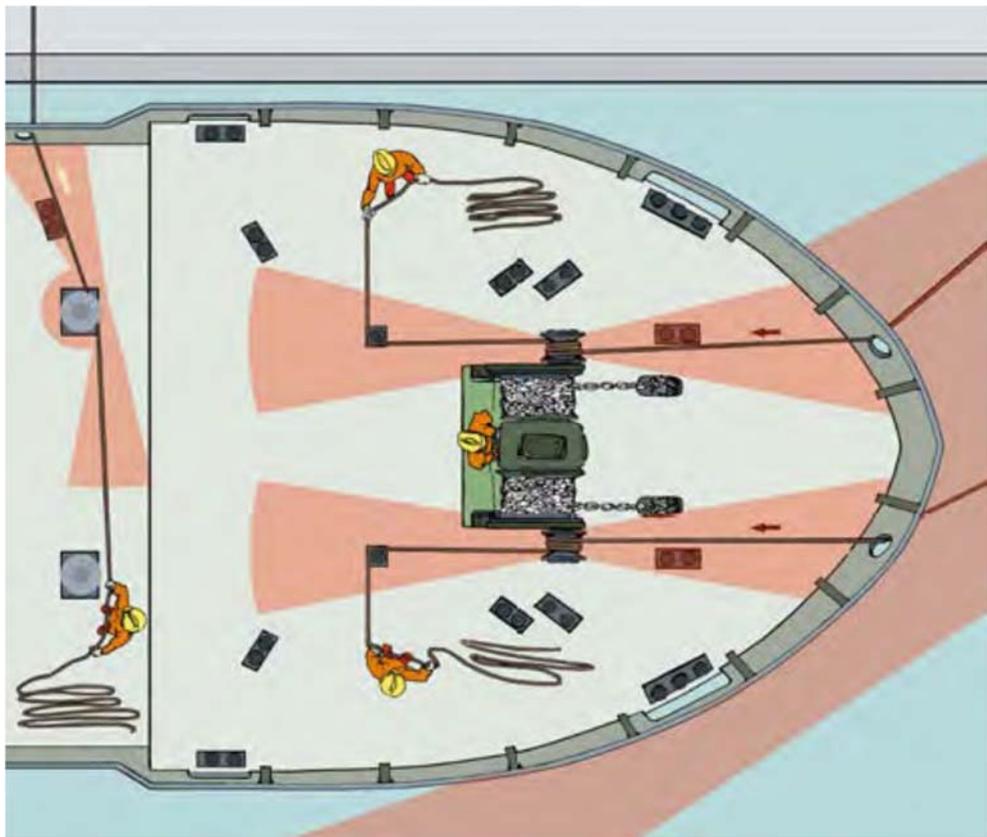
On departure, crewmen should be very careful when retrieving the lines aboard again safely and securely. At this point, there is still a considerable risk of being caught by line or getting hit by parted lines. It is very important that spooling is done correctly so the lines are properly laid onto the winch ready for the next mooring operation.

The angle of the line onto most mooring winches does not automatically change to lay each new turn immediately next to the previous one when a line is hauled in. The line tends to

randomly pile up in one section of the barrel unless each turn is laid next to the previous turn as it comes onto the barrel. The line will lie better on the barrel if it is spooled slowly with some hold-back tension.

In bad spooling, riding turns trap the line in gaps in lower layers. This will cause problems when the line is being run out to the mooring gang ashore the next time the ship comes alongside. Poorly spooled lines should be manually re-spooled properly before each berthing.

Mooring lines are dangerous because of the loads they carry and their ability to ensnare. These dangers have always existed on and near ships. Awareness of these dangers combined with a focus on safe working practices can prevent injury and death in areas where mooring operations are being carried out.



*Perfect mooring situation*

### **6.2.7 What does the law say?**

The two principal statutes governing the application of health and safety law are the Health and Safety at Work etc. Act (HSWA) 1974, and the Management of Health and Safety at Work Regulations (MHSWR) 1999, which set out the basic requirements to ensure, so far as is reasonably practicable, the health, safety and welfare of all involved in mooring operations.

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