

# **Seacare Authority Code of Practice Approval 2018 - Health and Safety in Shipboard Work, including Offshore Support Vessels**

made under the

*Occupational Health and Safety (Maritime Industry) Act 1993*, section 109

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## **1. Name of instrument**

This instrument is the Seacare Authority Code of Practice Approval 2018 - Health and Safety in Shipboard Work, including Offshore Support Vessels.

## **2. Commencement**

This instrument commences on the 1 January 2019.

## **3. Code of Practice Approval**

I approve the Seacare Authority Code of Practice 2018 - Health and Safety in Shipboard Work, including Offshore Support Vessels under section 109 of the *Occupational Health and Safety (Maritime Industry) Act 1993*.

## **4. Repeal of Approval**

The Seacare Authority Code of Practice Approval 2017 (F2017L00326) made on 23 March 2017 is repealed.

CRAIG LAUNDY

Minister for Small and Family Business, the Workplace and Deregulation

22/8/18

Date

**Seacare Authority**

**Code of Practice  
for  
Health and Safety in Shipboard Work,  
including Offshore Support Vessels**

**April 2018**

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## FOREWORD

This Code of Practice on maritime health and safety for seafarers is an approved code of practice under section 109 of the *Occupational Health and Safety (Maritime Industry) Act 1993* (OHS(MI) Act).

An approved code of practice is a practical guide to achieving the standards of health and safety required under the OHS(MI) Act, the *Occupational Health and Safety (Maritime Industry) Regulations 1995* and the *Occupational Health and Safety (Maritime Industry)(National Standards) Regulations 2003* (OHS(MI) Regulations 2003).

Similar to regulations, codes of practice deal with particular issues and do not cover all hazards or risks that may arise. The health and safety responsibilities require duty holders to consider all shipboard risks not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the OHS(MI) Act and Regulations. Failure to comply with a provision of a code of practice may be used by the courts as evidence of an offence under the OHS(MI) Act and Regulations in the circumstances to which the code relates.

The OHS(MI) Act and Regulations may be complied with in another way, for example by following a technical or an industry standard, if this provides an equivalent or higher standard of health and safety than that set out in the code.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice.

This Code of Practice is a revision of the *Seacare Authority Code of Practice 1/2000* first approved in May 2000, which incorporated the Australian Offshore Support Vessel Code of Safe Working Practice and the Code of Safe Working Practice for Australian Seafarers.

## SCOPE AND APPLICATION

This Code covers the health and safety of seafarers, contractors and other persons on board prescribed ships and units to which the OHS(MI) Act applies. This Code is relevant for all types of ships, including offshore support vessels.

This Code should be read in conjunction with relevant Marine Orders and codes of practice on specific hazards and control measures relevant to shipboard work.

## HOW TO USE THIS CODE OF PRACTICE

In providing guidance, the word 'should' is used in this Code to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

This Code also includes references to provisions of the OHS(MI) Act and Regulations and Marine Orders. These references are not exhaustive. The words 'must', 'requires' or 'mandatory' indicate legal requirements exist which must be complied with. References to Marine Orders must be complied with to the extent that they apply to the vessel.

A list of key terms and abbreviations used in this Code is in Appendix A.

# 1. GENERAL DUTIES

## 1.1 Operators duties

The operator of a ship is primarily responsible for ensuring the health, safety and welfare of all persons on board the ship.

Under the OHS(MI) Act, the operator must take all reasonable steps to ensure that seafarers and other people are not exposed to health and safety risks arising from the conduct of the operator's undertaking. This duty includes:

- providing and maintaining a safe work environment (including plant and systems of work)
- ensuring the safe use, handling and storage of plant and substances
- providing adequate facilities for the welfare at work
- providing and maintaining a safe means of access to and from the workplace
- providing any information, training, instruction or supervision that is needed to enable seafarers to carry out their work in a way that is safe and without risk to their health
- monitoring the health of seafarers and the conditions at the workplace
- providing appropriate medical and first aid services
- developing a health and safety policy in consultation with any involved unions and other persons the operator considers appropriate.

The operator should also provide the necessary resources to implement a safety program<sup>1</sup> based on the safety policy. The policy and program should set out the responsibilities of all relevant parties, including shore staff, contractors and any other persons on, or in the vicinity of the ship.

The operator should ensure that the design of a new ship and any modifications to an existing ship takes account of ergonomic principles and the relevant Australian and international standards and codes of practice.<sup>2</sup>

The operator must maintain their ships, provide and maintain equipment, tools, operating manuals and other documentation<sup>3</sup>, plan and organise all work so that health and safety risks are eliminated, or if that is not possible, minimised so far as is reasonably practicable.

The operator must also comply with [Marine Order 28 \(Operations standards and procedures\)](#), including:

- providing written instructions to the person in command of each ship setting out the policies and procedures to ensure all newly employed seafarers are given a reasonable opportunity to become familiar with the shipboard equipment, operating procedures and other arrangements needed for the proper performance of their duties, before being assigned to those duties
- ensuring that seafarers are provided with minimum hours of rest, and
- checking that the seafarers hold appropriate medical and competency certificates.<sup>4</sup>

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<sup>1</sup> MSC-MEPC.2/Circ.3 – Guidelines on the basic elements of a shipboard occupational health and safety programme.

<sup>2</sup> MSC-MEPC.7/Circ.3 – Framework for consideration of ergonomics and work environment. MSC/Circ.982 - Guidelines for ergonomic criteria for bridge equipment and layout.

<sup>3</sup> IMO Circular MSC.1/Circ.1462 – List of certificates and documents required to be carried on board ships, 2013.



The operator must ensure that, as soon as practicable after joining the ship, seafarers are instructed in the hazards associated with their work and the shipboard environment and trained in the procedures used to eliminate or minimise exposure to health and safety risks. The training should include contingency planning and emergency preparedness.

The operator should take into account the necessary standards of fitness, experience and competence to ensure the health and safety of seafarers in the performance of their duties when operating on board. In doing so the operator should:

- ensure acceptable working and living conditions, including working hours and rest periods;
- plan shipboard operations to take into account the expected period of work and the prevailing conditions on board in order to minimise the risk of fatigue; and
- consider reports and recommendations made by the person in command, health and safety committee or other on board committees regarding health and safety issues on the ship.

The operator should direct the person in command, and the person in command should work closely with the health and safety committee and health and safety representatives, to ensure that the work on board is organised in such a way as to eliminate or minimise health and safety risks. The operator should make the person in command and seafarers fully aware of all activities on board that could affect their health and safety.

The operator must designate a person(s) ashore to be responsible for:<sup>5</sup>

- monitoring the safety aspects of the operation of each ship; and
- ensuring that adequate resources and shore-based support are applied, as required.

The operator must, if requested by a health and safety representative or an involved union, establish a health and safety committee on the ship. The OHS(MI) Act also enables the operator, in consultation with the involved unions or other persons, to establish such a committee covering health and safety matters across several ships.

The operator must ensure that the person in command fulfils the obligations imposed by the OHS(MI) Act and the *Navigation Act 2012* including:

- consulting health and safety representatives on implementation of changes that affect safety in the workplace;
- allowing health and safety representatives access to the workplace;
- allowing health and safety representatives to be present at interviews relating to health and safety matters (if the person being interviewed agrees);
- giving health and safety representatives access to health and safety related information, other than confidential medical information;
- allowing health and safety representatives, who have not previously completed the approved health and safety representatives training course, time to complete the course during working hours as soon as is reasonably practicable;
- allowing health and safety representatives such time off work as is reasonably necessary for them to exercise their powers;
- complying with provisional improvement notices, to the extent that they relate to matters under the person in command's control;

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<sup>4</sup> In accordance with Section A-VIII/1 of the STCW Code, Regulation 1.2 and 2.3 of MLC, 2006, Marine Order 9, Marine Order 11 and Marine Order 28.

<sup>5</sup> In accordance with Marine Order 58 (Safe Management of Vessels)

- making available to health and safety committees any information, other than confidential medical information, relating to the health and safety of seafarers;
- allowing members of health and safety committees reasonable time during working hours, to perform committee functions; and
- complying with requirements set out in [Marine Order 11 \(Living and working conditions on vessels\)](#).

The operator must ensure a person under 16 years is not employed on the ship and that the working conditions in Marine Order 11 for a person under 18 years are met.

The operator should arrange regular safety inspections of all parts of their ships to which the safety of the seafarers may depend. Marine Order 11 requires weekly inspection of accommodation, food, drinking water, storage areas and galleys. In addition, the inspection of medical chest and medical equipment must be conducted at least once every 12 months.

## 1.2 Duties of the person in command (ship's master)

The person in command is responsible for implementing the operator's health and safety policy and program on board the ship. The policy and program, including safety rules and instructions, should be clearly communicated to all seafarers.

The person in command must ensure that:

- seafarers are assigned only to tasks which they are physically fit and suitably qualified to do
- no person under the age of 18 is assigned to inappropriate duties and work arrangements<sup>6</sup>
- any hazardous activities are properly supervised
- safety equipment, including all emergency and protective equipment, is maintained and stowed properly
- all statutory drills and musters are carried out at the required intervals and in compliance with the *Navigation Act 2012* and [Marine Order 21 \(Safety and emergency arrangements\)](#)
- seafarers are trained in emergency procedures, and
- seafarers have access to the information they need to conduct their work safely, including operating manuals, vessel plans and safety procedures. Any necessary instructions and notices regarding health and safety should be posted in prominent places or brought to the seafarers' attention by other effective means. The person in command should check that such instructions have been understood.

The person in command should ensure that all seafarers have:

- a reasonable workload;
- reasonable hours of work; and
- reasonable rest periods during working hours, having regard to work which is strenuous, hazardous or monotonous.<sup>7</sup>

When a person in command receives a prohibition notice or an improvement notice from an inspector the person in command must give a copy of the notice to the health and safety representative (if any) and display a copy in a prominent place at or near each workplace.

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<sup>6</sup> Marine Order 11 and Standards A.1.1, B1.2 and B2.3 of MLC, 2006.

<sup>7</sup> Regulation 2.3 of MLC, 2006 and Marine Order 11

If a person in command receives a notice of resignation from the health and safety representative the person in command must display a copy of the notice in a prominent place.

### 1.3 Seafarers duties

Seafarers must take all reasonable steps to protect their own health and safety as well as the health and safety of other seafarers and persons on board. Seafarers must co-operate with the operator in complying with health and safety requirements at the workplace. If equipment is provided by the operator, seafarers must use it in accordance with the information, instruction and training provided.

Seafarers should take an active role in implementing the operator's health and safety policy and program as delegated to them by the person in command. If a seafarer does not fully understand an order, instruction or any other communication, they should seek clarification from their supervisor.

Seafarers should:

- immediately report any potential hazards which they cannot properly deal with themselves to their supervisor;
- participate in health and safety meetings;
- not operate or interfere with equipment that they are not authorised to use. Except in an emergency, seafarers should not interfere with, remove, or displace any safety device or other equipment provided for their protection or the protection of others.

### 1.4 Other duty holders

Manufacturers, importers and suppliers of plant and substances must ensure, so far as is reasonably practicable, that the plant or substance is manufactured, imported and supplied without risks to health and safety. There are also safety duties for persons:

- erecting, installing, repairing or maintaining plant in a workplace
- constructing, modifying or repairing a structure on a ship, and
- persons engaged in loading or unloading a ship.

### 1.5 Reporting incidents

Requirements for reporting an incident, including dangerous occurrences, are set out in the OHS(MI) Act, the *Navigation Act 2012* and the *Transport Safety Investigation Act 2003*. The operator or person in command of the ship must submit an incident alert to AMSA within 4 hours of becoming aware of the incident and the full incident report within 72 hours of the incident.<sup>8</sup>

The operator should investigate all incidents to identify their underlying causes and prevent re-occurrence.

A full report of the investigation should be provided to the health and safety committee and the relevant authorities.

The operator's shore management should consider the reports and, if necessary, amend the operator's health and safety policy to take account of the outcomes of the investigation and any recommendations to prevent re-occurrence.

The operator should encourage seafarers to report any safety concerns and hazardous conditions or activities.

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<sup>8</sup> Details of incident reporting requirements and reporting forms are available at [www.amsa.gov.au](http://www.amsa.gov.au).

## 1.6 Consultation and representation

Consultation involves sharing of information, giving workers a reasonable opportunity to express views and considering those views before making decisions on health and safety matters.

Seafarers are entitled to take part in consultation arrangements and to be represented on work health and safety matters by a health and safety representative who has been elected to represent their work group.

Consultation may occur through:

- workplace induction or training processes
- toolbox talks
- committee meetings
- participative risk assessment processes
- sessions or events called for a specific purpose.

Toolbox talks may include discussions on:

- changes to the work environment that may impact on health and safety
- safe working instructions for particular tasks, and
- recent incidents including 'near misses' and key lessons to prevent a reoccurrence.

When using toolbox talks it is good practice to:

- keep a written record of the topic covered, attendees and feedback received
- organise a program of toolbox talks to ensure seafarers are given sufficient opportunity to provide input into how risks should be controlled, and
- review the effectiveness of toolbox talks and the level of understanding in the discussions.

Further guidance on how to consult effectively on health and safety matters is available in Safe Work Australia's Code of Practice: [Work health and safety consultation, co-operation and co-ordination](#)

## 2. RISK MANAGEMENT

Risk management is a systematic process to eliminate or minimise the potential for harm to people. It involves:

- identifying hazards
- if necessary, assessing the risks associated with these hazards
- implementing and maintaining risk control measures, and
- reviewing risk control measures.

Further guidance on the general risk management process is in Safe Work Australia's Code of Practice: [\*How to manage work health and safety risks\*](#).

### 2.1 Identifying the hazards

The first step in managing the risks of shipboard work is to find out what could potentially cause harm to people. This may be done by:

- inspecting the working environment and talking to workers about how work is carried out
- inspecting equipment and materials used during shipboard operations
- reading product labels and manufacturers' instruction manuals
- talking to manufacturers, suppliers and health and safety specialists, and
- reviewing reports of incidents, injuries and dangerous occurrences.

Table 1 lists common hazards associated with shipboard operations. Health and safety duties require a duty holder to consider all risks associated with work, not only those mentioned in this Code.

**Table 1:** Hazards associated with shipboard operations

HAZARD	EXAMPLES OF TASKS
Hazardous manual tasks (see section 3.4)	Handling cargo and equipment Working above shoulder height
Working at height (see section 11)	Working near an open hatch Accessing cargo Work overboard Climbing ladders
Working in confined spaces (see section 7)	Working in holds, pump rooms, tanks Working in between cargo
Falling objects (see section 16)	Working with suspended cargo or unsecured loads Exceeding safe working load
Plant and equipment (see sections 8, 15, 16 and 18)	Working around mobile plant Using damaged or poorly maintained equipment e.g. damaged ladders, ropes, stretched chains and defective hooks

HAZARD	EXAMPLES OF TASKS
Working environment (see sections 3, 5 and 6)	Working in extreme weather conditions Accumulation of ice or snow on deck Working in inadequate light, e.g. in holds or at night Working near refrigerated containers
Electricity (see section 12)	Working on live equipment Using electrical equipment in wet areas
Stored energy	Pressurised liquids and gases (section 18) Tensioned cable or ropes (section 15)
Noise (see section 3.5)	Using noisy machinery or power tools
Hazardous chemicals including dangerous goods (see sections 10, 13 and 14)	Oil or chemical spills during loading and unloading hazardous cargo Exposure to chemicals used to fumigate ship's holds
Fire (see sections 4, 9 and 14)	Hot works e.g. welding or oxy-cutting Handling combustible cargo Storing or handling flammable substances near open flames or other heat sources.

A number of hazards may co-exist in the workplace, for example shipboard operations may involve being near moving parts and performing hazardous manual tasks in the presence of high noise levels.

Hazards may also change as work is carried out, for example entries and exits may become blocked preventing escape in emergencies.

## 2.2 Assessing the risks

A risk assessment involves considering what could happen if someone was exposed to a hazard—the consequence—and the likelihood of this happening. A risk assessment can help determine:

- if there is further action that should be taken to control the risk, and
- how urgently the action needs to be taken.

Factors to consider when assessing risks from shipboard operations include:

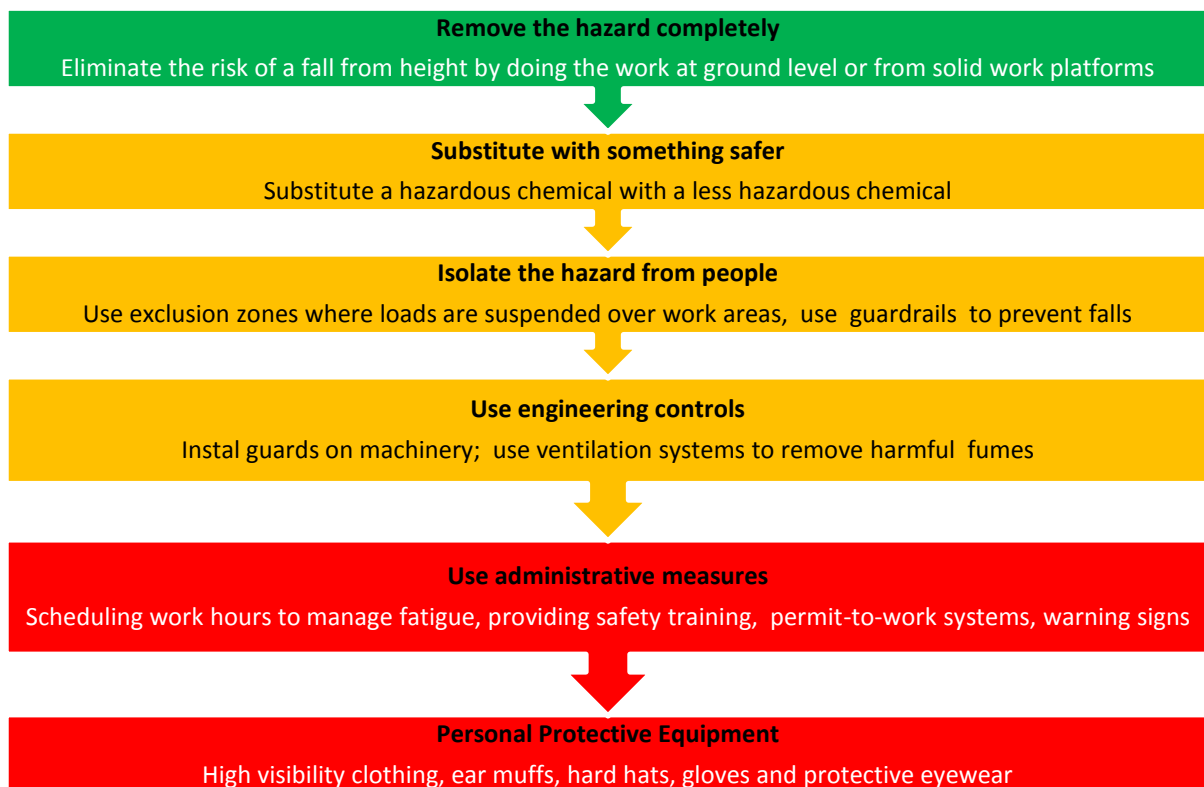
- the type of work being performed
- the work environment
- how many people are exposed
- communication methods and effectiveness
- the suitability of equipment for the activity e.g. ropes and lifting gear
- time of day and hours of work, and
- the training and experience of seafarers.

## 2.3 Controlling the risks

The ways of controlling work health and safety risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the *hierarchy of risk control* (see Figure 1).

The most effective control is elimination where the hazard is completely removed. Operators should always aim to eliminate a hazard. If it is not reasonably practicable to do so, the risks should be minimised by working through the other options in the hierarchy from top to bottom.

**Figure 1** The hierarchy of control measures



Administrative controls and personal protective equipment (PPE) rely on human behaviour and supervision. Used on their own these measures tend to be least effective in minimising risks.

In many cases, a combination of control measures provides the best solution.

## 2.4 Maintaining and reviewing control measures

Reviewing risk controls is an important part of the risk management process. The aim is to ensure the implemented controls are effective and working.

A review can be done by using the same methods as the initial hazard identification process. Reviewing the control measures also involves considering whether a higher order control measure is now reasonably practicable.

Consult seafarers and any health and safety representatives as part of the review process and consider the following questions:

- Are all foreseeable hazards being identified?
- Are the control measures working effectively in both their design and operation?
- Have the control measures introduced new problems?
- Has instruction and training provided to workers been successful?

- Is the frequency and severity of health and safety incidents reducing over time?
- If new legislation or new information has become available, does it indicate the current controls may no longer be the most effective?
- Have changes occurred affecting health and safety, for example has new plant or equipment been introduced? Are new procedures required?

If changes or improvements are identified, further decisions are needed to control the risks.

## **2.5 Developing a safety management system**

The risk management process is essential in developing a safety management system as required under [Marine Order 58 \(Safe management of vessels\)](#) and the ISM Code.

A safety management system includes the following key elements:

- A safety and environmental protection policy
- Instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag state legislation
- Defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel
- Procedures for reporting incidents and non-compliance
- Emergency response procedures
- Procedures for internal audits and management reviews



## 3. THE GENERAL WORKING ENVIRONMENT

### 3.1 Housekeeping and hygiene

Good housekeeping practices should be implemented to control risks on vessels.

- Minor deficiencies in the ship structure, equipment or furnishings (for example, protruding nails and screws, loose fittings and handles, uneven and damaged flooring) may contribute to cuts, bruises, trips and falls. They should be repaired as soon as they are noticed.
- Ropes and wires are frequently under strain during mooring operations and seafarers should, as much as possible, always stand in a place of safety from whiplash should ropes or wires break.
- The stowage and dispersal of deck or machinery equipment should be well planned and organised so that each item has its proper place.
- Seafarers should always stand clear of any load being lifted and should not walk near or underneath any load being lifted, or while it is suspended.
- Loose items that may create a hazard from potential vessel movement should be properly secured
- Electrical cables are stowed away from walkways and wet areas
- Litter presents a fire risk and may cause slips, falls or conceal other hazards. It must be disposed of in compliance with [Marine Order 95 \(Marine pollution prevention – garbage\)](#)<sup>9</sup>

High standards of personal cleanliness and hygiene should be maintained at all times. Seafarers should protect their own health and safety by ensuring:

- they have relevant up-to-date vaccinations and inoculations;
- small cuts and abrasions are treated immediately;
- precautions are taken to avoid insect bites. In particular, anti-malaria precautions should be taken before, during and after the ship visits ports where malaria is known to exist.

### 3.2 Air quality

Emissions from plant and substances in ships' holds and storage areas may create hazardous atmospheres. Where there is a likelihood of reduced air quality that may affect health and safety, for example contaminated, oxygen-deficient or explosive atmospheres, a risk assessment should be carried out and relevant control measures implemented. Control measures may include:

- providing measures for detecting hazardous atmospheres
- providing natural or mechanical ventilation to prevent accumulation of harmful concentrations of gases, fumes, vapours and fumigants
- eliminating use of combustion-powered plant or equipment in poorly ventilated spaces e.g. by using electric forklift trucks
- managing the length of time plant is used e.g. switching off engines when not in use
- providing access to safety data sheets (SDS) for hazardous chemicals (refer to section 13)

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<sup>9</sup> Giving effect to MARPOL legislation

- training seafarers in emergency response related to hazardous atmospheres, and
- providing appropriate PPE like respiratory equipment and ensuring these are properly fitted, worn and maintained.

Workers should not enter fumigated areas until these areas have been ventilated and are assessed as safe to enter.

### **3.3 Working on deck**

Work activities should be supervised and under the control of a responsible officer. Bridge watchkeeping officers should be informed of all work being performed on deck or in deck spaces.

Seafarers should work in pairs or in teams.

Seafarers should be prohibited at all times from sitting upon the vessel's bulwark or rail or walking along the bulwark.

If heavy weather is expected, lifelines should be rigged in appropriate locations on deck. The lashings of all deck cargo should be inspected and tightened, as necessary.

No seafarers should be on deck during heavy weather unless it is absolutely necessary for the safety of the ship or crew. Work on deck during heavy weather must be authorised by the person in command and the bridge watch should be informed.

Any person required to go on deck during heavy weather should wear appropriate PPE including a life-jacket, portable transceiver and waterproof reflective clothing and equipment. If possible, the person should remain in communication with a back-up person and be visible at all times.

Working in conditions of high humidity and heat may cause heat exhaustion or heat stroke. Precautions include drinking sufficient water.

Seafarers should protect themselves from prolonged sun exposure by wearing protective clothing (wide brim hat, long-sleeved collared shirt, long pants, sunglasses) and sunscreen.

### **3.4 Manual tasks**

Manual tasks are carried out when a person needs to exert force to lift, lower, push, pull, carry or otherwise move, hold or restrain any person, animal or thing. The following factors can make manual tasks hazardous and lead to musculoskeletal disorders:

- Repetitive or sustained force;
- High or sudden force;
- Repetitive movement;
- Sustained or awkward posture;
- Exposure to vibration.

The operator must ensure that hazardous manual tasks are identified and the risks controlled in accordance with Part 3 of the OHS(MI) Regulations 2003. The operator must eliminate or minimise the risk of injury so far as is reasonably practicable by:

- redesigning the task or finding another method of doing the same job
- providing mechanical aids to move loads, such as trolleys and pallet lifters, and
- providing instructions and training to seafarers who are required to handle loads. The training should include the correct use of mechanical aids, safe manual handling techniques or team lifting procedures.

Before lifting and carrying objects, seafarers should first inspect the load's weight, size and shape. Attention should be given to sharp edges, protruding nails or splinters, greasy

surfaces or any other features which might lead to injury. The size and shape of the load are not a reliable indication of its actual weight.

The working environment should be assessed including the weather and the ship's movement when loads are being carried on board ship, particularly if the ship is at sea. The area over which the load is to be moved should not be slippery and should be free from obstructions.

Loads should be gripped with two hands and lifted, lowered and carried close to the body.

The load should be carried in a way that ensures vision is not obscured, otherwise another method of moving the load should be used.

When two or more people are carrying a load, those involved should safely coordinate the activity.

Further information is in the Code of Practice: [Hazardous manual tasks](#)

### 3.5 Noise

Seafarers must be protected from the effects of noise. SOLAS Regulation II-1/3-12 requires new ships to be constructed to reduce on-board noise and to protect personnel from noise, in accordance with the IMO *Code on Noise Levels on Board Ships* which sets out maximum noise level limits for machinery spaces, control rooms, workshops, accommodation and other spaces on board ships.

Warning signs should indicate spaces in which hearing protection needs to be worn. When work has to be carried out in such areas, a suitable system of communication should be agreed to before the work begins.

Guidance is also available in Safe Work Australia's Code of Practice [Managing noise and preventing hearing loss at work](#).

### 3.6 Smoking

Seafarers should be made aware of the health hazards related to smoking. The operator should develop a policy and instructions in relation to smoking on board ship.

Smoking on board a ship should not be permitted except in authorised areas. Signs prohibiting smoking should be prominently displayed.

Ashtrays, or other suitable containers, should be provided and used in locations where smoking is permitted. The operator should consider allocating a smoking room as an authorised area where practicable.

### 3.7 Fatigue

Fatigue is a state of physical and/or mental exhaustion resulting from inadequate sleep, disruption of the internal body clock or physical, mental or emotional exertion. Fatigue can impair alertness and the ability to perform safety-related duties.

To reduce the risk of fatigue, the following should be taken into account:

- the need for onboard relief for the crew and person in command during prolonged operations
- the effects of bad weather
- the level of onboard automation (ensuring crew are trained and able to use deck machinery rather than manual handling to reduce physical exertion)
- voyage patterns
- crew training and competence, and
- the supply of nutritional victualling arrangements and drinking water.

A fatigue management plan should be developed to help control the risks of fatigue. It may include procedures for:

- ensuring adequate resources (including manning) are available to conduct all tasks safely
- designing work schedules and shift rosters to minimise fatigue and providing adequate opportunities for rest and sleep between shifts
- designing the vessel's sleep areas to support good quality sleep without disturbance
- using task rotation to break up job monotony, and
- providing fatigue awareness training to seafarers and encouraging reporting of fatigue related issues.

Some vessels will need to comply with prescribed hours of work and hours of rest.<sup>10</sup> Seafarers must co-operate with any reasonable policy or procedure relating to fatigue at the workplace, for example policies on fitness for work.

Further information is in the [Guide for managing the risk of fatigue at work](#).

### **3.8 Permit-to-work systems**

The permit-to-work system consists of a planned and predetermined safety procedure for any non-routine potentially hazardous work, such as:

- hot work
- entry into confined spaces
- electrical work
- work over water
- hazardous substances
- working at height
- work that compromises critical safety systems, such as fire and gas detection systems, alarms, public address systems, lifesaving equipment and fire-fighting equipment.

The permit-to-work itself does not make the job safe. In using a permit-to-work, the following principles apply:

- The permit should be relevant and as accurate as possible. It should state the location and detail of the work to be done, the results of the risk assessment or any preliminary tests and the measures taken to make the job safe.
- The permit should specify the period of its validity (which should not exceed 24 hours) and any time limits applicable to the work it authorises.
- Only the work specified on the permit should be undertaken.
- Before signing the permit, the authorising officer should check that all measures specified as necessary have in fact been taken.
- The authorising officer retains responsibility for the work until the permit is cancelled or formally transferred to another authorised person who should be fully informed of the situation. Anyone who takes over from the authorising officer should sign the permit to indicate transfer of full responsibility.
- The person responsible for carrying out the specified work should countersign the permit to indicate their understanding of the safety measures to be followed.

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<sup>10</sup> Regulation 2.3 of MLC, 2006; Section A-VIII/1 of the STCW

- On completion of the work, that person should notify the responsible officer to cancel the permit.
- The person carrying out the specified work should not be the same person as the authorising officer.

### 3.9 Hazardous and Restricted Areas

Any areas on a vessel that may present particular hazards should be adequately signposted as a *Hazardous Area* and have appropriate signage detailing any safety precautions or clothing that must be worn for entry to the area.

Examples of areas that may be Hazardous Areas:

- High noise areas
- Machinery and electrical spaces
- Areas where cranes are operating
- Refrigeration spaces
- Work deck areas on vessels performing specific functions such as construction, pipe-laying, diving support, underwater operations or other work of a specialized nature.

Certain hazardous areas should also have restrictions placed on them as to who may enter. These should be declared *Restricted Areas* and have signs on the entrances warning people that the area is restricted, with details on who is permitted to enter the Restricted Area.

The delineation of Hazardous Areas and Restricted Areas may need to be more comprehensive on specialized vessels, particularly those with a large and diverse crew. In these circumstances, hazardous areas need to be restricted to crew members who are familiar with the hazards by virtue of their training or position.

Some examples of areas that may need to be restricted:

- High voltage electricity areas
- Sensitive control rooms on specialized vessels
- Hazardous material storage areas
- Machinery spaces
- Wheelhouse and control rooms

### 3.10 Personal Protective Equipment

Personal protective equipment (PPE) does nothing to reduce the hazard and can only protect the person wearing it, if the person wears it correctly. Therefore, PPE should be used together with other controls or when risks cannot be eliminated or reduced to an acceptable level by more effective control measures.

The use of PPE may in itself become a hazard. For example, through reduced field of vision, loss of dexterity or agility.

PPE should be:

- of a type and standard as approved by Standards Australia or its equivalent
- suitable for the task for which it is required
- used, inspected and maintained in accordance with the manufacturer's instructions which should be kept with the relevant equipment, and
- kept clean and disinfected when necessary.

Records should be kept of servicing and any repairs carried out. Defective PPE that cannot be repaired must no longer be used and should be disposed of appropriately and immediately replaced.

All seafarers must be trained in the use and care of PPE and informed of its limitations. Persons using such items should check them each time before use. Training records of seafarers who have received the training should be kept.

Seafarers should wear appropriate safety clothing and footwear at all times.

Clothing worn in galleys and machinery spaces where there is a risk of burning or scalding should adequately cover the body and should be made from a low flammability material, such as cotton.

### **Head Protection**

Helmets may be designed for different purposes. A helmet designed to provide protection from objects falling from above may not be suitable for protecting seafarers from chemical splashes. The ship should be supplied with helmet types appropriate to the range of operations carried out on the ship. Australian Standard *AS 1800–1998 (Occupational protective helmets)* provides guidance on the selection, care and use of industrial safety helmets.

A helmet that is visibly damaged should not be used and should be disposed of and replaced.

### **Hearing Protection**

Seafarers who are exposed to high levels of noise, such as those working in machinery spaces, should be provided with and wear hearing protectors.

Various types of hearing protectors are available for shipboard use, including ear plugs and earmuffs. In general, earmuffs give the most effective protection and should be used in preference to ear plugs except in situations where the use of ear muffs is impracticable. Hearing protectors should comply with *AS/NZS 1270–2002 (Acoustics—Hearing protectors)*, or its equivalent.

### **Face and eye protection**

Face and eye protectors are available in a wide variety of designs. Careful consideration should be given to the nature of the hazard to ensure the appropriate protection is chosen. Eye protectors should comply with *AS/NZS 1337.1:2010 Personal eye protection – eye and face protectors for occupational application* or its equivalent.

Prescription (corrective) spectacles, unless manufactured to a safety standard, do not afford protection. Certain box-type goggles are designed so that they can be worn over ordinary spectacles.

### **Sun Protection**

Strong sunlight can severely damage the eyes and sunglasses should be worn whenever appropriate. Sunglasses should comply with *AS/NZS 1067-2003 Sunglasses and fashion spectacles*.

A wide-brimmed hat should be worn and a sunscreen of SPF 50+ used on exposed parts of the body when working in the sun.

### **Respiratory Protective Equipment**

Appropriate respiratory protective equipment should be provided for work in conditions where there is a risk of oxygen deficiency or exposure to poisonous, dangerous or irritating fumes, dust or gases. Respiratory devices should comply with *AS/NZS 1716–2012 Respiratory protective devices* or its equivalent.

There are two main types of equipment which perform different functions:

- a respirator filters the air before it is inhaled, and
- breathing apparatus supplies air or oxygen from an uncontaminated source.

The face-piece incorporated in respirators and breathing apparatus must be fitted correctly to prevent leakage. Wearing spectacles (unless designed for the purpose) or facial hair may interfere with the face seal.

*AS/NZS 1715–2009 Selection, use and maintenance of respiratory protective equipment* provides guidance on the selection, use and maintenance of respiratory protective devices.

[Marine Order 15 \(Construction – fire protection, fire detection and fire extinction\)](#) requires Emergency Escape Breathing Devices (EEBD) to be provided in accommodation and machinery spaces with the location and numbers of the devices indicated in the ship's fire control plan in accordance with SOLAS Regulations II-2/13.3.4 and II-2/13.4.3. Additionally, SOLAS Regulation II-2/10.10.1 requires breathing apparatus to be provided in fireman's outfit.

### **Hand and foot protection**

Gloves should be the right size for the wearer and be suitable for the type of work carried out. For example, leather gloves may be useful for handling rough or sharp objects but become slippery when they get wet or oily. Heat resistant gloves may be used for handling hot objects, and rubber, synthetic or PVC gloves for handling acids, alkalis, various types of oils, solvents and chemicals.

Seafarers should wear enclosed shoes or boots with non-slip soles to provide a secure foothold on decks and ladders. Safety footwear incorporating toe protection may also be suitable and should comply with *AS/NZS 2210.1– 2010 Safety, protective and occupational footwear – Guide to selection, care and use*.

### **3.11 Signs, notices and colour codes**

Signs and symbols are an effective method for warning against hazards and for presenting information in a non-linguistic form. Safety signs and notices must conform in shape and colour to the requirements of SOLAS, IMO Resolution A.760 (18) - Symbols related to life-saving appliances and arrangements and IMO Resolution A.952 (23) - Graphical symbols for shipboard fire control plans.

Fire extinguishers must be coloured and marked in accordance with the Marine Order 15 applicable to the fire extinguisher type. Each fire extinguisher should have a label fixed to it providing instructions for its use. Seafarers should familiarise themselves with the colour coding and markings on fire extinguishers to enable the appropriate extinguisher to be immediately selected in an emergency.

International Standards include requirements for the colour coding of electrical wiring cores. Seafarers should understand the meaning of the core colours on board the ship. If a replacement is required, it should be in accordance with the coding system on board, see *AS/NZS 3000–2007 Electrical installations*.

Pipelines should be marked with a colour coding system which indicates their contents. Replacement lengths of pipe should be immediately marked consistent with the colour coding system. A colour coding card should be provided (refer to *AS 1345–1995 Identification of the contents of piping, conduits and duct*).



## 4. SHIPBOARD EMERGENCIES

*Requirements relating to shipboard emergencies are in the following Marine Orders:*

- *Marine Order 15 (Construction – fire protection, fire detection and fire extinction)*
- *Marine Order 21 (Safety and emergency arrangements)*
- *Marine Order 25 (Equipment – lifesaving)*
- *Marine Order 58 (Safety Management of Vessels)*

*Guidance is available in the ISM Code and ISM Guidelines.*

The safety management system must include procedures for responding to various shipboard emergency situations, including the following types of emergency:<sup>11</sup>

- fire;
- damage to the ship;
- pollution;
- unlawful acts threatening the safety of the ship and the security of its passengers and seafarers;
- seafarer incidents;
- cargo-related incidents;
- emergency assistance to other ships.

The shipboard emergencies plan should include an emergency training module for seafarers to raise awareness of actions to be taken in the event of an emergency.

Seafarers may require specific training before joining the ship, to ensure that they are capable of carrying out safety related responsibilities.

Potential emergency situations likely to involve the ship should be analysed and actions required by seafarers during the emergency should be practised at drills.

A drill must be held prior to sailing when a ship enters service for first time, after a major modification or when a new crew is engaged.

The person in command must ensure that a muster list is compiled and kept up to date.<sup>12</sup>

When first joining a ship, seafarers must be informed of the location of the muster stations and the survival craft to which they have been assigned and of their duties in emergency situations. All seafarers with assigned emergency duties must be familiar with these duties before the start of the voyage.

Each seafarer must participate in drills in accordance with the requirements of the person in command and Marine Order 21 and SOLAS Regulation III/19, and the ship's safety management system, which sets out the procedure to be followed for an emergency stations practice muster.

Each seafarer must participate in at least one abandon ship drill and fire drill every month.

Drills should involve all seafarers but, in some circumstances, it might be preferable to confine certain drills to seafarers with specific tasks.

The timing of drills should be varied to ensure that seafarers who have not taken part in a particular drill should participate in the next drill. Seafarers should receive drill training as soon as possible. The abandon ship and fire drills must take place within 24 hours of the

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<sup>11</sup> IMO Resolution A.852 (20) provides guidelines for developing a uniform and integrated system of shipboard emergency plans.

<sup>12</sup> In accordance with Marine Order 21 and SOLAS Regulation III/37.



ship leaving a port if more than 25% of the seafarers have not participated in abandon and fire drills on board that particular ship in the previous month.

All seafarers should muster at a drill wearing the appropriate clothing and wearing life-jackets. Arrangements for drills should take account of prevailing weather conditions and be conducted as if there were an actual emergency.

Where practicable, drills should be conducted in a way that minimises the disturbance of rest periods and does not cause fatigue.

Although drills are an essential part of emergency training, a training scheme should consist of more than just drills. Information on subjects such as hypothermia and instructions on the use of particular equipment should be provided.

#### **4.1 Fire-fighting Equipment**

In accordance with Marine Order 15 a fire control plan must be permanently displayed on the ship. The plan must show the control stations for each deck and particulars of fire detection and fire alarm systems, sprinkler installation, fire-extinguishing appliances, means of access, details of the ventilation system and other relevant information for fire control.

At all times while a ship is in service, the fire-fighting equipment must be maintained ready for use, tested and inspected in accordance with the manufacturer's instructions. For the purpose of this requirement a ship is not in service when:

- it is in for repairs or lay-up (either at anchor or in port) or in dry-dock;
- it is declared not in service by the operator or the owner's representative; and
- in the case of passenger ships, there are no passengers on board.

The maintenance plan (which may be computer based) must be kept on board the ship and made available for inspection.

All fire-fighting equipment should be accessible at all times and emergency escapes and passages should be free of obstructions.

Portable extinguishers which have been discharged must be immediately recharged or replaced with an equivalent unit. Seafarers should not interfere with or discharge any fire extinguishers without a reasonable excuse and should report any faults or cases of accidental discharge to a responsible officer.

#### **4.2 Fire Drills and Training**

Seafarers must receive instructions on fire safety on-board the ship and on their assigned duties before the voyage begins, including the location and operation of any fire-fighting systems and appliances that they may need to use.

A copy of the fire training manual as required by SOLAS Regulation II-2/15 and a copy of the training manual on Life Saving Appliances of the ship as required by SOLAS Regulation III/35 must be provided in each crew mess room and recreation room or in each crew cabin. Seafarers should familiarise themselves thoroughly with these training manuals.

Seafarers should be trained in the operation and use of the following fire-fighting systems and appliances:

- all types of portable fire extinguishers carried on board;
- self-contained breathing apparatus;
- hoses with jets and spray nozzles;
- any fixed fire-fighting system such as carbon dioxide or foam;
- fire blankets;
- fireman's outfit;

- fire doors and smoke dampers; and
- escape systems and appliances.

Although many fires occur at port it may be difficult to arrange a drill with the local fire authorities. This can be partly resolved by instructing seafarers on the shore requirements using the contents of the fire wallet (the fire wallet should be positioned by the access arrangements and should outline information for shore fire authorities who are required to fight a fire on board ship).

Fire drills should be planned to enable regular practice in the various emergencies that may occur depending on the type of ship and the cargo.

The locations should be changed in successive drills to give practice in differing conditions and with different types of fire. Locations could include:

- holds, tanks and other spaces such as forepeak stores and paint lockers;
- engine or boiler rooms;
- accommodation spaces such as cabins and laundry rooms; and
- galleys.

Fire drills should be as realistic as circumstances permit. Search and rescue exercise should be undertaken in various parts of the ship. Where possible, local fire-fighting equipment, such as extinguishers, should be activated and the visibility of self-contained breathing apparatus masks should be reduced to imitate a smoke-filled atmosphere. Care should be taken with such drills to avoid trip and slip hazards.

The fixed water fire-fighting system should be used. Engine room crew should ensure that the fire pumps are operated and that full water pressure is on the fire mains. The emergency fire pump should also be used for fire drills.

A fire drill can be held as the first stage of an abandon ship drill.

Fire-fighting teams should assemble at their designated stations and be dispatched to the location of the supposed fire, carrying with them emergency equipment (for example, BA sets, radios, lamps and axes).

An adequate number of hoses to deal with the assumed fire should be deployed. At some stage during the drill, fire hoses should be tested under pressure.

The drill should extend, where practicable, to the testing and demonstration of the remote controls for ventilation fans, fuel pumps and fuel tank quick closing valves, the closing of openings and the appropriate isolation of electrical equipment.

Fixed fire extinguishing installations should be tested to the extent practicable.

At each drill, one extinguisher or more should be operated by a member of the fire-fighting team, a different member on each occasion. Different types of extinguishers available on board should be used on a rotational basis. The operation of extinguishers that cannot be charged on board should be explained. Extinguishers that are used during the drill must be recharged before being returned to their normal location.

Each member of the fire-fighting team should be trained in the use of breathing apparatus as part of the drill. The apparatus should be cleaned and checked to be in good order both before and after it is used. Cylinders of self-contained breathing apparatus should be recharged and seafarers should be trained in the use of the recharge system. Otherwise, sufficient spare cylinders should be carried for this purpose.

Fire appliances, fire and watertight doors, other closing appliances, and fire detection and alarm systems that have not been used in the drill should be inspected in accordance with ship's safety management system.

All equipment activated during fire drills should be immediately replaced with fully loaded appliances.

### 4.3 Action in the event of fire

A fire can usually be extinguished most easily in the first few minutes. Prompt action is essential.

The alarm should be raised and the bridge informed immediately. If the ship is in port, the local fire authority should be called. If it is safe to do so, attempts should be made to extinguish or limit the fire, either using suitable portable extinguishers or by smothering the fire as in the case of a fat or oil fire in the galley.

The ship's seafarers should be aware of the use of different types of fire extinguisher and their suitability for different types of fire. Water extinguishers should not be used on oil or electric fires and foam extinguishers should not be used on electrical fires.

Openings to the space should be shut to reduce the supply of air to the fire and to prevent it from spreading. Any fuel lines feeding the fire or threatened by it should be isolated.

If practicable, combustible materials adjacent to the fire should be removed, boundary cooling of adjacent compartments should be considered and temperatures monitored if spaces are not otherwise accessible.

If a space is filled with smoke and fumes, seafarers not properly equipped with breathing apparatus should leave the space immediately. Where necessary, escape should involve crawling on hands and knees and emergency escape breathing devices (EEBDs) should be used.

After a fire has been extinguished, precautions should be taken against its spontaneous re-ignition.

Seafarers should not re-enter a space where a fire has occurred without wearing breathing apparatus until it has been fully ventilated.

### 4.4 Abandon ship drills and training

The order to abandon ship can only be given verbally by the person in command.

Each abandon ship drill must include:<sup>13</sup>

- summoning passengers and seafarers to muster stations by the general alarm and ensuring that they are made aware of the order to abandon ship;
- reporting to stations and preparing for the duties described in the muster list;
- checking that all passengers and seafarers are at muster stations and are suitably dressed to minimise cold shock if direct entry into the sea is necessary;
- checking that life-jackets are correctly donned;
- where possible, lowering of at least one lifeboat after any necessary preparation for launching;
- starting and operating the lifeboat engine;
- a mock search and rescue of passengers/seafarers trapped in their cabins;
- instruction in the use of radio life-saving appliances; and
- where fitted, operating of davits for launching life-rafts.

Emergency lighting for mustering and abandonment should be tested at each abandon ship drill.

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<sup>13</sup> As required by SOLAS Regulation III/19.3.3

If possible, abandon ship drills should be held when a life-raft is due to be sent for servicing. Invaluable experience can be obtained by actually inflating a life-raft in the water and practising life-raft boarding techniques.

Different lifeboats should, as far as practicable, be lowered and manoeuvred at successive drills. Lowering or hoisting a boat should only be done with minimum seafarers on board. Each lifeboat must be launched and manoeuvred in the water by its assigned operating seafarers at least once every 3 months during an abandon ship drill.<sup>14</sup>

During drills, lifebuoys and lines should be readily available at the point of embarkation.

While boats are in the water, seafarers should practise manoeuvring the craft by oar or under motorised power.

When turning out davits or bringing boats or rafts inboard under power, seafarers should always keep clear of any moving parts.

The crank handle of a lifeboat winch is designed not to rotate except for manual hoisting action. Nevertheless, such handles should be removed from the winch as soon as manual hoisting is stopped. If, however, for some reason the handle cannot be removed and there is a chance of the handle rotating under the action of gravity or electricity, seafarers should keep well away from the handle although it may seem stationary.

The engines on motor lifeboats should be started and run ahead and astern. All means of starting arrangement should be tested. If two sets of batteries are provided then the engine should be started with individual set of batteries one by one. Care should be taken to avoid overheating the engine and the propeller shaft's stern gland. All seafarers should be familiar with the engine starting procedure.

Air bottle pressures and water spray systems (where fitted) must be tested in accordance with manufacturer's instruction.

Before craft in gravity davits are recovered by power, the operation of the limit switches and similar devices should be checked.

Free fall lifeboats should be boarded in an orderly manner at all times. Seafarers should immediately secure themselves into the seat with the restraining harness and carry out the instructions of the responsible officer.

Where simultaneous off-load or on-load release arrangements are provided, ensure that the hooks are fully engaged prior to launching and before recovery.

On-board training in the use of davit-launched life rafts must take place at intervals of not more than 4 months on every ship fitted with such appliances.<sup>15</sup> Whenever practicable, this must include the inflation and lowering of a life-raft. This life-raft may be a special life-raft intended for training purposes only, which is not part of the ship's life-saving appliances; such a special life-raft must be conspicuously marked.

Where life rafts are carried, instructions should be given to seafarers in their launching, handling and operation. Methods of boarding life rafts and the nature of equipment and stores on them should be explained.

Life-saving appliances must be maintained at all times. If the use of a life raft for practice would bring equipment below the specified scale, a replacement must first be provided.

Rescue boats (other than lifeboats which are also rescue boats), must be launched each month with their assigned seafarer aboard and manoeuvred in the water. Rescue boat launching drills should be conducted in sheltered waters and under supervision of an officer experienced in such drills.

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<sup>14</sup> As required by SOLAS Regulation III/19.3.3

<sup>15</sup> As required by SOLAS Regulation III/19.4.3

Seafarers in a fast rescue boat, rescue boat or survival craft being lowered should remain seated and keep their hands inside the craft to avoid them being crushed against the ship's side. Lifejackets should be worn. In totally enclosed lifeboats, seat belts should be secured.

Any additional provisions, water or equipment should be placed in the survival craft. A check of seafarers and passengers should be taken and the survival crafts lowered under the direction of the person in charge.

#### **4.5 Confined space entry and rescue drills**

Confined space entry and rescue drill must be planned and conducted in a safe manner at least once every two months in accordance with SOLAS Regulation III/19.3.6.

The operator should provide a schedule of regular on-board drills for seafarers with confined space entry or rescue responsibilities.

Each confined space and rescue drill must include:

- checking and use of personal protective equipment required for entry;
- checking and use of communication equipment and procedures;
- checking and use of instruments for measuring the atmosphere in confined spaces;
- checking and use of rescue equipment and procedures; and
- instructions in first aid and resuscitation techniques

All seafarers should be trained in confined space safety, including the on board procedures for identifying, assessing and controlling risks associated with entry into confined spaces.

All equipment (such as rescue equipment, portable oxygen/multi-gas detector etc.) used in connection with confined space entry should be in good working condition and inspected before use. The manufacturers' instructions should be strictly followed to ensure that the correct equipment is assembled. The seafarer using the equipment should be trained to use the equipment before entry.

No person should open or enter a confined space unless authorised by the person in command or the nominated responsible person and unless the relevant safety procedures are followed. Chapter 7 provides further guidance on working in confined spaces.

Each drill should be recorded in the ship's log book.

#### **4.6 Man overboard drills and rescue at sea**

The ship's emergency plan must include specific plans and procedures for the recovery of persons from water.<sup>16</sup>

The plans and procedures must identify measures to be taken to minimise the risk to seafarers involved in the recovery operations and the equipment intended to be used for recovery purposes.

Ship-specific procedures should specify the anticipated conditions under which a recovery operation may be conducted safely by taking into account:

- manoeuvrability of the ship;
- freeboard of the ship;
- points of the ship to which casualties may be recovered;

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<sup>16</sup> SOLAS Regulation III/17-1, *Guidelines for the development of plans and procedures for recovery of persons from the water* (MSC.1/Circ.1447), *Guidelines to recovery techniques* (MSC.1/Circ.1182) and *Guidelines for cold water survival* (MSC.1/Circ.1185/Rev.1).

- characteristics and limitations of equipment intended to be used for recovery operations;
- available seafarers and personal protective equipment;
- wind force, direction and spray;
- significant wave height;
- period of waves;
- swell; and
- safety of navigation.

As far as reasonably practicable, man overboard drills involving the manoeuvring of the vessel should be conducted at regular intervals.

Drills conducted in harbour or anchorages should be as realistic as possible and include manoeuvring the craft and recovering a training dummy or manikin from the water. Drills should also ensure that seafarers are familiar with the plans, procedures and equipment for recovery of persons from the water. Such drills may be conducted in conjunction with routine man overboard drills.

Where a fast rescue boat (FRC) is carried, it should be launched each month and tested in the water in a harbour or safe anchorage.

Prior to launching the rescue boat, communication with the deck and bridge should be checked.

Working lifejackets that do not restrict free movement should be worn. Immersion suits should be worn where there is a risk of hypothermia.

Rescue boat crews should receive training on correct techniques for retrieving persons from the water without sustaining injury.

Each ship should have a contingency plan in the event that someone falls overboard. The plan should take into account the particular characteristics of the ship, the life-saving equipment available and the number of seafarers. For example, a typical drill could test the action taken if the bridge watch keeping officer observes someone falling from the main deck into the sea. This would include:

- executing a Williamson turn or other ship's turn as appropriate;
- dropping the bridge wing quick-release lifebuoy;
- sounding the general or emergency squad alarm;
- announcing the type of emergency over the public address system so that the rescue boat can be prepared;
- assigning a person to the wheel and posting lookouts;
- radar "marking" of the man overboard position;
- initiating any communication such as a "Pan Pan Pan" message; and
- positioning the ship to make a lee and launching the rescue boat.

It may take the person in command a few minutes to reach the bridge before taking over the operation and therefore some decisions may need to be made before he or she reaches the bridge.

When a person witnesses someone falling overboard, he or she should throw a life buoy into the water, preferable one equipped with a light. Inform the bridge immediately by any means possible and call out for assistance. Keep the victim under surveillance if possible.

When a person is reported missing or unaccounted for, it will be presumed that the individual has been lost overboard and the circumstance becomes a search and rescue issue.

All ships must carry an up-to-date copy of Volume III of the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual. Procedures provided in the IAMSAR Manual should be adopted, especially if the search is carried out with other ships.

#### 4.7 Helicopter operations

In accordance with [Marine Order 57 \(Helicopter Operations\)](#) the person in command may permit a vessel-helicopter operation to be conducted only if the vessel has arrangements in place that:

- provide for emergency evacuation of people from the vessel; and
- do not interfere with the normal operations of the vessel; and
- are at least as effective in ensuring safety as the arrangements recommended in the International Chamber of Shipping *Guide to Helicopter/Ship Operations* for the kind of vessel-helicopter operations to be conducted.

The vessel arrangements must include

- the equipment necessary for the safe conduct of the vessel-helicopter operation; and
- seafarer training on non-emergency and emergency procedures for the vessel-helicopter operation.

The operator must ensure that the arrangements are included in the vessel's safety management system.

#### 4.8 Other drills

Emergency training should not be limited to abandoning ship, fire-fighting and man overboard drills. Seafarers should undergo regular refresher training in any emergency situations likely to occur aboard the ship.

First aid training should be provided for particular types of cargoes and operations. Posters, pamphlets and other means of reminding seafarers of first aid procedures should be made available throughout the ship.

Further information is available in Safe Work Australia's [Code of Practice: First aid in the workplace](#).



## 5. SAFE ACCESS TO SHIP

Access to a ship in port must be carried out in accordance with [Marine Order 12 \(Construction – subdivision and stability, machinery and electrical installations\)](#).

Under SOLAS Regulation II-1/3-9 ships in port must be provided with means of embarkation and disembarkation, such as gangways and accommodation ladders. The means of embarkation/disembarkation must be inspected and maintained in accordance with IMO Circular MSC.1/Circ.1331.

There should be a safe means of access between any ship and any quay, pontoon or similar structure or another ship alongside which the ship is secured. An accommodation ladder or gangway which is appropriate to the deck layout, size, shape and maximum freeboard of the ship should be used when accessing the ship.

The means of access from the wharf to a vessel's deck may be provided by the vessel or the port authority. If access is provided by the port authority or another party, the person in command must ensure that any safety concern is brought to the attention of the person providing access and to a person requiring access to or from the ship.

Seafarers should be provided with information on how to make their way safely to and from the ship through the marine terminal or shore side cargo handling area.

Access arrangements should be supervised at all times, either by seafarers or by shore personnel, particularly in ports which have large tidal ranges. The supervision of access arrangements also enhances security against unauthorised persons from boarding the ship.

A safe means of access to or from a ship must be:

- strong enough to support the weight placed on it;
- free of damage, degradation or wear that may affect the strength of the means of access;
- secured to prevent accidental displacement;
- illuminated sufficiently for people to use it safely at night;
- clear of the path of cargo being loaded or unloaded from a ship;
- kept clean and free of any material that could make its use unsafe, including any snow, ice, grease or other substance likely to cause a slip or fall;
- properly rigged and adjusted to allow for any changes in tidal levels and the ship's trim and freeboard;
- at an angle allowing safe access to the ship;
- firmly landed and clear of wharf edge and other potential hazards; and
- placed so that no suspended load passes over it.

Access equipment should be properly maintained and inspected at frequent intervals. It should not be painted or treated to conceal cracks or defects.

A lifebuoy with a self-activating light and a separate safety line or some similar device should be provided at the point of access aboard the ship.

Safety netting must protect the length of the accommodation ladder or gangway, including protecting the user from falling between the ship and the quayside. The safety net must meet the requirements in Marine Order 12.

Accommodation ladders and gangways should be clearly marked with maximum designed angle of use and maximum safe loading in both number of persons and total weight. Under no circumstances should this limit be exceeded.

The person in command of a ship at anchor or at a mooring may provide a pilot ladder as a means of access if the use of an accommodation ladder is impracticable. The use of such



ladder, except in an emergency, must be limited to pilots and other persons engaged in or in relation to the business of the ship. In such cases an assessment of the risks associated with using the pilot ladder should be carried out and the use of appropriate risk controls, such as buoyancy vests and/or harnesses, should be considered.

Section 22.2 provides further guidance on access to vehicle ferries or roll-on/roll-off vessels (RO-ROs).

## **5.1 Accommodation ladders and gangways**

The specifications for accommodation ladders and gangways are contained in Marine Order 12.

If the gangway rests on rollers or wheels, it should be fitted or protected in such a way as to prevent the user's feet from being caught and it should be placed in a position that does not restrict the free movement of the rollers or wheels. Where the wharf surface is irregular or gaps or ledges exist that may cause the rollers or wheels to jamb or catch, a suitably sized plate should be placed on the surface on which the rollers or wheels rest.

A gangway should never be allowed to drop between the shore and the ship in such a way that it may be crushed or damaged.

Regular inspections of gangways, ladders and metal fittings should be undertaken to detect any cracking, rusting or corrosion. Any defects posing a hazard should be rectified before further use.

## **5.2 Pilot transfer**

Pilot transfer requirements are contained in Marine Order 12. When a ship uses a pilot, the operator must ensure that pilot transfer arrangements comply with SOLAS Regulation V/23 and ensure that pilots are able to embark and disembark safely.

The rigging of the pilot transfer arrangements and the embarkation of a pilot must be supervised by a responsible officer who can communicate with the navigation bridge. The responsible officer must arrange for the escort of the pilot by a safe route to and from the navigation bridge. Seafarers engaged in rigging and operating any mechanical equipment must be instructed in the safe procedures to be adopted and the equipment must be tested prior to use.

The following equipment must be kept ready for immediate use when persons are being transferred:

- two man-ropes of not less than 28 mm and not more than 32 mm in diameter properly secured to the ship if required by the pilot; man-ropes to be fixed at the rope end to the ring plate fixed on deck and must be ready for use when the pilot disembarks, or upon request from a pilot approaching to board (the manropes must reach the height of the stanchions or bulwarks at the point of access to the deck before terminating at the ring plate on deck);
- a lifebuoy equipped with a self-igniting light;
- a heaving line.

Adequate lighting must be provided to illuminate the transfer arrangements overside and the position on deck where a person embarks or disembarks.

## **5.3 Transport of persons by water**

When persons have to be transported to or from a ship by water, suitable measures should be taken to ensure their safe passage. The boats used should be fit for purpose, properly equipped and maintained and suitably crewed. Embarkation and disembarkation should take place only at safe landing places and not in adverse weather.

## 6. SAFE MOVEMENT ONBOARD THE SHIP

When moving about the ship at sea, seafarers should always be aware of the possibility of a sudden lurch or heavy roll by the ship.

Permanent fittings which cause obstruction may be dangerous to people, vehicles or lifting equipment, and should be made visible by means of colouring, marking or lighting.

Any hazardous deck obstructions and head-height obstructions which cannot be removed should be painted a bright, conspicuous colour. If necessary, warning signs using graphic symbols should be displayed. Head-height obstructions should be padded.

Deck cargoes should be stowed in a way that allows safe access to safety equipment, crew quarters and boarding of pilots.

### 6.1 Passages and walkways

All passages, walkways, stairs and deck surfaces should be properly maintained and kept free from materials or substances that may cause slips or falls.

The surfaces of walkways and stair treads should, where practicable, be slip-resistant in dry as well as in wet conditions.

Walkways on deck should be delineated by painted lines or otherwise and indicated by signs.

Any gear or equipment stowed alongside a passage or walkway should be securely fixed or lashed against the movement of the ship when at sea.

### 6.2 Watertight doors

All seafarers who might use watertight doors should be instructed in their safe use.

Power-operated watertight doors can be closed from the bridge and particular care should be taken when using such doors. If opened locally under these circumstances, a door will re-close automatically and crush anyone in its path as soon as local control has been released. Both hands are usually required to operate the local controls, and for this reason no person should attempt to carry any load through such doors alone. The bridge should be notified whenever such doors have been opened and immediately after they have been closed.

Notices clearly stating the method of operating the local controls of watertight doors should be prominently displayed on both sides of the doors.

No attempt should be made to pass through a watertight door when it is closing or when the warning alarm is sounding.

Whenever a watertight door is energised and under remote control, transit is not allowed. If it is necessary to leave the area confined by such doors, emergency exits must be used. A warning to that effect should be displayed at the local operating point.

### 6.3 Lighting

Areas of the ship used for loading or unloading, other work processes or transit should be adequately lit. Marine Order 32 requires that loading and unloading must not be carried out unless:

- there is suitable deck and under-deck illumination, with a minimum level of:
  - 10 lux on access routes;
  - 20 lux on ladders that provide access to the vessel, accommodation ladders and gangways;
  - 50 lux in working areas onboard and adjacent to the vessel, taking into account any specific need that may require additional illumination;

- the level of light in adjacent areas is reasonably uniform;
- any artificial lighting does not expose persons engaged in loading or unloading to health and safety risks or the safety of the vessel or of the cargo; and
- any artificial lighting is designed and located to minimise glare, reflection and shadows.

Where visibility is poor, the level of lighting should be increased above the recommended minimum.

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 decks should either be kept illuminated or be properly or safely closed before lights are switched off.

Broken or defective lights should be reported immediately and repaired as soon as practicable. Failed light globes or faults in sealed waterproof or gas tight fittings must only be changed by the responsible engineer officer.

When portable or temporary lights are in use, the light supports and leads should be arranged, secured or covered so as to prevent a person tripping, or being hit by moving fittings, or walking into cables or supports. Any slack in the leads should be coiled and kept clear of possible causes of damage e.g. running gear, moving parts of machinery, equipment and loads. If they pass through doorways, the doors should be secured open. Leads should not pass through doors in watertight bulkheads or fire door openings when the ship is at sea.

Portable lights should never be lowered or suspended by their leads. To avoid risks of electric shock from mains voltage, the portable lamps used in damp or humid conditions should be of low voltage, preferably 12 volts.

Unlit or inadequately lit places on the ship should not be entered without safe portable lights. Lighting appliances and cabling should be appropriate for the space being entered, for example if the space does or may contain explosive fumes special electrical safety standards need to be applied.

Both fixed and portable lighting should be checked to ensure proper operation and safe rigging before use.

## **6.4 Protection around cargo hatches and other openings**

[Marine Order 32 \(Cargo handling equipment\)](#) sets out mandatory requirements for protective fencing around cargo hatches and other deck openings and machinery moving parts.

Any openings through which a person might fall should be fitted with secure guards or fencing.

Guard-rails or fencing should consist of an upper rail at a height of 1 metre and an intermediate rail at a height of 0.5 metres. The rails may consist of taut wire, rope or chain.

If constructed of rope or chain, the fence should be fitted with tensioning devices to keep the rope or chain as taut as possible. Guard-rails or fencing should have no sharp edges and should be properly maintained. If necessary, locking devices and suitable stops or toe-boards should be provided.

Open hatches for handling cargo or stores, through which persons may fall or on which they may trip, should be closed as soon as work stops, except during short interruptions or where they cannot be closed without risk to safety or mechanical efficiency because of the heel or trim of the ship. Where hatch covers are raised, temporary fencing can be used as a control measure to prevent falls.

Hatch covers, pontoons and beams that have been removed should be placed so as to leave a safe walkway from rail to hatch coaming and fore and aft.

Hatches and openings that provide access to holds should be checked to ensure:

- they are protected by coamings
- there is adequate clear space around the coamings to allow easy access
- hinged and pontoon hatch covers are secured, or removed if not adequately secured, to prevent them from accidentally closing during access
- approaches to a hold and an access hatch are kept unobstructed to reduce the risk of falls and to enable holds to be evacuated quickly in an emergency
- hatch covers are closed when the hatch is not in use to eliminate the risk of falls, and
- means of access includes a ladder which is clear of the hatchway through which cargo is loaded or unloaded.

### ***Mechanically operated hatch covers***

Mechanical, hydraulic or electrically powered hatch covers should only be operated by designated members of the ship's crew or other authorised people. When operating these types of hatch covers:

- warn people in the vicinity of the hatch cover before the hatch is opened or closed and instruct them to move to a safe area
- clear people and objects from the hatch cover before it is opened, and
- position preventer chains or other securing devices before permitting people on top of a retracted hatch cover.

## **6.5 Access to holds and other deck spaces**

Safe access must be provided into each hold or space below deck, in accordance with requirements of Marine Order 32.

Rope ladders should not be used to access holds.

All ladders and access arrangements should be inspected at frequent intervals by a responsible officer, but particularly before and after working cargo in the space. If 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 responsible officer should ensure that any defects are fixed as soon as practicable. Any welding or replacement of rungs, ladders or cleats should be inspected and tested by a responsible officer before use to ensure that the work has been properly carried out.

When heavy weather is expected, lifelines should be rigged securely across open decks.

Drains and scuppers should be regularly inspected and properly maintained to ensure that they do not become blocked.

Access within cargo spaces and holds should be kept clear.

## 7. CONFINED SPACES

*Under Part 4 of the OHS(MI) Regulations 2003, the operator has a duty of care to manage the health and safety risks associated with a confined space, including risks when entering, working in, on or near a confined space, as well as the risk of inadvertent entry.*

*Additional guidance can be found in Safe Work Australia's Code of Practice – Confined Spaces. Reference should also be made to the ship's safety management system.*

*Guidance in relation to entry into spaces on oil, chemical and gas tankers and ships carrying solid bulk cargoes, the following publications can assist:*

- *International Safety Guide for Oil Tankers and Terminals (ISGOTT),*
- *Liquefied Gas Handling Principles on Ships and in Terminals (SIGTTO), and*
- *International Maritime Solid Bulk Cargoes Code (IMSBC Code)*

A confined space is an enclosed or partially enclosed space that is:

- not designed or intended primarily to be occupied by a person; and
- is at normal atmospheric pressure while any person is in the space; and
- is or is likely to be a risk to health and safety.

All confined spaces are considered unsafe for entry until proven otherwise.

For the purpose of this chapter:

A *competent person* is a person who has, by a combination of training, education and experience, acquired the knowledge and skills to:

- make an informed assessment of the likelihood of an airborne contaminant/dangerous atmosphere being present; or subsequently arising in the confined space; or
- safely and correctly perform a specific task associated with the confined space.

A *standby person* is a competent person who is near the confined space when it's occupied for work – also known as an attendant in the IMO Resolution A.1050(27).

A *responsible person* is a competent person who is nominated to authorise confined space entry (e.g. permits) on behalf of the operator to ensure that the confined space is safe for entry.

Confined spaces in which an unsafe atmosphere is present, or can arise, include: cargo holds, double bottoms, cargo tanks, pump rooms, compressor rooms, fuel tanks, ballast tanks, cofferdams, void spaces, duct keels, inter-barrier spaces, sewage tanks, cable trunks, pipe trunks, pressure vessels, battery lockers, chain lockers, enclosed foc's'les, inert gas plant scrubber and blower spaces and the storage rooms for carbon dioxide (CO<sub>2</sub>). This list is not exhaustive and a list should be produced on a ship-by-ship basis to identify confined spaces.

Such confined spaces should not be entered except upon the explicit instruction of the person in command or the responsible officer. If a lack of oxygen or the presence of toxic gases, vapours or fumes is suspected in any space, then that space should be considered dangerous.

If there is an unexpected loss of ventilation in spaces which are usually ventilated by whatever means, then those spaces should also be considered as dangerous and should be vacated immediately.

Confined space entry and rescue drill must be planned and conducted in a safe manner at least once every two months (refer to section 4.5).

## 7.1 Safety management of confined spaces

The operator must ensure that the entry or work in confined space is carried out by a competent person and a risk assessment, considering the hazards, work to be carried out and implementation of appropriate risk controls and emergency measures is conducted.

The operator must ensure that all confined spaces are identified on board and the procedures for entering confined spaces are included among the key shipboard operations concerning the safety of the seafarers and the ship, in accordance with OHS(MI) Regulations 2003 and the International Safety Management (ISM) Code.

The operator must ensure that there is, at least, 1 standby person stationed to continuously monitor the conditions and wellbeing of those inside the confined space. The standby person should:

- understand the nature of the hazards inside the particular confined space and be able to recognise signs and symptoms of those in the confined space;
- remain outside the confined space and do no other work which may interfere with the primary role of monitoring those inside;
- have all required rescue equipment immediately available;
- have the authority to order seafarers to exit the space if a hazardous situation arises;
- initiate emergency response arrangements.

If any person working in a space feels in any way adversely affected, he or she must immediately leave the space.

The risk assessment for a confined space should be periodically reviewed to ensure it remains valid.

## 7.2 Confined space entry permit

A confined space entry permit provides a formal check to ensure that all elements of a safe system of work are in place before people are allowed to enter the confined space.

Under the OHS(MI) Regulations 2003, the operator must not allow or direct anyone to enter a confined space to carry out work unless there is a confined space entry permit for the work and the appropriate safety procedures for the particular ship have been followed. The permit must be authorised by a responsible person supervising the work in the confined space.

A confined space entry permit must be issued for each entry into the confined space. Each permit only applies to one confined space and allows one or more trained seafarers to enter that space.

Entry into a space should be planned in advance and if unforeseen problems or hazards arise during the operation, then work should be stopped and the space evacuated immediately. Permits to work should then be withdrawn and the situation reassessed. Permits to work should be revised as appropriate after the reassessment.

Everyone must leave the confined space on expiry of a "permit to work". The entrance should be closed or otherwise secured to prevent re-entry until declared safe for normal entry.

## 7.3 Preparing and securing the space for entry

Entry doors or hatches leading to confined spaces must be secured at all times against unauthorised entry. Signs should also be erected at each entry to warn against unauthorised entry.

A door or hatch cover which is opened to provide natural ventilation of a confined space may, wrongly, be taken to be an indication of a safe atmosphere. Therefore the use of a

mechanical barrier, such as a rope or chain positioned across the opening with an attached warning sign, could prevent such accidental entry.

Care should be taken to avoid the effects of a possible release of pressure or vapour when opening the entrance to the space.

Flammable vapours may still be present in cargo or other tanks that have contained oil products or chemical or gas cargoes. Cofferdams and other spaces that are adjacent to cargo and other tanks may contain flammable vapours should there have been leakage into the space.

Hydrocarbon gases or vapours are flammable as well as toxic and may be present in fuel or cargo tanks which have contained crude oil or its products. The gases or vapours may also be present in pump rooms and cofferdams, duct keels or other spaces adjacent to cargo tanks due to the leakage of cargo.

The space should be isolated and secured against the escape of dangerous substances by blanking off pipelines or other openings, or by closing valves. Valves should then be tied, or some other method used to show that they must not be opened.

The space should be cleaned or washed, if necessary, to remove as much as possible of the sludge or other deposit liable to give off dangerous fumes. If an empty tank or other confined space has been closed for a time the oxygen content may have been reduced.

The space should be thoroughly and continuously ventilated by natural or mechanical means, to ensure that all harmful gases are removed and no pockets of oxygen-deficient atmosphere remain. Compressed oxygen should not be used to ventilate any space. All persons in the space should leave immediately if the ventilation system fails.

Officers on watch, or persons in charge, on the bridge, on the deck, in the engine-room, or the cargo control room should be informed as necessary that a space is to be entered so that, for example, fans are not stopped, equipment not started or valves not opened by remote control.

Appropriate warning notices should be placed on the relevant controls or equipment.

If necessary, pumping operations or cargo movements should be suspended when entry is being made into a dangerous space.

#### **7.4 Procedures and arrangements before entry**

Access to, and lighting within, the space should be adequate.

Sources of ignition should not be taken into the space.

Persons entering enclosed spaces should be provided with calibrated and tested multi-gas detectors that monitor the levels of oxygen, carbon monoxide and other gases as appropriate.

A rescue team and resuscitation equipment should be available for immediate action. The resuscitation equipment should be positioned ready for use at the entrance.

A continuous communication system must be set up, agreed and tested by all involved, to ensure that persons entering the space can keep in touch with the standby person and responsible person or officer on watch. A signal should be pre-arranged with the standby person to allow for a more effective method to communicate issues promptly.

A pre-arranged plan should be drawn up to deal with the rescue of collapsed persons in a confined space. The plan should take into account the design of the individual ship, the equipment and resources available on board as well as emergency response arrangements to ensure prompt response from the rescue team.

The standby person should not enter the space leaving the entrance unattended, even in cases where a person inside the space is believed to be at risk, and certainly not before



initiating emergency response arrangements and advising the responsible person or person in command.

The general (or crew) alarm should be sounded in the event of an emergency, so that immediate back-up can be given to the rescue team.

The incapacitated person should be removed from the space as quickly as possible, unless he or she is gravely injured, and essential first aid treatment should be administered first.

It should be checked that entry with breathing apparatus is possible before entry is allowed. The extent by which movement could be restricted or the removal of a casualty could be hampered, by the use of breathing apparatus, lifelines or harnesses should be ascertained by a competent person.

Rescue harness lifelines should be long enough for the purpose and easily detachable by the wearer, but should not otherwise come away from the harness.

If hoisting equipment is needed for a rescue, the availability of persons to operate the equipment in the event of an emergency must be ensured prior to entry.

Particular care should be taken when working on pipelines and valves within the space as conditions may change. Changing conditions include increasing ambient temperatures, the use of oxygen-fuel torches, mobile plant, work activities in the confined space that could involve gases, or if the ship is ballasted or trimmed during the work.

## **7.5 Testing the atmosphere of confined spaces**

Before entering or working in a confined space, the operator must ensure that the atmosphere in and near the confined space is tested by a competent person in accordance with the OHS (MI) Act.

Testing of the atmosphere must be carried out with properly calibrated equipment. The manufacturers' instructions should be strictly followed.

Initial testing should be done from the outside of the confined space and continuously monitored at regular intervals until all work is completed. Where practicable, the testing of the space should be carried out at as many different levels and areas as it is necessary to obtain a representative sample of the atmosphere in the space.

Any gas testing should be carried out with ventilation to the confined space stopped, and after conditions have stabilized, in order to obtain accurate readings.

In some cases it may be difficult to test the atmosphere throughout the confined space without entering the space (e.g. the bottom landing of a stairway) and this should be taken into account when assessing the risk to persons entering the space. The use of flexible hoses, sample probe or fixed sampling lines, which reach remote areas within the confined space, may allow for safe testing without having to enter the space.

Before entry, the operator must ensure that the space has the following readings:

- 21% oxygen by volume by oxygen content meter;
- not more than 1% of lower flammable limit (LFL) on a suitably sensitive combustible gas indicator, where the preliminary assessment has determined that there is potential for flammable gases or vapours; and
- not more than 50% of the occupational exposure limit (OEL) of any toxic vapours and gases.

If there is any deterioration in the conditions, all persons should leave the space immediately.

The internal structure of the space, cargo, cargo residues and tank coatings may also result in oxygen-deficient areas, even when a confined space has been tested as being suitable for entry.



## **7.6 Additional requirements for entry into a confined space**

If it is not reasonably practicable to ensure the confined space contains a safe oxygen level, then appropriate respiratory protective equipment must be provided.

The number of persons entering should be limited to the minimum number necessary to undertake the work.

Two air supplies should be available to the wearer of breathing apparatus, except in the case of emergency, or where this is impractical because movement in the space would be seriously impeded. A continuous supply provided from outside the space should be used. Should it prove necessary to change over to the self-contained supply, the person should immediately vacate the space.

Precautions should be taken to safeguard the continuity of the outside source of air during occupation of the space by the wearer of breathing apparatus. Special attention should be given to supplies originating from the engine-room.

A single air supply may be acceptable, where remote testing of the space is not reasonably practicable, provided prolonged presence in the space is not required and the person is situated so that he or she can be hauled out immediately in case of emergency.

A rescue harness should be worn and lifelines should be used where practicable.

Portable lights and other electrical equipment should be of a type approved for use in a flammable atmosphere.

If the person becomes unwell, an immediate check should be made that the air supply to ensure it is being maintained at the correct pressure.

## **7.7 Breathing apparatus and resuscitation equipment**

Only self-contained breathing apparatus, specifically designed for confined space entry should be used.

Before entry, the responsible person and competent person should undertake the full pre-wearing check and donning procedures recommended by the manufacturer. In particular the following should be checked:

- sufficient clean air is at the correct pressure;
- low pressure alarms are working properly;
- the face mask fits correctly against the wearer's face, so that, there will not be an ingress of oxygen-deficient air or toxic vapours when the user inhales. It should be noted that facial hair or spectacles will prevent the formation of an airtight seal between a person's face and the face mask;
- the wearer of the breathing apparatus is aware of the emergency procedures;
- when work is being undertaken in the space, the wearer should keep the self-contained supply ready for use in case there is a failure of the continuous supply from outside the space.

When in the confined space, the breathing apparatus should not be removed and shared with others unless it is necessary to save a person's life.

## **7.8 Maintenance of equipment and training**

The operator must ensure that all equipment used in connection with entry to or work in a confined space or during an emergency or rescue response is appropriately maintained and periodically inspected for correct operation. A maintenance record must be kept.

Equipment for testing the atmosphere of dangerous spaces must be regularly serviced and calibrated. The manufacturer's recommendations should be kept with the equipment and should be followed.

The operator should provide seafarers with the necessary training, instructions and information on entry into confined spaces. These include:

- recognition of the circumstances and activities likely to lead to the presence of a dangerous atmosphere;
- recognition of the hazards associated with entry into dangerous spaces, and the precautions to be taken;
- the selection, use and proper care of equipment and clothing used in connection with entry into confined spaces;
- contents of any relevant confined space permit;
- emergency procedures; and
- confined space entry and rescue drills.

## 8. TOOLS AND OTHER EQUIPMENT

All machines, tools and other equipment should be suitable for the tasks and conditions in which they are to be used.

Seafarers must be trained in the safe operation of any equipment they need to use. Manufacturer's instructions should always be followed.

Tools that are not being used should be placed in a carrier, box or tool rack located in a safe position against movement at sea and any cutting edge should be protected.

Any tools used when working at heights should be secured to prevent them from falling.

Suitable PPE should be worn (e.g. eye, face and hearing protectors and hair nets for long hair). Loose clothing or jewellery should never be worn while using any machinery, as there is a risk that it may become caught in moving parts.

General guidance on managing risks associated with machinery, tools and other items of plant is available in Safe Work Australia's Code of Practice: [Managing risks of plant in the workplace](#).

### 8.1 Portable electric, pneumatic and hydraulic tools

Power-operated tools are dangerous if they are not maintained and operated correctly. Battery powered tools should be used to minimise the risks associated with electrical leads.

Special care should be taken when using electrical tools in damp conditions since the risk of electric shock is greatly increased in the presence of moisture or high humidity.

Electrical tools and power supply leads should be inspected before use. Damaged, frayed or suspect leads must not be used.

Hand-held electrical tools should be provided with a spring-loaded switch that will break the circuit automatically when the tool is released from the hand. Portable electrical tools and appliances should not be used in a potentially flammable, oxygen enriched or explosive atmosphere, unless they are certified for use in such an atmosphere and the action is authorised by a responsible officer.

The risk of electric shock is increased by perspiration and locations which are damp, humid or have large conductive surfaces. In such conditions power tools should be operated from low voltage supplies (e.g. no more than 50 volts AC with a maximum of 30 volts to earth or 50 volts DC).

Where it is not practicable to use low voltages, other precautions such as a local isolating transformer supplying one appliance only or a high sensitivity earth leakage circuit breaker (also known as a residual current device) should be used.

Hand-held tools manufactured with non-metallic cases are called double-insulated. Although this design reduces the risk of grounding deficiencies, a shock hazard can still exist. Double insulated tools are not recommended for use on ships because water can provide a contact between live parts and the casing, increasing the risk of a fatal shock. An earth leakage circuit breaker may also fail to operate when used with such tools as there may be no earth wire in the power supply cable fitted to the tool.

Ensure that electrical leads and hydraulic/pneumatic tool hoses are kept clear of anything that might damage them and that they do not obstruct safe passage. Where they pass through doorways, the doors should be secured open.

Power tools should be switched off and disconnected from the power source when not in use. Tool pieces, such as drills or bits, must be secured in the tool and should not be fixed or replaced while the tool is connected to a power source.

## 8.2 Workshop and bench machines

Permanent signs should be fitted above workshop and bench machines alerting users to any necessary precautions appropriate to the machine, such as the wearing of eye protection.

All dangerous parts of machines, for example revolving shafts, gearing and belt drives, must be properly guarded. Before use, the operator should check that:

- guards and safety devices are in position and operative
- all tool pieces (e.g. drill bits and cutting blades) are in good condition, and
- the work area is adequately lit and free from clutter. This includes ensuring that machine residues such as metal turnings and swarf do not build up excessively, and are disposed of safely.

If any defect is identified, the machine should be isolated from its source of power, tagged and/or locked out until it has been repaired by a competent person.

Machine operators should be competent in the use of the machine and familiar with its controls.

No control or light switch should be in such a position that the user is required to lean over the machinery to reach it.

A machine in use should never be left unattended and should always be stopped when it is not in use.

Before a drill or lathe is started, the chuck key should be removed and the machine operator should ensure that other people are clear of the machine.

Work pieces for drilling and milling should be securely held at all times by a machine vice or clamp.

## 8.3 Abrasive wheels

Abrasive wheels should be selected, mounted and used only in accordance with the manufacturer's instructions and by a competent person. They are relatively fragile and should be stored and handled with care.

A wheel should be closely inspected for damage and brushed clean before it is mounted.

The clamping nut should be tightened only enough to hold the wheel firmly.

A strong guard should be provided and kept in position at every abrasive wheel both to contain the parts in the event of the wheel bursting and to prevent the user from coming into contact with the wheel.

The speed of the spindle should not exceed the stated maximum speed of the wheel and should be periodically checked.

When dry grind operations are being carried out or an abrasive wheel is being trued or dressed, suitable transparent screens should be fitted in front of the exposed part of the wheel and users must wear properly fitting suitable eye protection.

## 8.4 Compressed gas cylinders

The labelling, stowage and carriage of compressed gas cylinders are governed by the IMDG code. Cylinders should always be handled with care, whether full or empty.

Cylinders should be properly secured and kept upright but must be capable of quick release. Oxygen and fuel gas cylinders (such as acetylene) should be kept in separate, well-ventilated compartments that are not subject to extremes of temperature. The space should have no electrical fittings or other sources of ignition. "No smoking" signs should be displayed at the entrance and within the space.

Protective caps over the valve should be screwed in place when cylinders are not in use or are being moved. Valves should be closed when the cylinder is empty.

Cylinder valves controls and associated fittings should be kept free from oil, grease and paint. Controls should not be operated with oily hands.

Gas cylinders should be clearly marked with the name of the gas, its chemical formula or symbol and the body should be coloured according to its contents. *AS/NZS 4484-/NZS-2004 Gas cylinders for industrial, scientific, medical and refrigerant use – Labelling and colour coding* or its equivalent, sets out the requirements for the labelling of gas cylinders. A colour-coding card should be provided.

## 9. WELDING, FLAME CUTTING AND OTHER HOT WORK

Risks associated with welding, flame-cutting and other hot work must be controlled using the permit-to-work system and in accordance with the ship's safety management system.

General guidance on how to manage risks associated with welding is available in Safe Work Australia's Code of Practice [Welding processes](#).

The operator must provide appropriate training, information and instructions to seafarers that will be required to operate welding and flame-cutting equipment.

The equipment should be inspected before use by a competent person to ensure that it is in a serviceable condition.

Harmful fumes can be produced during these operations from galvanising paint and other protective materials. Oxygen in the atmosphere can be depleted during these operations. Adequate ventilation should be provided during flame cutting and welding operations in confined spaces (refer to section 7). Compressed gas cylinders must not be brought into confined spaces.

Where portable lights are needed to provide adequate illumination, they should be clamped or otherwise secured in position with leads kept clear of the working area.

The equipment operator and other persons involved in the work process should wear appropriate PPE, for example:

- a welding shield or welding goggles with a suitable shade of filter lens (goggles are only recommended for gas welding and flame cutting);
- leather gloves;
- fire resistant apron (e.g. leather) when appropriate; and
- long-sleeved natural-fibre boiler or other approved protective clothing.

### 9.1 Precautions against fire and explosions

Before any work begins, inspections and tests should be carried out to ensure there are no combustible solids, liquids or gases at, or in any compartments adjacent to, the work area which might be ignited by heat or sparks from the work. An assessment of the task in the context of other work being done on board should be undertaken by a responsible officer.

All surfaces to be welded, or upon which hot work is to be conducted, should be free of oil, grease or any flammable or combustible materials. If necessary, combustible materials and dunnage should be moved to a safe distance before commencing hot work. Such working surfaces should also be free of materials that could release a flammable substance if disturbed.

All openings through which sparks might fall should be closed where practicable. Where closure is not possible, ensure that no flammable materials below can be ignited and that the area below is cordoned off to prevent persons accessing this area while work is occurring.

When welding is to be carried out near open hatches and other similar spaces, suitable screens should be erected to prevent sparks dropping down hatchways, hold ventilation or other similar spaces.

Cargo tanks, fuel tanks, cargo holds or other tanks or spaces (including cargo pumps and pipelines) that have contained flammable substances should be certified by a competent person as being free of flammable gases before any work commences (see section 7). The testing should be carried out at regular intervals and include the testing of any adjacent spaces, double bottoms and cofferdams.

When carrying out hot work on tankers and similar ships, all tanks, cargo pumps and pipelines should be thoroughly cleaned and particular care taken with the drainage and cleaning of pipelines that cannot be directly flushed using the ship's pumps.

Welding and flame-cutting operations should be properly supervised and a fire watch maintained, both in the operational area and all adjacent areas, including spaces on the other side of affected bulkheads. Due to the risk of delayed fires resulting from the use of burning or welding equipment, frequent checks should be made for at least two hours after the work has stopped.

Suitable fire extinguishers should be kept at hand. A person with a suitable extinguisher should also be stationed to keep watch on areas not visible to the welder that may be affected.

For hot work on or near cargo containment systems, Regulation 18.11 of the *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IGC Code)<sup>17</sup> requires special fire precautions to be taken in the vicinity of cargo tanks and, particularly, insulation systems that may be flammable or contaminated with hydrocarbons or that may give off toxic fumes as a product of combustion.

Hot work near fuel tanks, fuel piping and insulation systems that may be flammable, contaminated with hydrocarbons, or that may give off toxic fumes as a product of combustion may only be undertaken after the area has been secured, confirmed safe for hot work and all approvals have been obtained.

## **9.2 Electric welding equipment**

In order to minimise the risk of electric shock, the power supply to electric welding machines for shipboard use should be direct current (DC) of no more than 70 V, with a minimum ripple.

When DC equipment is not available, AC output power sources may be used providing they have an integral voltage-limiting device to ensure that the idling voltage (the voltage between electrode and workpiece before an arc is struck between them) does not exceed 25 V rms. The proper function of the device (which may be affected by dust or humidity) should be checked each time a welding set is used. Some voltage-limiting devices are affected by their angle of tilt from the vertical, so it is important that they are mounted and used in the position specified by the manufacturer. This requirement can be affected by adverse sea conditions.

The "go and return" system where the welding set has two cables should be used, with the "return" cable separately earthed to the ship's structure. The lead and return cables should be of the shortest length possible (and of an appropriate cross-section) to avoid voltage drop.

Cables should be inspected before use, and connectors should be fully insulated. If the insulation is impaired or conductivity reduced they should not be used.

Electrode holders should be fully insulated so that no live part of the holder is exposed to touch and, where practicable, they should be fitted with guards to prevent accidental contact with live electrodes, and as protection from sparks and splashes of weld metal.

A local switching arrangement or other suitable means should be provided for rapidly cutting off current from the electrode should the equipment operator encounter difficulties, and also for isolating the holder when electrodes are changed.

The direct current output from power sources should not exceed 70 volts open circuit.

Cable connectors should be fully insulated when connected, and so designed and installed that current-carrying parts are adequately recessed when disconnected.

## **9.3 Precautions during electric-arc welding**

Non-conducting safety footwear should be worn and clothing including hand gloves should be kept as dry as possible.

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<sup>17</sup> Given effect through [Marine Order 17 \(Chemical tankers and gas carriers\)](#)

An assistant should be present during welding operations. The nominated assistant should be alert to the risk of accidental shock to the welder and ready to cut off power instantly, raise the alarm and provide artificial respiration without delay. It may be desirable to have a second assistant if the work is to be carried out in difficult conditions.

Where persons, other than the equipment operator, are likely to be exposed to harmful radiation or sparks from electric arc welding, they should be protected by screens or other effective means.

In restricted spaces, where the equipment operator may be in close contact with the ship's structure or is likely to make contact in the course of ordinary movements, protection should be provided by dry insulating mats or boards.

There are increased risks of electric shock to the equipment operator if welding is done in hot or humid conditions. Under such conditions, the operation should be deferred until such time that an adequate level of safety can be achieved.

Under no circumstances should the welding operation be conducted in wet conditions.

When the welding is completed or temporarily suspended, the electrode should be removed from the holder. Hot electrode ends should be ejected into a suitable container; they should not be handled by bare hand. Spare electrodes should be kept dry in their container until required for use.

#### **9.4 Flame cutting and brazing**

Equipment should have backpressure valves fitted adjacent to the torch in the oxygen and acetylene lines and flame arresters fitted at the low pressure side of the regulators.

Oxygen pressure should always be sufficient to prevent acetylene from entering the oxygen line.

Acetylene may explode under excessive pressure. It should not be used at a pressure exceeding one (1) atmosphere gauge.

If a backfire occurs, the valves on the oxygen and acetylene cylinders should be closed immediately. Equipment operators should be trained in the appropriate methods for cooling and/or jettisoning cylinders which become hot. An acetylene cylinder that becomes overheated is very dangerous as an impact could cause internal ignition and subsequent explosion.

Only hoses which have been specially designed for flame cutting and brazing should be used. Hoses in which a flashback has occurred, or which are in any other way damaged, should be discarded.

Blowpipes should be lit by safe means such as a stationary pilot flame or a special friction igniter.

Gases should be shut off at the pressure reducing regulators before a blowpipe is changed.



## 10. PAINTING

Paints may be considered as hazardous substances. The packaging or Safety Data Sheet (SDS) will contain warning signs or information, which will give the first indication of any risks. The SDS must be accessible to seafarers using such paint.

Paints may contain toxic or irritant substances. Paints containing lead, mercury or similar toxic compounds should not be used.

A paint for which no manufacturer's information or Safety Data Sheet (SDS) is available should not be used. Information must also be provided on thinners and cleaning solvents.

Some paints dry by evaporation of the paint's solvent and the process may release flammable or toxic vapours. All interior and confined spaces should be well ventilated while painting is in progress and until the paint has dried.

Because the ingredients or composition of old paint may be unknown, painted surfaces should always be rubbed down wet to reduce dust from the old paint, which may be toxic if inhaled.

If the surface to be rubbed down is known to contain lead, then methods that do not create dust should be adopted. It is safer to avoid or minimise dust creation than to try to clean up the dust afterwards. Sanding or abrasive blasting should be avoided. Lead based paint should never be burnt off because fumes will contain metallic lead in a readily absorbed form. Appropriate respiratory protective equipment should be worn to protect against dusts.

Rust removers are acids and contact with unprotected skin should be avoided. Eyes and skin protection should be worn against splashes. If painting at heights or otherwise near ropes, care should be taken to avoid splashes on ropes.

Smoking should not be permitted during painting. Naked lights, such as matches, should not be used in spaces until paint has fully dried.

Care should be taken when mixing two-pack (two component) paint, as a chemical reaction takes place during the mixing which might create heat and fumes.

When painting is done in the vicinity of machinery, the power supply should be isolated and the machine immobilised in such a way that it cannot be moved or started up inadvertently. Appropriate warning notices should be posted.

Spaces where paint and painting equipment are stored should be well ventilated. If the ventilation system in the paint store is inoperative, it should be treated as a confined space as per section 7.

### 10.1 Spray painting

Operators should follow the manufacturer's instructions when using spray equipment.

Paints containing tin, mercury, lead or any toxic compounds should not be sprayed in interior spaces.

Airless spray equipment should be used with caution as it ejects paint at a very high pressure, which can penetrate the skin or cause eye injuries.

A "paint mist" may form during spraying. Suitable PPE should be worn such as a combination suit, hood, gloves and eye protectors. Depending on the nature of the paint being sprayed, a respirator should also be worn. In some cases, it may be necessary to use specialist breathing apparatus.

If a spray nozzle clogs, the trigger of the gun should be locked in a closed position before any attempt is made to clear the blockage.

Before a blocked spray nozzle is removed or any other dismantling is attempted, pressure should be relieved from the system. When blowing through a reversible nozzle to remove a blockage, all parts of the body should be kept clear of the nozzle mouth.

The pressure in the system should not exceed the recommended working pressure of the hose. The system should be regularly inspected for defects.

General guidance on managing risks associated with spray painting is available in Safe Work Australia's Code of Practice [Spray painting and powder coating](#).

## 11. WORKING AT HEIGHTS

Falls from height are one of the major causes of serious injuries and fatalities for Australian seafarers. Working at height includes undertaking work inside a tank, over the side and near an opening such as hatch, or a fixed stairway.

Work should only be carried out at height if there is no reasonably practicable alternative. For example, the risk of falls when working over the side can be eliminated by using drones or remote cameras for inspection work or using a boat instead of a ladder.

The sea and weather conditions and the possibility of squalls should be assessed before commencing work at heights or over the side. In coastal waters strong tidal or current rips could cause sudden, unexpected ship movements. In general, working at heights or over the side should not be permitted if the movement of a ship makes such work hazardous.

Consideration should be given to hazards associated with working near the ship's whistle, funnel, radio aerials and radar scanners. All relevant officers should be informed before work starts and all relevant equipment should be isolated or shut down. Warning notices should be posted as appropriate. Officers should be informed when the work is completed.

Only competent persons should engage in any activity and use of equipment, including the organisation, planning and supervision relating to working at height or over the side. Activities including training associated with working at height or over the side must be supervised by a competent seafarer.

Safety harnesses and restraints appropriate to the conditions should be worn. Safety nets should be rigged where necessary. Persons working over the side should wear a lifeline and life-jackets or other suitable flotation devices. Someone should be in attendance on deck. A lifebuoy with a line attached should be readily available.

Warning notices that persons are working at heights or over the side should be posted on deck, and at other visible areas as appropriate. Tools should be kept secured at all times, for example using belt tool carriers.

All equipment, such as ladders, blocks and gantlines, should be carefully examined before use. If there is any doubt of the standard, quality and condition of any item, it should not be used.

Where possible, only permanent fixtures to the ship's structure, such as welded eye pads, should be used as securing points for ladders, blocks and gantlines. Securing points should be inspected to ensure that they are capable of carrying the weight.

Ladders and gantlines should be kept away from, or protected from, sharp edges.

Cargo handling operations should not take place in the vicinity where seafarers are working at heights or over the side.

General guidance on controlling the risk of falls when working at heights is in Safe Work Australia's Code of Practice: [Managing the risk of falls at workplaces](#).

### 11.1 Cradles and stages

Cradles should be at least 45 cm wide and fitted with guard-rails to a height of one (1) metre from the floor.

Plank stages should be made from sound wood and materials and should be free from defect.

As far as possible, stages should be secured against movement. Wooden components of staging should be stowed in a dry, ventilated space and not subjected to heat.

Gantlines should be long enough to allow stages to be lowered to a level which enables seafarers to step off the stage easily. Gantlines used for working afloat 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.

When a stage is rigged overside, the two gantlines used in its rigging should be at least long enough to trail into the water to provide additional lifelines should a person fall. A lifebuoy and line should be kept ready nearby.

Stages and staging that are not suspended should always be secured against movement. Hanging stages should be restricted against movement to the extent practicable.

In machinery spaces, staging and its supports should be kept clear of contact with hot surfaces and moving parts of machinery. In the engine room, a crane gantry should not be used directly as a platform for cleaning or painting, but can be used as the base for a stable platform if suitable precautions are taken.

## **11.2 Suspended scaffold – Bosun’s chairs/swing chair**

A suspended scaffold must be designed and installed by a competent person. Guidance is available in Safe Work Australia’s [Guide for suspended swing stage scaffolds](#).

Unless a large enough exclusion zone is set up under the chair to protect other people, control measures should be in place to prevent tools or equipment falling from the chair (e.g. lanyards for hand tools or heavy equipment suspended from another rope).

The chair, gantlines, hoists and lizards must be thoroughly load tested and examined for damage, wear and cracks before use and at pre-determined intervals by competent persons.

The person in the suspended scaffold must be able to activate every control from the seated position. If the chair is subjected to movement due to wind forces or the work carried out, lateral restraints are required.

When used with a gantline, the chair should be secured to it with a double-sheet bend and the end seized to the standing part with adequate tail. Hooks should not be used to secure bosun’s chairs unless they are of the type that, because of their special construction, cannot be accidentally dislodged, and have a marked safe working load that is adequate for the purpose.

## **11.3 Ropes**

The safety of seafarers working at heights depends to a large extent on the condition of the ropes used in the operations (refer to section 15.2).

Ropes should be stowed in a special locker and used for no other purpose than for working at heights. Nothing else should be stowed in the locker as 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. Although the surface of a rope may look like it is in good condition, it may have deteriorated inside.

## **11.4 Portable ladders and scaffolding**

A portable ladder should only be used where no safer means of access is reasonably practicable. Guidance on the selection and safe use of portable ladders is set out in Safe Work Australia’s Code of Practice: [Managing the risk of falls at workplaces](#).

Ladders should be inspected regularly by a competent person.

Where a portable ladder is in use in a hatchway, no cargo may be loaded or unloaded through that hatchway.

When using portable ladders:

- they should be placed on a firm and secure surface

- the distance between the ladder base and supporting structure should be about one (1) metre for every four (4) metres of working ladder height (4:1 ratio)
- the ladder should extend to a height of at least one (1) m above the top landing place and be secured at the top or held steady while being used, and
- workers should face the ladder and use both hands to climb it and not carry any tools or equipment while climbing up and down.

The person working at heights should use a safety harness with a lifeline secured above the work position.

Metal ladders should never be used where there is any risk of the ladder or user coming into contact with an electrical source.

All scaffolding must be erected, altered and dismantled by competent persons. Any scaffold from which a person or object could fall more than four metres must be erected, altered and dismantled by or under the direct supervision of a licensed scaffolder.

Information on the safe use of scaffolding is set out in Safe Work Australia's [Scaffolds and scaffolding work guidance material](#).

### **11.5 Rope ladders**

Rope ladders should be of good construction, adequate strength and properly maintained.

The rope ladder should be properly secured. Do not secure a rope ladder to railings, or to any other means of support, unless the railings or support will safely take the weight/load of the person and the ladder.

The rope ladder should either hang fully extended or be pulled up completely. It should never be left so that slack may suddenly pay out when the ladder is used.

The ladder should be rigged and used under the supervision of a competent person.

## 12. WORKING WITH ELECTRICAL EQUIPMENT

All relevant national and international regulations governing the design and construction of electrical installations must be followed, taking into account unusual conditions which may be encountered in service such as exposure to:

- moisture, steam and oil vapour, salt-laden atmosphere, sea spray, high winds and ice formation;
- abnormal vibrations, deformation and mechanical shock;
- unusually high or low temperatures; and
- explosive mixtures when used in certain areas.

The risk of electric shock is high on board as moisture, high humidity and high temperature (including sweating) reduces the contact resistance of the body. In these conditions, severe and even fatal shocks may be caused at voltages as low as 60V. Cuts and abrasions also significantly reduce skin resistance.

Working with electrical equipment in small spaces increases the risk due to the difficulty of being able to exit quickly should an equipment fault occur. Similarly, small spaces make it difficult to avoid contact with items such as extension leads used with portable power tools.

General guidance on electrical safety is available in Safe Work Australia's Code of Practice: [Managing electrical risks at the workplace](#)

Seafarers must receive adequate training before being permitted to work on electrical installations. Seafarers not authorised to carry out electrical work should never install new equipment or alter existing equipment.

Work on or near live equipment should be avoided if possible but when it is essential for the safety of the ship or for testing purposes, the following precautions should be taken:

- A second person, who should be competent in the treatment of electric shock, should be continually in attendance.
- Adopt a working position to avoid accidental contact with live parts. Insulated gloves should be worn where practicable.
- Contact with the deck, particularly if it is wet, should be avoided. Footwear may not give adequate insulation if it is damp or has metal studs or rivets. The use of dry insulating mats at all times is recommended.
- Contact with bare metal should be avoided. A hand-to-hand shock is especially dangerous. To minimise the risk of a second contact should the working hand accidentally touch a live part, one hand should be kept in a trouser pocket whenever practicable.
- Wrist watches, metal identity bracelets and rings should be removed. They provide low resistance contact with the skin. Metal fittings on clothing or footwear are also dangerous.

The installation should be maintained and protected to minimise the possibility of fire, external explosion, electrical shocks and danger to seafarers.

All live parts should be effectively insulated and enclosed in conduits or otherwise protected and should be maintained in that condition.

The enclosures of live circuits, such as terminal boxes, should be designed to prevent accidental contact and to ensure that only authorised persons can access them.

All electrical equipment should be regularly inspected to ensure that it is suitable for its intended use. Any electrical faults or other defects should be immediately reported to the appropriate person and properly tagged out and disconnected from any power source. The faulty equipment should be removed and repaired by a competent person.

Parts of electrical equipment may remain live even when the equipment is switched off. Equipment must be tested, verified as being isolated, disconnected from any power source and the system de-energised before any work commences.

Attention should be paid to the maintenance of the emergency source of electrical power and alarm systems supply and backup.

All electrical appliances should be clearly marked to indicate their safe operating voltage.

Circuits and appliances carrying different voltages in the same installation should be clearly distinguishable by notices, markings on distribution boxes and other conspicuous means.

Seafarers should not interfere with an installation intended to prevent circuits and apparatus from being subjected to voltages which exceed those for which they were designed.

Only an engineer officer or other competent person should carry out repairs to electrical installations. A "permit-to-work" should be issued (see section 3.8).

Effective means of ensuring safe isolation of every circuit, sub-circuit and apparatus, such as facilities to lock off isolators, key control or signing, should be provided to minimise or eliminate danger to seafarers.

Every circuit should be protected against overload currents, so as to reduce damage to the system and keep the danger of fire to a minimum.

Redundant circuits or apparatus should be disconnected or dismantled and marked accordingly.

Contact with live equipment should be avoided by:

- placing live parts out of reach;
- effective enclosure of live parts;
- adequate insulation; and
- preventing work on live equipment or plant.

PPE, such as rubber gloves and rubber boots, should be used whenever there is a risk of electric shock but should not be regarded as providing full protection against such a risk.

Suitable fuses or contact-breakers should be placed in each circuit to limit the current to the safe rating for the cable or equipment.

Where fuses are used, they should bear clear markings indicating their rated current and, as far as practicable, their rated capacity.

Only authorised persons should replace fuses. Replacement fuses should be of the correct rating. Effective means (such as a fuse replacement tool) should be used to ensure that persons removing or inserting fuses will not be endangered by any adjacent live parts.

In general, it should not be possible to remove or insert fuses in a circuit unless it has been made dead by means of an isolating device on the incoming side.

The following notices should be displayed at suitable places:

- a warning notice prohibiting unauthorised persons from entering electrical equipment rooms, interfering with switchboards, and handling or interfering with electrical apparatus;
- a warning notice specifying the person to be notified in the event of an electrical accident or some other dangerous occurrence, and indicating how to communicate with that person;
- a notice specifying the voltage present in equipment or conductors; and
- a notice prohibiting the use of naked flames in the vicinity of the battery room.

Only authorised persons should have access to and enter equipment rooms containing live electrical equipment or have access to the rear of live switchboards.



No work should be done in dangerous proximity to a conductor or installation until it has been made dead and signs have been suitably posted.

All conductors and equipment should be considered to be live until proven otherwise.

If a conductor or an installation is in the immediate vicinity of a work location and cannot be de-energised, special precautions should be taken. This operation should be supervised accordingly.

Before a circuit is re-energised, an engineer officer should ensure that no seafarer is in a dangerous position and that all work has been completed with all permits to work signed off accordingly.

After work has been done on electrical equipment, the circuit should be re-energised only by, or on the orders of, a competent person.

Distribution apparatus and switch gear should be protected in all circumstances, particularly:

- against dripping or splashing of water; and
- in switchboard rooms and machinery spaces.

If temporary connections have to be made while repairs are being carried out, the connections should be made with cables having an adequate margin of current and voltage rating and by an engineer officer. They should be disconnected and removed as soon as they are no longer required.

Accurate up-to-date drawings, including cabling diagrams and electrical equipment arrangement diagrams, covering the whole installation must be on hand.

Distribution panels should include a list identifying the lighting fixtures, socket outlets and fixed appliances supplied by each of the panel's circuit breakers or fuses.

Distribution panels and local group starter panels should be clearly labelled to show their identity as depicted on the drawings.

Before any work on electrical equipment is carried out, fuses should be removed or circuit breakers opened to ensure that all related circuits are isolated and de-energised. If possible, switches and circuit breakers should be locked open or, alternatively, a 'not to be closed' notice attached. Where a fuse has been removed, it should be retained by the person working on the equipment until the job is completed. A check should be made that any interlocks or other safety devices are operative.

Additional precautions are necessary to ensure safety when work is to be undertaken on high-voltage equipment (designed to operate at a nominal system voltage in excess of 1000V). The work should be carried out by, or under the direct supervision of, a competent person with sufficient technical knowledge using a permit to work system.

Any test meters used must be rated for the voltage being tested with meter probes having only minimum amounts of metal exposed and insulation of both probes should be in good condition. Care should be taken that the probes do not short circuit adjacent connections. When measuring voltages that are greater than 250V, the probe should be attached and removed with the circuit de-energised.

## **12.1 Flexible cables, portable lights, electric tools and other equipment**

Battery powered tools should be used to minimise the risks associated with electrical leads. All flexible cables should:

- be of sufficient size and current rating for the purposes for which they are to be used;
- be constructed, insulated, secured and protected to eliminate or minimise electrical risks;
- not be laid on surfaces that are oily, wet or where corrosive liquids are present;



- be kept clear of moving loads, running gear and moving equipment;
- not be used to lift portable lamps or portable tools to which they are connected, unless specifically designed for that purpose.

Every electrical connection should be of suitable construction with regard to conductivity, insulation, mechanical strength and protection, taking into account the need to use such equipment in exposed locations.

Cables and conductors should be mechanically protected and properly and durably insulated at points where they are joined, branched or led into any apparatus. For these purposes junction boxes, sleeves, bushings, glands or equivalent connecting devices should be used.

Where practicable, flexible cables should be joined by junction boxes or plug and socket couplings, and the attachment should be made by screwing, clamping, soldering, riveting, brazing and crimping or equivalent means.

Where armoured cables are joined, care should be taken to continue the conductive bond between the armouring of the cables by bridging the junction boxes.

All conductors and apparatus that may be exposed to a flammable or explosive atmosphere should be constructed to prevent ignition of the vapour or explosive dust. Reference should be made to the *International Electrotechnical Commission (IEC) 60079* series of explosive atmosphere standards.

The supply voltage to portable tools and appliances should generally not exceed 240V.

A hand lamp or other portable lamp should be of an approved type with effective protection for the bulb and with a suitable cover of glass or other transparent material. Such equipment should be dust and water proof and, where necessary, gas proof.

When using portable equipment or portable lamps, ensure that any flexible cables passing through doors, hatches or other openings are protected and that their insulation is not damaged by the closing of doors, covers or lids.

A sufficient number of well-placed socket outlets should be provided so that permanent extension leads are not needed.

## 12.2 High-voltage systems

A high voltage apparatus is any apparatus, equipment or conductors normally operated at a voltage higher than 1000 volts alternating current (1000 V a.c.) or 1500 volts direct current (1500 V d.c.).

High-voltage systems are very dangerous and therefore only competent persons should work on them. Additional precautions are necessary to ensure safety when work is to be undertaken on high voltage equipment / installations.

Manufacturer's instruction manuals should be provided for all high-voltage equipment and be closely followed.

All high-voltage equipment should be enclosed or protected. Access should be only obtained by authorised persons using a special tool or key that is retained by the responsible engineer officer, unless the equipment is designed in a way to ensure that any attempt at access will automatically isolate and render it safe.

Work on high voltage equipment should not be carried out unless an agreed switching plan has been developed and implemented so that the equipment /installations are isolated. A switching plan is a plan or programme, developed by the authorised person, which details the intended sequence of switching, isolation and earthing operations required to be carried out to isolate and make dead, or reinstate and make live, high voltage equipment or installation.

The switching plan must be agreed between the authorised and the competent persons undertaking the task prior to executing the plan. If contractors are involved, then their agreement is also required.

### **12.3 Rectifiers and electronic equipment**

Working near charged capacitors associated with rectification circuits is hazardous.

Maintenance or repair work should not be attempted until the equipment has been effectively isolated and any stored energy dissipated. Only competent persons should be authorised to repair electronic equipment.

### **12.4 Radio communication and navigational equipment**

Aerials and open wire feeders should be placed and guarded in a way to make them inaccessible to unauthorised persons.

Conductors that pass through areas of high electro-magnetic flux should be insulated or otherwise protected in areas to which seafarers have access.

Seafarers should not be allowed to work near transmitting aerials whilst there is a possibility that they may be energised. Any work in the vicinity of transmitting aerials should be carried out only under the "permit-to-work" system (see section 3.8). Warning notices should be posted at appropriate places until the work has been completed.

Suitable means should be provided and maintained to exclude any persons from the vicinity of equipment where there is a danger from shock, radio frequency burns and injury from X-rays or other radiation.

Notices warning of the danger of high voltage should be displayed near radio transmitter aerials and lead-through insulators.

Where accumulators are used they should be disconnected at source; otherwise control measures should be implemented to prevent short circuiting the accumulator with consequent risk of burns.

Live chassis connected to one side of the mains are usually marked appropriately and should be handled with caution. Where the mains are AC and a transformer is interposed, the chassis is usually connected to the earth side of the supply, but this should be verified using an appropriate meter.

Modern equipment often includes a master crystal enclosed in an oven; the supply to the oven is taken from an independent source and is not disconnected when the transmitter is switched off and the mains switch is off. Mains voltage will be present inside the transmitter, and care should be taken.

Before work is begun on the energy harvesting (EH) section of a transmitter or other EH apparatus, with the mains switched off, all EH capacitors should be discharged using an insulated jumper, inserting a resistor in the circuit to slow the rate of discharge. This precaution should be taken even where the capacitors have permanent discharge resistors fitted.

An electrolytic capacitor that is suspect, or shows blistering, should be replaced since it is liable to explode when electrical supply is on. There is a similar risk when an electrolytic capacitor is discharged by a short circuit.

### **12.5 Batteries and battery rooms**

Particular hazards when charging batteries are hydrogen explosion and short circuits. During charging, a battery gives off hydrogen and oxygen and the subsequent mixture can be easily ignited. Short circuits may cause arcing which could lead to an explosion or burn seafarers.

Battery rooms therefore, must be adequately ventilated to avoid accumulation of explosive gases.

Light fittings and any electrical equipment in the battery room should be certified as being suitable for use in a hydrogen enriched atmosphere. Light fittings in battery compartments should be properly maintained at all times, with protective glass in position and properly tightened. If cracked or broken glass cannot be replaced immediately, the electric circuit should be isolated until replacements are obtained.

All electrical connections including battery terminals, in battery compartment should be checked regularly and well maintained. Unclean and poor connections may cause overheating and sparking. Temporary clip-on connections should never be used as they may become loose due to vibration, cause a spark and short circuit.

Insulation and/or guarding of cables in battery compartments should be well maintained.

No unauthorised modifications or additions should be made to electrical equipment (including light fittings) in battery compartments.

Only authorised persons should enter battery rooms and, when doing so, they should ensure that they do not introduce any source of ignition. A warning notice prohibiting smoking or welding in and near battery rooms should be displayed near the entrance to the compartment.

Battery rooms should be kept clear of any equipment, including any other electrical equipment likely to act as a source of ignition, and should not be used as storerooms.

When using metal tools or implements, avoid making contact with the metal battery case or terminals.

Remove jewellery, watches and rings etc. when working on batteries. A short circuit through any of these items will generate heat rapidly and may cause a severe skin burn. If rings cannot be removed, they should be heavily taped in insulating material.

Lead-acid batteries and alkaline batteries should not be stored in the same room because of the possible interaction of the electrolytes. Where both lead-acid and alkaline batteries are in use, ensure that the materials and tools used in servicing each type are kept apart, as contamination of the electrolytes may cause deterioration of battery performance and mixing of the two electrolytes may produce a vigorous, uncontrollable chemical reaction.

Battery chargers and all circuits fed by the battery should be switched off when leads are being connected or disconnected. Whilst individual cell voltages may not present a shock risk, dangerous voltages can exist when a number of cells are connected together in series. A lethal shock needs a current of only tens of milliamps and particular care should be taken when the voltage exceeds 50V.

Ventilation tubes of battery boxes should be examined regularly to ensure that they are free from obstruction.

Lids of battery boxes (if provided) should be fastened while opened for servicing and properly secured again when the work is finished.

Batteries should be kept battened into position to prevent shifting in rough weather.

Batteries should always be transported in the upright position to avoid spillage of electrolyte and in a way that will minimise the risk of injury due to heavy lifting.

Safe and effective means of inspecting and servicing the batteries should be provided by adequate lighting and access to each cell. Personal protective clothing, gloves and a face shield suitable for use with acid should be supplied and worn by seafarers engaged in topping up the batteries. Open flames and naked lights should not be used to inspect battery cells.

## **12.6 Lead acid batteries**

When the electrolyte is being prepared, the concentrated sulphuric acid should be added slowly to the water. If water is added to the acid, the heat generated may cause an explosion of steam, splattering acid over the person handling it.

Goggles, rubber gloves and a protective apron should be worn.

To neutralise acid on skin or clothes, copious quantities of clean fresh water should be used.

An eyewash bottle should be available for immediate use on the eyes in case of accident. This bottle should be clearly distinguishable by touch from acid or other containers, so that it may be easily located by a person who is temporarily blinded.

The corrosion products which form around the terminals of batteries are harmful to skin and eyes. They should be removed by brushing, away from the body. Terminals should be protected by petroleum jelly.

An excessive charging rate causes acid mist to be carried out of the vents onto nearby surfaces. This should be cleaned off with diluted ammonia or soda solution, and affected areas then dried.

## **12.7 Alkaline Batteries**

The general safety precautions with this type of battery are the same for the lead-acid batteries with the following exceptions.

The electrolyte in these batteries is alkaline but is similarly corrosive. It should not be allowed to come into contact with the skin or clothing. In the case of accident the affected parts should be washed with plenty of clean fresh water.

Unlike lead acid batteries, the metal case of alkaline batteries remain live at all times and care should be taken not to touch them or to allow metal tools to come into contact.

## **12.8 Visual display units (VDUs) including microcomputers**

Seafarers should be given adequate training in the use and capabilities of VDUs and microcomputers, if necessary to carry out their duties.

Work with VDUs can be mentally tiring and measures should be taken to minimise the risk of eyestrain. Lighting should be adequate for the task, with glare and reflection cut to a minimum, and the display screen should be clear and easy to read. Rest periods should be provided.

Symptoms such as neck and arm pains may arise as the result of bad posture. VDU operators should avoid sitting in a slumped or cramped position and should be provided with an adjustable chair. Screens and keyboards should be adjustable to the correct height and the correct distance from the operator.

## 13. HAZARDOUS SUBSTANCES AND RADIATION

Under Part 2 of the OHS(MI) Regulations operators must assess the risks arising from hazardous substances before introducing them on their ships. Health and safety risks must be eliminated or minimised so far as is reasonably practicable, in accordance with the hierarchy of control measures (refer to section 2.3)

The operator must also:

- ensure containers are labelled to clearly identify the substance in the container
- obtain the current Safety Data Sheet (SDS) from the manufacturer or supplier of the chemical and ensure it is readily accessible to all users
- maintain a register listing all hazardous substances used on the ship and ensure the register is accessible to all persons who could be exposed to the substances
- ensure that a hazardous substance in an enclosed system (e.g. pipeline, tank) is clearly identified, for example with a label or warning notice
- provide instruction and training to workers on the nature of the hazard associated with the substance and the control measures needed, including the correct use of any PPE
- ensure that exposure standards are not exceeded
- undertake atmospheric monitoring and health monitoring if the risk assessment indicates it is needed.

Some substances such as residual fuel oil and used engine oil contain chemicals that cause cancer. In addition to these effects, contact between oil and skin can lead to skin conditions ranging from mild irritation to severe oil acne. Control measures must be implemented to eliminate or minimise exposure to these substances.

Precautions on the label and in the SDS should be followed.

Hazardous substances should be stored in a locked, well ventilated area in the original packaging or in another similarly labelled container that clearly identifies the substance. A chemical from an unlabelled container should never be used.

Some domestic cleaning substances contain bleach (sodium hypochlorite) or caustic soda (sodium hydroxide) whilst some disinfectants contain carbolic acid (phenol). These substances can burn the skin and they are poisonous if swallowed. They should not be mixed together or used at more than the recommended strength.

Wherever possible, non-hazardous cleaning products should be used.

Some chemical products emit fumes that are hazardous if inhaled, for example adhesives and solvents used for degreasing. These substances should only be used in well ventilated areas and appropriate respiratory equipment should be worn.

Exposure to certain substances such as mineral oils, natural solvents, domestic cleaning agents and detergents, may cause dermatitis. Suitable gloves should be worn when using such substances. Barrier creams may also help protect the skin.

Even seemingly innocuous material may contain harmful substances. Before removing insulation, paint and other coatings, obtain information on the nature of the material, if possible, to determine whether there are any hazards associated with it, so that exposure can be minimised.

Inadvertent contact with toxic chemicals or other harmful substances should be reported immediately and the appropriate remedial action taken in accordance with the SDS.

General guidance on managing the risks of hazardous chemicals is available in Safe Work Australia's Code of Practice [Managing risks of hazardous chemicals in the workplace](#).

## 13.1 Asbestos

Asbestos fibres released into the air are harmful because they can become lodged in the lungs and may cause cancer.

Asbestos is likely to occur on older vessels in insulation and panelling, but certain asbestos compounds may also be found elsewhere and on other vessels in machinery components such as gaskets and brake linings.

From 31 December 2003 the installation of asbestos on Australian ships has been prohibited. The same prohibition has been effective internationally from 1 January 2011, in accordance with SOLAS Chapter II-1 Reg. 3-5.2.

The risks of exposure to in situ asbestos on ships must be eliminated or minimised so far as is reasonably practicable as required under Part 2 of the OHS(MI) Regulations 2003. Health surveillance is also required for seafarers who may be exposed to asbestos.

Ship owners and operators should ensure that:

- Asbestos or asbestos containing materials are identified by a competent person
- Analysis of material samples is undertaken by laboratories accredited by the National Association of Testing Authorities (NATA)
- Once asbestos or ACM is identified, its presence and location is clearly indicated.

Asbestos that is sealed is unlikely to release dust; however if asbestos is in poor condition consideration should be given to its removal.

In general asbestos must only be dealt with by a specialist contractor or licensed asbestos removalist. This includes any work or repairs.

The removal or disposal of asbestos should be carried out in accordance with the State or Territory legislation. Ship owners and operators should contact the relevant State or Territory Work Health and Safety (WHS) regulator to ensure that removal work is carried out as per the applicable legislation.

Further guidance is provided in Marine Notice – *Asbestos on Ships* and Safe Work Australia's Code of Practice [How to manage and control asbestos in the workplace](#) and the Code of Practice [How to safely remove asbestos](#).

## 13.2 Synthetic mineral fibres

Synthetic mineral fibres, such as those found within insulation material, can cause skin, nose and eye irritation. Appropriate PPE, such as goggles, masks and coveralls should be worn when handling such material.

## 13.3 Radio and radar installations

Warning notices of the danger of high voltages should be located near radio transmitter aerials and lead-through insulators.

Radio transmitters and radar equipment should not be operated when persons are working near aerials and scanners. Equipment should be isolated from mains supply and radio transmitters earthed. Warning notices should be placed on transmitting and radar equipment and at the mains supply point to prevent the equipment being switched on until clearance is received that the work is complete.

Fuses should be removed from any equipment upon which work is to be carried out before that work commences.

Some dry recorder papers used in echo sounders and printers gives off toxic fumes in use. The equipment should be well ventilated to avoid inhalation of the fumes.

Aerials should be rigged out of reach of seafarers standing at normal deck level or mounting easily accessible parts of the superstructure. If this is impracticable, safety screens should be erected.

### **13.4 Ionising radiation**

Precautions against exposure to dangerous levels of microwave radiation recommended by manufacturers should be strictly followed. Radar sets should generally not be operated with waveguide disconnected. However, if it is necessary for servicing purposes, special precautions should be taken.

Exposure to dangerous levels of X-ray radiation may occur in the vicinity of faulty high voltage valves. Care should be exercised when fault tracing in the modular circuits of radar equipment. An open circuited heater of such valves can lead to X-ray radiation where the anode voltage is in excess of 5000V.

Eyes are particularly sensitive to microwave and ultra-wave radiation, therefore looking into a radar scanner or waveguide when a radar is operating should be avoided.

Work should not be carried out within the marked safety radius of a satellite terminal antenna unless its transmitter has been switched off and isolated.

## 14. CARRIAGE OF DANGEROUS GOODS

*Mandatory requirements relating to the carriage of dangerous goods are in:*

- [Marine Order 34 \(Solid bulk cargoes\)](#)
- [Marine Order 41 \(Carriage of dangerous goods\)](#)
- *International Maritime Dangerous Goods Code (IMDG Code)*
- *SOLAS Chapter VII (Carriage of Dangerous Goods), and*
- *International Maritime Solid Bulk Cargoes (IMSBC) Code.*

The provisions of SOLAS Chapter VII, the IMDG Code, Marine Order 41 and any port rules and regulations must be followed before any known or suspected dangerous goods are loaded.

If dangerous goods are on board a ship or are to be loaded into or onto a ship, or unloaded from a ship, the person in command must implement a safe system of work. In particular, the person in command must ensure that:

- adequate warning of the risks are given to seafarers and other persons on board the ship and that they are advised of suitable precautions to be taken;
- any incident involving dangerous goods, including leakage and spillage of goods that are or might be dangerous goods, occurring on board the ship are reported as soon as possible to AMSA;
- no bunkering is carried out at any time during the handling of dangerous goods of Class 1 (other than Class 1.4S); and
- radio transmitters are not operated in an unsafe manner during loading or unloading of explosive articles.

Under SOLAS Regulation VII/ 4, each ship carrying dangerous goods in packaged form must have a special list, manifest or stowage plan which shows the location of all dangerous goods on board and identifies the goods by class. The documentation must state the Proper Shipping Name of the goods (the manufacturer's trade name alone is not sufficient) and the United Nations number preceded by the letters "UN" with the contents identified in accordance with the IMDG classification and labelling system.

A copy of the stowage plan must be available before departure for the respective shore authorities and another copy must be kept on the vessel's bridge.

The IMDG Code contains provisions for ensuring the safe handling and carriage of dangerous goods, including requirements for electrical equipment and wiring, fire-fighting equipment, ventilation, smoking, repair work, provision and availability of special equipment, and should be referred to before handling dangerous goods.

Containers or road vehicles, except for portable tanks, containing dangerous goods must not be loaded without the provision of a container packing certificate or vehicle packing certificate.<sup>18</sup> IMO Circular MSC.1/Cir.1497 IMO/ILO/UNECE *Code of Practice for Packing of Cargo Transport Units* (CTU Code) provides additional information on container packing certificates/vehicle packing declaration.

Dangerous goods should be loaded or unloaded only under the supervision of a responsible ship's officer. All packages should be tallied.

Dangerous goods packaging must comply with IMDG Code standards and any special packaging requirements specified in Marine Order 41.

Seafarers handling consignments containing dangerous goods must be given information about the nature of the substances and any special precautions that are to be taken.

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<sup>18</sup> The requirement for container / vehicle packing certificate is provided in Chapter 5.4 of the IMDG Code.



The shipper is responsible for informing the shipowner of any special hazard, and is required to forward instructions to the person in command on the dangers and the medical treatment of accidental spillage or poisoning and, if necessary, should supply any special drugs required for medical treatment. For further information on accidental exposure to dangerous substances and any special drug requirements, the IMDG Code and the IMO's Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG) should be consulted.

Dangerous goods that are liable to spontaneous heating, combustion or interact dangerously must be effectively segregated from one another in accordance with the IMDG Code and Marine Order 41 requirements.

Explosives and other dangerous goods must comply with the requirements of the IMDG Code and Marine Order 41 requirements before carriage.

Dangerous goods should be stowed away from living quarters.

Marine Order 34 and the IMSBC Code include requirements for the safe stowage and shipment of solid bulk cargoes, excluding grain. They include procedures to be followed whenever bulk cargoes are to be shipped, a description of the hazards associated with certain materials and lists of typical material currently shipped in bulk.

Appendix 1 (Individual schedules for solid bulk cargoes) of the IMSBC should be followed. Additional advice can be found in section 22 of this Code.

Pesticides used on board ship may be classed as dangerous goods; information on various aspects of pest control can be found in the IMO [Recommendations on the Safe Use of Pesticides in Ships](#).

## 14.1 Emergency response

Emergency response for the carriage of dangerous goods is contained in the MFAG and the *Emergency Response Procedures for Ships Carrying Dangerous Goods* (the EmS Guide).<sup>19</sup> The goods included in the EmS Guide are classified according to the IMDG Code and are grouped so that goods with the same or similar emergency action appear on one emergency schedule. The appropriate schedules should be consulted before goods are loaded to ascertain that the vessel has the correct equipment to deal with any incidents that might occur.

### Spillage

Incidents involving dangerous goods may result in spillages. The effects of an incident depends on the type and amount of product released, together with any other product involved and whether the spillage is on deck or in confined spaces.

Spillages could create additional hazards to those indicated by classification and labelling of the dangerous goods (e.g. the spillage of a flammable liquid may create an explosive atmosphere). Of particular concern are leakages of reactive chemicals, which in contact with other materials or further spillages will produce additional or other chemicals (e.g. toxic gases).

Emergency response to a spillage will vary depending on where the goods are stowed and whether a substance is gaseous, liquid or solid. Drills and exercises specific to the cargoes on board at the time should be a part of shipboard routine.

When dealing with incidents involving flammable gases or flammable liquids all sources of ignition (for example, naked light, unprotected light bulbs, electric hand tools, etc) should be avoided.

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<sup>19</sup> Both of these documents are available either as free-standing guides or incorporated into the IMDG Code in the supplement to the Code.

If the packaging has been damaged, the contents may have leaked. In this circumstance, the emergency team may have to deal with toxic, corrosive, or flammable solid, liquids or vapour. Vapour may arise due to a reaction between the spilled substances or other materials.

Eye protection should always be worn. If hazardous dust may be encountered, respiratory protection should be used and if the substance is a significant toxic hazard, self-contained breathing apparatus (SCBA) should be used when working with such substances.

The response to the spillage should be in accordance with the appropriate EmS Guide spillage schedule(s) for the dangerous good(s) involved in the incident.

In general, if there is a spillage, it should be washed overboard with copious quantities of water. However, certain dangerous goods react violently with water producing flammable and toxic vapours. Others will produce pollution if washed overboard. Disposal of dangerous goods overboard is a matter of judgement by the person in command, noting that the safety of seafarers has priority over pollution of the sea. If it is safe to do so, spillages and leakages of substances, articles and materials identified in the IMDG Code as 'marine pollutant' should be collected for safe disposal. Absorbent material should be used for liquids.

Spillages collected with absorbent material should be kept in plastic bags or other containers and stowed safely for disposal ashore. Collecting spillages with absorbent material under deck may not be fully effective, and precautions for entry into confined spaces should be observed.

A careful inspection of structural damage should be carried out after dealing with spillages of highly corrosive substances.

Control measures should be implemented promptly to render harmless any spillage of dangerous goods. Particular attention may be necessary if such substances are transported in refrigerated compartments where the spillage may be absorbed by insulating material.

If leaking dangerous goods or damaged packaging are discovered, work in the affected area must stop immediately and resumed only after the risks have been assessed and controlled.

In the event of leakage or spillage involving dangerous gas or fumes, a gas detector should be used before a space is declared to be safe. Gas masks should only be used for purposes of escape. The place where the leakage has occurred should be treated immediately with an appropriate neutralising substance.

PPE used in an incident involving dangerous goods may become contaminated and may need to be disposed of in secure containers or thoroughly decontaminated on board.

## **Fire**

Preventing a fire from occurring is a very important part of the shipboard safety program. Before loading commences all fire detection systems should be tested. During loading, suitable fire-fighting appliances should be ready for use and all unauthorised seafarers should be excluded from the area.

Given the complexity of extinguishing a fire involving dangerous goods, it is essential that the guidelines in the EmS Guide are incorporated into the ship's training regime so that seafarers are able to respond to a fire in a timely and effective manner.

Water is generally suitable as a fire-fighting medium for most dangerous goods at sea. However, detailed guidance should be obtained from the relevant schedules contained in the EmS Guide.

For certain substances which are highly reactive with water, the use of dry chemical fire extinguishers is recommended. This would not preclude the use of suitable powdered inert material if available in sufficient quantity. The other alternative is the use of copious quantities of water, which will have a cooling effect on the fire, although reacting with the substance.

Where possible, packages should be removed from the vicinity of the fire. There is a possibility that the heat will cause a chemical or physical change in the substance, or effect the integrity of a package, leading to rupture and dispersal of the contents. Keeping the packages cool may prevent this from occurring. Care should be exercised with those substances liable to polymerise, as this reaction can continue long after the removal of external heat.

Since some substances that catch fire may emit poisonous fumes, protective clothing and sets of self-contained breathing apparatus should be readily available.

For incidents under deck, the best course of fire-fighting may be to batten down the hatch, shut down all ventilation and operate the fixed fire-fighting installation. Self-contained breathing apparatus should be used when battening down the hatches or if there is any need to enter the space (for example, after the fire is extinguished).

Where the EmS Guide advises against the use of foam, this does not preclude the use of special foams.

The general fire-fighting recommendations for a number of dangerous goods suggest that they should be jettisoned if there is a likelihood of their involvement in a fire. Where full or nearly full container loads or other units are concerned, this may be impractical, in which case other measures should be taken to prevent the spread of fire to those containers. If, despite preventive measures, fire seems likely to affect these containers, seafarers should be withdrawn accordingly as the contents may explode.

## 15. WIRE AND FIBRE ROPES

Many types of synthetic and natural fibre rope are available, each with different properties and different resistance to contamination by substances which may seriously weaken the rope. The following table is a guide to the resistance of the main rope types but the precise formulation of the material, the amount of contamination the rope receives and the length of time, as well as the temperature at which it is exposed to contamination, all affect the properties of the rope. In some cases, damage may not be apparent even on close visual inspection.

Resistance to chemicals of rope made of <sup>20</sup>						
Substance	Manila or Sisal	Polyamide (nylon)	Polyester	Poly-propylene	Poly ethylene (HMPE)	Aramid
Sulphuric (battery) acid	None	Poor	Good	V Good	Good	Poor
Hydrochloric acid	None	Poor	Good	V Good	V Good	Good
Typical rust remover	Poor	Fair	Good	V Good	-	-
Caustic Soda	None	Good	Fair	V Good	V Good	Good
Liquid Bleach	None	Good	V Good	V Good	V Good	Good
Creosote, crude oil	Fair	None	Good	V Good	-	-
Phenols, Crude tar	Good	Fair	Good	Good	V Good	Good
Diesel oil	Good	Good	Good	Good	-	-
Synthetic detergents	Poor	Good	Good	Good	-	-
Chlorinated solvents, e.g. trichloroethylene (used in some paint and varnish removers)	Poor	Fair	Good	Poor	V Good	Good
Other organic solvents	Good	Good	Good	Good	V Good	V Good

All ropes should be of adequate strength for the service required. Refer to *AS 3569–2010 (Steel Wire Ropes)* and *AS 4142–1993 (Fibre ropes—Care and safe usage)*.

Before use, all ropes should be inspected internally and externally for signs of deterioration, undue wear or damage and confirmed adequate for the intended working load.

A competent person should periodically inspect all ropes used for load bearing purposes.

When any rope has been lengthened, altered or repaired, it should be examined and tested before it is used again.

All ropes should be well maintained. When not in use they should be stowed under cover in clean, dry and well ventilated places.

Avoid damaging or weakening a rope through:

- exposure to excessive heat or harmful chemicals
- excessive stress and strain;

<sup>20</sup> Section 18.33.2, *MCA Code of Safe Working Practice for Merchant Seamen 2015*

- rubbing or chafing against sharp objects;
- passing it through too small a sheave or block, or
- allowing the formation of a kink in a rope under strain.

Care should be taken in withdrawing rope from a new coil. For stranded rope, this should be done from the inside of a coil, taking it counter-clockwise for a rope for right-hand lay in order to retain the twist. Kinks should always be taken out by correct coiling (a right-hand coiling for a right-hand rope).

Any rope, whether natural, synthetic or wire, and of any construction, should not be put under a load suddenly or taken up with a jerk, since such action may overload it.

Where thimbles are required for eye splices on ropes, they should be of suitable size.

Rope ends and splices should be properly seized with yarn or other suitable means.

## 15.1 Wire ropes

Wire rope should not be used on board unless it is accompanied by a certificate stating that it has been made to a recognised national or international standard and which gives details of its construction, safe working load and minimum breaking strain.

Gloves should be used to protect hands against injury from wire ropes except when the rope is under stress or is being paid out. In such cases care should be taken to avoid hand injuries from broken or frayed strands.

All wire ropes should be treated at regular intervals with suitable lubricants free from acid or alkali and, if possible, of a type recommended by the manufacturer. Wire ropes should be regularly inspected for loose or broken strands or internal damage. Special attention should be paid to the condition of eye splices.

Wire ropes should be stored on reels of suitable diameter. When a wire rope normally stored on a reel is required for use it should be taken from the reel and flaked on the deck in a safe manner. It should be inspected thoroughly for corrosion, damage, and for the expiry of shelf life that the manufacturer may have recommended.

A wire rope should not be used if:

- it shows signs of corrosion;
- there is a tendency towards separation of the strands or wires;
- excessive wear is indicated by flats appearing on the individual wires;
- there is excessive reduction in the measured diameter;
- the number of broken wires in any length of 10 diameters exceeds five percent of the total number of wires in the rope;
- its statutory life or service life as recommended by the manufacturer has expired, although the wire may look outwardly good; or
- it fails to meet requirements of a test.

Where eyes are formed they should be made by eye splicing or using appropriate compression fittings (using swages or ferrules). The use of bulldog grips is discouraged, and they must not be used on lifting wires and mooring wires.

## 15.2 Fibre ropes

At regular intervals and always after any cutting or splicing, fibre ropes used for hoisting purposes should be examined for abrasions, broken fibres, cuts, fraying, displacement of the yarns, discolouration and other defects. Contact with grit or sand or dragging over rough surfaces may damage rope and should be avoided.

An eye or rope splice in a rope of natural fibre should have not less than three tucks and the tail of each tuck should be whipped in a suitable manner.

Ropes used in connection with safety equipment should preferably be of natural fibre.

If synthetic fibre ropes are used for life-saving purposes, they should:

- be approved for the purpose; and
- carry a means of identification that they are of the approved quality.

When using synthetic fibre ropes, seafarers should:

- be aware of the whiplash effects of a breakage in synthetic fibre ropes resulting from their added elasticity and lack of warning signs before breaking;
- avoid operations by which friction can heat the strands of the rope and produce a partial melting or stickiness in operation, as for example during surging or slacking away on a drum end or winch barrel, excessive angle around or movement over bollards or fairleads, or rubbing against or across a wire rope or hatch coaming;
- ensure that the manufacturer's recommendations are followed when surging operations are carried out using winch drums to avoid excessive slippage;
- ensure that when taking in or paying out rope, slippage between the rope and the drum or barrel is reduced to a minimum;
- avoid gripping any rope that has become heated by friction;
- not allow ropes to run freely through their hands; and
- ensure that such ropes are not unduly exposed to sunlight or harmful chemicals.

Rope of synthetic material stretches under load to an extent which varies according to the material. Polyamide rope stretches the most. Stretching of synthetic fibre rope, which may be up to double that of natural fibre rope, is usually recovered almost instantaneously when tension is released. A break in the rope may therefore result in a dangerous back-lash and an item of running gear breaking loose may be projected with lethal force. Snatching of such ropes should be avoided. Where it may occur inadvertently, seafarers should stand well clear of the danger areas. The possibility of a mooring or towing rope parting under the load is reduced by proper care, inspection and maintenance and by its proper use in service, but it can nevertheless still happen without warning.

Synthetic fibre ropes may easily be damaged by melting if frictional heat is generated during use. Too much friction on a warping drum may fuse the rope with the consequential sticking and jumping of turns, which can be dangerous. Polypropylene is more liable to soften than other material. To avoid fusing, ropes should not be surged unnecessarily on winch barrels. For this reason, a minimum of turns should be used on the winch barrel; three turns are usually enough but on whelped drums one or two extra turns may be needed to ensure a good grip; these should be removed as soon as practicable.

Synthetic fibre ropes should be replaced when worn or damaged and as required by the competent authority.

The method of making eye or loop splices in ropes of synthetic fibre should be in accordance with the manufacturer's instructions for the particular material of which the rope is made. As a general rule, polyamide (nylon) and polyester fibre ropes need four full tucks in the splice each with the completed strands of the rope followed by two tapered tucks for which the strands are halved and quartered for one tuck each respectively. The length of the splicing tail from the finished splice should be equal to at least three rope diameters. The portions of the splice containing the tucks with the reduced number of filaments should be securely wrapped with adhesive tape or other suitable material.

Polypropylene ropes should have at least three but no more than four full tucks in the splice. The protruding spliced tails should be equal to three rope diameters at least.

Polythene ropes should have four full tucks in the splice with protruding tails of three rope diameters at least.

Mechanical fastenings should not be used in lieu of splices on synthetic fibre ropes because strands may be damaged during application of the mechanical fastening and the grip of the fastenings may be affected by slight unavoidable fluctuations in the diameter of the strands.

If any part of a synthetic rope has come into contact with organic solvents such as paint stripper or paint, it should be discarded.

If a synthetic rope has been subjected to a severe shock, it should be carefully examined.

A natural fibre rope that has become wet should be allowed to dry naturally.

A natural fibre rope that has been, or is suspected of having been, in contact with any acid, alkali or any other substance known to cause damage to rope fibre should be taken out of service and destroyed.

Fibre ropes of diameter less than 12 millimetres should not be used to lift materials.

## 16. CARGO OPERATIONS

[Marine Order 32 \(Cargo handling equipment\)](#) sets out requirements for loading or unloading a vessel. Guidance is available in:

- ILO Code of Practice – Safety and Health in Ports
- Safe Work Australia's Code of Practice – [Managing Risks in Stevedoring](#).

The requirements of the port where cargo operations will take place should be complied with and these requirements should be made known to seafarers.

Before commencing cargo operations, clear methods of communication should be established between the ship's crew and terminal personnel or waterside workers. This is particularly important in the case of hazardous cargoes or hazardous operations. If hand signals are to be used, their meaning must be clear in advance to all those involved in the cargo operations.

Only competent persons should operate cargo handling equipment. Manufacturers' instructions regarding operation and maintenance as contained in the ship's cargo handling manual should be followed at all times.

The safe working load of equipment must not be exceeded, except in accordance with Marine Order 32. It is important, especially in older vessels, not to overstress any part of the ship's structure.

All equipment should be thoroughly examined by a responsible officer before use and regularly inspected during use. The frequency of examination should depend on the operation. No equipment should be used or operated unless the prescribed certificates of tests and examinations are on the ship and are current and valid.

Seafarers should wear appropriate PPE when carrying out cargo operations, fitting or securing deck lashings and should use specially designed leverage bars to tighten cargo tensioning devices.

When work is interrupted or has temporarily ceased, hatches should be left in a safe condition, with either guardrails or the hatch covers in position.

No other work should be carried out in a space in which cargo is being worked.

Seafarers should immediately report any damage of cargo handling equipment to a responsible ship's officer. Damaged equipment should be immediately taken out of service.

Cargo gear should be properly stowed to prevent it from breaking loose and posing a hazard when the vessel is at sea. Cargo should be stowed and secured assuming the worst weather conditions that may be expected.

When deck cargoes are carried, particularly timber, attention should be paid to ensuring the ship's stability throughout the voyage, especially in consideration of the possibility of added weight due to absorption of water or accumulation of ice or snow.

### 16.1 Lifting equipment

All lifting equipment used on board ship should be of good design, sound construction and material, adequate strength for the purpose for which it is used, free from defect, properly installed or assembled and properly maintained.

The person in command must keep an up-to-date register of material handling equipment which includes a ship's lifting gear in accordance with Marine Order 32. This register should be kept in an accessible place on the ship.

Lifting equipment must be tested, examined and certified by a competent person. The record of tests and inspections should be included in or attached to the register.



Lifting equipment must not be used unless it is clearly marked with its safe working load, including the safe working load at various operating positions.

A pre-operational inspection should be carried out for ship based cranes to check:

- crane brakes, limiting devices and emergency controls are fully operational
- for obstructions impairing safe operation e.g. oil, debris or structures like cable trench, rollers and rail tracks
- the safety of crane access ladders or stairs including surfaces and lighting, and
- emergency escape provisions are provided and suitable.

For rail-mounted cranes, inspections should include ensuring:

- track wheels at deck level are fitted with foot guards
- collision prevention devices are fitted where more than one crane is located on the same track, and
- locking devices on overside extensions are engaged.

Control measures for handling suspended loads include:

- implementing exclusion zones to ensure workers are clear of the active arc of travel while loads are being lifted or lowered, and
- prohibiting working or walking under suspended loads.

Persons operating equipment should have a clear view of the operations. If this is not possible, a signaller should be placed at a safe point clearly visible to the equipment operator and from the area of work. When using radios a dedicated frequency should be selected for the duration of the crane operations to prevent interference with other radio equipment being used in the vicinity of the crane. Work should stop immediately if there is a loss of communication.

Hoisting or lowering, whether by crane or by chain blocks, should be performed only after all persons involved have been informed of the intended action.

Where lifting or eye bolts are used, the thread on the bolt and in the part to be lifted should be clean and in good condition, and the threaded part fully screwed home and locked before any lifting is applied.

Any friction fit, tightness or adhesion of the part of any load being lifted should be broken by wedges or tapping, and not by increasing the load on the lifting appliance, as there is potential to overload the lifting appliance.

### ***Use of slings***

Straps and slings for loading or unloading must be used in accordance with Marine Order 32. The slings should be of sufficient size and length to enable them to be used safely and be applied and pulled sufficiently tight to prevent the load or any part of the load from slipping and falling.

Before lifting heavy loads such as lengths of steel sections, tubes and lumber, the load should be given a trial lift to test the effectiveness of the slinging.

Except for the purpose of breaking out or making up slings, lifting hooks should not be attached to:

- the bands, straps or other fastenings of packages of cargo;
- the rims of barrels or drums.

Slings or chains being returned to the loading position should be securely hooked on the cargo hook before the signaller gives the signal to hoist. Hooks or claws should be attached to the egg link or shackle of the cargo hook, not allowed to hang loose. The cargo hook should be kept high enough to keep slings or chains clear of persons and obstructions.

Loads (setts) should be properly put together and properly slung before they are hoisted or lowered.

Loads should be raised and lowered smoothly, avoiding sudden jerks or "snatching" loads.

Suitable precautions, such as the use of packing or chafing pieces, should be taken to prevent chains, wire and fibre ropes from being damaged by the sharp edges of loads.

When slings are used with barrel hooks or similar holding devices where the weight of the load holds the hooks in place, the sling should be led down through the egg or eye link and through the eye of each hook in turn so that the horizontal part of the sling draws the hooks together.

The angle between the legs of slings should not normally exceed 90 degrees. Where this is not reasonably practicable, the angle may be extended 120 degrees provided the slings have been designed to work at the greater angle.

Trays and pallets should be hoisted with four-legged slings and, where necessary, nets or other means should be used to prevent any part of the load falling. Cages should be used wherever possible for loose items.

When bundles of long metal goods such as tubes, pipes and rails are being hoisted, two slings and, if necessary, a spreader should be used. A suitable lanyard should also be attached, where necessary.

Cargo buckets, tubs and similar appliances should be carefully filled so that there is no risk of the contents falling out. They should be securely attached to the hoist (for example, by a shackle) to prevent tipping and displacement during hoisting and lowering.

Shackles should be used for slinging thick sheet metal if there are suitable holes in the material; otherwise, suitable clamps on an endless sling should be used.

Bricks and other loose goods of similar shape, carboys, small drums, canisters etc., should be loaded or discharged in suitable boxes or pallets with sufficiently high sides, lifted by four-legged slings.

### ***Pulley blocks***

Blocks used for loading or unloading must be inspected, tested and certified in accordance with Marine Order 32. Each block should be regularly greased.

When inspecting a block, ensure that:

- it has identification marks and a safe working load marked on it in tonnes
- no sheave is cracked
- the block shank turns freely and the groove is not excessively worn
- the head swivel fitting is securely fastened
- the site straps are sound
- all sheave clearances are satisfactory, and
- all grease nipples and/or lubrication holes are kept clear.

### ***Hooks and shackles***

Every hook must be fitted with a device to prevent a load from becoming detached or be constructed to prevent displacement of the load from the hook.

Hooks and shackles should not be used unless the safe working load is clearly marked. A shackle should be of the correct type, size and safe working load for its intended use.

All shackles should have their pins effectively secured or seized with wire. The running part of any rigging should not come into contact with the pin of a shackle. All shackle pins should be kept lubricated.

## 16.2 Storage, stowage and securing of cargo

Cargo not in containers, for example coils, pipes and beams, should be stored or stowed in stable stacks. Ensure there is a plan for stacking cargo which takes into account the:

- floor capacity of the storage area
- type, dimensions and weight of cargo and method of storage
- potential for stored energy due to stacking arrangements
- safe access and egress for workers
- mechanical handling equipment and ability to operate it safely
- storage or separation requirements of hazardous chemicals or dangerous goods
- length of time the goods or material will be kept, and
- stability and securing devices for different types of cargo.

Control measures for safe storage include:

- ensuring stacks of goods remain stable—the maximum height of the stack is determined by the need to ensure the stability
- ensuring coils:
  - are used with end stops in the vicinity of pedestrian walkways
  - are supported by coil collapse arrest systems when in the vicinity of amenities or offices
- using racking systems where appropriate
- using jersey curbs
- using dunnage correctly including:
  - using means other than hands to place dunnage under loads
  - avoiding placing hands or limbs under loads during glutting
- using correct chocking methods like:
  - fixed chocks at the end of walkways
  - materials used for chocking and dunnage are fit for purpose and sufficient to withstand the weight of the load
- using bolsters at the end of walkways
- identifying and communicating the load bearing capacity of floors, and
- maintaining exclusion zones where necessary.

## 17. ANCHORING, DOCKING AND MOORING

All anchoring, docking and mooring work must be supervised by a competent officer, who is in constant communication with the bridge.

The assessment of risks associated with these activities should include the consequences of the failure of any element of the equipment. The windlass, anchors, chains, mooring lines and wires should be carefully maintained and regularly inspected for damage and defects.

Seafarers should be aware that it is usual for capstans, winches, or windlasses to be designed to stall or walk back before exceeding the safe working load of the weakest part of the system. Seafarers should not tamper with such arrangements or settings.

### 17.1 Anchoring

Before using an anchor, a competent seafarer should check that the brakes are securely on and then clear voyage securing devices. A responsible person should be in charge of the anchoring team, with an adequate communications system with the vessel's bridge.

The anchoring team should wear appropriate PPE - safety helmets, safety shoes and goggles as a minimum protection from dirt, rust particles and debris which may be thrown off during the operation. Wherever possible, they should stand aft of the windlass.

Where the means of communication between bridge and anchoring team is by portable radio, the identification of the ship should be clear to avoid misinterpretation of instructions from other users of such equipment.

Before anchors are let go, a check should be made that no small craft or other obstacle is under the bow. As a safety precaution it is recommended that the anchor is 'walked out' clear of the pipe before letting go. For larger ships with heavy anchors and cables, the anchor should be paid out rather than be allowed to 'free-fall', minimising the risk of injury to crew or damage to the anchor handling equipment.

Anchors housed and not required should be properly secured to prevent accidental release.

Any anchor or chain showing defects should be withdrawn from service and repaired and tested by a suitable shore workshop.

Except in emergencies the anchor should not be dropped from the hawse pipe but should be walked back to a suitable position and let go from that position.

Seafarers engaged in operating the brake, and others in the vicinity should wear goggles (or a full-face shield) and safety helmets for protection from dust and debris thrown from the chain.

Seafarers engaged in stowing an anchor chain into the locker should stand in a protected position and should keep in constant communication with the windlass operator.

### 17.2 Mooring and unmooring

SOLAS Regulation II-1/3-8 prescribes requirements for ships' towing and mooring arrangement. IMO Circular MSC.1/Circ.1175 provides guidance on shipboard towing and mooring arrangement.

All seafarers involved in mooring and unmooring operations of any kind should be informed of the hazards of engaging in such operations.

A competent person should be in charge of mooring operations and ascertain that there are no persons in a dangerous position before commencing any heaving or letting go operation.

On each occasion that a vessel berths, all relevant circumstances such as weather, tides, passing vessels etc., should be considered in determining a safe securing pattern of ropes and wires.

Mixed moorings of wires and ropes in the same direction should not be used because wires and ropes stretch differently.

There should be sufficient seafarers available to ensure the safe conduct of operations.

Only competent persons should operate windlasses and winches.

Under no circumstances should seafarers stand in a bight of a rope or wire which is lying on deck. Seafarers should never stand or move across a rope or wire that is under strain.

Ropes and wires are frequently under strain during mooring operations and seafarers should always stand in a place of safety from whiplash should ropes or wires break.

Due to the types of synthetic ropes that may be on board ship, seafarers should be trained in the techniques of "stopping off" wires and ropes. Chain securing devices should be used for stopping off wire mooring ropes but never for fibre ropes.

Vessels' heaving lines should be constructed with a 'monkey's fist' at one end. To prevent personal injury, the 'fist' should be made only with rope and should not contain added weighting material.

Areas where mooring operations are to be undertaken should be clutter free as far as possible. Decks should have anti-slip surfaces provided by fixed treads or anti-slip paint coating, and the whole working area should be adequately lit for operations undertaken during periods of darkness.

All equipment used in mooring operations should be regularly inspected for defects. Any defects found should be fixed as soon as possible. Particular attention should be paid to the risk of oil leaks from winches. Surfaces of fairleads, bollards, bitts and drum ends should be clean and in good condition. Rollers and fairleads should turn smoothly and a visual check should be made that corrosion has not weakened them.

Ensure that pedestal roller fairleads, lead bollards, mooring bitts etc. are:

- properly designed to meet all foreseeable operational loads and conditions;
- correctly sited; and
- effectively secured to a part of the ship's structure which is suitably strengthened.

Mooring ropes, wires and stoppers that are to be used in the operation should be in good condition. Ropes should be frequently inspected for both external wear and wear between strands. Wires should be regularly treated with suitable lubricants and inspected for deterioration internally and broken strands externally. Splices in both ropes and wires should be inspected regularly to check they are intact. Where wire rope is joined to fibre rope, a thimble or other device should be inserted in the eye of the fibre rope. Both wire and fibre rope should have the same direction of lay.

Ropes and wires which are stowed on reels should not be used directly from stowage, but should be run off and flaked out on deck in a clear and safe manner, ensuring sufficient slack to cover all contingencies. If there is doubt of the amount required, then the complete reel should be run off.

It is often difficult to achieve an ideal mooring layout. Ship's equipment can be used to the best advantage if the following general principles are remembered:

- breast lines provide the bulk of athwartships restraint;
- backsprings provide the largest proportion of the longitudinal restraint; and
- very short lengths of line should be avoided when possible, as such lines will take a greater proportion of the total load when movement of the ship occurs.

A watchman should regularly inspect the moorings when a vessel is alongside and the moorings should be kept tight at all times to prevent the ship's movement.

### 17.3 Mooring to buoys

Where mooring to buoys by the ship's crew is permitted by the local authority, the following additional precautions should be followed:

- Lifebuoys, with and without attached lines, should be readily available
- Seafarers engaged in mooring to buoys from a ship's boat should wear personal protective equipment and a life-jacket
- Measures should be provided to enable anyone who falls into the water to climb on board the boat. If a boarding ladder with flexible sides is used, it should be weighted so that the lower rungs remain below the surface
- The eye of a slip wire used for mooring to buoys should never be put over the bitts
- Mooring strong points, such as chain securing devices and quick-release mechanisms, should be maintained in a serviceable condition
- Where mooring to buoys is undertaken from the ship, a lifebuoy with attached line of sufficient length should be available for immediate use
- When slip wires are used for mooring to buoys or dolphins, the eyes of the wires should never be put over the bitts, as at the time of unmooring it may not be possible to release the load sufficiently to lift the eye clear. To prevent accidental slippage of the wire eye(s) over the bitts or other obstruction the eyes should be seized, partially closing the eye.

## 18. WORKING IN MACHINERY SPACES

All operations in machinery spaces should be performed under the supervision of a responsible engineering officer.

Maintenance work or repair that may affect the supply of water to the fire main or sprinkler system should not be started without the prior permission of the chief engineer. No alarm system should be isolated without the permission of the chief engineer.

No work other than routine duties should be undertaken except on the orders of a responsible engineering officer. Maintenance work should be carried out in compliance with manufacturers' instruction manuals. When necessary, specific work should be carried out within the "permit-to work" system (see section 3.8).

Access to fire-fighting equipment, emergency escape routes and watertight doors should never be obstructed.

Every dangerous part of a ship's machinery or other equipment should have guards or protection devices to prevent access to dangerous or moving parts.

Guards, fencing or shielding should not be removed during repair or maintenance except when the machinery to which it relates has been stopped and isolated. The machinery should not be restarted until the guards have been replaced and secured.

If removal is essential for maintenance or examination of the equipment, the following precautions should be taken:

- Removal should be authorised by a responsible person, and only a competent person should carry out the work or examination;
- There should be adequate clear space and lighting for the work to be done;
- Anyone working close to the machinery should be told what the risks are and instructed in safe systems of work and precautions to take; and
- A warning notice should be clearly displayed.

Whenever floor plates or handrails are removed, warning notices should be posted, the openings should be effectively fenced or guarded and the area well illuminated. Floor plates and handrails should be secured in place on completion of the work.

Lifting handles should be used when a floor plate is removed or replaced. When lifting handles are not provided, the plate should be levered up with a suitable tool and a chock inserted before lifting. On no account should fingers be used to prise up the edges.

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 alarm is sounding. This should preferably take the form of a light or lights with rotating reflectors.<sup>21</sup>

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

If the use of any piece of machinery or equipment is considered to be temporarily unsafe, it should be immobilised or put in a safe place or condition immediately and, if necessary, a warning notice should be posted next to it or at the control position. The ships lock out or tag out system should be used where applicable.

All valves, pipes and fittings should be adequately supported and fixed or clamped to avoid vibration and possible fracture. All such fixtures and supports should be properly maintained and replaced after maintenance.

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<sup>21</sup> Guidance may be found in the International Maritime Organization (IMO) Code on Alerts and Indicators.



Items such as steam pipes, exhaust pipes and fittings which present a hazard due to their location and operating temperature, should be lagged or shielded. The insulation of hot surfaces should be properly maintained, particularly in the vicinity of oil systems. This can be monitored through thermographic survey or the use of infra-red thermometers to ensure that surface temperatures do not exceed 220 C.

Waste oil should not be allowed to accumulate in the bilges or on tank tops. Any accumulation should be removed as soon as possible in compliance with MARPOL. Tank top and bilge spaces should be washed down at regular intervals or as necessary for safety. Tank tops and bilges should, where practicable, be painted a light colour and kept clean and well illuminated in the vicinity of pressure oil pipes so that leaks may be readily located.

A documented procedure should be in place to ensure that, whenever a fuel oil tank is being filled, or the contents of one tank are being transferred to another, it does not overflow. Such a procedure may include permanently displayed line diagrams. Whenever fuel oil is being loaded or transferred, the operation should be supervised by the responsible officer.

Extreme 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. Openings in the tanks should always be secured so that if a tank is overfilled the oil is directed to a safe place through the overflow arrangements.

When filling tanks that have their sounding pipes in the machinery spaces, 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 and mud-boxes should be kept clear of rubbish and substances so that the bilges can be 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.

Special attention should be given to preventing leakages into machinery spaces of exhaust gases from boilers, inert gas plants, uptakes etc.

All areas should be suitably illuminated:

- areas under floor plates where oil pipes are located should be painted a light colour.
- any light that fails should be replaced as soon as possible;
- temporary or portable lighting should be used to provide additional illumination as required, and should be removed immediately after use.

Ventilation should be maintained to ensure a comfortable atmosphere so far as is reasonably practicable in all areas, with special attention being given to working areas and control rooms. If necessary, ventilation should be increased where maintenance and repair work is to be carried out in areas of high temperature or high humidity.

Unless properly equipped and authorised to be operated without persons in attendance, the boiler room and machinery space should be under the direct supervision of an engineer officer at all times.

All work on piping systems should be performed under the supervision of an engineer officer and the following precautions should be taken:

- all drains on equipment such as pipes and filters should be kept clear;
- ensure that any pressure has been relieved in all relevant piping, system or container before it is opened or any flange or joint is broken, noting that valves may not be completely tight nor lines fully drained and that pressure, or accumulation of oil and scalding water, may build up in a pipe even after the pressure has been relieved;



- as a precaution, bolts should be only slackened back and not removed until the flange or joint is broken;
- if the flange or joint does not part easily, separation should be made with a wedge and not by allowing pressure into the line. The pipe should be secured temporarily if necessary before the flange or joint is broken;
- any valve controlling flow should be effectively locked or secured as long as the line remains open and, if necessary, a warning notice should be posted.

All stores and tools should be properly stowed and adequate arrangements should be made in preparation for heavy weather.

When lifting weights, seafarers should avoid strains by using chain blocks or the engine room crane, as appropriate. When turning valves or hand wheels, seafarers should avoid strains by using lever or wheel spanners.

Where heavy items are lifted by chain blocks or by an engine room crane:

- the lifting device and lifting arrangements should be examined by the responsible engineer officer, who should ensure that the safe working load is not exceeded;
- slings should be examined for broken or ragged strands, and padded if necessary to avoid damage on sharp edges.

When working alone, a person should arrange to communicate at regular and frequent intervals with other persons in the machinery spaces or on the bridge.

## **18.1 Boilers, oil heaters, unfired pressure vessels and steampipes**

No person should open or perform any operation on a boiler, unfired pressure vessel or steam pipe that could result in the release of steam, air, or oil except:

- under the supervision of an engineer officer; and
- with the knowledge and approval of the chief engineer; and
- where adequate arrangements have been made to prevent any back flow of steam or working fluid by blanking off, or locking shut, any lines or valves that might allow such back flow of steam, hot water or exhaust gases to enter the boilers, combustion chamber or pressure vessel.

All boilers, and unfired pressure vessels and steam piping should be inspected internally and externally at regular intervals by a competent person as required under Marine Order 31 (Vessel Surveys and Certification) and classification society rules.

Operating instructions should be clearly displayed at each boiler.

No boiler or unfired pressure vessel should be operated or kept at working pressure if unsafe for use or if not provided with the properly maintained fittings necessary for safe operation.

A boiler or an unfired pressure vessel is enclosed and potentially a dangerous space. Therefore, confined space entry procedures must be followed when performing any operations.

Before any boiler, or unfired pressure vessel is opened for inspection, any pressure therein should be released, the contents cooled down to atmospheric temperature and the system effectively drained off.

Before entry is permitted to a boiler that is part of a range of two or more boilers, the engineer officer in charge should ensure that either:

- all inlets through which steam or water might enter the boiler from any other part of the range have been disconnected, drained and left open to atmosphere; or
- where that is not practicable, all valves or cocks, including blowdown valves controlling entry of steam or water, have been closed and securely locked, and notices posted to prevent them being opened again until authorisation is given.

After emptying, check that the vacuum is broken before access doors are removed. Even if an air cock has been opened to break the vacuum, it is good practice to loosen the access door nuts and break the joint before removing the dogs and knocking in the doors. The top access door should be knocked in first with the dogs slacked back but not removed. The access door should be held by a rope or other means when the dogs are removed. When the top access door has been removed, the bottom access door may be knocked in.

Seafarers should:

- stand clear of hot vapours when doors are opened, and
- not enter any boiler, boiler furnaces or boiler flue until it has cooled sufficiently to make work in such places safe.

Work should not be undertaken while a second boiler is in operation, or when this is not possible, there are at least two valves providing isolation between the fired boiler and the boiler being inspected.

Spaces at the top and sides of boilers should not be used for storage.

Safety valves should be properly sealed and maintained in good operational condition at all times. Special care should be taken to maintain water gauges in proper order. They should be checked and blown through in a proper manner by a competent person at frequent intervals. Only a competent person should replace gauges.

The water level should be checked at all times when fires are alight. Should the water level fall below the glass, the boiler should be immediately secured as required.

When bringing a boiler back into service, ensure that:

- the combustion chambers have been properly purged free of gas and that no loose oil has accumulated on the furnace floor
- all burners are clean and properly assembled
- the fuel oil has been recirculated until all parts of the system have reached a suitable temperature before admission to the furnace
- when lighting up a boiler, all persons are standing clear of any openings to avoid injury from a possible blowback.

Should a furnace fail to light for any reason when the oil valve is opened:

- the valve should be closed;
- the combustion chamber should be properly purged.

Seafarers cleaning tubes, scaling boilers and cleaning back-ends should wear appropriate PPE including respirators. Before using any chemicals for this work, ensure the SDS for the chemical is checked and that suitable control measures are implemented (refer to section 13).

The escape routes from the boiler fronts and firing spaces must 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.

The same isolating and maintenance principles should be applied to thermal oil heaters and systems as those required for boilers. However, as the venting and drainage systems are closed systems to the thermal oil header tank or thermal oil drain tank respectively, additional care must be taken when isolating heaters to ensure that the system is fully drained and no residual pressure remains, before fittings are removed or pipes disconnected.

After completing work on thermal systems, measures must be taken to prevent water and moisture being introduced to the system. The steam produced, its sudden expansion and the significantly greater volume occupied may cause damage to equipment and significant

disruption to the system as a whole. Before the system is refilled from the thermal oil header tank, the header tank drain should be tested for the presence of water. This should also be done whenever the header tank is refilled from the thermal oil drain tank or thermal oil storage tank.

## **18.2 Propulsion machinery**

The propulsion machinery must be provided and maintained in accordance with the requirements of Marine Order 12 (Construction – subdivision and stability, machinery and electrical installations) and the manufacturer's operating manuals.

Maintenance should be carried out under the supervision of an engineer officer and the officer informed immediately if any actual, or latent, fault or defect is observed with remedial action being taken as appropriate.

Where necessary, suitable staging, which is adequately secured, should be used to provide a working platform (refer to section 11).

Before any work is done, the machinery should be stopped with the throttle or starting system closed, the turning gear or a suitable brake engaged and a warning notice posted.

Before anyone is allowed to enter or work in the main engine crankcase or gear case, the engine-starting system must be in local control and fully isolated with starting air drains opened to atmosphere. Turning gear should be engaged and a warning notice posted at the start position and turning gear local control. Turning gear should be under the control of the person carrying out the work. The spaces should be well ventilated and the atmosphere tested.

Before the main engine turning gear is used, a check should be made to ensure that all seafarers are clear of the crankcase and any moving part of the main engine, and that the duty deck officer has confirmed that the propeller is clear.

If a hot bearing has been detected in a closed crankcase, the crankcase should not be opened until sufficient time has been allowed for the bearing to cool down; otherwise the entry of air could create an explosive air/oil vapour mixture.

The opened crankcase or gear case should be well ventilated to expel all flammable gases before any source of ignition, such as a portable lamp (unless of an approved safety type), is brought near to it.

Before the main engine is restarted, a responsible engineer officer should check that the shaft is clear and inform the duty deck officer who should confirm that the propeller is clear.

## **18.3 Turbines**

The governor, low lubricating oil pressure alarm and shutdown devices, and other speed limiting devices should be made ready to operate should abnormal operations occur.

Steam joints, valve gland and gland sealing arrangements should be maintained in good order to avoid excessively high humidity in the surrounding area.

## **18.4 Internal combustion engines**

Internal combustion machinery should be maintained in safe condition and be regularly inspected as required by the manufacturer.

Scavenge trunks should be kept clean and free from loose oil and turbo-blowers should be kept free of accumulations of oil and dirt.

A source of ignition (e.g. a portable electric light or naked flame) should not be brought near an open engine crank case until it has been cooled and well ventilated and until all explosive gases have been expelled.

## **18.5 Air compressors and reservoirs**

Air compressors should be properly maintained and inspected by an engineer officer.

The sudden release of air can cause hearing damage or even rupture an eardrum. Maintaining air receivers properly prevents the potential for an explosive rupture.

Compressed air should never be directed at any part of a person's body as air puncturing the skin can result in an air bubble in the blood stream which can be fatal.

Compressed air should not be used to clean a working area.

Seafarers should be particularly aware of the dangers of using high pressure pneumatic equipment, such as cleaning and scaling devices, as their misuse can lead to fatal consequences.

## **18.6 Refrigeration systems**

Information about the operating and maintenance safeguards of the refrigeration plant should be displayed on each vessel, including the particular properties of the refrigerant and the precautions for its safe handling.

Refrigeration compressors and systems should be properly maintained to avoid leakage of refrigerant, either in the compressor room or in the refrigerated compartments. Where refrigerating equipment is isolated, the responsible engineer officer should be notified before entering the machinery room or compartment.

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 notified of the situation. If it is necessary to enter the space, the procedures for entry into confined spaces should be followed (section 7).

The compartment or flat 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. When 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.

When refrigerant plant is being charged through a charging connection in the compressor suction line, the cylinder is sometimes heated to evaporate the last of the liquid refrigerant. This should only be done by placing the cylinder in hot water or some similar indirect method and never by heating the cylinder directly with a blow lamp or other flame.

If it is necessary for repair or maintenance to apply heat to vessels containing refrigerant, appropriate valves should be opened to prevent build-up of pressure within the vessels.

## **18.7 Oil-based systems**

There is a risk of fire associated with the rupture of unprotected oil lines and joints.

Precautions should be taken when working on systems containing oil, in particular, hot oil.

All protective covers on oil lines should be drained before removing same. Protective covers should be promptly replaced after completion of any work and after verification that no leaks are evident in the system.

Safety devices of oil pumps, oil heaters and coolers should be well maintained.

## **18.8 Steering gear**

The operation of the steering gear should be checked or inspected at frequent intervals by the responsible officer and safety devices should be ready to operate at all times.

The steering gear should be tested within 12 hours before proceeding to sea in accordance to SOLAS Regulations V/26.

Generally work should not be done on steering gear when a ship is under way. If it is necessary to work on steering gear when at sea, the ship should be stopped and the rudder immobilised by closing the valves on the hydraulic cylinders or by other appropriate means.

## **18.9 Control rooms and unattended machinery spaces**

Only authorised persons should enter a control room or an unattended machinery space.

Seafarers, including the engineer officer in charge, must report by telephone or other means provided to the bridge/deck duty office before entering the space, at regular intervals when in the space and when leaving the space.

When watch keeping is carried out from a control room, the engineer officer should ensure that a competent person patrols the machinery space at regular intervals.

Any alarms that have operated should be reset before the machinery space is left. No alarm system should be isolated without the permission of the chief engineer.

At any time when the machinery spaces are to be left unattended, a responsible engineer officer should ensure that all instruments and alarm systems of the unattended machinery space are in good operational order and that all persons have been accounted for and have left the space.

Notices of safety precautions to be observed by seafarers working in control-rooms and unattended machinery spaces should be clearly displayed at entrances.

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 before reverting to engine room control of the machinery.

## **18.10 Hydraulic systems**

Hydraulic systems should be frequently inspected by a responsible officer and be properly maintained and kept free of leaks.

The system should be purged as necessary to avoid erratic operations that could be dangerous to seafarers.

Before repairs to or maintenance of hydraulic and pneumatic equipment is undertaken, any load should be removed or, if this is not practical, adequately supported by other means. All pressure in the system should be released. The part being worked on should be isolated from the power source and a warning notice displayed by the isolating valve, which should be locked.

Precautions should be taken against the possibility of residual pressure being released when unions or joints are broken.

For safe operation of the hydraulic and pneumatic system, the working area and tools, as well as the system and its components, should be kept clean during servicing work. Ensure that replacement units are clean and free from any contamination, especially fluid passages.

Only replacement components that comply with manufacturers' recommendations should be used. Any renewed or replacement item of equipment should be properly inspected or tested before being operated.

Since vapours from hydraulic fluid may be flammable, naked lights should be kept away from hydraulic equipment that is being tested or serviced.

A jet of hydraulic fluid under pressure should never be allowed to spray onto parts of the body. If a person is subjected to hydraulic fluid under high pressure on unprotected skin, immediate medical assistance should be sought. Any hydraulic fluid spilt on the skin should be thoroughly washed off.

## 19. WORKING IN GALLEYS AND OTHER FOOD HANDLING AREAS

[Marine Order 11 \(Living and working conditions on vessels\)](#) and Maritime Labour Convention, 2006 (MLC, 2006) include mandatory requirements for galleys, pantries and other food handling areas.

The owner of a vessel must ensure that the catering area of the ship is equipped and organised to allow for:

- the preparation of varied and nutritious meals; and
- the serving of meals in hygienic conditions.

The person in command must ensure that weekly inspections are carried out and documented for:

- the provision of food and drinking water; and
- the spaces and equipment used for the storage and handling of food and drinking water; and
- the galley and other equipment used for the preparation and service of meals.

All seafarers working in the galley, pantry and other food handling areas should be trained in related safety measures before assuming their roles. Seafarers who are engaged as ships' cook must be trained, qualified and found competent.

There should be no smoking in galleys, pantries, store rooms or other places where food is prepared or stored. Notices to this effect should be displayed.

Galleys present particular fire hazards. A means to smother fat or cooking oil fires, such as a fire blanket and appropriate fire extinguisher, must be readily available. Water must never be used in attempts to fight fires involving hot oil in cooking areas.

All seafarers working in the galley should be trained in the use of appropriate fire-fighting equipment

Remote cut off and stops should be clearly marked and known to galley staff.

Seafarers and staff involved in catering operations should wear clean clothing, including appropriate protective equipment, if necessary, when handling food and preparing meals.

Hands and fingernails should be washed before handling food. A supply of hot running water, soap and clean towels should be available in food preparation areas.

All cuts, however small, should be reported immediately and first-aid attention provided to prevent infection. Food must not be handled unless cleared to do so.

Illness, coughs and colds, rashes or spots, however mild, should be reported immediately when the symptoms appear. If suffering from diarrhoea and/or vomiting, which may be signs of food poisoning or a sickness bug, the person should not work in food-handling areas until medical clearance has been given.

The person in command must ensure that the galley and its equipment are kept clean and neat at all times.

Marine Order 11 outlines that meat and fish must be stored apart from each other and all refrigerated or frozen food is kept at -15 degrees Celsius (for very cold food) or 5 degrees Celsius (for cold food). Ensure other food is kept at its required temperature at all times. The Australia New Zealand Food Standards give further guidance on the storage of food.

Fresh fruit and salad should be thoroughly washed in fresh water before being eaten.

Food, including drinking water, should be stored so that it is protected from contamination. Ensure the environmental conditions under which it is stored will not adversely affect the quality and suitability of the food.

Raw food should be kept apart from cooked food or food that requires no further treatment before consumption (e.g. milk). Separate refrigerators are preferred although, if stored in the same unit, the raw food must always be placed at the bottom to avoid drips contaminating prepared food. Food should also be covered to prevent drying out, cross contamination and absorption of odour.

Separate work surfaces, chopping boards and utensils should be set aside for the preparation of raw meat and must not be used for the preparation of foods that will be eaten without further cooking. Colour coding is a useful way of ensuring separation between the two activities.

Food waste, empty food containers and other garbage should be placed in covered storage facilities safely away from foodstuffs. Their discharge into the sea is prohibited except in circumstances specified in MARPOL.

### **19.1 Safety precautions**

Remove or minimise the risk of tripping and slipping when moving around galleys or carrying or serving food. If any water, oil or grease is spilt on decks, the person responsible should clean it up immediately or warn others of the risk until the clean-up is completed.

Seafarers should be particularly careful when carrying food up and down stairs and companionways, which should be kept clear. One hand should be kept free to hold handrails or supports. Loads should be carried in such a manner as not to obstruct the line of view, and movements should not be hurried. Extra caution should be taken in all catering operations when the vessel is moving.

Protective footwear of a type that fully covers the foot, with slip-resistant soles, should be worn at all times.

When meat is being chopped, ensure that:

- the chopping block is firm and placed in a clear unobstructed area so as to reduce and eliminate any dangers to the seafarer and others nearby;
- the cutting area of the meat is entirely on the block;
- fingers, arms and legs are clear of the line of strike; and
- protective gloves are worn.

When foodstuffs are being chopped or cut with a knife, fingers should be bent inwards towards the palm of the hand with the thumb overlapped by the forefinger. The knife should be angled away from the work so that the blade is sloped away from the fingers as the work is fed to the knife.

When meat is being sawed or boned, care should be taken to ensure that the saw or knife does not slip off the bone. A protective apron should be worn.

Adequate lighting should be provided where catering operations are carried out, with additional lighting in areas where cutting or chopping is done.

All areas where catering operations are carried out should be adequately ventilated. Cooking areas should be provided with exhaust ventilation. The uptakes and any filters in such a system should be cleaned at frequent intervals to remove oily deposits.

Pans or fat should never be left unattended in an oven or on a heating stove, or to allow water to come into contact with hot fat. There should be no form of hot oil on stove tops and other similarly exposed locations where they may be subject to splashing.

Sea water should never be used in the preparation of food.

Cracked or chipped crockery and glassware should be carefully discarded and any food that has been in contact with broken glass or crockery should be thrown out.



Precautions should be taken to prevent burns and scalding when handling hot kitchen equipment such as carrying pans and dishes, removing lids off boilers, opening steamers and pressure cookers or opening oven doors.

Cleaning should never be carried out when any part is in motion, and power should be disconnected from any electrical equipment, using lock out/tag out procedures, before cleaning any part or removing any blockage.

Before washing down the galley or cleaning any kitchen equipment, electrical appliances should be unplugged or otherwise isolated from the power source and stoves should be switched off. Ensure the ingress of water into electrical appliances is prevented, regardless of whether or not the power is off. Decks should be mopped clear and surplus water removed after washing.

Cleaning products should be stored in a suitable locker/cupboard separate from food-handling areas.

Any defects in equipment or utensils should be reported to the responsible officer, who should arrange for their repair or replacement as soon as possible. In the meantime, the defective item should be taken out of service.

Repairs to galley equipment must only be made by, or under the supervision of an engineer officer.

Potentially dangerous heated or moving parts of any machinery or equipment should have suitable guards which should always be in position when the equipment is being used or operated.

Catering staff, including seafarers engaged in catering operations, should:

- only use mechanical or electrical equipment if they have been trained and instructed in how to use or operate it safely:
- ensure that all safety devices are in place before operating slicing, mincing or chopping machines.

When a user is in doubt as to the operation of any electrically driven machine, the machine should be switched off and the responsible engineer officer informed.

Sharp knives, saws and choppers should be safely stowed in a proper rack and should never be left lying around or in washing-up water. Tins should be opened only with proper tin openers, which should preferably be securely mounted on a bench or bulkhead.

## **19.2 Loading and storing provisions**

Whenever possible, stores and provisions should be taken aboard, preferably by a crane or derrick, onto a deck area where no cargo is being worked. There should be a short and convenient route to the storerooms and, as far as practicable, this route should not pass across areas where cargo is being worked.

Any obstructions between the loading area and the storerooms should be removed or properly marked or protected. Where possible, wooden ramps should be installed so as to provide unimpeded passage over steps or obstructions.

When crates are handled or opened, any protruding nails, staples, metal strips or projections should be removed before handling.

Any hooks or sharp equipment used for handling stores should be stowed in a safe place.

Refrigerator chamber doors should be fitted with a device of adequate strength to hold them open in a seaway; and a means of opening them from the inside.

Refrigerator rooms should have a means of sounding the alarm both from inside and outside. The area immediately outside a refrigerator room should have a slip-resistant surface.



If a leakage of refrigerant in a refrigerated storage space is suspected, a warning notice to that effect should be posted on the door or access and seafarers should not enter.

When seafarers enter refrigerated chambers that are usually padlocked they should take the padlocks in with them.

Seafarers should make themselves familiar with the operation of the inside release for the door and the location of the alarm button so they may be easily found in the dark.

The proper functioning of alarm bells, door clasps and the inside release should be checked at regular intervals.

## 20. SAFETY IN LIVING ACCOMMODATION

[Marine Order 11 \(Living and working conditions on vessels\)](#) and Regulation 3.1 of the Maritime Labour Convention, 2006 (MLC, 2006) include mandatory requirements for accommodation and recreational facilities.

Under Marine Order 11, the person in command of a vessel must ensure that:

- seafarer accommodation is inspected weekly to ensure that it is safe, clean, fit for human habitation and well maintained; and
- a report of each inspection is recorded and kept on board.

Shipowners should provide the necessary cleaning equipment to allow seafarers to maintain cleanliness of the accommodation.

The emergency stations and duties of the occupants of each cabin should be clearly displayed in that cabin or immediately adjacent to the door of the cabin. Seafarers should read and memorise this information immediately upon being allocated the cabin. A careful note should be made of emergency escape routes from the cabin.

When electrical equipment, including personal electrical equipment, is used in the accommodation, the following precautions should be taken:

- any mains-operated electrical equipment purchased outside Australia should be checked to ensure it is compatible with the ship's power supply;
- any mains-operated electrical equipment which develops a fault should be immediately unplugged and not used;
- double adaptors should not be used;
- disposable fuses should never be rewired or replaced by others of a higher rating;
- portable lamps, radios and other electrical equipment should be switched off at the main switch when not in use or when the user leaves the room;
- electrical equipment should be properly secured against movement in a seaway;
- faulty cabin wiring should be immediately reported to an engineer officer.

The safety of the entire ship and crew depends upon off-duty crew members being able to get adequate rest and sleep. Noise and other behaviour that may disturb others should be kept to a minimum, especially near or in seafarers' accommodation areas.

Before leaving a common space, seafarers should always check that loose objects are appropriately secured against movement.

Accommodation areas should be inspected as part of a fire patrol when most seafarers are asleep.

### 20.1 Sanitary and laundering facilities

The owner and/or operator must ensure that seafarers have convenient access to sanitary facilities and laundry facilities on the vessel that meet the minimum requirements set out in MLC, 2006 and Marine Order 11.

Hot and cold running fresh water must be available in all wash places. Slip-resistant bath mats and proper handholds should be provided in bathrooms and showers.

Towels and clothing should be put away in their proper place when not in use. Wet clothing should be hung in drying room and be kept clear of other sources of heat.

All seafarers required to work in a laundry, or use any part of the equipment there, must be fully instructed on the proper operation of the machinery. The manufacturer's operating instructions for washing, cleaning or drying machines should be followed.

Clothes washing and drying machines should be installed according to the manufacturer's instructions concerning ventilation and operation.

Frequent and regular inspection, with thorough checking of all electrical equipment, is also necessary to ensure the standard of maintenance essential for laundries. Problems with the operation of the equipment should be reported immediately and the machine removed from use until repairs have been carried out. A notice warning against use should be displayed prominently on the defective machine.

Machines should not be overloaded and loads should be distributed uniformly.

Reliance should not be placed entirely on interlocking or cut-off arrangements on the doors of washing machines, hydro-extractors and drying tumblers, etc.; doors should not be opened until all movement has ceased.

When hand or industrial irons are used, precautions should be taken to avoid burns and scalds and such equipment should be switched off and returned to the stowed position whenever the user leaves the laundry room.

Dry-cleaning chemicals should not be used.

## **20.2 Recreational facilities**

The operator should take into account the MLC *Guidelines B3.1.11* to ensure that the recreational facilities meet the needs of seafarers living and working on the vessel.

Where there are rooms furnished with equipment to maintain physical fitness, all equipment should be installed, secured and used in accordance with the manufacturer's instruction. Free weights are dangerous and should not be used at sea.

Seafarers should be encouraged to maintain health and fitness. It may not be safe to use certain gym equipment when the ship is moving in a seaway. Regular inspection and maintenance of gym equipment should be conducted.

Where a swimming pool is available, warning signs should be placed around the pool to discourage dangerous activities such as swimming alone or diving.

The swimming pool should be emptied when heavy weather is expected. A net should be stretched across the pool and properly secured whenever the pool is empty.

The water in the swimming pool should be changed at regular intervals and the pool should not be filled with water that might be hazardous to health.

## **20.3 Sewage systems**

The risk of gases from sewage systems finding their way into working and living spaces should be eliminated or minimised so far as is reasonably practicable. An operational procedure should be introduced for reporting, recording inspections, maintenance of the sewage system and the action taken to deal with complaints of foul or musty smells which may be due to toxic or oxygen-depleted gases.

The use of toilet cleaning products that kill germs and bacteria should be avoided as they may destroy the bacteria which are essential to the aerobic operation of sewage treatment plants. The manufacturer of the treatment plant should be consulted for details of appropriate non-harmful cleaning products.

If entry into the sewage tanks or work on the system is necessary, all personnel engaged on this work need to follow confined space procedures due to the risk of encountering oxygen-depleted, toxic and flammable gases (see section 7).

When inspecting a sewage system, ensure that:

- all drainpipes have satisfactory water/gas tightness and adequate water seals and traps to prevent the back flow of gases into the respective compartments;
- all sanitary fittings are securely fastened to prevent relative movements at pipe joints;

- where toilet pans are fitted with vacuum-breaking arrangements at the back of the water trap, such as individual air pipes or patented back flow prevention valves, these are in a satisfactory condition and operation;
- there is an adequate supply of flush water to clear toilet pans and to replenish water seals, and
- drains and air vents are clear of obstructions and are in sound water/gas tight condition throughout their length.

Adequate air vents should be fitted to the piping network, paying special attention to the extremities of the system. These should ensure an adequate supply of air and prevent plugs of water from breaking the water seal during violent rolling or pitching.

Ventilation systems to all compartments of a ship should be designed, installed and balanced to ensure satisfactory distribution of air. They should be maintained in a clean and efficient condition to achieve the designed air changes throughout the service life of the vessel. Particular attention should be paid to the exhaust or extraction systems in toilet or washing areas. In general, attention should be paid to the examination of extraction grilles, louvres, ducts etc. to ensure that they are clear and free of accumulated dirt, fluff etc.

## 21. OFFSHORE SUPPORT VESSELS

This section provides additional guidance for Australian offshore support vessels on how to manage the key risks associated with cargo and personnel transfer, towing, anchor handling and barge work.

Further information is available in the [Guidelines for Offshore Marine Operations](#).

### 21.1 Risk management

Offshore operations are often complex and hazardous, involving many parties who share responsibility for ensuring these operations are carried out safely. Before commencing any offshore operations, vessel operators must carry out a risk management process (described in section 2 of this Code) in consultation with all other relevant duty holders including the charterer, Offshore Installation Manager (OIM) and operators of any other support vessels carrying out simultaneous activities at an installation.

The outcome of the risk management process should be used by the operator to develop a Safety Management Plan which sets out the health and safety roles and responsibilities and various procedures that the company expects to be followed as part of the safe operation of its vessels.

Offshore installations operate under risk management plans or safety cases approved by the National Offshore Petroleum Safety and Environmental Management Authority. Offshore support vessels may therefore need to comply with additional requirements under the facility's safety case regime which should be discussed and agreed as part of the charter party.

The person in command must discuss with the operator and charterer any provisions of the charter party that may exceed the limitations or capabilities of the vessel to the extent that safety may be compromised. Each vessel should have on board a copy of the charter party before commencing operations so that the person in command and crew are aware of any special expectations that the charterer may have of the vessel, and of their obligations to the charterer.

Weather forecasts must be available during all offshore operations, and operations planned accordingly.

### 21.2 Communication

To ensure effective safety management of offshore operations, it is essential that operators of offshore support vessels and charterers establish a process for consultation, ongoing communication and coordination of activities. A direct line of communication needs to be established between operators and charterers to enable all safety matters to be raised and addressed. Individuals should be nominated for this purpose. This direct line should not replace the first line of communication between the person in command of the vessel and the OIM but should complement it.

Before commencing offshore cargo operations, anchor handling or towing, the planned activities should be discussed and agreed by radio between the OIM and person in command, or their appointed deputies, to ensure that the installation and vessel are ready in all respects. The person in command must be advised of any anticipated helicopter movements during the operations.

The installation should be informed of any factors limiting the vessel's expected performance before or during operations, and the person in command should, in turn, be given information on limitations of the installation which may affect the operation.

Effective communication between the person in command, the installation personnel, particularly the crane operator, the deck officer in charge on the vessel and the deck crew are vital for safety during operations. An effective radio communication link between the

vessel and installation on a dedicated channel should be maintained at all times whilst the vessel is engaged in offshore operations.

## **21.3 Cargo Transfer Operations**

### ***Pre-planning***

Cargo pre-planning should be conducted both at the shore terminals and offshore to facilitate the safe transfer of cargo between offshore support vessels and installations.

The order of loading, discharging and stowage arrangements should be planned to avoid 'cherry picking' and to minimise the number of lifts at the installations. The person in command should be informed of any high priority items before loading so that they can be discharged first. A cargo plan should be maintained on board showing the locations of the 'blocks' of cargo for each facility together with the number of lifts in each block and other relevant details.

All cargo should be accompanied by a cargo manifest identifying the goods loaded onto the vessel with details of the contents, destination, general dimensions and weight. Operators should provide equipment at the shore base to verify weight during loading operations.

The person in command should be provided with details of any unusual items of cargo requiring special securing arrangements, or heavy lifts, before loading.

All deck cargo must be correctly stowed and adequately secured for the intended voyage.

Congestion on the cargo decks of both offshore vessels and installations can create hazardous situations. A vessel should plan to arrive at an offshore facility with approximately 10% of its useable deck clear and ready to receive initial back-load. This allows sufficient space to be cleared on the facility's deck before any cargo is taken up from the vessel.

The person in command has the authority to decide the sequence of cargo discharge to, and back-loading from, the installation.

The person in command should be informed of expected delays to operations so that the vessel's work programme may be synchronized with that of the installation. Excessive standby/waiting time alongside the installation should be avoided.

### ***Bulk cargo transfer operations***

Undertaking bulk cargo operations should include the following general precautions:

- The pressure ratings of all components of the transfer system should be checked to ensure that they are suitable for the proposed operation. The pressure at which bulk cargo is delivered must not exceed the safe pressure of the receiving system.
- Agreement is needed between all relevant parties, including vessel, base, facility or tanker regarding the pressure rating to avoid overpressure.
- Communication arrangements should be agreed and tested before commencing the operation and at frequent intervals as it proceeds.
- Relevant personnel must be readily available and nearby throughout transfer operations.
- Remote stop controls must be provided for all bulk cargo discharges, i.e. dry bulk and liquid bulk, to enable the immediate shutdown of operations in the event of a problem.
- In bad weather and under certain conditions of trim, considerable amounts of water may flow over the after deck when a vessel is approaching a rig stern-on under power. Open stern vessels pose an increased risk of flooding. Crew members should be aware of this possibility and seek positions of safety.
- Do not close valves against a cargo pump.

- Do not use compressed air to clear hoses used for the transfer of any hydrocarbon based products since an increased risk of explosion will result.
- Do not use potable water hoses for transferring other bulk liquids, including ordinary fresh water. The transfer of potable water and fuel at the same time should be avoided.
- Hoses should remain afloat at all times.

Before arriving at offshore installations to discharge liquids, cargo and bulk, the following matters should be checked:

- that the ship can approach the installation safely;
- that there are no divers, ROVs etc in the water;
- that the weather/tide/current/sea and swell conditions are suitable;
- the type, weight and number of units to load or discharge;
- the existing cargo on deck;
- that there is sufficient space on deck to allow safe access to and from the work area;
- that all engine/steering/thrusters/joystick controls have been checked and are fully operational and the main engine pitch control is fully operational;
- vessel's electrical load must be carried by auxiliary alternators and is not totally reliant on shaft alternators; and
- hose connection points on the vessel are in good order.

Before proceeding with the cargo operation the person in command must ensure that:

- all emergency pump stops are operational;
- the vessel is able to remain on location in the prevailing weather and sea conditions;
- correct couplings have been identified for the products to be transferred; and
- constant communication is maintained with the person on the platform responsible for supervising the transfer of hoses and receiving of cargo.

The hose terminations should be colour-coded by use of a coloured band to mark the product, and all support vessels and installations should adopt a universal colour and connection scheme as follows:

Product	Coupling colour	Connection	Vessel coupling
Dry cement	Yellow	5" hammer lug union	Male
Dry barite & bentonite	Orange	5" hammer lug union	Female
Potable water	Blue	4" hammer lug	Female
Fuel	Brown	4" quick release self-sealing coupling	Female
Base oil	White	4" quick release self-sealing coupling	Female
Drill water	Green	4" hammer lug	Female
Brine	Red	4" quick release self-sealing coupling	Male
Oil based mud	Black	4" quick release self-sealing coupling	Male
Methanol	Black and yellow (tiger stripes)	4" quick release self-sealing coupling	Male

Hoses should only be lifted by a certified wire strop on a certified hook eye fitting. Hoses should be secured to the vessel by a rope lashing before disconnection from the crane. Further rope lashings at appropriate places will minimize 'kicking' of dry bulk hoses.

When the hose is connected and installation lines are set, the support vessel should be instructed to start pumping at a slow rate. If no leaks are observed, the support vessel should be instructed to increase pumping, up to the full delivery rate. Relevant installation personnel should stand by appropriate valves so as to act quickly in event of an emergency.

When pumping has finished, both the installation and the support vessel should set their lines to allow the hose to be drained back to the vessel's tank. If the installation has a vacuum breaker fitted to the line, this should be used to aid draining. Lines may also be blown through with air, if available, to ensure that they are properly cleared. In suitable conditions the crane should also be used to lift the hose to aid draining.

### ***Fuel Handling Equipment***

The condition of hoses and connections should be inspected before each use to identify any chafed or worn areas. 'Dry Break' type couplings should be used where possible. In cases where ball valves are used in the end of fuel hoses measures should be taken to prevent damage to the valve handle when the hose is landed on the support vessel deck.

Ensure that hoses passed to or from the vessel are empty and not under any pressure, and that the risk of spilling oil is eliminated or minimised.

### ***Dry Bulk and Cement Equipment***

Check the condition of hoses and connections. Worn sections of hoses should be replaced before use as a blow-out creates a severe dust hazard as well as a hazard from hoses whipping around under pressure.

Bleed off/ test cocks should be fitted near the hose connection point to enable crew to check that pressure is off the line prior to connecting/disconnecting. These cocks should be placed in the upper end of the pipe and regularly serviced to avoid blockage by product or rust.

### ***Glycol and Methanol Systems***

Glycol and methanol must only be carried in dedicated tanks and delivered through dedicated systems.

Methanol, when carried on deck, must only be carried in specialised portable tanks as a sole deck cargo. The tanks must be secured and adequate fire fighting equipment must be laid out ready for instant use. All tools and connections used must be made of approved material that will not provide a source of ignition.

### ***Securing to the Installation***

An adequate area for handling mooring lines should be left free of cargo at the stern of the vessel if the vessel is securing to the installation. If it is necessary to carry deck cargo in the area that the crew require for mooring activities, such cargo should be discharged to the installation before the vessel is moored.

### ***Unusual cargo items***

All tubular backloads should be indicated to the vessel in good time to allow for planning of stowage. Tubular cargoes should be pre-slung in bundles or singly and secured by bulldog grips or other equivalent methods to prevent slippage. All pipe lifts should be slung so as to be level. Varying lengths of sling in one lift should not be used.

Other operations, bulk handling etc., may have to be suspended whilst heavy lifts are underway. Subject to agreement with the person in command, taglines may be attached to heavy or large lifts, if considered necessary to aid handling.



## **Crane Operations**

For offshore crane operations a safety pendant ('Stinger') of sufficient length should be provided between either the headache ball or floating block and the hook, all of which should be of high visibility colour. The tag line attached to the 'Stinger' should be a minimum diameter of 12mm and not too short or too long to create a hazard.

The 'Stinger' and hook must be of an appropriate SWL for the lifts being worked. The installation should have a selection available for the type of cargo that is normally handled. The lighter the weight of the 'Stinger' and hook, the less hazardous it is for the deck crew on a moving ship to handle, provided that it is of sufficient SWL.

For routine cargo operations, only swivel self-locking safety hooks should be used. For non-routine cargo, alternative hooks or lifting gear as agreed between the person in command and OIM may be used, providing that such equipment is fit for the purpose.

The crane driver should always have a clear view of the vessel's deck and have direct radio communication to the bridge of the vessel. Directions given to the crane driver by the deck crew on the vessel must only be given by one person who has been designated to perform that function.

Consideration must be taken of impact loadings caused by the vertical movement of the craft in the swell when the weight of the cargo is taken by the crane.

When planning the loading ashore, containers and pre-slinging arrangements should be suitably de-rated to take account of the expected sea conditions during discharge at the offshore installation.

As far as is practicable, all crane lifts made from or onto a supply vessel should not be lifted directly over the vessel if the height of the lift above the vessel exceeds 3 metres inclusive of any swell which may be in existence. Once the height of the lift exceeds 3 metres, the remainder of the lift should be made over water.

## **21.4 Offshore Transfer of Personnel**

Various methods may be used to transfer personnel to or from a vessel whilst it is offshore. The preferred method of undertaking such transfers will normally be by helicopter or where conditions are suitable, a small boat specifically designed to move personnel. Fast rescue craft should not be used for this purpose as they are intended for emergency operation only.

If these methods are unavailable, 'Frog' personnel transfer capsules, transfer baskets or other forms of carrier lifted by a crane on the facility may be used. In general, baskets or carriers incorporating a rigid frame which provides protection for occupants are preferable.

The risk management process should be followed whenever personnel transfers are considered. Personnel transfer should include the following general precautions:

- The capacity of the personnel transfer basket, carrier or craft as determined by the manufacturer of the equipment must not be exceeded at any time.
- The suitability of the vessel to carry out a transfer should be determined by its ability to maintain station alongside the installation and have sufficient clear deck space to safely receive the carrier.
- Personnel should be briefed on the correct means of boarding, riding and disembarking the carrier. A person to be transferred who is not sufficiently experienced or trained should not be permitted to transfer unaccompanied.
- Personnel transfer should generally not proceed where the prevailing conditions include one or more of the following:
  - Wind speeds in excess of 20 knots (10 metres / second) at height of 10 metres above sea level.
  - Significant wave heights in excess of 2.5 metres.

- Horizontal visibility of less than 500 metres, vertical visibility of less than 100 metres.
- Heavy accumulations of snow or ice on landing areas, access and egress routes.
- Supervisors and operators of equipment used in transferring personnel between offshore installations and/or vessels should be competent to undertake the tasks assigned to them.
- Wherever possible, supervisors should have a clear view of all phases of the entire transfer operation.
- The means of communication between the various personnel involved in the transfer operations should be determined as part of the risk management process. All such means of communication should be in place and their correct operation tested before commencing any transfer activities.
- Transfer operations should be conducted during daylight hours. If this is not possible, the transfer areas should be adequately illuminated.
- A basket or carrier should be fitted with sufficient buoyancy to support the unit itself and its occupants in the event of entering the water.
- Baskets or carriers should be visually inspected by a competent person before each operation to ensure that all rigging, fixtures and fittings remain fit for purpose and secure.
- Lift-off and landing areas on the facility and vessel should be clearly marked and kept free of any obstructions.
- Appropriately briefed personnel should be in attendance for both lift-off and landing to assist in controlling the movement of the basket or carrier. In particular, such personnel should be briefed in the use of attached tag lines.
- Any other work in the vicinity of the lift-off and landing areas should be suspended whilst the transfer is in progress.
- The transfer route should be planned so that the basket or carrier is always well clear of any exhausts, discharges or obstructions.
- After the basket or carrier is lifted from the deck of the facility the crane should be slewed so that it is over the water, whereupon it is lowered to a height of approximately 2 metres above the vessel's cargo rail. The basket or carrier should then be moved to a position over the designated landing area on the vessel before being finally lowered onto its deck. Transfers from the vessel to the installation should follow the reverse route.
- Free-fall or non-powered lowering should not be used.

### ***Safety Equipment***

Personnel being transferred should be provided with suitable PPE which may include:

- Watertight immersion suit
- Thermal protection
- Inflatable lifejacket or buoyancy aid
- Personal Locator Beacon, where detection and tracking facilities are available.

Personnel should be given instructions on the correct donning and use of the equipment. Before boarding the basket, carrier or craft it should be checked by the person supervising the transfer.

Personnel should not wear any clothing or carry any items which could restrict their mobility or interfere with the correct operation of any protective equipment.

## ***Rescue procedures***

Rescue facilities must be available at immediate notice during personnel transfer operations. Where a stand-by vessel is in attendance, if not directly involved in the transfer operation, its rescue boat should be made ready for immediate launching.

Alternatively, fast rescue craft installed on other vessels, should be identified and agreed before the persons in charge give the necessary authorisation.

## ***Roles and responsibilities***

The duties of those involved in the transfer of personnel should include the following:

### Person in command of the vessel

- confirmation to the OIM of accepting the transfer and understanding the procedure
- confirm that the vessel is stationary and that its station keeping arrangements are fully operational
- the deck crew is fully briefed
- persons to be transferred are adequately briefed and fit to be transferred

### Crane Driver

- the crane is fully operational
- the windspeed is satisfactory for safe operation
- the crane driver has a clear and unobstructed view of the carrier or basket, or is able to see the directions of the 'Dogman'
- adequate communications are established.

### Dogman and Deck Supervisor

- the transfer procedure is understood
- they are clearly identifiable as 'Dogman' and 'Deck Supervisor'
- the personnel basket or carrier is correctly used
- the transferees are fit for transfer and understand procedures
- proper communications have been established
- they have a full view of the transfer areas.

### Individuals who are to be transferred

- the transfer procedure is understood
- confirm that they agree to the transfer
- correctly use the safety equipment provided
- observe all instructions from those in charge of the operation.

## ***Transfer by Boat***

The person in command is responsible for deciding whether such transfer is safe in the prevailing conditions, by taking into account the following:

- Wind and sea state
- Movement of the vessel from which the boat is to be launched
- Movement at the access point on the installation
- Performance characteristics of the boat and launching/recovery equipment
- Boat crew and transferee training and experience

- Any other prevailing circumstance that may affect the safety of the transfer.

Further guidance is available in the ILO *Code of Practice on Accident Prevention on Board Ship at Sea and in Port*.

## **21.5 Anchor Handling**

Anchor handling involves lifting extremely large weights and can involve a fleet of vessels working together as they move the anchors of an installation. Risk assessments are essential for such operations. Offshore personnel should be aware of the operational limitations of the various vessels used, including their power and freeboard. Detailed procedures for each operation should be set out in the ship's Operations Manual.

Vessel owners must ensure that vessels involved in anchor handling operations are fit for the purpose and adequately manned.

Where several vessels are working together on the same operation, a specific communication plan for that activity must be established to ensure an effective and coordinated action in the event of any unintended incident.

Communication between vessel workstations where the person in command and winch driver will be, and the anchor handling deck must be decided prior to the operation.

As anchor handling is often performed over the stern, control measures must be implemented to eliminate or minimise the risk of crew members being washed across the deck by seas coming aboard during operations. The person in command has the authority to cease operations if the weather is such that there is a significant risk of injury due to boarding seas.

If in attendance, the standby vessel should be informed of all operations in progress.

### **Crew Briefing**

Before commencing work, the person in command should brief the crew on the planned operation, including any unusual aspects of the job and hazards that may be encountered. A Job Safety Analysis covering the proposed work program should be reviewed and discussed at this 'toolbox meeting'.

If it becomes necessary to deviate from the plan during the operation, written procedures should be established detailing responsibilities. Any deviation from the plan should be agreed by all parties.

Crew should also be provided with an opportunity to familiarise themselves with the operation of deck machinery.

### **Clear Decks**

Anchor handling vessels should have clear decks prior to commencing anchor handling operations. All personnel should be clear of the deck and in a protected place at all times, except when they are actually working on the anchor handling equipment.

### **Equipment**

Anchor handling equipment is exposed to heavy wear and damage. A system must be in place for the testing, inspection and maintenance of anchor handling equipment.

All equipment used in anchor handling operations should be secured until required. Care should be taken when opening up wire coils, in particular pendant wires, as injuries have occurred when the coils spring open following release of the securing bands.

When running anchors, the person in command of the anchor handling vessel should be advised where the installation winches have payout limitations so that speed can be controlled.

It is preferable to have a length of chain installed between the crown of the anchor and the pendant and this chain should be long enough to reach the vessel securing device and thus allow crews to change pendants without the need to deck the anchor.

A safe and effective method of stoppering wire pendants should be implemented.

### **Wires**

Work wires must be of adequate size for the power of the vessel, the strength of the anchor handling winch, the size of anchors to be worked and the depth of water. They should be at least the same diameter as that specified for the tow wire of the vessel. They must be long enough to have at least one full wrap on the work drum when the wire is led out as far as it would normally be when working with anchors.

The securing device for the 'bitter end' of the work wire must be the correct size for the wire in use to provide an adequate fixing to the winch drum.

Tugger wires should be of adequate size and strength with regard to the size and weight of the gear being handled, and the power of the tugger winches. The SWL must be at least equal to the maximum pulling power of the winch. They must be of sufficient length to always have at least one full wrap on the winch drum at the maximum extension. Tugger wires must also have an adequate means of securing the 'bitter end' to the winch drum.

'Latchlock' style hooks are preferred for use on tugger wires.

### **Sockets and Eyes**

Because the majority of breaks occur at or near the wire terminal, the condition of all sockets and eyes should be closely monitored. The terminals of work wires, tuggers and pennants in particular are subject to damage (work hardening, kinking and overstress) due to being wound onto winch drums under load and compressed or distorted by other layers on top.

Similarly, the 'long stirrup' type of socket should not be used for anchor handling where it is to be wound around a winch drum. 'Short stirrup' type sockets should be used instead.

Sockets should be inspected often with particular attention to the join between the lug and the body of the socket. Hard eyes should be checked, paying particular attention to the wire at both ends of the swage and the condition of the thimble. Wires with badly crushed or distorted thimbles should not be used.

Sockets and eyes must be of an appropriate size to enable easy connection when used with the correct size shackle. The use of two shackles between pendants or work wires is discouraged due to the hazards created when winding excess gear onto work drums.

Current test certificates (preferably proof load or ultrasonic/magnetic particle test as a minimum) must be available for sockets (with individual serial numbers rather than the previously used batch numbers) prior to use. Sockets should be properly fixed to the wire by an experienced person using correct procedures and materials that are approved for the purpose.

### **Shackles**

Only shackles of sufficient SWL must be used when handling anchors, taking into account that the anchor may be deeply embedded in the seabed thus increasing the load to which the equipment is subjected.

Link type shackles ('Baldt' or 'Kenter' style) or hinge links are preferred for use between pennants or where multiple shackles must be wound onto the winch drum. The risk of fouling the pennant as it is unwound under load is much reduced when these links are used.

If 'Bow' type shackles are used for winding onto winch drums they should be placed such that the pin is toward the winch as this also reduces the incidence of fouling of the wire when it is unwound under load.

## ***Roller Fairleads***

The use of roller fairleads mounted on the deck or crash barriers of vessels should be carefully monitored. Inspection and maintenance must be performed regularly as any uplift by external forces, such as a tugger wire, may dislodge roller fairleads from their seating. Careful reassembly of these leads after maintenance is important.

Personnel should never stand inside the bight of wire around a roller fairlead.

## ***Hydraulic or Mechanical Stoppers***

These usually come in the form of 'Shark Jaws' (or Triplex gear), 'Ulstein Tong', and 'Karm Fork' designs or other similar proprietary mechanical/hydraulic securing devices. These devices should be used strictly in accordance with the manufacturer's instructions.

'Ulstein Tongs', 'Karm Forks' and other types that use removable jaws for different applications are dangerous if the wrong jaws are used. For this reason it is important that the correct jaws be used for chain and wire applications.

Ensure the device is 'Locked' either mechanically (by pins or bars) or hydraulically before crew members commence work on the connection. Visual inspection must be done on each occasion with the hydraulic locking type to ensure that the arms have reached the over-centre point where locking is effective.

Hard eye or soft eye wires with a 'Tellurit' or sleeve (ferrule) type termination should not be used in a mechanical stopper where the sleeve bears the weight against the stopper jaws or inserts. Wire pendants may be supported in mechanical stoppers by attaching five links of anchor chain to the pendant or forming three links of anchor chain with the thimble and using a chain link in the mechanical stopper.

Soft eye pendants wear more quickly than hard eye pendants and therefore require frequent inspection. If doubts exist as to the suitability of the pendant it should be returned to the rig and replaced.

Any equipment returned to the installation as suspect or unserviceable must not be used or sent back to a vessel for use until it has been repaired, retested and recertified by a competent person.

## ***Buoy Catchers***

The person in command should consider the following factors before deciding to use the 'Lightweight' type of buoy catchers:

- Weather conditions
- Depth of water
- Weight of the buoy and pennant system
- Size and movement of the vessel
- Likelihood of the anchor being fouled
- Other conditions that may lead to an excessive load being applied to the catcher.

If any of the above factors are unfavourable, an alternative should be used to reduce the potential failure of the buoy catcher. A heavier chain may be pulled around the pennant under the buoy or around the crucifix with a tugger wire or mooring line and shackled back to the work wire, thus providing a much more substantial buoy catcher which is less likely to fail under heavy load.

Ensure that the heavy chain buoy catcher is properly stoppered while connection is being made due to the likelihood of snatch loads being suddenly applied to the gear.

All anchor handling vessels must carry equipment that may be used as a heavy duty alternative to the 'Lightweight' buoy catchers.

Regardless of the type of catcher used, it is essential for safety that all crew are 'off the deck' or behind the crash rail while heaving the buoy as excessive weight may suddenly come on the catcher, parting it. This may happen due to a fouled anchor making the pennant shorter than expected, the vessel drifting away from the line of the anchor in the swell or some other unforeseen circumstance.

### ***Chasers***

It is preferable for chain chasing operations that the chaser wire be one continuous length. This reduces the hazards associated with numerous shackles and sockets on the winch drum while recovering anchors.

The chaser wire should be the same size as the work wire normally used on the vessel and long enough for there to be at least one full wrap on the drum when it is paid out to its full working length for the water depth.

### ***Pipelines, Sub-Sea Obstructions/Structures***

All personnel involved must have full details regarding the location of pipelines and sub-sea obstructions/structures relating to the whole operation.

Where it is known that anchor handling and/or towing operations will be conducted near pipelines or sub-sea obstructions/structures, then full written procedures should be agreed by all parties.

### ***Winch Drum Visibility***

On all anchor handling vessels the winch driver must have a clear view of the winch drum that is being operated. The person in command should also have a clear view of the drum. Both the person in command and winch driver should have a clear view of the working deck.

On vessels where there are video cameras installed to provide a view of the winch drum, these and the associated lighting must be positioned to give the best view possible. The video system should be maintained so that the winch driver always has a clear view of the drum.

In an emergency or system breakdown it may be necessary to operate the winches using a crew member as an observer at the drum using a radio or hand signals to communicate direct to the winch driver. If this is necessary the observer should be positioned to eliminate or minimise any risks from the winch or the equipment being wound on/off. Hand signals should be agreed prior to the operation and all personnel fully briefed on the requirements.

### ***Chain Chasing***

This operation should be performed using the recommended amount of wire for the depth of water and using the methods recommended by the manufacturer.

To avoid picking up bights of chain/wire with consequent overloading of the gear, tension should be maintained by the installation on the anchor chain/wire until the vessel has run the full distance and is ready to commence heaving.

To avoid overloading of the equipment, the vessel should be kept directly over the line of the anchor cable while chasing and care should be taken not to use excessive amounts of power on the vessel's propulsion.

The crew should be off the deck and in a protected location during chasing operations.

### ***Grappling***

Care should be taken deploying grapples and 'J' hooks over the stern. If the weight suddenly comes on the pendant wire it may whip across the deck. This hazard can be addressed by using the vessel's tow pins.

Excessive power or speed may cause sudden overloading on equipment when the grapple or 'J' hook encounters the cable.

### ***Recovering Anchors***

Care should be taken when lifting anchors, especially those that are deeply embedded in the seabed, to avoid as much as possible sudden heavy loads on the pendant string from the rise and fall of the vessel in the seaway.

If it is necessary to deck an anchor, it should be secured on deck so that it cannot move due to the movement of the vessel.

### ***Multiple Pendants***

Care should be taken when stowing multiple pendants on the winch drum to avoid fouled pendants when the wire is unwound. If 'bow' type shackles are used they should be placed so that the pin is toward the winch as this reduces the possibility of fouling behind the pin when the wire is unwound under load.

### ***Length of Pendant from Rig***

The length of pendant that is passed to the vessel from the installation should be sufficient to allow the vessel room to manoeuvre to keep the pendant slack while it is being connected to the work-wire/pendant by the deck crew.

### ***Anchor Deployment***

The anchor handling vessel should be held in line with the anchor cable while the anchor is deployed and until the buoy is in the water so that the pendant is laid out in a straight line away from the anchor, reducing as much as possible the hazards associated with fouled anchors.

The installation should tension the cable as soon as possible after the anchor is on the bottom to 'set' the anchor below the seabed and thus avoid fouled anchors.

### ***Buoy Deployment***

Buoys should be deployed from as close to the stern of the vessel as possible to avoid an uncontrolled and damaging progression along the length of the deck.

### ***Passing Pendant to Rig***

Ensure that the pendant is not released from the securing device on deck until the crane has taken the weight as this can lead to unacceptable shock loads on the crane.

### ***Clearing Fouled Anchors***

Crew members should be aware that coils of pendant wire fouling an anchor may move sharply as they are cleared. Clearing should be accomplished as much as possible using tuggers and other mechanical means.

Pendant wires that have been cleared from a fouled anchor should be closely inspected by an officer of the vessel for damage before a decision is made as to whether they are suitable for use. If there is damage to the wire sufficient to render it suspect, the wire should be marked 'Out of Service' and returned to the installation.

## **21.6 Towing**

Towing can be hazardous. Offshore personnel should be aware of the operational limitations of the various vessels, including their power and freeboard.

Vessel owners must ensure that vessels involved in towing operations, together with their equipment, are fit for the purpose and adequately manned by competent personnel.

The person in command of the towing vessel must prepare a detailed passage plan taking into account water depth, other offshore or subsea facilities and emergency locations or refuges which may be needed.



A safe method of passing the main towing pendant from the installation to the towing vessel should be established. A system to prevent tow-line chafing should be used.

As soon as the towing vessel is connected and starts towing operations, winches on the vessel being towed (if used in the towing gear) must be continuously manned during the initial stages of the tow and be under control of the person in command of the towing vessel.

### ***Clear Decks***

Once the tow is safely connected, the crew should 'clear the deck' and stay clear until the tow is streamed to towing length and the person in command authorizes fitting of chafing gear or other necessary maintenance.

Vessels involved in towing should have decks as clear as possible with no cargo or other equipment encroaching on the area of the deck covered by the tow wire between its extremes of possible movement.

### ***Towing Equipment***

The towing equipment should be inspected by a competent officer of the vessel before connection to ensure that there are no apparent defects that may affect the safety of the tow.

The main towing equipment must be of sufficient size and construction as recommended by the rig/barge builder. The power of the towing vessel and size of the towed vessel gear should be taken into account. As a guide, the towed vessel bridle and forerunner should be larger and stronger than the towing vessel tow-wire.

The bridle and fore-runner should be long enough to allow the towing vessel room to manoeuvre while connecting and disconnecting and there should be an effective and safe means of passing/recovering the gear to/from the towing vessel.

The securing points on the installation should be of a type that allows slipping of the towing gear in an emergency ('Smit' brackets or similar).

### ***Reserve Tow Equipment***

The secondary towing system on an installation should be identified, a readily available method of retrieval of the main towing gear established, and a safe method of passing the secondary towing system agreed.

Towing vessels engaged in long tows or where there is only a single towing vessel should carry a complete set of spare gear to enable reconnection in the event of failure.

Where possible, spare tow-wires should be stored permanently on powered drums.

Towing vessels should ensure that the installation personnel are aware of the time that may be required to rig their spare towing wire. When an additional vessel is available as reserve tug whilst on passage, it should be rigged for towing.

All crew must be fully briefed on the procedure for installing the spare tow gear and reconnecting as this is normally required to be done in adverse conditions when hazards are greater than normal and mistakes can be made due to undue haste.

### ***Manned Tow***

The personnel on board the towed vessel are responsible for:

- using the proper navigation signals on a manned tow and following the instructions issued by the person in command of the tow, and
- maintaining the vessel properly ballasted and trimmed and not making changes without the prior knowledge and agreement of the person in command of the tug.

A continuous communications link on a dedicated channel should be established and maintained between the tug and tow for the duration of the tow.

## ***Unmanned Tow***

The person in command or officer of the towing vessel must inspect the towing arrangements of unmanned tows to become familiar with the layout of both main and reserve towing gear on the vessel to be towed and to have any apparent defects corrected before connection.

The person in command or officer of the towing vessel should also check that:

- the navigation lights of the vessel to be towed are working and have capacity to last the entire length of the proposed tow, and
- sea fastenings on any cargo that the towed vessel is carrying are adequate for the intended tow.

Any machinery that may be fitted to the vessel to be towed should be inspected to ensure that side valves, watertight doors and any other hull openings are closed and that the towed vessel is in all respects ready for the proposed tow, properly ballasted and trimmed.

The reserve towing gear should be rigged so that it can be recovered by the tug crew without having to board the tow. This normally means a floating line streamed astern of the tow connected to the reserve towing gear.

## **21.7 Barge Work**

Safe access and egress between the vessel and barge must be provided if assistance with mooring is needed. Movement of the floating vessel and barge can cause movement of the gangway, thus increasing the risk of workers falling or being injured. A small boat may be used to transport personnel to the barge and provide access via a barge ladder.

### ***Hipping up***

Hipping up to the barge for close handling work requires considerable tension to be applied to the tug mooring lines if it is to be done effectively. The crew must be properly briefed prior to hipping up so that they are aware of the particular hazards associated with this operation.

Hipping up at sea presents additional hazards due to movement caused by sea and swell and deck crew should exercise great care when handling mooring lines to avoid injuries.

Consideration must be given to the limitations imposed by the shape of the vessel and the effect that any movement in the seaway will have on the safety of the operation. In most circumstances, support vessels are not designed with sufficiently straight sides and bow or with sufficient structural strength in this area to allow hipping up vessels in a situation where movement in the seaway between the vessels may occur.

### ***High Wire Hazard***

Crews must be made aware of the hazard presented by a high wire when working close to a barge with a high bow and short bridle and fore-runner. This may cause the towing gear to rise and fall from the work deck if weight unexpectedly comes on the wire during connection/disconnection. No attempt should be made to work on the wire while it is off the deck or when there is any weight on the gear.

## 22. OTHER SPECIFIC VESSEL TYPES

This section provides further guidance on additional hazards relevant to specific types of vessels.

### 22.1 Bulk carriers and bulk cargoes

Requirements for bulk cargoes are set out in:

- Marine Order 33: [Cargo and cargo handling - grain](#)
- Marine Order 34: [Solid bulk cargoes](#)
- Marine Order 35: [Additional safety measures for bulk carriers](#)
- International Maritime Solid Bulk Cargoes Code (IMSBC Code).

Dry bulk may consist of materials that emit dangerous gases, spontaneously combust, liquefy, develop hot spots, develop biological hazards or become unstable. For example:

- ammonium nitrate fertilisers produce toxic gases during decomposition
- antimony ore dust is toxic
- barium nitrate dust is toxic if swallowed
- pencil pitch may cause severe irritation of the skin and eyes in sunlight
- dust created by certain cargoes, particularly in loading, discharging or hold cleaning operations, may pose an explosion hazard.

Some bulk materials are liable to oxidation. This may result in oxygen reduction, emission of toxic fumes and self-heating. Some materials may emit toxic fumes, particularly when wet. Other materials, if they become wet, are corrosive to skin, eyes and mucous membranes, as well as to the ship's structure.

Cargo dust should be prevented from entering the ship's accommodation area by keeping portholes and doors closed in port.

Spaces used for carrying bulk cargoes should be treated as confined or dangerous spaces. The procedures for entering such spaces (see section 7) must be strictly followed.

Ships which carry cargoes that may emit toxic gases should be provided with the appropriate gas detection equipment.

Many bulk cargoes, particularly ores, are loaded into holds from great heights and at very fast rates which may create sufficient stress to damage the structure of the vessel. This should be avoided by reducing the loading rate.

A formal loading plan is required under SOLAS.<sup>22</sup> The plans for loading and discharging of ships should be properly followed, so that the vessel is not exposed to unacceptable stresses, shear forces and bending moments.

Some kinds of cargoes, including concentrates, certain coals and other materials with similar physical properties, may liquefy and cause a shift in cargo, if the moisture content exceeds the transportable moisture limit. The moisture content should therefore be checked before loading and the surface of the cargo in the holds checked during the voyage, as moisture migration may occur due to vibration and/or ship motion.

Precautions should be taken to prevent:

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<sup>22</sup> The IMSBC Code and the IMO Code of Practice for Safe Loading and Unloading of Bulk Carriers (the BLU Code) provide further information.

- liquids entering through pipelines into cargo holds in which bulk cargoes are stowed throughout the voyage, and
- seawater entering holds through hatch covers moving or flexing when the ship is working in a seaway.

Water should not be used to cool cargoes that may liquefy.

The appropriate national and international requirements with respect to ventilation should be followed. Certain cargoes, such as some coals, copra, swarf, charcoal and concentrates are liable to self-heating and may catch fire if the temperature is high enough. Cooling such material should be carried out with extreme care since water used to cool the cargo may actually increase heating and lead to spontaneous ignition and/or explosion. The temperature of holds containing such cargo should be checked daily or in accordance with the operator's or shipper's instructions.

The dust from some bulk cargoes including grain and sugar dusts can be explosive. Particularly when cleaning holds after discharge, seafarers should be made aware of this hazard. Smoking should be prohibited and cleaning carried out to minimise dust formation, for example, by hosing down. Static electricity is a major source of hazard and care must be taken to ensure that equipment used is suitable for controlling static hazards.

Seafarers and other personnel should not enter wing tanks when grain is being loaded.

Ensure equipment used for loading and unloading dry bulk, including conveyors, are fit for purpose, maintained and inspected as required.

## **22.2 RO-ROS and vehicle and passenger ferries**

Operators must provide seafarers with training, especially in the operation and maintenance of ramps and vehicle access doors.

The cargo securing manual should be kept readily accessible. The movement, stowage and securing of vehicles on vehicle decks and ramps should be supervised by a responsible ship's officer.

Special attention should be paid to the possible ingress of water, for example, through defective door closures, scuppers, broken bilge pipes and faulty bilge non-return valves, which may affect the stability of the ship. Any water that does enter should be reported to the bridge immediately. The officer of the watch should arrange for the water to be pumped out as soon as possible and the cause of the inflow investigated and remedied.

The person in command should ensure that an effective system of supervision and reporting of the closing and opening of doors and ramps is in operation. Doors should never be opened when the ship is under way. Openings in the deck must be suitably framed.

The appropriate gas detection instruments must be carried on board to ensure ro-ro spaces are safe (refer to section 7).

The advice given in operating manuals should be followed when opening, working, closing, locking and maintaining cargo access equipment.

There should be no unauthorised persons on vehicle decks at any time, and there should be no entry to vehicle decks when the vessel is at sea, unless specifically permitted.

Where closed-circuit television (CCTV) cameras are fitted, they should, where practicable, have an uninterrupted view of the vehicle deck. The use of CCTV for continuous watch does not necessarily preclude the need for car-deck patrols, e.g. coupled with fire patrols of passenger accommodation.

Vehicles should be provided with the requisite number of securing points to enable the cargo to be properly secured to withstand forces, particularly transverse forces, which may arise during the voyage.

Ships should be provided with fixed cargo securing arrangements and with portable securing gear, the correct application of which should be described in the ship's cargo handling manual.

Shippers' advice or guidelines on handling, loading, stowing and lashing individual cargo units should be followed.

Before being accepted for shipment, every freight vehicle should be inspected externally by a responsible person to check that it is in satisfactory condition for shipment. Cargo units or vehicles should not be accepted for shipment if there is reason to suspect that:

- cargo has been packaged or stowed in an unsatisfactory way;
- a vehicle is in a bad state of repair or overloaded;
- the unit itself cannot be safely stowed or secured to the ship and may therefore pose a danger to ship, cargo and crew;
- the unit might contain dangerous goods;
- the unit is not properly marked.

The type and number of lashings per vehicle depends on the stowage space within the ship and the dimensions and the weight of the vehicle.

The movement, stowage and securing of vehicles should be well planned and carried out by at least two competent persons under the supervision of a responsible officer. Adequate means of communication (e.g. hand-held radios) should be used when possible.

Ships' ramps, car platforms, retractable car decks and similar equipment should be operated only under the supervision of the responsible officer. Safe systems of work should be provided to ensure that the health and safety of persons are not put at risk when the equipment is operated.

Passengers and drivers should not be permitted to remain on vehicle decks without the express authority of the responsible officer. Prominent notices should be displayed in vehicle spaces and passenger accommodation to bring this restriction to the attention of passengers and drivers. The period prior to disembarkation, when passengers and drivers are requested to return to their vehicles, should be kept to a minimum.

Ramps used by vehicles should not be used for pedestrian access unless there is suitable separation of vehicles and pedestrians.

Where permanent walkways are provided on vehicle decks, they should be safe to use, clearly marked and signposted.

Suitable notices or appropriate instructions should warn persons on vehicle decks of the dangers from moving vehicles and of the need to exercise extreme caution to minimise the risk to health and safety.

Seafarers working on vehicle decks should wear high visibility clothing.

Seafarers should exercise great care when supervising the driving, marshalling, stowing and securing of vehicles to ensure that no person is put at risk.

No attempt should be made to secure a vehicle until it is parked, the brakes have been applied and the engine switched off.

Hand lamps and torches should be available wherever seafarers are working in poorly lit areas or have to go under vehicles to secure lashings.

Seafarers engaged in the securing of vehicles should take care to avoid injury from projections on the underside of vehicles.

Lashings and their points of attachment should be regularly checked during the voyage and re-tightened when necessary. Persons inspecting vehicle spaces during a voyage should exercise caution to avoid being injured by moving or swaying vehicles. If necessary, the ship's course should be altered to reduce movement when lashings are being adjusted. The

officer of the watch should always be informed whenever an inspection of the vehicle deck is being carried out.

Diesel engine exhaust emissions contain many known carcinogenic substances. To reduce exposure to diesel particulates and fumes, for example carbon monoxide, drivers should be instructed to stop their engines as soon as practicable after embarking and to avoid starting up prior to departure until instructed to do so. Warning notices to this effect should be posted at the entrances to and within vehicle spaces. The appropriate national and international requirements with respect to ventilation should be observed. Where there is doubt about the quality of the air, arrangements should be made for testing. The car deck should be ventilated in accordance with the ship's ventilation plan. Further guidance is available in Safe Work Australia's [Guidance for managing the risks of diesel exhaust](#).

Noise levels on vehicle decks should be monitored and hearing protection with the appropriate attenuation made available.

Smoking is not to be permitted on the vehicle deck. "No smoking" signs should be permanently affixed within the space and at all entrances.

If the presence of flammable vapour is suspected or detected, all electrical circuits and items of equipment that are not intrinsically safe, or certified flame-proof, should be isolated from a position outside the space. Employees and passengers should not be allowed into the space until the vapour has been effectively dispersed.

All vehicle decks, ships' ramps and lifting appliances should be kept free of water, grease, oil, or any liquid which might cause a person to slip or fall.

Drums, canisters, fuel, gas and acetylene cylinders should not be stowed on the vehicle deck.

Retractable car decks and lifting appliances should be securely locked in the stowed position. Doors and ramps, when open, should be locked in position.

No vehicle movements should occur until the ferry has been made fast to the dock.

Vehicle decks should have adequate ventilation at all times, with special regard to hazardous substances.

Particular attention should be paid to vehicles, unit load and trucks carrying dangerous goods. The goods carried and full safety information should be specified on the relevant transit document of the vehicle. Ensure the proper separation from other vehicles, or from other substances carried in other vehicles, is maintained.

## **22.3 Bunker barges and oil tankers**

Bunker barges and other ships carrying fuel or petroleum products in bulk are at risk from fire or explosion due to vapour igniting from the cargo.

Uncontrolled spills are a major risk associated with bunkering operations. Before commencing bunkering operations, ensure that:

- The scuppers/wash ports are firmly plugged/sealed
- Bunker connections not in use are well blanked
- The bunker connection has been provided with a good seal
- There is a well-tightened bolt in every bolthole at the bunker pipe connection flange
- Drip trays are in position on decks around connections and bunker tank vents.
- The bunker hoses are in good condition, well supported and are of sufficient length to allow for movement of the vessel.
- There is effective communication established and maintained between responsible officers, so as to enable immediate shutdown if required
- The filling sequence, pumping rate and emergency shut down procedure is agreed



- Any cargo handling in progress will not hinder bunker transfer operations.

Once bunkering has commenced:

- No smoking, naked flame or hot work is permitted within 25 metres of any bunker flange and or vent pipes associated with the bunker transfer operation.
- All cargo and bunker tank hatch lids are closed.
- A constant visual watch is maintained on board the barge and on the ship receiving bunkers.
- Bunker tank contents are monitored at regular intervals.
- Sufficient absorbent material is available on site to deal with any accidental spillage.

The International Safety Guide for Oil Tankers and Terminals (ISGOTT) provides comprehensive information on the safe operation of tankers.

The person in command should ensure an adequate number of competent people familiar with the bunkering system or safe tanker operations are allocated to the ship's crew.

Crew members need to be aware of:

- the hazards associated with the cargoes onboard and the inherent dangers of cargo pumprooms;
- the carcinogenic health hazards resulting from exposure to minor concentrations of benzene vapour in the air. This hazard can result from breathing vapours of benzene containing cargoes such as gasoline, JP-4 and some crude oils;
- the safety precautions and emergency action to be taken in the event of spillage.

## 22.4 Passenger vessels

The IMO Convention for the Safety of Life at Sea (SOLAS) requires a sufficient number of trained persons to be on board for mustering and assisting untrained persons. The requirements for practice musters and drills are outlined in SOLAS Regulation III/26.

Personnel nominated on muster lists to assist passengers in emergency situations should receive additional training to enable them to perform their duties properly. The number of trained persons should always be sufficient to assist the total number of passengers who may be on board at any one time. The number of trained persons should be included on the ship's safe manning document.

The training should include:

- awareness of life-saving appliance plans and fire-control plans, and knowledge of muster lists and emergency instructions including:
  - general alarms and procedures for mustering of passengers;
  - areas of responsibility with emphasis on "own section";
- general layout of the ship with special emphasis on location of muster and embarkation stations, accesses and escape routes;
- location and use of emergency equipment relevant to the duties in paragraph 25.8.2 with emphasis on "own section" and escape routes therefrom;
- location of adult and infant life-jackets;
- location of other evacuation supplies, e.g. blankets, to be taken to survival craft;
- elementary first aid and transportation of casualties;
- communication including the use of internal communication systems, raising the alarm, alerting the passengers as well as reporting and notification.
- evacuation such as:

- the use of passenger lists or counts;
- the alarm signals;
- mustering; importance of keeping order and panic avoidance procedures;
- emergency exits;
- evacuation equipment;
- control of passengers in corridors, staircases and passageways;
- maintenance of escape routes clear of obstructions;
- assistance enroute to muster and embarkation station;
- methods available for evacuation of disabled persons and persons needing special assistance;
- restrictions on the use of elevators;
- search of accommodation spaces;
- ensuring that the passengers are suitably clothed and have donned their life-jackets correctly;
- fire situations:
  - fire detection and initial containment;
  - raising the alarm;
  - danger of smoke inhalation;
  - breathing protection;
- abandon ship situations:
  - correct use of individual survival equipment, e.g. life-jackets, immersion suits, lifebuoys, light and smoke signals etc.;
  - need for assistance to special cases;
- familiarisation by means of repeated organised guided tours on board;
- repeated participation in fire drills and lifeboat drills including transportation of simulated casualties;
- repeated exercise in use of equipment such as donning of life-jackets and appropriate protective clothing;
- repeated exercise in use of internal communication systems;
- repeated exercises in evacuation.

Where training is given in a shore-based training course, it should be supplemented by shipboard training. The training should be to the satisfaction of the flag State and some means should be established of ensuring that seafarers and relevant personnel maintain continued proficiency through periodic refresher training, drills or related work experience.

Communication skills of the nominated seafarers should be sufficient to assist passengers during an emergency, taking into account the following criteria:

- the language or languages appropriate to the principal nationalities of passengers carried on a particular route;
- the likelihood that an ability to use elementary English vocabulary for basic instructions can provide a means of communicating with a passenger in need of assistance whether or not the passenger and crew member share a common language;
- the possible need to communicate during an emergency by some other means (e.g. by demonstration, or hand signals, or calling attention the location of instructions,



muster stations, life-saving devices or evacuation routes) when verbal communication is impractical);

- the extent to which complete safety instructions have been provided to passengers in their native language or languages; and
- the languages in which emergency announcements may be broadcast during an emergency or drill to convey critical guidance to passengers and to help crew members in assisting passengers.

Before the vessel leaves port, instructions should be issued to passengers on emergency and evacuation procedures.

Where possible a short safety video should be screened shortly after embarkation of passengers.

Unambiguous emergency signs to assist passengers should be placed at the appropriate level and should be in a language understood by a majority of passengers, indicating paths to muster stations and the location of life-jacket containers. The IMO international symbols should be used for this purpose.

Lifeboat drills should be carried out in compliance with SOLAS and other life-saving appliances and equipment should be examined regularly and kept in good order. The manufacturers' instructions with respect to maintenance and replacement should always be followed.

Communications systems should be tested regularly and kept in good working order.

Man-overboard drills and procedures should be conducted regularly.

## **22.5 Liquefied natural and petroleum gas carriers**

Additional information and guidance on the operational procedures and precautions that should be taken on these vessels is available from:

- [Marine Order 17 \(Chemical tankers and gas carriers\)](#)
- Tanker Safety Guide (Liquefied Gas) published by the International Chamber of Shipping
- IMO Codes for the International Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC)
- International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels (IGF Code), and
- Liquefied Gas Handling Principles on Ships and in Terminals

Cargo pipes, valves and connections, and any point of leakage of the gas cargo, may be intensely cold. Contact with these may cause severe cold burns.

Pressure should be carefully reduced and the liquid cargo drained from any point of the cargo transfer system, including discharge lines, before any opening up or disconnecting is begun.

Some cargoes such as ammonia have a very pungent, suffocating odour and very small quantities may cause eye irritation and disorientation together with chemical burns. Seafarers should take this into account when moving about the vessel, and especially when climbing ladders and gangways. The means of access to the vessel should be such that the cargo can be closely supervised and sited as far away from the manifold area as possible. Seafarers should be aware of the location of eyewash equipment and safety showers.

Ships intended for the carriage of liquefied gas should carry only those liquids for which its construction and equipment are suitable, and which are specified on the certificate of fitness.

Shipowners should provide seafarers employed on liquefied gas carriers with appropriate training and instructions in the relevant operational and safety requirements associated with their duties and emergency situations.

Comprehensive operating instructions should be provided concerning the particular ship and cargo.

For each operation, the person in command should designate a competent officer who is familiar with the safe operation of liquefied gas carriers. The person in command should ensure that the designated officer has available an adequate number of experienced seafarers.

Particular attention is drawn to the need to:

- ensure that a full description of the cargo's physical and chemical properties is supplied with each cargo loaded;
- ensure that seafarers are made aware of the safety precautions and emergency action to be taken in the event of spillage;
- plan effective first aid treatment due to possible physical contact with liquefied gases or cold cryogenic pipelines, some of which can be at a temperature of minus 160 degrees Celsius;
- carry out emergency drills at regular intervals using personal protective equipment and safety and rescue devices.

## **22.6 Container ships**

Operators must provide seafarers with specific training in the safe operation and maintenance of on-board container cranes.

Operators should provide each ship with instruction manuals for the operation and maintenance of cargo handling equipment. A stowing and securing manual must also be provided.

Each container should be fitted with a safety approval plate specifying the country of approval, date of manufacture, identification number, maximum operating gross weights, allowable stacking weight, transverse racking and test load value.

The stack height of containers should take account of their design strength and also not impair visibility from the bridge. The number of tiers on deck or in the hold should not exceed the design limitation of both the vessel and the container.

When carrying containers on a hatch cover the strength of the hatch cover should not be exceeded. Covers should be restrained against sliding and tipping by approved type stoppers and locking devices.

Containers stowed on deck should be secured to the ship, for example, by stacking cones and twist locks. Twist locks can be used effectively when containers are stowed one or two high, especially if the container in the second tier is either light loaded or empty. Care should be taken that twist locks are placed in the correct way and locked. When the number of tiers on deck exceeds two, stacking cones and wire or steel rod lashings should be used.

All containers should be effectively secured, preferably at the bottom corners, in a way that will prevent them sliding.

No restraint system should be imposed on containers, or any of their fittings, which create forces in excess of those for which they have been designed.

In the handling of containers, attention should be paid to the possibility of uneven or poorly distributed loading or incorrectly declared weight.

Heavy items of machinery or plant that are stored on flats may need to be further secured by additional lashings.

Safe means should be provided for access to containers stacked on deck to check lashings. Where practicable, seafarers should be protected from falling by the use of a properly secured safety harness or by other suitable arrangements.

Where the ship's electrical supply is used for refrigerated containers, the supply cables should be provided with proper connection for the power circuits and for earthing the container. Before the supply is used, cables and connections should be inspected and any defects repaired and tested by a competent person. Supply cables should be handled only if the power is switched off.

Seafarers should be aware that a container may drop as a result of failure of cargo handling equipment and that the structure of a container itself may fail due to overloading or damage during cargo operations. This may result in the contents of the container spilling out and falling on deck.

Seafarers should be aware that loose lashing gear, particularly twistlocks and lashing gear inadvertently dropped during cargo operations, pose a considerable danger.

All deck areas and the tops of containers should be checked for loose lashing gear after cargo operations have been completed.

If a container is leaking, the contents should first be identified from its placarding and from the documentation carried on board the ship.

Freight containers should be hoisted vertically and with the aid of the correct spreader.

Containers should never be lifted with the aid of wire slings alone, as deformation of the container may occur which renders it unsuitable for replacing in cell guides and/or handling by specialised equipment.

## **22.7 Bulk chemical tankers**

Aspects of section 22.3 may also apply to this section.

Additional information and guidance can be obtained from, Marine Order 17 (Chemical tankers and gas carriers).

A bulk chemical tanker may be dedicated to the carriage of one or a small number of products or it may be constructed with a large number of cargo tanks in which numerous products are carried simultaneously side by side.

The products carried range from the so-called non-hazardous to those that are extremely flammable, toxic or corrosive, or have a combination of these properties, or that possess other hazardous characteristics.

IMO has produced codes (International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) and Interpretations of the IMO Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code)) for the construction and equipment of ships carrying dangerous chemicals in bulk. The codes are statutory under merchant shipping regulations. Ships carrying cargoes in bulk that are listed in the IBC Code must display for the information of all on board any data necessary for the safe carriage of the cargo, including action to be taken in the event of spills and leaks, countermeasures against accidental personal contact, and firefighting procedures and firefighting media.

All seafarers should be trained in the use of relevant PPE and in emergency procedures. Guidance on general operational procedures and precautions that should be followed on chemical tankers is given in the Tanker Safety Guide (Chemicals) published by the International Chamber of Shipping. This publication, together with the codes referred to in earlier chapters and any special safety requirements issued by the operator should be available on board.

Ships intended for the carriage of chemicals should carry only those chemicals for which their construction and equipment are suitable, and which are specified on the certificate of fitness.

It is important to have comprehensive information on the safe operation of chemical tankers. Only approved documentation should be used. SDS must be provided and be freely available for all chemical cargoes carried.

Shipowners should provide seafarers employed on chemical tankers with specialised training and instructions in the safe carriage of all chemicals which the ship may be required to carry and the relevant operational and safety requirements associated with their duties and emergency situations.

For each operation the person in command should designate a competent officer who is familiar with the safe operation of chemical tankers. The person in command should ensure that the designated officer has available an adequate number of experienced seafarers.

Particular attention is drawn to the need to:

- ensure that any cargo offered is listed in the shipping documents by the correct technical name;
- ensure that where a cargo is a mixture, an analysis is provided indicating the dangerous components which contribute significantly to the hazard of the product. This information should be available on board, and freely accessible to all concerned;
- ensure that a full description of a cargo's physical and chemical properties is supplied with each cargo loaded;
- ensure that seafarers are made aware of the safety precautions and emergency action to be taken in the event of spillage or crew exposure to possible contamination by chemicals;
- ensure that cargoes requiring stabilisers or inhibitors, and which are not accompanied by the required certificates, are not accepted for shipment;
- carry out emergency drills using protective equipment and safety and rescue devices at regular intervals;
- plan effective first aid treatment in the event of accidental personal contact.

## APPENDIX A: DEFINITIONS AND ABBREVIATIONS

**AMSA** means Australian Maritime Safety Authority.

**Authorised person** means an authorising officer is appropriately trained and appointed in writing by the superintendent / senior officer or engineer to carry out work as permitted.

**Competent person** means a person having the relevant training, qualification, experience, knowledge and skills, to perform particular tasks.

**Dangerous occurrence** is an incident that could have caused the death, serious injury or incapacity of a person, but which did not have that outcome.

**Earthed** means connected to the general mass of earth in such a manner that will ensure an immediate discharge of electrical energy without danger.

**Electro Technical Officer (ETO)** means a specialist electrical, electronic and control system engineer certified in accordance with STCW Regulation.

**Health and safety representative** means a seafarer selected in accordance with section 41 of the OHS(MI) Act.

**ILO** means the International Labour Organization.

**IMDG Code** means International Maritime Dangerous Goods Code as defined in Marine Order 41.

**IMO** means the International Maritime Organization.

**IMSBC Code** means the International Maritime Solid Bulk Cargoes Code.

**Incident** has the same meaning as in section 10 of the Occupational Health and Safety (Maritime Industry) Regulations 1995.

**ISM Code** means the International Safety Management Code as defined in Marine Order 58.

**MLC, 2006** means Maritime Labour Convention, 2006

**MARPOL** means International Convention for the Prevention of Pollution from Ships 1973, as modified and added to by the 1978 Protocol and as affected by any amendments (other than amendments not accepted by Australia) made under Article 16 of the Convention.

**OHS(MI) Act** means the Occupational Health and Safety (Maritime Industry) Act 1993.

**Operator** means the person who has management or control of the ship or unit.

**Person in command** under the OHS(MI) Act means:

- a) In relation to a prescribed ship – the person in command, or in the absence of the person in command, the person on board responsible, as agent for the operator, for the operation of the ship
- b) In relation to a prescribed unit – the person on board responsible, as agent for the operator, for the operation of the unit.

**Personal protective equipment (PPE)** anything used or worn by a person to minimise risk to the person's health or safety and includes a wide range of clothing and safety equipment.

**Safety policy** means a written document developed by an operator indicating in broad terms its commitment, aims and objectives in relation to the occupational health and safety of employees in accordance with section 12 of the OHS(MI) Act.

**Safety program** means a detailed plan designed to implement the commitment and intentions expressed in the safety policy.

**Seafarer** means any person employed or engaged in any capacity (including that of person in command) on board a ship on the business of the ship or unit. The term "seafarer" includes "employee" as given by section 4 of the OHS(MI) Act.

**Ship** means a ship engaged in trade or commerce. For the purposes of this code, the term “ship” embraces the terms “prescribed ship” and “prescribed unit” in the OHS(MI) Act.

**SOLAS** means the International Convention on Safety of Life at Sea 1974, as amended by the Protocol of 1978, and the subsequent amendments.

**STCW** means the International Convention on Standards of Training, Certification and Watchkeeping 1978, as amended.

