MARITIME
NEW ZEALAND

CODE OF SAFE WORKING PRACTICES
FOR MERCHANT SEAFARERS

2007

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Maritime New Zealand

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PREFACE

This *Code of Safe Working Practices for Merchant Seafarers* is aimed at seafarers on New Zealand registered SOLAS ships.

Copies of this Code should be carried on all New Zealand registered vessels and made available to any seafarer who requests it.

The Code reflects the requirements of the Health and Safety in Employment Act 1992 (HSE Act), the Maritime Transport Act 1994 (MT Act), the Maritime Rules and the Marine Protection Rules.

Although the Code is intended primarily for seafarers, the practices recommended apply to both employers and employees alike, and it can be effective only if all understand it and co-operate in its implementation.

The Code is divided into four key sections:

- Section 1 deals with safety management and the statutory duties underpinning the advice in the remainder of the Code
- Section 2 sets out the safety procedures that should be brought to the attention of new recruits
- Section 3 is concerned with various working practices common to all ships
- Section 4 covers safety for specialist ship operations.

Maritime New Zealand wish to acknowledge the United Kingdom Maritime and Coastguard Agency, who made their Code of Practice available, and which this document is based upon. We would also like to thank the members of the maritime industry for their work in the production of this Code.

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Director
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CHAPTER 1: HAZARD IDENTIFICATION

1.1 Introduction

Employers are required under the Health and Safety in Employment Act 1992 (HSE Act) to ensure the health and safety of employees and other persons, by the application of certain principles, which include the identification of hazards and their management.

Assessment requirements

Employers are required to make systematic and thorough assessments that should include physical inspections of the workplace, analyses of tasks and processes as well as references to previous near miss incidents.

Keys points to note are that:

- the method used in the hazard identification process should be written down to record the fact that the employer is meeting their obligations and for future review
- the assessment should extend to others on board ship who may be affected by acts or omissions of the employer
- procedures must be reviewed regularly to ensure that the hazard identification systems are working satisfactorily and are still valid.

Reporting hazards

Everyone on board must be informed about and understand the risks from identified hazards and the measures taken to manage them.

Every employer and every self-employed person on board ship is required to inform the owner of the ship (or the person who has assumed responsibility for the operation of the ship from the owner) of any hazards to health and safety arising from the conduct of their business.

Employers' response

Employers must ensure that measures are taken to ensure an improvement in the safety and health of employees and other persons in respect of those hazards identified by the assessment.

1.2 The principles of hazard identification and management

A **hazard** is any activity, situation or substance that can cause harm. Hazards can:

- be actual or potential
- be physical, biological or behavioural, including temporary conditions such as fatigue, shock, alcohol or drugs
- arise or be caused within or outside a place of work.

Overall, the aim is to minimise accidents and ill health on board ship.

An **assessment** should first establish what (if any) hazards are present at the place of work and then identify the most effective way to manage them.

The assessment will depend on the type of ship, the nature of operations and the type and extent of the hazards and risks. The process should be simple, but meaningful.

The **preferred action** is to eliminate the hazard so that it no longer poses a risk to safety. If this can't reasonably be done, the hazard should be isolated. If this can't reasonably be done, the danger posed by the hazard must be minimised.

1.3 Good practice: what, how and who?

Everything in the workplace needs to be looked at as a potential hazard. And, employees and employers must work together to achieve the best health and safety outcomes.

The process should be systematic, thorough and the assessment methods employed should be recorded to show that the employer's obligations have been met.

Employers

In all cases, individual employers have responsibility for assessing the risks to their employees and other persons who may be affected by their activities. The employer will be responsible for co-ordinating hazard identification and management. The HSE Act requires employers to give employees, ie the crew, reasonable opportunities to be involved in the process.

Employees

Employees are obviously well placed to advise employers about actual or potential hazards that arise in the course of their work.

An employee, who has been elected as a health and safety representative, can formally bring the employer's attention to hazards in the workplace and discuss ways that they may be dealt with.

1.4 Assessments: how and when?

Hazards need to be assessed to determine whether or not they are significant. A "significant" hazard is an actual or potential source of serious harm or harm that is more than trivial – this harm may not necessarily occur or be detectable until some time after exposure to the hazard.

While all hazards should be identified and appropriately managed, the HSE Act describes an order of action for managing significant hazards based on **elimination**, **isolation** or **minimisation**.

When to assess?

Hazard identification should be seen as a continuous process. In practice, the risks to health and safety in the workplace should be assessed before work begins on any task for which no valid hazard identification exists.

In addition, an assessment must be reviewed and updated as necessary, to ensure that it reflects any significant changes of equipment or procedure.

Hazard identification example

Employers may wish to use a simple process to record the findings of an assessment.

For example, Appendix Five of the MNZ *Health and Safety A Guide* illustrates a six-stage approach, in brief:

1. **Background** – is this hazard significant and why?
2. **Elimination** – can the hazard be eliminated and if so, what steps are required to achieve this?
3. **Isolation** – can the hazard be isolated and if so, what steps are required to achieve this?
4. **Minimise** – list the steps you will take to minimise the likelihood of harm; and the equipment and clothing required to protect employees from harm
5. **Review and monitoring** – have you tested your answers against the all practicable steps requirement? How will the employees' exposure to the hazard be monitored? How will you review the success of your control measures?
6. **Sign-off**.

1.5 Hazard identification: practical steps

These three simple questions help to identify a potential hazard:
1. Is there a source of harm?
2. Who (or what) could be harmed?
3. How could harm occur?

Hazards that clearly possess little potential for harm should not be documented or given further consideration, provided that appropriate control measures remain in place.

To help identify hazards, it's useful to categorise hazards, for example by topic:
- mechanical
- electrical
- physical
- radiation
- substances
- fire and explosion.

And it's also useful to develop a checklist, ie during work activities could the following hazards exist?
- slips/falls on the level
- falls of persons from a height
- falls of tools or materials from a height
- inadequate headroom
- inadequate ventilation
- hazards from plant and machinery associated with assembly, commissioning, operation, maintenance, modification, repair and dismantling
- hazards from manual handling.

This list is not exhaustive, and employers should develop their own checklist taking into account their particular circumstances.

1.6 Determine the significance of a hazard

The risk from the hazard may be determined by estimating:
1. the potential severity of harm; and
2. the likelihood that harm will occur.

These two components should be judged independently.

1. Determine the potential severity of harm

When establishing the potential severity of harm, you should consider:
- part(s) of the body likely to be affected
- nature of the harm, ranging from harmful to seriously harmful:

Harmful examples

Superficial injuries
Minor cuts and bruises
Eye irritation from dust or nuisance and irritation
Headaches
Ill-health leading to temporary discomfort

Seriously harmful examples

Any harm that requires hospital treatment for 48 hours or more within 7 days of the harm's occurrence is likely to be an example of serious harm.

Specific examples of serious harm include the following:

- the permanent loss of bodily function or temporary severe loss of body function due to any of the following: respiratory disease, noise induced hearing loss, neurological disease, cancer, dermatological disease, communicable disease, musculoskeletal disease, illness from exposure to infected material, decompression sickness, poisoning, vision impairment, chemical or hot metal burns to the eye or penetration wound to the eye, bone fracture, laceration, crushing
- amputation, burns requiring specialist treatment, loss of consciousness due to lack of oxygen or acute illness.

2. Establish the likelihood of harm

To establish the likelihood of harm, the adequacy of control measures already in place should be considered. Legal requirements and guidance in this Code and other safety publications are good guides to adequate control of specific hazards.

The following issues should then typically be assessed:

- number of personnel exposed
- frequency and duration of exposure to the hazard
- effects of failure of power or water supply
- effects of failure of plant and machinery components and safety devices
- exposure to the elements
- protection afforded by personal protective equipment and its limitations
- possibility of unsafe acts by persons for example, who:
  - may not know what the hazards are
  - may not have the knowledge, physical capacity, or skills to do the work
  - underestimate risks to which they are exposed
  - underestimate the practicality and utility of safe working methods.

The likelihood of harm can be assessed as **highly unlikely**, **unlikely** or **likely**.

Any given hazard is more serious if it affects a greater number of people, however, some more serious hazards may be associated with an occasional task carried out by just one person, eg maintenance of inaccessible parts of lifting equipment.

1.7 Decide if risk is tolerable

The table below shows a simple method for estimating risk broken down into likelihood and severity. Employers may develop other methods according to the nature of their operations.

	HARMFUL	SERIOUSLY HARMFUL
Very unlikely	Tolerable risk	Moderate risk
Unlikely	Moderate risk	Substantial risk
Likely	Substantial risk	Intolerable risk

1.8 Prepare a risk control action plan

Having determined the significant risks, the next step is to decide what action should be taken to improve safety, taking account of precautions and controls already in place.

Risk categories form the basis for deciding whether improved controls are required and the timescale for action.

The table below provides a simple approach – basically that the effort made to control risk should reflect the seriousness of that risk.

ACTION AND TIMESCALE

TOLERABLE
No additional controls are required.
Consideration may be given to a more cost effective solution or improvement that imposes no additional cost burden.
Monitoring is required to ensure that the controls are maintained

MODERATE
Efforts should be made to reduce the risk, but the costs of prevention should be carefully measured and limited.
Risk reduction measures should be implemented within a defined time period.
Where the moderate risk is associated with extremely harmful consequences, further assessment may be necessary to establish more precisely the likelihood of harm as a basis for determining the need for improved control measures.

SUBSTANTIAL
Work should not be started until the risk has been reduced. Considerable resources may have to be allocated to reduce the risk. Where the risk involves work in progress, urgent action should be taken.

INTOLERABLE
Work should not be started or continued until the risk has been reduced. If it is not possible to reduce the risk even with unlimited resources, work has to remain prohibited.

Note: “Tolerable” here means that the risk has been reduced to the lowest level that is reasonably practicable.

The outcome of a risk assessment should be an inventory of actions, in priority order, to devise, maintain or improve controls.

In addition to emergency and evacuation plans, it may be necessary to provide emergency equipment relevant to the specific hazards.

1.9 Review adequacy of action plan

Any action plan should be reviewed before implementation, typically by asking:

- will the revised controls lead to tolerable risk levels?
- are new hazards created?
- what do people affected think about the need for, and practicality of, the revised preventive measures?
- will the revised controls be used in practice, and not ignored in the face of, for example, pressures to get the job done?

CHAPTER 2: HEALTH SURVEILLANCE

2.1 Duty of employers

Where there are no practical steps that may be taken to eliminate or isolate a significant hazard, the employer must, among other things, obtain the employee's consent to the monitoring of their health and the monitoring of their exposure to that hazard.

Health surveillance is a means of identifying early signs of ill health caused by occupational hazards so that action can be taken to protect individuals at an early stage from further harm.

Health surveillance is not a substitute for measures to control risks to health and safety. Control measures should always be the first consideration to reduce risk.

Once it is decided that health surveillance is appropriate, it should be maintained while the employee remains exposed to the hazard(s) in question. An employee's health surveillance records should, where possible, be retained even when the employee changes employment.

2.2 Health surveillance in practice

Health surveillance may involve one or more of the following, as applicable:

- inspection of readily detectable conditions, eg skin damage by a person acting within the limits of their training and experience
- enquiries about symptoms
- hearing checks (audiometry)
- medical examinations or company health checks
- testing blood or urine samples.

The frequency of such checks should be determined on the basis of suitable general guidance, eg skin inspection for skin damage.

The employees concerned could be given an explanation of the purpose of health surveillance and an opportunity to comment on the proposed frequency of such procedures, either directly or through their health and safety representatives.

2.3 Medical surveillance

Where medical surveillance is required, and it is necessary to take samples or record other personal information, it is essential that confidentiality is maintained in respect of individual health records containing clinical information.

If an employee has been so harmed by exposure to a significant hazard that the approved medial practitioner believes that the employee should cease doing anything that may worsen the condition, a medical certificate should be issued to the employee and the employer to ensure that work ceases. Approved medical practitioners are appointed by the Director Maritime New Zealand under Maritime Rules Part 34.3.

Where the health of an employee could be affected by their continuing work, the approved medical practitioner should examine the employee's fitness for work taking into account that:

- a particular work activity may cause ill health
- an identifiable disease or adverse health condition is related to the work
- recognised testing methods are available for early detection of an occupational disease or condition, eg audiometry, skin inspection where dermatitis is a hazard

- there is a reasonable likelihood that a disease or condition may occur in relation to particular working conditions
- surveillance is likely to further the protection of the employee's health

A list of approved medical practitioners is available on the Maritime New Zealand website: www.maritimenz.govt.nz

CHAPTER 3: RESPONSIBILITIES FOR SAFETY

3.1 Employers, employees, self employed and principals

Every person on board has a responsibility for safety.

You have responsibilities under the HSE Act if you:

- work on a New Zealand registered vessel under a New Zealand based contract as either a contractor or an employee
- engage or employ individuals to work on a New Zealand registered vessel
- are an employee or contractor on a foreign vessel carrying coastal cargo on demise charter to a New Zealand operator or working on a foreign ship carrying petroleum in New Zealand waters
- are a pilot, ship's agent, stevedore, waterside worker, provedore, surveyor or contractor or anyone who has been contracted to work on board
- own or are working on a New Zealand registered vessel out of New Zealand waters which employs staff or contractors.

In particular, the employer (person who pays the wages) must take all practicable steps to ensure that the ship and the persons who work on it are safe.

The master controls the workplace and must ensure that any hazards do not cause any harm to people who are lawfully at work or visiting.

Crew members must take all practicable steps to ensure their own health and safety.

Employer duties

Every employer is expected to

- systematically identify hazards
- eliminate, isolate or minimise hazards
- develop and maintain emergency procedures
- provide protective clothing and equipment
- provide safety information to employees
- provide training or supervision
- keep a register of accidents and incidents related to personal harm in the workplace
- notify Maritime New Zealand all cases of serious harm to employees
- monitor the health of employees to determine whether their work methods or environment are having a detrimental effect
- enable employees to contribute to health and safety
- take all practical steps to ensure that no action or inaction on the part of employees has a detrimental effect on the health and safety of any other person
- allow a health and safety representative two days' paid leave each year to attend health and safety training.

Employee duties

Crew who are paid wages are defined as employees and they must:

- take all practical steps to ensure their own health and safety and that of other persons
- use protective equipment and clothing
- not undertake work that is unsafe
- make unsafe situations safe or if this is not possible they should inform supervisor or manager
- be familiar with and follow emergency procedures
- report work related accidents, illnesses, injuries and hazards
- co-operate with monitoring of hazards and health

- comply with any improvement and prohibition notices
- refuse to do work if they believe it is likely to cause them serious harm.

Self-employed persons' duties

Self-employed persons must:

- take all reasonably practical steps to ensure that nothing they do harms themselves or any other persons
- consider health and safety matters in planning work activities
- keep a register of accidents and incidents related to personal harm in the workplace
- advise Maritime New Zealand when an accident involving serious harm occurs.

A principal's duties

A principal is a person who hires contractors and a principal must:

- make sure that no contractor or subcontractor and no employee of a contractor or subcontractor is harmed while doing any work they have been engaged to do
- include health and safety issues in the contract and discuss them with the contractors
- keep a register of accidents and incidents related to personal harm in the workplace
- advise Maritime New Zealand when an accident involving serious harm occurs.

3.2 Employee participation

Every employer must allow employees to participate in processes for improving health and safety.

Employers and employees need to co-operate in good faith to achieve effective health and safety outcomes. Good faith requires openness, honesty and understanding with an acknowledgement that all involved have a legitimate interest in developing a safety culture.

The HSE Act does not impose any particular system of employee participation and if an agreed system exists, there is no need to replace it. The HSE Act sets out examples of what may be included in an agreed system (Schedule 1A).

A health and safety representative is an employee elected as an individual or as a member of a health and safety committee or both to represent the views of employees in relation to health and safety at work.

An election must involve candidates who work sufficiently regularly and for a sufficient duration to enable them to carry out their functions effectively and they must be willing to take on the position.

In addition, when electing a health and safety representative:

- the election must be conducted through a secret ballot
- the election must give all employees in a relevant grouping an opportunity to vote
- the outcome must be determined by the wishes of the majority who vote.

The parties to an agreed employee participation system may wish to consider the following functions of health and safety representatives, such as to:

- foster positive health and safety management practices
- identify hazards and bring them to the attention of the employer and to discuss ways of managing them
- consult with inspectors on health and safety issues
- promote the interest of employees in health and safety issues generally and in particular to help those employees who have been harmed to undergo rehabilitation so that they may return to work.

Health and safety representatives should:

- put forward their views and recommendations in a firm but reasonable and helpful manner
- be sure of the facts

- be aware of the legal position
- be conscious of what is reasonably practicable
- (having made recommendations they should) request to be kept informed of any follow-up actions taken, or the reasons why such action was not possible.

A health and safety representative should be given reasonable time to carry out the role and be provided with the necessary resources. The representative is entitled to paid leave each year to attend approved courses.

The assessment as to whether or not a hazard is significant and thus how it should be managed is effectively a matter for the employer's judgement although employers and employees should endeavour to co-operate in the process in good faith.

3.3 Hazard notices

A hazard notice describes a hazard identified in a place of work and may set out suggested steps to manage the hazard.

If a health and safety representative has reasonable grounds to believe a hazard exists and brings it to the notice of an employer who then refuses to discuss or take steps to deal with it, a hazard notice may be issued to the employer on the prescribed form. The hazard notice form is available to download from the website: www.osh.govt.nz (go to "Resources" and then "Forms").

The HSE Act requires employers to record all accidents and incidents and investigate them to determine whether or not they were caused by significant hazards.

The Act also requires accidents involving serious harm to be reported to Maritime New Zealand.

It may sometimes be appropriate for employers to inform other ships in their fleet of an incident, and give appropriate recommendations on action to be taken, in accordance with the company's safety management system.

Right to refuse work

Employees can refuse work that they believe is likely to cause them serious harm. If such work involves emergency action that itself may involve a risk of serious harm, then employees may only refuse to work if the danger has become greater than is usual under such circumstances.

3.4 Safety committees

If a safety committee is formed to implement the employee participation element of health and safety on board, it should form the basis of consultation between the master, the employee representative and others. It may be used by employers for consultation with the company and with employees.

Its effectiveness will depend on the commitment of its members, in particular that of the master. Because of its broad membership, the committee has the means to take effective action in all matters which it discusses other than those requiring the authorisation of the company and employer.
The frequency of meetings will be determined by circumstances but as a general guideline, the committee should meet about every 4-6 weeks.

Agenda

An agenda (together with any associated documents and papers, and the minutes of the previous meeting) should be circulated to all committee members in time for them to digest the contents and prepare for the meeting.

If there is a particularly long agenda, it may be better to hold two meetings in fairly quick succession rather than one long one. If two meetings are held, priority at the first meeting should be given to the most urgent matters.

The first item on the agenda should always be the minutes of the previous meeting. This allows any correction to the minutes to be recorded and gives the opportunity to report any follow-up action taken.

The last item but one should be "any other business". This enables last minute items to be introduced, and prevents the written agenda being a stop on discussion.

The last item on the agenda should be the date, time and place of the next meeting.

Minutes

Minutes of each meeting should record concisely the business discussed and conclusions reached. A copy should be provided to each committee member. Normally, they should be agreed as a true record at the next meeting, or amended if necessary, under the first item of the agenda.

A minutes file or book should be maintained, together with summary of recommendations recording conclusions reached, to provide a permanent source of reference and ensure continuity if there are changes in personnel serving on the committee.

All personnel should be kept informed on matters of interest that have been discussed, eg by posting summaries or extracts from the minutes on the ship's notice boards. Suggestions may be stimulated by similarly posting the agenda in advance of meetings.

Relevant extracts of agreed minutes should be forwarded through the master to the company and, where appropriate, individual employers, even when the matters referred to have already been taken up with them.

3.5 Accident investigation

The investigation of accidents and incidents plays a very important part in safety. It is by the identification and study of accidents, principally through the publicity given to Maritime New Zealand's and the Transport Accident Investigation Commission's accident reporting conclusions, that similar events may be prevented in future.

The statutory requirements regarding accident reporting are set out in the MT Act and in the HSE Act.

The master is responsible for the statutory reporting of all accidents resulting in the death of or serious harm to a person or any other accident or incident to Maritime New Zealand as soon as practicable.

The HSE Act requires the employer to instigate a review of hazard identification and control procedures following an accident to ensure that the cause of the accident has been adequately determined and the hazard managed appropriately.

CHAPTER 4: PERSONAL PROTECTIVE EQUIPMENT

Risks to the health and safety of employees must be identified and assessed. It's often not possible to remove all risks but attention should be given to control measures that make the working environment and methods as safe as reasonably practicable.

Personal protective equipment must be used only when risks cannot be avoided or reduced to an acceptable level by safe working practices that cause no health risk to any employee. This is because personal protective equipment does nothing to reduce the hazard and can only protect the person wearing it, leaving others vulnerable.

It should be noted that the use of personal protective equipment may in itself cause a hazard, eg through reduced field of vision, loss of dexterity or agility.

4.1 Duties of employers and employees

Employers

It is the responsibility of the employer to ensure that employees are provided with suitable personal protective equipment where it is needed.

As a general rule, personal protective equipment should be supplied at no cost to the employee.

Employers should assess the equipment required to ensure that it is suitable and effective for the task in question, and meets the appropriate standards of design and manufacture.

Suitable equipment should:

- be appropriate for the risks involved and the task being performed, without itself leading to any significant increased risk
- fit correctly after any necessary adjustment
- take account of ergonomic requirements and the wearer's state of health
- be compatible with any other equipment in use at the same time, so that it continues to be effective against the risk.

Personal protective equipment must be supplied wherever risk assessment indicates that there is a risk to health and safety from a work process, which cannot be adequately controlled by other means, but which can be alleviated by the provision of such clothing or equipment.

The employer is also required to ensure that personal protective equipment is regularly checked and maintained or serviced. Records should be maintained of servicing and any repair required and carried out.

All employees who may be required to use protective equipment must be properly trained in its use. This should include being advised of its limitations. A record should be kept of who has received training.

Defective or ineffective protective equipment provides no defence. It is therefore essential that the correct items of equipment are selected and that they are properly maintained at all times. The manufacturer's instructions should be kept safe with the relevant apparatus and if necessary referred to before use and when maintenance is carried out. Personal protective equipment should be kept clean and should be disinfected as and when necessary for health reasons.

Employees

Employees must wear the protective equipment or clothing supplied when they are carrying out a task for which it is provided, and follow appropriate instructions for use.

Personal protective equipment should always be checked by the wearer each time before use.

Employees should comply with the training they have received in the use of protective items, and follow the manufacturer's instructions for use.

4.2 Types of equipment

Overalls, gloves and suitable footwear are the proper working dress for most work about ship but these may not give adequate protection against particular hazards in particular jobs. There will be other occasions when the need for such special protection will be identified by the risk assessment carried out by the officer in charge at that particular time.

Personal protective equipment must always be chosen according to the hazard being faced and the kind of work being undertaken, in accordance with the findings of the risk assessment. It can be classified as follows:

TYPE	EXAMPLES
Head protection	Safety helmets, bump caps hair protection
Hearing protection	Ear muffs, ear plugs
Face and eye protection	Goggles and spectacles, facial shields
Respiratory protective equipment	Dust masks, respirators, breathing apparatus
Hand and foot protection	Gloves, safety boots and shoes
Body protection	Safety suits, safety belts, harnesses, aprons, high visibility clothing
Protection against drowning	Lifejackets, buoyancy aids and lifebuoys
Protection against hypothermia	Immersion suits and anti-exposure

4.2 Head protection

Safety helmets are most commonly provided as protection against falling objects. They can also protect against crushing or a sideways blow and chemical splashes.

The hazards may vary and no one type of helmet is ideal as protection in every case. Design details are normally decided by the manufacturer whose primary consideration will be compliance with an appropriate standard. The standard selected should reflect the findings of the risk assessment.

Safety equipment should be used in accordance with manufacturers' instructions.

Helmets

The shell of a helmet should be of one piece seamless construction designed to resist impact. The harness or suspension when properly adjusted forms a cradle for supporting the protector on the wearer's head. The crown straps help absorb the force of impact. They are designed to permit a clearance of approximately 25 mm between the shell and the skull of the wearer. The harness or suspension should be properly adjusted before a helmet is worn.

Bump cap

A bump cap is simply an ordinary cap with a hard penetration-resistant shell. They are useful as protection against bruising and abrasion when working in confined spaces such as a main engine crankcase or a double bottom tank. They do not, however, afford the same protection as safety helmets and are intended only to protect against minor knocks.

Hair

Personnel working on or near to moving machinery have always to be on their guard against the possibility of their hair becoming entangled in the machinery. Long hair should always be covered by a hair net or safety cap when working with or near moving machinery.

4.3 Hearing protection

All persons exposed to high levels of noise, eg in machinery spaces, should wear ear protection of a type recommended as suitable for the particular circumstances. Protectors are of three types – ear plugs, disposable or permanent, and ear muffs.

Ear plugs

The simplest form of ear protection is the ear plug. However, ear plugs have the disadvantage of limited capability of noise level reduction. Ear plugs of rubber or plastic have only limited effect, in that extremes of high or low frequency cause the plug to vibrate in the ear canal causing a consequential loss in protection.

Disposable ear plugs are recommended because it may be difficult to keep re-usable ear plugs clean on a ship. Ear plugs should never be used by anyone with ear trouble without medical advice.

Ear muffs

In general, ear muffs provide a more effective form of hearing protection. They consist of a pair of rigid cups designed to completely envelope the ears, fitted with soft sealing rings to fit closely against the head around the ears. The ear cups are connected by a spring loaded headband (or neck band) that ensures that the sound seals around the ears are maintained.

Different types are available and provision should be made according to the circumstances of use and expert advice.

4.4 Face and eye protection

The main causes of eye injury are:

- infra-red rays – gas welding
- ultra-violet rays – electric welding
- exposure to chemicals
- exposure to particles and foreign bodies.

A wide variety of protectors are available, designed to international standard specifications, to protect against these different types of hazard.

Ordinary 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.

4.5 Respiratory protective equipment

Respiratory protective equipment is essential for protection when work has to be done in conditions of irritating, dangerous or poisonous dust, fumes or gases.

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

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

Advice on the selection, use and maintenance of the equipment is contained in the relevant standard. This should be available to all those concerned with the use of respiratory protective equipment on board ship.

It is most important that the face-piece of respirators and breathing apparatus is fitted correctly to avoid leakage. The wearing of spectacles (unless adequately designed for that purpose) or of beards is likely to adversely affect the face seat. This is a particularly important consideration in emergency situations.

Respirators

The respirator selected must be of a type designed to protect against the hazards being met.

- The **dust respirator** gives protection against dusts and aerosol sprays but not against gases. There are many types of dust respirator available but they are generally of the ori-nasal type, ie half-masks covering nose and mouth. Many types of light, simple face masks are also available and are extremely useful for protecting against dust nuisance and non-toxic sprays but should never be used in place or proper protection against harmful dusts or sprays.
- The **positive pressure powered dust respirator** incorporates a battery-powered blower unit, connected by a tube to the face mask to create a positive pressure in the face-piece. This makes breathing easier and reduces face-seal leakage.
- The **cartridge-type respirator** consists of a full face-piece or half mask connected to a replaceable cartridge containing absorbent or absorbent material and a particulate filter. It is designed to provide protection against low concentrations of certain relatively non-toxic gases and vapours.
- The **canister-type respirator** incorporates a full face-piece connected to an absorbent or absorbent material contained in a replaceable canister carried in a sling on the back or side of the wearer. This type gives considerably more protection than the cartridge type.

The filters, canisters and cartridges incorporated in respirators are designed to provide protection against certain specified dusts or gases. It is important that the appropriate type is selected for the particular circumstances or conditions being encountered.

In addition, they have a limited effective life and must be replaced or renewed at intervals in accordance with manufacturer's instructions.

A key point is that **respirators provide no protection against oxygen deficient atmosphere**.

They should never be used to provide protection in confined spaces such as tanks, cofferdams, double bottoms or other similar spaces against dangerous fumes, gases or vapours.
Only breathing apparatus (self-contained or airline) is capable of giving protection in such circumstances.

Breathing apparatus

The type of breathing apparatus to be used when entering a space that is known to be, or suspected of being deficient in oxygen or containing toxic gas or vapours is given in a later section.

Breathing apparatus should not be used underwater unless the equipment is suitable for the purpose, and then only in an emergency.

Resuscitators

It is recommended that resuscitators of an appropriate kind should be provided when any person may be required to enter a dangerous space.

4.6 Hand and foot protection

Gloves

The exact type of glove selected will depend on the kind of work being undertaken or the particular substance being handled, and in these cases expert advice should be followed.

The following are general rules:

1. Leather gloves should be used when handling rough or sharp objects
2. Heat-resistant gloves should be used when handling hot objects
3. Rubber, synthetic or PVC gloves are generally best for handling acids, alkalis, various types of oils, solvents and chemicals in general.

Footwear

Foot injuries most often result from the wearing of unsuitable footwear, eg sandals, plimsolls and flip-flops or jandals) rather than from failure to wear safety shoes and boots. It is nevertheless strongly advisable that all personnel while at work on board ship wear appropriate safety footwear.

Injuries are commonly caused by impact, penetration through the sole, slipping, heat and crushing. Safety footwear is available which is designed to protect against these or other specific hazards identified in the risk assessment, manufactured to various standards appropriate to the particular danger involved.

4.7 Protection from falls

All personnel who are working aloft, outboard or below decks or in any other area where there is a risk of falling, should wear a safety harness (or belt with shock absorber) attached to a lifeline. If a vessel is shipping frequent seas, nobody should be required to work on deck unless absolutely necessary.

However, where this is unavoidable, persons on deck should wear a harness and, where practicable, should be secured by lifeline as a protection from falls and from being washed overboard or against the ship's structure.

Inertial clamp devices allow more freedom of movement.

4.8 Body protection

Special outer clothing may be needed for protection when personnel are exposed to particular contaminating or corrosive substances. This clothing should be kept for the particular purpose and dealt with as directed in the relevant section of the Code.

High visibility clothing should be worn when it is important to be seen to be safe, eg during loading and unloading operations.

4.9 Protection against drowning

Where work is being carried out over the side or in an exposed position where there is a reasonable foreseeable risk of falling or being washed overboard, or where work is being carried out in or from a ship's boat, a lifebuoy with sufficient line should be provided.

In addition and as appropriate, a lifejacket or buoyancy aid should be provided. Where necessary, personnel should be provided with thermal protective clothing to reduce the risks of cold shock.

CHAPTER 5: SAFETY SIGNS

5.1 Safety signs

Any safety signs permanently erected on board the ship for the purpose of giving health and safety information or instruction must comply with the Rules according to the MT Act.

Safety signs, which include hazard warnings, should be used whenever a hazard or obstruction exists and such a sign is appropriate. Particular attention should be paid on passenger ships to hazards that may be familiar to seafarers but not to passengers.

Where a language other than English is extensively used on a ship, any text used in conjunction with a sign should also be displayed in that language.

Colours and symbols, when used appropriately, can provide information and warnings of hazards which can be understood by anyone, regardless of what language they speak. Chapter 21 gives references to signs that generally conform to international systems, where they exist, and European and Australasian wide standards.

Symbols relating to life saving appliances are governed by international standards. Those relating to fire control plans are recommended international standards.

5.2 Role of the employer and employee

Employers should ensure that safety signs are displayed where appropriate. If the employer is not in a position to provide signs, eg where the fittings of the ship are not within their control, they should ensure that signs are in place before allowing any person to start any relevant work.

The employer should also ensure that the system of signs in use is clearly understood.

All **employees** should ensure that they understand the meaning of signs and any colour coding system in use on their ship and follow the relevant safety procedures

Those aware of any deficiency in their colour vision should tell their supervisor or employer, and take extra care where colour is used as a means of identification.

CHAPTER 6: MEANS OF ACCESS AND SAFE MOVEMENT

6.1 Means of access

New Zealand legislation places an obligation on both the master of a ship and the employer of the master to ensure that a safe means of access is provided and maintained, both between the ship and the shore or another ship alongside which the ship is secured.

In carrying out the duties arising from these Rules full account must be taken of the principles and the guidance in Chapter 18: Boarding arrangements.

Where the provision of equipment is necessary to ensure safe means of access, it must be placed in position promptly, be properly rigged and deployed, safe to use and adjusted as necessary to maintain safe access.

When access equipment is provided from the shore, it is still the responsibility of the master to ensure as far as it reasonably practicable that the equipment meets these requirements.

Any access equipment and immediate approaches to it must be adequately lit.

Any equipment used for the provisions of means of access and any safety net must be fit for purpose and properly maintained. Accommodation ladders and any portable or rope ladders used for access must comply with the Rules. All access equipment should be inspected by a competent person at appropriate intervals.

A portable ladder should only be used for access to the ship where no safer access is reasonably practicable. A rope ladder should only be used between a ship with high freeboard and a ship with low freeboard or between a ship and a boat if no safer means of access is reasonably practicable.

A lifebuoy with a self-activating light and also a separate buoyant safety line attached to a quoit or some similar device must be provided ready for use at the point of access aboard the ship.

An adequate number of safety nets of a suitable size and strength are to be carried on the ship or otherwise be readily available. Where there is a risk of a person falling from the access equipment or from the quayside or ship's deck adjacent to the access equipment, a safety net shall be mounted where reasonably practicable.

Guidance on the rigging of safety nets is given in Chapter 18 of this code.

Use of equipment

When suitable access equipment is provided from the ship or from the shore or from another ship, any person boarding or leaving the ship must use that equipment.

6.2 Access for pilots

Maritime Rules require the owner to provide pilot ladders, accommodation ladders and hoists that comply with construction and testing requirements.

In addition, the Rules require the master to ensure that:

- each pilot ladder, accommodation ladder, hoist and associated equipment is properly maintained and stowed, and regularly inspected to ensure that, so far as is reasonably practicable, each is safe to use
- each pilot ladder and hoist is used only for the embarkation and disembarkation of pilots

and by officials and other persons while a ship is arriving at or leaving a port
- the rigging of the pilot ladder, accommodation ladder, hoist and associated equipment is supervised by a responsible officer who is in communication with the navigating bridge. This officer's duties will include arranging for the pilot to be escorted by a safe route to and from the bridge. Advice on safe rigging of such equipment is contained in Chapter 18 of this Code
- personnel engaged in rigging or operating any mechanical equipment are instructed in the safe procedures to be adopted and that the equipment is to be tested prior to each use.

A safety-line and harness, a lifebuoy with a self-igniting light and a heaving line should be kept at hand ready for use.

The pilot ladder or hoist and its controls, and also the position where the person embarks and disembarks on the ship should be adequately lit.

The owner and the master must ensure that there is on board a copy of the approved manufacturer's maintenance manual for the hoist, containing a maintenance log book. The hoist must be maintained in accordance with the maintenance manual, and a record kept by the responsible officer in the maintenance log book.

The master is required to ensure that the hoist is subject to regular test rigging and inspection. Such tests should be carried out by designated ship's personnel at regular intervals. All tests should be logged.

6.3 Safe movement

Maritime Rules place an obligation on both the master of a ship and the employer of the master to ensure that a safe means of access is provided and maintained to any place on the ship to which a person may be expected to go. In carrying out the duties arising from these Rules full account must be taken of the principles and the guidance in this Code.

Places on the ship where people may be expected to go include accommodation areas as well as normal places of work.

All deck surfaces used for transit about the ship and all passageways, walkways and stairs must be properly maintained and kept free from substances liable to cause a person to slip or fall.

Areas uses for the loading and unloading of cargo or for other work processes or for transit should be adequately and appropriately lit.

The employer and master are also responsible for ensuring that any permanent safety signs displayed on board the ship are clear, legible and in the appropriate language.

Any opening, open hatchway or dangerous edge into, through or over which a person may fall shall be fitted with secure guards or fencing of adequate design and construction. Advice on guardrails and safety fencing is given in Chapter 18 of this Code. These requirements do not apply where the opening is a permanent access way, or where work is in progress which could not be carried out with the guards in place.

All ship's ladders must be of good construction and sound material, strong enough for the purpose for which they are used, free from patent defect and properly maintained. Ladders providing access to the hold must comply with the standards in Annex 6.1.

Suitable hand-holds should be provided at the top and at any intermediate landing place of all fixed ladders.

The Maritime Rules also require the employer and master to ensure that ship's powered vehicles (which include mobile lifting plant) are only driven by a competent person who is authorized to do so and to ensure that they are used safely. Such vehicles must be properly maintained.

6.4 Entry into dangerous spaces

A dangerous space is "any enclosed or confined space in which it is foreseeable that the atmosphere may at some stage contain toxic or flammable gases or vapours, or be deficient in oxygen, to the extent that it may endanger the life or health of any person entering that space." A later section (17.3) of this Code gives advice on identifying these hazards.

The master is required to ensure that all unattended dangerous spaces are secured against entry, except when it is necessary to enter.

Employers must have procedures in place for entering and working in confined spaces, and it is the master's responsibility to ensure these are followed. No person should enter or remain in a dangerous space except in accordance with the set procedures.

The guidance in this Code must be taken into account both in drawing up and implementing the procedures.

ANNEX 6.1 STANDARDS FOR HOLD ACCESS

Hold access – new ships

These ships are required to be built to the requirements of a classification society and comply with the design, construction and equipment requirements of SOLAS 74.

All ships are required to comply with the SOLAS 74 requirements applicable at the time of their build plus those applying to existing ships, except New Zealand ships which operate only on the coast of New Zealand. The latter are required to comply with the SOLAS 74 requirements applicable at their time of build plus any requirements for existing ships that the Director of Maritime NZ, by notice in the *New Zealand Gazette*, directs shall apply to such ships.

The following or equivalent standards of hold access should be provided:

- the access shall be separate from the hatchway opening, and shall be by a stairway if possible
- a fixed ladder, or a line of fixed rungs, shall have no point where they fill a reverse slope
- the rungs of a fixed ladder shall be of suitable dimensions and adequate strength. Suitable dimensions could be a rung, cleat or cup at least 300 mm wide, and so shaped or arranged that a person's foot cannot slip off the ends. An example of suitable spacing for rungs is that they should be evenly spaced at intervals of not more than 300 mm and there shall be at least 150 mm clear space behind each rung
- there shall be space outside the stiles of at least 75 mm to allow a person to grip them
- there shall be a space at least 760 mm wide for the user's body, except that at a hatchway this space may be reduced to a clear space of at least 600 mm by 600 mm
- fixed vertical ladders should be provided with a safe intermediate landing platform at intervals of not more than 6 m
- where vertical ladders to lower decks are not in a direct line a safe intermediate landing shall be provided
- intermediate landings shall be of adequate width and afford a secure footing and extend from beneath the foot of the upper ladder to the point of access to the lower ladder. They shall be provided with guard rails
- fixed ladders and stairways giving access to holds shall be so placed as to minimise the risk of damage to them from cargo handling operations
- fixed ladders shall, if possible, be so placed or installed as to provide back support for a person using them; but hoops shall be fitted only where they can be protected from damage to them from cargo handling operations.

Hold access – existing ships

- Access should be provided by steps or ladder, except:
  - at coamings; and
  - where the provision of a ladder on a bulkhead or in a trunk hatchway is clearly not reasonably practicable.
- In such cases ladder cleats or cups may be used.
- All ladders between lower decks should be used in the same line as the ladder from the top deck, unless the position of the lower hatch or hatches prevent this.
- Cleats or cups should be at least 250 mm wide and so constructed as to prevent a person's foot slipping off the side.
- Each cleat, cup, step or rung of a ladder shall provide a foothold, including any space behind the ladder, at least 115 mm deep. Cargo should not be stowed as to produce this foothold.
- Ladders, which are reached by cleats or cups on a coaming, should not be recessed under the deck more than is reasonably necessary to keep the ladder clear of the hatchway.
- Shaft tunnels should be equipped with adequate handholds and footholds on each side.
- All cleats, cups, steps or rungs of ladders should provide adequate handholds.

Portable ladders

A portable ladder should only be used where no safer means of access is reasonably practicable.

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

CHAPTER 7: WORK EQUIPMENT

7.1 Health and Safety in Employment Act 1992

Employers are required to take all practicable steps to ensure that plant used by any employee at work is so arranged, designed, made and maintained that is safe for the employee to use.

The word “plant” includes appliance, equipment, fitting, furniture, implement, machine, machinery, tool and vehicle and part of any plant, the controls of any plant and anything connected to any plant.

Any equipment made available to workers should comply with any relevant standards laid down in Maritime Rules and maintained in accordance with the manufacturers’ instructions.

Equipment not covered by specific rules or type approvals should comply with the appropriate international equivalent.

The employer is responsible for ensuring that workers are properly trained to use any equipment they need to do their job.

Instruction does not necessarily have to be a formal training course. All instruction or information must be in a language that those concerned understand and communicated effectively.

7.2 Maritime Rule Part 40B

The owner of a ship must ensure that the ship has electrical installations that comply with the applicable requirements of Part A and Part D of Chapter II-I of SOLAS.

Every dangerous part of the ship’s machinery must be securely guarded, where that is necessary for the safety of anyone on board.

Exceptions are allowed for the purposes of examination, adjustment or any test that is shown to be immediately necessary. However, the following conditions must be in place:

- exposure of the dangerous part must be the minimum necessary
- a responsible ship’s officer or other responsible person must authorise the exposure
- only a competent person may carry out the examination
- any person working close to the machinery must have enough clear space and adequate lighting while they are working
- any person operating or close to the machinery must have adequate instruction in safe systems of work for that machinery, the dangers arising from its operation and the precautions to be taken; and
- a conspicuous warning notice must be displayed on or close to the machinery.

Guards and other devices provided under these regulations must be of substantial construction and properly maintained and, except as allowed above, kept in position when the relevant machinery parts are in motion.

There must be a means for taking prompt action to stop any machinery and cut off power in the event of an emergency.

All ship’s electrical equipment and installations must be constructed, installed, operated and maintained in such a way that there is no electrical hazard to the ship or any person.

7.3 Code of Practice for Health and Safety in Port Operations

Parts 2.5 and 2.6 of the above Code give guidance relating to the health and safety of employees when working in or near hatches.

7.4 Hatches

Any hatch covering must be of sound construction and material, fit for purpose, free from patent defect and properly maintained.

The master must ensure that:

- a hatch covering is only used if it can be removed and replaced without endangering personnel
- a hatch is not used unless the covering has been completely removed or properly secured
- only an competent person operates a power-operated hatch covering, except in the event of an emergency.

7.5 Lifting plant

Maritime Rule Part 49 deals with the use, handling and testing of lifting plant aboard ship.

“Lifting appliance” means (for the purposes of Maritime Rules 49.4 to 49.11 inclusive) any stationary cargo-handling appliance on board a ship used for suspending, raising or lowering loads or moving loads from one position to another while they are suspended or supported.

For the purposes of Rule 49.12 it means any appliance or gear fitted in or carried by the ship and used in the ship’s machinery spaces to lift any item associated with the operation, maintenance and servicing of such spaces.

The Rules require, amongst other things, that the owner and master of a ship must ensure that:

- a certificate of test is obtained for every lifting appliance and every item of loose gear carried on the ship and that the validity of the certificate of test is maintained
- every lifting appliance and every item of loose cargo gear carried on the ship is maintained in good repair and working order
- a person using a lifting appliance on a ship or any item of loose cargo gear carried by the ship must:
  - do so in a safe and proper manner; and
  - not load the lifting appliance or gear beyond its safe working load or loads, except for testing purposes required by Rule 49.5, in which case it must be loaded and used under the direction of a competent person
- no person may use a ship's lifting appliance or item of loose cargo gear unless there is in force for that lifting appliance or item of loose cargo gear a valid certificate of test.

Lifting plant should be kept in good, efficient working order and in good repair. Systematic preventative maintenance should be carried out, following any manufacturer’s instructions. This should include regular inspection by a competent person to assess whether the lifting plant is safe for continued use.

Guidance on safe use of lifting equipment is contained in Chapter 21 of this Code

The master is required to ensure that any one-trip sling, pre-slung cargo sling, or any pallet or similar piece of equipment for supporting loads or lifting attachment that forms an integral part of the load is not used unless it is of good construction, adequate strength for the purpose for which it is used and free from patent defect.

Only those trained and competent to do so, may operate any ship's lifting plant. The same applies to the operation of ship's ramp or a retractable car deck, except in the event of an emergency endangering health and safety.

Training should consist of theoretical instruction enabling the trainee to appreciate the factors affecting the safe operation of the lifting plant, and supervised practical work with the appropriate plant etc. Employers may issue certificates to personnel who have successfully completed training, specifying the type of appliance on which the test was carried out.

Employers should keep records of training and testing undertaken, and should ensure the routine monitoring of the competence of those operating lifting appliances.

7.6 Testing and examination of lifting equipment

The employer and the master are responsible for ensuring that:

- no lifting plant on board ship is used:
  - after manufacture or installation, or
  - after any repair or modification that is likely to alter the safe working load, or affect the lifting plant's strength or stability, without first being tested by a competent person
- no lifting appliance on board ship is used unless it has been suitably tested by a competent person within the preceding five years
- no lifting plant is used unless it has been thoroughly examined by a competent person at least once in every 12-month period.

Competent person

"Competent person" means a person, who in relation to ship's lifting appliances and loose cargo gear, is authorised to carry out any testing, thorough examination and issue of certificates of test required by this Part. They may be authorised by one of the following:

- the manufacturer of that equipment, or
- a classification society in pursuance of a scheme of classification or certification of such equipment, or
- a testing establishment recognised by:
  - (for a New Zealand ship or a foreign ship) the Director
  - (for a foreign ship) the Flag State Administration
- an international or national inspection agency approved by:
  - (for a New Zealand ship or a foreign ship) the Director
  - (for a foreign ship) the Flag State Administration
- a Flag State Administration.

Thorough examination

"Thorough examination" means a detailed visual examination by a competent person, supplemented if necessary by other means or measures of examination, to arrive at a reliable conclusion as to the safety of the lifting appliance or item of loose cargo gear examined.

The owner or master of a ship must ensure that every lifting appliance on the ship and every item of loose cargo gear carried by the ship is thoroughly examined by a competent person at least once in every 12 months.

The competent person must ensure that the completion of a satisfactory thorough examination is recorded in the register of equipment required by Rule 49.9.

If on completion of a thorough examination the competent person considers the lifting appliance or item of loose cargo gear is unsatisfactory, that lifting appliance or item of loose cargo gear must not be used until any defect is remedied to the satisfaction of a competent person.

7.7 Marking lifting equipment – Maritime Rule Part 49

The master of a ship must ensure that no lifting appliance on a ship and no item of loose cargo gear carried by the ship is used in loading or unloading a ship unless:

- the lifting appliance is clearly and permanently marked with its safe working load for each operating condition
- the item of loose cargo gear is clearly and permanently marked with its safe working load
- the safe working load or loads of a ship's lifting appliance and safe working load of loose cargo gear carried on a ship must be marked on each lifting appliance and item of loose cargo gear by a competent person, having regard to the design, strength, material of construction and proposed use of the lifting appliance or gear and the test required by Rule 49.5.

7.8 Register of equipment

The master of a ship must ensure that a register of equipment listing all the ship's lifting appliances and items of loose cargo gear, stating their safe working loads, is kept and maintained on board in accordance with the requirements of Rule Part 49.

The register must record particulars of all tests undertaken or certificates of test issued as required by Rule 49.5, examinations undertaken as required by Rule 49.6, inspections undertaken as required by Rule 49.7(1) that prove unsatisfactory, and any heat treatment, maintenance, repair or replacement of lifting appliances or loose cargo gear.

A register of equipment may be kept in any convenient form, provided each entry is clearly legible and is authenticated by the responsible person.

Rigging plan

The owner and the master of a ship fitted with derricks or cranes for working cargo must ensure that the ship has on board a fully detailed rigging plan and any other relevant information necessary to permit the safe rigging of the ship's derricks or cranes, and associated gear.

Certificates of test

Following a satisfactory test in accordance with Rule 49.5(l)(a) and a satisfactory examination in accordance with Rule 49.5(6) the competent person must issue a certificate of test in respect of that lifting appliance to the owner of the ship.

Following a satisfactory test in accordance with Rule 49.5(l)(b) and a satisfactory examination in accordance with Rule 49.5 the competent person must issue a certificate of test in respect of that item of loose cargo gear to the owner of the ship.

The certificate of test is valid for a period not exceeding five years from the date of issue, unless within that period the lifting appliance or loose cargo gear suffers a failure affecting the safe operation of the appliance or gear or undergoes a substantial alteration, in which case the certificate expires on the close of the date of the failure or alteration. If any question arises regarding the date of the failure or alteration, the date is to be determined by the Director.

The certificate must specify the date of issue, the name of the competent person issuing the certificate and the organisation authorising the competent person to issue the certificate.

Subject to Rule 49.5(7), the master of a ship must ensure that a valid certificate of test, or certified copy of the certificate of test, for each of the ship's lifting appliances and each item of loose cargo gear carried by the ship is readily available on board the ship and kept with the register of equipment.

7.9 Access to ships' holds, cargo decks and cranes

When a ship is being loaded or unloaded alongside a quay or another ship, adequate and safe means of access to the ship is required, properly installed, secured and adjusted to suit tidal conditions.

From a wharf (quay), access to the ship must be by means of a gangway with nets slung from the ship's side to the opposite side of the gangway, or an enclosed solid structure, or by other means that will prevent a person falling from the gangway and landing on the wharf or in the water.

Access to a ship's hold, cargo deck or crane may be by means of:

- a fixed stairway or where this is not practicable, a fixed ladder or cleats or cups of suitable dimensions, of adequate strength and proper construction. In no case shall any straight ladder exceed 6 m in length without a landing or rest point
- alternative means of access such as certified man cages, which may be supported by a spreader.

So far as is reasonably practicable, the means of access will be separate from the hatchway opening.

Only a competent person is to be permitted to open or close power-operated hatch covers. The hatch covers are not to be opened or closed while any person is liable to be injured by the operation of the covers.

Before loading or unloading takes place, any hatch cover or beam that is not adequately secured against displacement is to be removed.

Hatch covers and beams are not to be removed or replaced while work is in progress in the hold under the hatchway.

The provisions of this section will apply, with appropriate modification and application, to power-operated ship's equipment such as a door in the hull of a ship, a ramp, a retractable deck or similar equipment.

A safe means of escape must always be available.

7.10 Machinery

All dangerous parts of machinery are to be effectively guarded, unless they are in such a position or of such construction as to be as safe as they would be if effectively guarded.

Only an authorised person is to be permitted to:

- remove any guard where this is necessary for the purpose of the work being carried out
- remove a safety device or make it inoperative for the purpose of cleaning, adjustment or repair.

If any guard is removed, adequate precautions must be taken, and the guard shall be replaced as soon as practicable.

If any safety device is removed or made inoperative, the device will be replaced or its operation restored as soon as practicable and measures taken to ensure that the relevant equipment cannot be used or inadvertently started until the safety device has been replaced or its operation restored.

Effective means are needed for promptly cutting off the power to any machinery in an emergency.

When any cleaning, maintenance or repair work that would expose any person to danger has to be undertaken on machinery, stop the machinery before work has begun and take adequate measures to ensure that the machinery cannot be restarted until the work has been completed.

Control devices are to be secured in the inoperative position by the use of locks or lockout procedures or other equally effective means. Provided that a responsible person who is following a procedure established for carrying out of cleaning, maintenance or repair in a safe manner may restart the machinery for the purpose of any testing or adjustment which cannot be carried out while the machinery is at rest.

7.11 Holds and cargo decks

All practicable steps are to be taken to ensure the safety of employees required to be in the hold or on the cargo deck of a ship.

The industry recognises that the least number of staff involved in the hold of a ship while loading takes place is the safest option.

Loads are not to be raised or lowered unless slung or otherwise attached to the lifting machine or appliance in a safe manner.

Where a fall of more than 3 m is possible, means must be provided to prevent a fall.

Adequate measures are to be taken to protect any opening in or on a deck where employees are required to work, through which opening employees, machinery, or other articles, materials or equipment are liable to fall.

Every hatchway not fitted with a coaming of 900 mm minimum height and adequate strength shall be closed or its guard replaced when the hatchway is no longer in use, except during short interruptions of work, and a responsible person should be charged with ensuring that these measures are carried out.

Adequate arrangements, including safe means of escape, must be made for the safety of persons when dry bulk cargo is being loaded or unloaded in any hold or cargo deck, or when an employee is required to work in a bin or hopper.

Suitable personal protective clothing and equipment is to be provided, including the provision of a suitable life line and harness for employees required to work in a bin or hopper, which must be attended by another employee at all times so that emergency assistance can be given if necessary.

All necessary measures must be taken to ensure the safety of employees required to work in any place in which the temperature of the atmosphere is likely to cause harm.

In the case of ships carrying containers, all practicable steps must be taken for ensuring the safety of employees lashing or unlashing the containers.

No person is to be not conveyed to, nor be supported at, an elevated workplace by any self-propelled elevated work platform, or any device lifted by a crane or forklift, unless it has been certified for the carriage of personnel.

7.12 Lifting plant

No crane operator shall move a load when such action places others at risk.

Where the operator/driver working the move does not have a clear and unrestricted view of those parts of the hold and wharf where work is being carried on, or other personnel are working in such a position that a potential hazard exists, a clear means of signalling is required.

7.13 Electrical

Electrical equipment on board a ship will be in accordance with classification society and international standards for marine electrical systems and covered by rules made under the MT Act.

SECTION 2

PERSONAL HEALTH AND SAFETY

MARITIME NEW ZEALAND

CHAPTER 8: PERSONAL HEALTH AND SAFETY

8.1 General

All new personnel joining a vessel (other than passengers) must undergo a safety induction by a responsible officer which must, as a minimum, cover the requirements of the relevant parts of the STCW Code attached to the International Convention on Standards of Training, Certification and Watchkeeping 1978 as amended in 1995 (STCW 95).

This training should cover:

- personal survival techniques
- fire prevention and fire fighting
- elementary first aid
- personal safety and social responsibilities.

The statutory content of such training is set out in section A-VI/I Tables 1-4 of the STCW Code.

It is recommended that each company should design and implement a standard induction programme for each vessel, covering the STCW requirements, and incorporating any expanded detail specific to that vessel's particular needs.

This chapter gives guidance on the subjects to be covered.

On completion of the standard safety induction, it is also recommended that new personnel receive departmental induction covering safe working practices, areas of responsibility, departmental Standing Orders, and training/certification requirements to operate specific machinery or undertake specific tasks.

8.2 Emergency procedures and fire precautions

All new personnel should be given a clear explanation of the vessel's alarm signals, and be given instruction on the emergency assembly stations, lifeboat stations and fire drill/team requirements.

Smoking regulations on the vessel should be strictly observed. Safe and correct disposal of cigarette ends is essential, and "No Smoking" notices should be strictly obeyed.

Fire aboard a vessel can be disastrous. Common causes are:

- faulty electrical appliances/circuitry
- overloading of electrical circuitry
- careless disposal of cigarette ends
- spontaneous combustion of dirty waste/rags especially if contaminated with oil
- damp storage of line/materials
- oil spillage/leakage in machinery spaces
- galley fires due to overheating of cooking oils
- carelessness with hand pressing irons
- incorrect methods of drying laundry.

Personnel should be made aware of these risks and ensure at all times through good housekeeping, regular inspection and maintenance of electrical circuitry and appliances that fire risks are removed where possible or kept to a minimum.

8.3 Accidents and medical emergencies

All personnel should know the action to be taken in cases of accident or medical casualty on board ship, eg they will need to know how to raise the alarm and seek assistance.

8.4 Health and hygiene

It is the responsibility of individuals to ensure high standards of personal hygiene and to look after their own health. Attention should be paid to:

- personal cleanliness
- sensible diet
- adequate sleep during rest periods
- regular exercise
- avoidance of excess alcohol/tobacco
- prompt attention to cuts/abrasions
- maintenance of working clothes and protective equipment in a clean condition
- appropriate dress for the work and climate
- avoidance of recreational drugs.

On international voyages, any vaccinations/inoculations required should be fully updated. Medications for prevention of illness (eg anti-malarial tablets) should be taken as and when required.

In hot climates, it is important to protect skin from strong sunlight and drink plenty of salt-containing liquids to replace the body fluids lost through perspiration.

8.5 Good housekeeping

All ships move in a seaway and as space is very limited aboard any vessel, good housekeeping is essential for safe working/access and hygiene control. Particular attention should be paid to the following areas:

- safe and secure stowage of loose items
- proper securing of doors etc
- good maintenance of fittings and fixtures
- adequate illumination of all work/transit areas
- avoidance of overloading of electrical circuits especially in cabins
- clear and legible signs/operational notices
- proper clearance and disposal of garbage/waste materials.

8.6 Environmental responsibilities

The maintenance of good standards to protect the environment (whether local, ie accommodation/work areas, or the wider environment) is the responsibility of all personnel. Many aspects are covered by international legislation and it is the duty of all personnel to ensure strict compliance with such legislation.

Handling and storage of garbage can present health and safety hazards to crews and ships. Requirements of the garbage management plan should be observed.

Particular attention should be paid to the correct methods of disposal of waste oils (eg bilge), chemicals, galley waste, garbage (especially plastics, glass, drums and other non-biodegradable items), redundant items (eg moorings, dunnage, cargo cleanings).

Incinerators and compactors should always be operated by competent personnel, and operating instructions should be strictly followed.

8.7 Occupational health and safety

All new personnel should be made aware of the recommendations governing occupational health and safety on board such as those governing the use of lifting plant or means of access. Section 3 of this Code gives further advice.

All safety measures should be based on an assessment of the hazards involved in a particular task, and the identification of the most effective measures to combat those hazards. Guidance on hazard identification is given in an earlier chapter of this Code.

8.8 Employer and employee responsibilities

All new personnel should be informed of their employer's duties in respect of health and safety. The details are in the regulatory framework at the start of this Code.

It is particularly important that they are reminded to follow any training, oral or written instructions they have been given, and know to whom they should report any deficiencies in equipment or unsafe practices they may notice.

Personnel who find any defects in any equipment, or a condition they believe to be hazardous or unsafe, should immediately report it to a responsible person, who should take appropriate action.

8.9 Consultation procedures

New personnel must be told about the procedures for consultation on health and safety matters, who their health and safety representatives are (where applicable) and should be encouraged to contribute ideas to improve safety.

ANNEX 8.1 SUMMARY OF AT SEA GARBAGE DISPOSAL TAKEN FROM ANNEX V OF THE MARPOL CONVENTION

GARBAGE TYPE	ALL SHIPS EXCEPT PLATFORMS – NOTE 3		OFFSHORE PLATFORMS – NOTE 3
	OUTSIDE SPECIAL AREAS	IN SPECIAL AREAS – Note 1	
Plastics – include synthetic ropes and fishing nets and plastic garbage bags	Disposal prohibited	Disposal prohibited	Disposal prohibited
Floating dunnage, lining and packing materials	> 25 miles offshore	Disposal prohibited	Disposal prohibited
Paper, rags, glass, metal, bottles, crockery and similar refuse	> 12 miles	Disposal prohibited	Disposal prohibited
All other garbage including paper, rags, glass etc. comminuted or ground – Note 2	> 3 miles	Disposal prohibited	Disposal prohibited
Food waste note comminuted or ground	> 12 miles	> 12 miles	Disposal prohibited
Food waste comminuted or ground	> 3 miles	> 12 miles	Disposal prohibited
Mixed refuse types	Note 4	Note 4	Note 4

Notes:

1. "Special areas" are as defined in the Convention.
2. Comminuted or ground garbage must be able to pass through a screen with mesh size no larger than 25 mm.
3. Offshore platforms and associated ships include all fixed or floating platforms engaged in exploration or exploitation of seabed mineral resources, and all ships alongside or within 500 m of such platforms.
4. When garbage is mixed with other harmful substances having different disposal or discharge requirements, the more stringent requirement shall apply.
5. A New Zealand registered ship shall comply with Annex V of the MARPOL Convention brought into force by the Marine Protection Rules.
6. A New Zealand registered ship shall comply with the Antarctic (Environmental Protection) Act 1994 when entering the Antarctic Zone. Specifically. Marine Protection Rule 160.

CHAPTER 9: FIRE PRECAUTIONS

The prevention of fire on board ship is of utmost importance. Significant organisational measures can be taken to reduce the risk of fire.

A later part of the Code deals with action in the event of fire and other emergency procedures.

9.1 Smoking

Conspicuous warning notices should be displayed in any part of the ship where smoking is forbidden (permanently or temporarily) and observance of them should be strictly enforced.

Ashtrays or other suitable containers should be provided and used at places where smoking is authorised.

9.2 Electrical and other fittings

All electrical appliances should be firmly secured and served by permanent connections whenever possible.

Flexible leads should be as short as practicable and so arranged as to prevent their being chafed or cut in service.

Makeshift plugs, sockets and fuses should not be used.

Circuits should not be overloaded since this causes the wires to overheat, destroying insulation and thus resulting in a possible short-circuit that could start a fire. Notices should be displayed warning that approval should be obtained from a responsible officer to connect any personal electrical appliances to the ship's supply.

All portable electrical appliances, eg lights should have insulation readings taken before use, and should be isolated from the mains after use.

Electrical equipment that is to be used in any cargo area should be of an approved design.

All fixed electric heaters should be fitted with suitable guards securely attached to the heater and the guards maintained in position at all times. Drying clothing on or above the heaters should not be permitted – suitably designed equipment should be supplied or areas designated.

When using drying cabinets or similar appliances, the ventilation apertures should not be obscured by overfilling of the drying space. Any screens or fine mesh covers around the ventilation apertures should be regularly inspected and cleaned, so that they do not become blocked by accumulated fluff from clothing.

The use of portable heaters should be avoided wherever possible. If they are required while the ship is in port (as temporary heating during repairs and as additional heating during inclement weather) a protective sheet of a non-combustible material should be provided to stand them on to protect wooden floors or bulkheads, carpets or linoleum. Portable heaters should be provided with suitable guards and should not be positioned close to furniture or other fittings. These heaters should never be used for drying clothes.

Personal portable space-heating appliances of any sort should not be used at sea and notices to this effect should be displayed.

The construction and installation of electric heaters should always be carried out in accordance with the relevant regulations and instructions or guidance supplied by the manufacturer.

9.3 Spontaneous combustion

Dirty waste, rags, sawdust and other rubbish – especially if contaminated with oil – may generate heat spontaneously that may be sufficient to ignite flammable mixtures or may set the rubbish itself on fire. Such waste and rubbish should therefore be properly stored until it can be safely disposed of.

Materials in ship's stores, including linen, blankets and similar absorbent materials are also liable to ignite by spontaneous combustion if damp or contaminated by oil.

Strict vigilance, careful stowage and suitable ventilation are necessary to guard against such a possibility. If such materials become damp, they should be dried before being stowed away. If oil has soaked into them, they should be cleaned and dried, or destroyed. They should not be stowed in close proximity to oil or paints, or on or near to steam pipes.

9.4 Machinery spaces

All personnel should be made fully aware of the precautions necessary to prevent fire in machinery spaces in particular, the maintenance of clean conditions, the prevention of oil leakage and the removal of all combustible materials from vulnerable positions.

Suitable metal containers should be provided for the storage of cotton waste, cleaning rags or similar materials after use. Such containers should be emptied at frequent intervals and the content safely disposed of.

Wood, paints, spirits and tins of oil should not be kept in boiler rooms or machinery spaces including steering gear compartments.

All electric wiring should be well maintained and kept clean and dry. The rated capacity of the wires and fuses should never be exceeded.

9.5 Galleys

Galleys and pantries present particular fire risks. Care should be taken in particular to avoid overheating or spilling fat or oil and to ensure that burners or heating plates are shut off when cooking is finished. Extractor flues and ranges etc. should always be kept clean.

Means to smother fat or cooking oil fires, such as a fire blanket, should be readily available close to stoves. Remote cut-offs and stops should be conspicuously marked and known to galley staff.

CHAPTER 10: EMERGENCY PROCEDURES

10.1 Action in the event of fire

The risk of fire breaking out on board a ship cannot be eliminated but its effects will be much reduced if the advice given in this chapter is conscientiously followed.

Training in fire-fighting procedures and maintenance of equipment should be assured by regular drills. Access to fire-fighting equipment should be kept clear at all times and emergency escapes and passageways should never be obstructed.

A fire can usually be put out most easily in its first few minutes. Prompt and correct 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 possible, an attempt should be made to extinguish or limit the fire by any appropriate means readily available, either using suitable portable extinguishers or by smothering the fire, eg for a fat or oil fire in the galley.

The different types of portable fire extinguishers on board are appropriate to different types of fire. Water extinguishers should not be used on oil or electric fires.

Openings to the space should be shut to reduce the supply of air to the fire and to prevent it 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.

If a space is filling with smoke and fumes, any personnel not properly equipped with breathing apparatus should get out of the space without delay. If necessary, escape should be effected by crawling on hands and knees because air close to deck level is likely to be relatively clear.

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

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

10.2 Musters and drills

Musters and drills are required to be carried out regularly in accordance with Maritime Rules.

Musters and drills are designed to prepare a trained and organised response to dangerous situations, which may unexpectedly threaten loss of life at sea. It is important that they should be carried out realistically, approaching as closely as possible to emergency conditions.

Changes in the ship's function and changes in the ship's personnel from time to time should be reflected in corresponding changes in the muster arrangements.

Muster list

The muster list must be conspicuously posted before the ship sails and, on international voyages and where appropriate should be supplemented by emergency instructions for each crew member (eg in the form of a card issued to each crew member or affixed to individual crew berths and bunks). These instructions should describe the allocated assembly and action, if any, to be taken on hearing such signals.

Drills and training

An abandon ship drill and a fire drill must be held within 24 hours of leaving port if more than 25% of the crew have not taken part in drills on board the ship in the previous month.

As soon as possible but not later than two weeks after joining the ship, onboard training in the use of the ship's life-saving appliances, including survival craft equipment, must be given to crew members.

As soon as possible after joining the ship, crew members should also familiarise themselves with their emergency duties, the significance of the various alarm systems and the locations of their lifeboat station and of all lifesaving and fire fighting equipment.

All the ship's personnel concerned should muster/assemble at a drill wearing lifejackets properly secured. The lifejackets should continue to be worn during lifeboat drills and launchings but in other cases may be subsequently removed at the master's discretion if they would impede or make unduly onerous the ensuing practice, provided they are kept ready to hand.

The timing of emergency drills should vary so that personnel who have not participated in a particular drill may take part in the next.

Any defects or deficiencies revealed during drills and the inspections which accompany them should be made good without delay.

10.3 Fire drills

Efficient fire-fighting demands the full co-operation of personnel in all departments of the ship. A fire drill should be held simultaneously with the first stage of the abandon ship drill. Fire-fighting parties should assemble at their designated stations.

Engine room personnel should start the fire pumps in machinery spaces and see that full pressure is put on fire mains. Any emergency pump situated outside machinery spaces should also be started; all members of the crew should know how to start and operate the emergency pump.

The fire parties should be sent from their designated stations to the selected site of the supposed fire, taking with them emergency equipment such as axes and lamps and breathing apparatus. The locations should be changed in successive drills to give practice in differing conditions and in dealing with different types of fore so that accommodation, machinery spaces store rooms, galleys and cargo holds or areas of high fire hazard are all covered from time to time.

An adequate number of hoses to deal with the assumed fire should be realistically deployed. At some stage in the drill, they should be tested by bringing them into use, firstly with water provided by the machinery space pump and secondly with water provided by the emergency pump alone.

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

Fire extinguishers

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

Portable fire extinguishers should be available for demonstration of the manner of their use. They should include the different types applicable to different kinds of fire.

At each drill, one extinguisher or more should be operated by a member of the fire party, a different member on each occasion. Extinguishers so used should be recharged before being returned to their normal location or sufficient spares should otherwise be carried for demonstration purposes.

Breathing apparatus

Breathing apparatus should be worn by members of the fire-fighting parties so each member in turn has experience of its use. Search and rescue exercises should be undertaken in various parts of the ship. The apparatus should be cleaned and verified to be in good order before it is stowed; cylinders of self-contained breathing apparatus should be recharged or sufficient spare cylinders otherwise carried for this purpose.

In addition to the statutory inspection, fire appliances, fire and watertight doors, other closing appliances, and fire detection and alarm systems which have not been used in the drill should be inspected, either at the time of the drill or immediately afterwards.

10.4 Survival craft drills

IMO MSC/Circ1136 sets out the current procedure for drills. Arrangements for liferaft or lifeboat drills should take account of prevailing weather conditions.

Crew members should muster wearing warm outer clothing and lifejackets properly secured.

Where appropriate, the lowering gear and chocks should be inspected and a check made to ensure that all working parts are well lubricated.

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

The engines on motor lifeboats should be started and run ahead and astern. Care should be taken to avoid overheating the engine and the propeller shaft stern gland. All personnel should be familiar with the engine starting procedure.

Hand-operated mechanical propelling gear, if any, should be examined and similarly tested.

Radio life-saving appliances should be examined and tested, and the crew instructed in their use.

Water spray systems, where fitted, should be tested in accordance with the lifeboat manufacturer's instructions.

When a drill is held in port, as many as possible of the lifeboats should be cleared and swung out. Each lifeboat should be launched and manoeuvred in the water at least once every 3 months.

Where launching of free-fall lifeboats is impracticable, they may be lowered into the water provided that they are free-fall launched at least once every six months. However, this may be extended to 12 months provided that arrangements are made for simulated launching which will take place at intervals not exceeding 6 months.

When fast rescue boats/rescue boats are carried which are not also lifeboats they should be launched and manoeuvred in the water every month so far as is reasonable and practicable. The interval between such drills, must not, exceed 3 months.

Where simultaneous off-load/on-load release arrangements are provided great care should be exercised to ensure that the hooks are fully engaged before a boat is recovered, after it has been stowed and prior to launching.

Where davit-launched liferafts are carried then on-board training, including inflation, must be carried out at intervals not exceeding four months. Great care should be taken that the hook is properly engaged before taking the weight of the raft. The release mechanism should not be cocked until just prior to the raft landing in the water. If the raft used for the inflation is part of the ship's statutory equipment and not a special training raft, then it **must** be repacked at an approved service station.

Where the handle of the lifeboat winch would rotate during the operation of the winch, it should be removed before the boat is lowered on the brake or raised with an electric motor. If a handle cannot be removed, personnel should keep well clear of it.

Personnel in a fast rescue boat /rescue boat or survival craft being lowered should remain seated, keeping their hands inside the gunwale to avoid them being crushed against the ship's side. Lifejackets should be worn. In totally enclosed lifeboats seat belts should be secured. Only the launching crew should remain in a lifeboat being raised.

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

While craft are in the water, crews should practice manoeuvring the vessel by oar or the appropriate motive power and should operate the water spray system when fitted on enclosed lifeboats.

Seafarers should keep their fingers clear of the long-link when unhooking or securing clocks onto lifting hooks while the boat is in the water, and particularly if there is a swell.

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

A portable hoist unit to recover a craft should be provided with a clutch or have an attachment to resist the torque. These should be checked if neither device is available, the craft should be raised by hand.

Where liferafts are carried, instruction should be given to the ship's personnel in their launching, handling and operation. Methods of boarding them and the disposition of equipment and stores on them should be explained.

The statutory scale of life-saving appliances must be maintained at all times. If the use of a liferaft for practice would bring equipment below the specified scale, a replacement must first be made available.

10.5 Drills and rescue from dangerous spaces

There is a statutory requirement for drills simulating the rescue of an incapacitated person from a dangerous space to be carried out every two months. Each drill should be recorded in the official log book. A drill should normally be held soon after significant changes in crew members.

Any attempt to rescue a person who has collapsed within a space should be based on a pre-arranged plan, which should take account of the design of the individual ship. Allocation of personnel to relieve or back-up those first into the space should be borne in mind.

Regular drills should prove the feasibility of the ship's rescue plan under different and difficult circumstances. The space should be made safe or, for operational convenience, a non-dangerous space may be used, provided that it provides realistic conditions for an actual rescue.

If there are indications that the person in the space is being affected by the atmosphere, the person outside the space should immediately raise the alarm.

On no account should the person stationed at the entrance to the space attempt to enter it before additional help has arrived. No one should attempt a rescue without wearing breathing apparatus and a rescue harness and, whenever possible, use of a lifeline.

10.6 Assisting a casualty

Anyone on board ship may find a casualty, and everyone should know the basic priorities for action, ie the positioning of an unconscious casualty and how to give artificial respiration. These actions may save life until more qualified help arrives.

Personnel encountering a casualty should first ensure that they are not themselves at risk. If necessary the casualty should be removed from danger, or danger removed from the casualty but **see below on casualties in an enclosed space**.

If there is **only one unconscious casualty** (irrespective of the total number of casualties) immediate basic treatment should be given to the unconscious casualty, then help should be summoned

If there is **more than one unconscious casualty**, help should be summoned first, then appropriate treatment given, priority being any casualty with stopped breathing/heart.

If the **unconscious casualty is in an enclosed space**:

- personnel **must not** enter the enclosed space unless they are a trained member of a rescue team acting upon instruction
- help should be summoned and the master informed
- it must be assumed that the atmosphere in the space is unsafe - the rescue team must not enter unless wearing breathing apparatus
- separate breathing apparatus or resuscitation equipment should also be fitted on the casualty as soon as possible
- the casualty should be removed quickly to the nearest safe adjacent area outside the enclosed space unless their injuries and the likely time of evacuation makes some treatment essential before they are removed.

Should it be necessary to remove injured persons from a hold, the best available method should be adopted but where practicable all access openings should be opened and the following equipment used where available:

- a manually-operated davit, suitably secured over the access opening
- a cage or stretcher fitted with controlling lines at the lower end.

Casualties who have been exposed to a hazardous chemical should rest quietly and be observed for at least 24 hours in case any complications arise.

10.7 Dangerous goods

Emergency responses to spillage of dangerous goods are contained in the *IMO Medical First Aid Guide* and the *IMO Emergency Procedures for Ships Carrying Dangerous Goods* (EmS). Both of these are available either as free-standing documents or incorporated into the International Maritime Dangerous Goods (IMDG) Code.

Recommendations on emergency action differ depending on where the goods are stowed and whether a substance is gaseous, liquid or solid. When dealing with incidents involving flammable gases or flammable liquids, all sources of ignition, eg naked lights, unprotected light bulbs, electric hand tools, should be avoided.

Normally dangerous goods in packaged form can be handled without the use of special protective clothing or equipment. If the packaging has been damaged, the contents may have spilt or leaked.

Under these circumstances the emergency team may have to deal with toxic corrosive or flammable solids, liquids or vapours. Vapours may arise from a spilt substance itself or as a result of the reaction between spilt substances themselves and other materials. Eye protection should always be worn, and if hazardous dust may be encountered, respiratory protection should be used (where the substance offers a significant toxic hazard this should be self-contained breathing apparatus).

Spillages

In general the recommendation is to wash spillages on deck overboard with copious quantities of water, and, where there is likely to be a dangerous reaction with water, from as far away as practicable.

Disposal of dangerous goods overboard is a matter for judgment by the master, bearing in mind that the safety of the crew 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 and kept in plastic bags or other receptacles may need to be stowed safely for ultimate disposal ashore. Collection of spillages with absorbent material under deck may not be fully effective, and precautions for entry into enclosed spaces should be observed.

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

Fire

Water is generally recommended as the fire fighting medium for most dangerous goods at sea. However, reference should be made to the relevant schedules.

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

For incidents under deck, the best course of fire fighting will usually be to batten down the hatch, exclude all ventilation and operate the fixed fire-fighting installation. Self-contained breathing apparatus should be worn when battening down the hatches or if there is any need to enter the space, for example after the fire is out.

For certain substances which are highly reactive with water, only 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 only alternative is the use of copious quantities of water, which will have a cooling effect on the fire, although reacting with the substance.

Where a recommendation 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 everything possible should be done to prevent the spread of fire to those containers.

If, despite preventative measures, fire seems likely to affect these containers, it should be borne in mind the contents may burn with explosive violence and personnel should be withdrawn accordingly.

CHAPTER 11: SECURITY ON BOARD

Shipboard security is essential in reducing the risks of terrorism, stowaways, piracy and drug smuggling. Effective security measures are not always easy and particular vigilance is required when operating in areas of increased risk.

It is important to control access to the ship and the screen visitors before they are allowed on board as unauthorised personnel can be a danger to themselves and the others.

Note that information on personal safety can be obtained by contacting the New Zealand Embassies, High Commissions and Consulates in the area concerned.

11.1 International terrorism

The chances of a ship experiencing a terrorist attack are very low, but attacks do happen. The main threat is from people trying to smuggle weapons and explosives on board. An appropriate sign at all access points stating the “all items brought on board this ship are liable to be searched” will act as a deterrent.

Other security measures that may be considered include surveillance and detection equipment. The ISPS Code contains details of security plans that should be in place.

11.2 Stowaways

If there is any likelihood of stowaways, a thorough search of the vessel should be made before departure. They may hide in places that are secured at sea and that may be deficient in oxygen so that they suffocate or starve, or in holds which may be fumigated.

It is obviously easiest to send stowaways ashore in the port where they boarded.

11.3 Piracy and armed robbery

The latest information on piracy attacks and the regions of greatest risk may be obtained free of charge from the IMB Regional Piracy Centre, Kuala Lumpur.
Phone +60 3 201 0014
Fax +60 3 238 5769
Tlx MA 31880 IMBPCI.

The Centre also issues status reports and warning messages on the SafetyNET service of Inmarsat C at 0001 UTC each day.

The dangers to a vessel can be significantly reduced if the ship’s crew take relatively simple precautions, such as remaining vigilant and keeping means of access closed as much as possible, particularly access to crew accommodation.

All ships operating in waters where attacks occur should have an anti attack plan. The plan should cover:

- the need for enhanced surveillance and the use of lighting and surveillance or detection equipment
- crew responses if a potential attack is detected or an attack is underway
- minimising the opportunity to steal cargo, stores or personal effects
- ensuring the safety of the ship’s crew and passengers
- details of the radio and alarm procedures to be followed
- the reports that should be made after an attack, or attempted attack.

11.4 General precautions

Owners or masters of ships operating in areas where attacks may occur are responsible for deciding what measures to take. The following notes are guidance only, based on advice from security experts.

Further details are contained in the ISPS Code and your ship security officer, if applicable, can be consulted.

Be vigilant
The majority of attacks will be deterred if the robbers are aware that they have been observed, and that the crew has been alerted and is prepared to resist attempts to board. Ensure that crew members are constantly seen to be moving around the ship, making random rather than predictable patrols.

Maintain a 24 hour visual and security watch
This should include short-range radar surveillance of the waters around the ship. The use of a small yacht radar, fitted in such a way as to ensure complete coverage of the stern, unobscured by the radar shadow of the ship itself, should be considered.

Keep a special look-out for small boats and fishing boats that pirates often use because they are difficult to observe on radar. In piracy black spots, discourage the crew from trading with locals using small craft which may approach the ship.

Strengthen night watches
Strengthen night watches especially around the rear of the ship and particularly between the hours of 0100 and 0600 when most attacks occur, with continuous patrols linked by “walkie-talkie” to the bridge. A drill should be established for regular two-way communication between the watch and the bridge.

If possible, an additional officer should assist the normal bridge watchkeepers at night to provide dedicated radar and visual watch for small craft that might attempt to manoeuvre alongside, and allow the watchkeepers to concentrate on normal navigational duties.

Seal off means of access to the ship, ie fit hawse pipe plates, lock doors and hatches
While taking due account of the need for escape in the event of fire or other emergency, as far as possible all means of access to the accommodation should be sealed off and windows and doors of crew quarters should be kept locked at all times. Blocking access between the aft deck and the crew’s quarters is particularly important.

VHF contact
Establish radio (VHF) contact and agree emergency signals specifically for pirate attacks with:
- crew
- ships in the vicinity
- shore authorities.

Locate an emergency VHF set – away from the master’s cabin and the radio room, which are often the first targets.

Provide adequate lighting
Provide adequate lighting, eg deck and over-side lights, particularly at the bow and stern, should be provided to illuminate the deck and the waters beyond and to dazzle potential boarders.

Searchlights should be available on the bridge wings, and torches carried by the security patrols to identify suspicious craft. Such additional lighting should not, however, be so bright as to obscure navigation lights or to interfere with the safe navigation of other vessels.

Water hose and any other equipment
Water hose and any other equipment, which may be used to repel potential boarders, should be readily available. Keep a constant supply of water provided to the hoses. In danger areas keep the deck wash pump in operation at all times – spray water over the rear deck where it is easiest for the attackers to board.

Reduce opportunities for theft
For example, remove all portable equipment from the deck and so far as is possible stow containers containing valuables door-to-door and in tiers, and seal off access to the accommodation.

Establish a secure area or areas
If large numbers of armed robbers succeed in boarding the ship, it may be essential for crew members to retreat to a secure area or areas.

Depending upon the construction of the accommodation and the extent to which areas can be effectively sealed off, the secure area may be established in the accommodation as a whole, or in more restricted parts around the bridge and inside the engine room. Provision should be made for escape during a fire or other emergency.

Inform crew of the security plan
Hold a training exercise and ensure the crew are fully briefed on the actions to take in the event of an attack by armed robbers.

If pirates succeed in boarding the vessel, resistance and confrontation are not recommended as the likelihood of violence will undoubtedly be magnified. Agreeing to the demands of the attackers will hopefully keep the unwelcome visit brief, thereby allowing full control of the ship to be regained as soon as possible.

Crew members can assist passively by mentally noting as many details as possible and pooling such information later on.

11.5 Drugs

Another benefit of good security is preventing illegal drugs being smuggled aboard. Personnel should be alert to the possibility, and should be made aware of the procedures to follow if such substances are found or the activity suspected.

CHAPTER 12: LIVING ON BOARD

The aim of the Code as a whole is to provide information and guidance aimed at improving the health and safety of those living and working on board ship. This chapter gives some more specific advice for the individual seafarer.

12.1 Health and hygiene

It is the seafarer's responsibility to look after his own health and fitness. High standards of personal cleanliness and hygiene should be maintained.

On board ship, simple infections can easily be spread from one person to others so preventive measures, as well as easily effective treatment, are essential.

Good health depends on sensible diet, adequate sleep and avoidance of recreational drugs, and substance or drug misuse, excesses of alcohol and tobacco. Regular exercise is also beneficial in maintaining good health.

Treatment should be sought straight away for minor injuries, cuts and abrasions should be cleaned and first aid treatment given as necessary to protect against infection. Barrier creams may help protect exposed skin against dermatitis and also make thorough cleansing easier.

The risk of contracting malaria in infected areas can be much reduced by taking precautions to avoid mosquito bites, eg by using mosquito wire-screening and nets, keeping openings closed, and using anti-mosquito preparations or insecticides

Rats and other rodents may be carriers of infection and should never be handled, dead or alive, with bare hands.

Medication

Anyone taking medication, particularly any medication which may affect alertness, should notify a responsible officer, so that allowance may be made in allocating tasks.

Drinking alcohol whilst under treatment with medication should be avoided, since even common remedies such as aspirin, seasickness tablets, anti-malarial tablets and codeine may be dangerous in conjunction with alcohol.

The individual has a responsibility to ensure that inoculations and vaccinations required for international voyages are kept up to date and medications for the prevention of illness, such as suitable anti-malarial tables, are taken when required.

Personnel on board ship are trained and equipped to provide initial medical care for the range of health problems that may arise. If a worker develops a serious health problem or suffers a serious injury, medical advice should be obtained by radio. Where necessary, arrangements may be made to transport the sick or injured worker ashore for medical treatment.

Further advice on medical care is contained in the *Ship Captain's Medical Guide*.

12.2 Working in hot climates

High humidity and heat can lead to heat exhaustion and heat stroke. Perspiration is the body's best heat control mechanism, but sweat consists mainly of salt and water which must be replaced.

When working in these conditions it is advisable to drink at least 4.5 litres of cool (but not iced) water daily. It is best to take small quantities at frequent intervals. Salt can be taken in food, supplemented by salt-containing drinks to prevent heat cramps. Alcohol should be avoided.

If working in enclosed spaces, they should be well ventilated. The minimum of light clothing should be worn, to allow the largest possible surface for free evaporation of sweat.

In tropical areas especially, exposure to the sun, particularly during the hottest part of the day, should be avoided as far as possible. When it is necessary to work in very strong sunlight, appropriate clothing offering protection to both head and body should be worn. Light cotton clothing will reflect the heat and help to keep the body temperature down.

When working in exceptionally hot and/or humid conditions or when wearing respiratory equipment, breaks at intervals in the fresh air or in the shade may be necessary.

12.3 Working clothes

Clothing should be appropriate for the working conditions. Working clothes should be close-fitting with no loose flaps, pockets or ties, which could become caught up in moving parts of machinery or on obstructions or projections.

Where there is a risk of burning or scalding, as in galleys, clothing should adequately cover the body and material should be of low flammability, such as cotton or a cotton/terylene mix.

Shirts or overalls provide better protection if they have long sleeves. Long sleeves should not be rolled up. Long hair should be tied back and covered. Industrial or safety footwear should be worn when appropriate.

12.4 Shipboard housekeeping

Good housekeeping is an essential element in promoting health and safety on board:

- equipment and other items should be safely and securely stored to ensure that defects are discovered and articles can be found when required
- fixtures and fittings should be properly maintained
- all work and transit areas should be adequately lit
- electric circuits should not be overloaded, particularly in cabins
- garbage and waste materials should be cleared up and disposed of correctly and promptly
- doors and drawers should be properly secured
- instruction plates, notices and operating indicators should be kept clean and legible.

Many aerosols have volatile and inflammable contents. They should never be used or placed near naked flames or other heat source even when “empty”. Empty canisters should be properly disposed of.

Some fumigating or insecticidal sprays contain ingredients which, though perhaps themselves harmless to human beings, may be decomposed when heated. Smoking may be dangerous in sprayed atmospheres while the spray persists.

12.5 Substances hazardous to health

Many substances found on ships may be dangerous to those exposed to them. They include recognised hazard substances, such as dangerous goods cargoes and asbestos, and also some domestic substances. For example, caustic soda and bleaching powders or liquids can burn or penetrate the skin and may react dangerously with other substances and should never to be mixed.

The employer's hazard assessment will identify when personnel are working in the presence of substances hazardous to health. Appropriate measures should be taken to remove, control or minimise such hazards.

It is important to read carefully all labels on chemical containers before opening them, to find out about any hazards from the contents. A chemical from an unlabelled container should never be used unless it is clearly established what it is.

If asbestos-containing panels, cladding or insulation become loose or are damaged in the course of a voyage, pending proper repair, the exposed edges or surfaces should be protected by a suitable coating or covering to prevent asbestos fibres being released and dispersed in the air.

Prolonged exposure to mineral oils and detergents, may cause skin problems. All traces of oil should be thoroughly washed from the skin but hydrocarbon solvents should be avoided. Inadvertent contact with toxic chemicals or other harmful substances should be reported immediately and the appropriate remedial action taken. Working clothes should be laundered frequently. Oil-soaked rags should not be put in pockets.

Coughs and lung damage can be caused by breathing irritant dust. The risk is usually much greater for a person who smokes than for a non-smoker.

Employers are required to instruct, inform and train personnel so that they know and understand the risks arising from their work, the precautions to be taken and the results of any monitoring of exposure.

Personnel should always comply with any control measures in place, and wear any protective clothing and equipment supplied.

In cases where failure of the control measures could result in serious risks to health, or where their adequacy or efficiency is in doubt, health surveillance should be undertaken.

12.6 Common personal injuries

Hand injuries
Gloves are a sensible precaution when handling sharp or hot objects but may easily be trapped on drum ends and on machinery. Loose-fitting gloves will allow hands to slip out readily, but they do not give a good grip on ladders. Wet or oily gloves may be slippery and great care should be taken when working in them.

Foot injuries
Unsuitable footwear, such as sandals, plimsolls, jandals and flip-flops, give little protection if there is a risk of burning or scalding, for example, and may lead to trips and falls. The Code gives advice on suitable footwear. Care should be taken to keep feet away from moving machinery, bights of ropes and hawsers.

Eye injuries
Great care should be taken to protect the eyes. Appropriate protective goggles should be worn for any work involving sparks, chips of wood, paint or metal and dangerous substances.

Head injuries
It is important to remember to duck, when stepping over coamings etc to avoid hitting the head on the door frame.

Cuts
To avoid cuts all sharp implements and objects should be handled with care. They should not be left lying around where someone may accidentally cut themselves. In the galley, sharp knives

and choppers should not be mixed with other items for washing up but cleaned individually and stored in a safe place. Broken glass should be swept up carefully, not picked by hand.

Smoking
Ashtrays should always be used where provided. Matches and cigarette ends should not be thrown overboard since there is a danger that they may be blown back on board. It is dangerous to smoke in bed. The use of safety ashtrays is to be preferred.

Burns and scalds
Burns and scalds are commonly caused by hot pipelines and stoves, as well as by fires. Every hot machine and every container of scalding liquid should be regarded as a hazard, capable of causing injury and adequate precautions should be taken.

Faulty electrical equipment can cause severe burns as well as an electric shock. Equipment should be checked before use and if something appears wrong, it should be reported.

Precautions should always be taken against sun burn and heat stroke.

Misuse of tools
Injury can be caused by the misuse of tools. It is important always to use the correct tool for the job, and to make sure it is used in the right way. Tools should never be left lying around where they can fall on someone, or be tripped over. After a job is finished, they should be put away in a safe place.

Manual handling
It is easy to strain muscles when manual handling. Pulled muscles may be avoided if proper lifting techniques are used. Chapter 19 gives guidance on handling loads.

Mooring
Mooring and unmooring operations provide the circumstances for potentially serious accidents. Personnel should never stand in the bight of a rope or near a rope under tension, and should treat ropes on drums and bollards with the utmost care.

Electrical hazards
Unauthorised persons should not interfere with electrical fittings. No personal electrical appliance should be connected to the ship's electrical supply without approval from a responsible officer.

Clothing or other articles should be left to dry only in designated areas, not in machinery spaces or over or close to heaters or light bulbs. This may restrict the flow of air and so lead to overheating and fire.

Hand pressing irons should not be left standing on combustible materials. They should be switched off after use and stowed safely.

CHAPTER 13: SAFE MOVEMENT

Personnel are reminded to take care as they move about the ship. The following points are all too often overlooked:

- watch out for tripping hazards, and protrusions such as pipes and framing
- always bear in mind the possibility of a sudden or heavy roll of the ship
- wear suitable footwear that will protect toes against accidental stubbing and falling loads, and provide a good hold on deck and give firm support while using ladders – extra care should be taken when using ladders while wearing sea boots
- it is dangerous to swing on or vault over stair rails, guardrails or pipes; and to jump off hatches
- manholes and other deck accesses should be kept closed when not being used; guardrails should be erected and warning signs posted when they are open
- spillage of oil, grease or soapy water should be cleared up as soon as practicable
- areas made slippery by snow, ice or water should be treated with sand or some other suitable substance
- the presence of temporary obstacles should be indicated by appropriate warning signs
- litter and loose objects, eg tools, should be cleared up
- wires and ropes should be coiled and stowed
- lifelines should be rigged securely across open decks in rough weather
- ladders should be secured and ladder steps in good condition; care should be taken when using ladders and gangways providing access to or about the vessel, particularly when wearing gloves
- never obstruct the means of access to fire fighting equipment, emergency escape routes and watertight doors.

13.1 Drainage

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

Drains and scuppers should be regularly inspected and properly maintained.

Where drainage is by way of channels in the deck, these should be suitably covered.

Duck boards, where used, should be soundly constructed and designed and maintained so as to prevent accidental tripping.

13.2 Transit areas

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

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

When rough weather is expected, life-lines should be rigged securely across open decks.

Gratings in the deck should be properly maintained and kept closed when access to the space below is not required.

Permanent fittings that may cause hazards to movement, eg pipes, single steps, framing, door arches, top and bottom rungs of ladders, should be made conspicuous by use of contrasting

colouring, marking, lighting or signing. Temporary obstacles can also be hazardous and, if they are to be there for some time, they should be marked by appropriate warning signs.

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

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

Particular attention should be given to areas to which shore-based workers and passengers have access, especially on deck, as they will be less familiar with possible hazards.

When deck cargo is being lashed and secured, special measures may be needed to ensure safe access to the top of, and across, the cargo.

13.3 Lighting

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

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

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

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

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

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

Portable or temporary lights

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.

The leads should be kept clear of possible causes of damage, eg 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.

Where portable or temporary lighting has to be used fittings and leads should be suitable and safe for the intended usage. 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, or other suitable precautions taken.

13.4 Guarding of openings

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

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

Guard-rails or fencing should consist of an upper rail at a height of 1 m and intermediate guard rails at distances not exceeding 380 mm and the lowest rail is not to be more than 230 mm above the deck. The rails may consist of taut wire or taut chain.

Where the opening is a permanent access way, or where work is in progress which could not be carried out with the guards in place, guards do not have to be fitted during short interruptions in the work, eg for meals, although warning signs should be displayed where the opening is a risk to other persons.

13.5 Watertight doors

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

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

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

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

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

13.6 Shipboard vehicles

Persons selected to drive ships' powered vehicles and powered mobile lifting appliances should be fit to do so, and have been trained for the particular category of vehicle or mobile lifting appliance to be driven, and tested for competence.

Authorisations of crew members should either be individually issued in writing or comprise a list of persons authorised to drive. These authorisations may need to be made available for inspection.

Maintenance of ships' powered vehicles and powered mobile lifting appliances should be undertaken in accordance with manufacturers' instructions.

Drivers of ships' powered vehicles and powered mobile lifting appliances should exercise extreme care, particularly when reversing.

CHAPTER 14: FOOD PREPARATION AND HANDLING

Catering staff should have a basic knowledge of food safety and hygiene as they have responsibility for ensuring that high standards of personal hygiene and cleanliness of the galley, pantry and mess rooms are always maintained.

14.1 Health and hygiene

There should be no smoking in galleys, pantries, store rooms or other places where food is prepared.

Hands and fingernails
Hands and fingernails should be washed before handling food using a dedicated hand basin, a bacterial liquid soap from a dispenser and disposable towels or another individual method of hand drying such as a hot air dryer. It is important to wash hands after using the toilet, blowing your nose, or handling refuse or contaminated food.

All cuts, however small, should be reported immediately and receive first aid attention to prevent infection.

Cut, burns, illness and rashes
An open cut, burn or abrasion should be covered with a coloured waterproof dressing which must be changed regularly. Anyone with a septic cut, a boil or stye should stop working with food until it is completely healed.

Illness, rashes or spots, however mild should be reported immediately the symptoms appear.

A person suffering from diarrhoea and vomiting should not work in food handling areas until medical clearance has been given.

Cleanliness
Catering staff should wear clean protective clothing when handling food and preparing meals.

Catering staff should not wear jewellery apart from a plain wedding band.

Cleanliness of all food, crockery, cutlery, linen, utensils, equipment and storage is vital. Cracked or chipped crockery and glassware should be destroyed. Foodstuffs, which may have come into contact with broken glass or broken crockery, should be thrown away.

As a general rule fresh fruit and salad should be thoroughly washed in fresh water before being eaten.

Food storage
Foodstuffs and drinking water should not be stored where germs can thrive. Frozen food must be defrosted in controlled conditions, ie an area entirely separate from other foods in cool conditions. Food should be prevented from sitting in the thaw liquid by placing it on grids in a container or on a shelf. Deep frozen food which has been defrosted is not to be refrozen.

The risks of cross contamination should be eliminated by thoroughly stripping and cleaning the relevant parts of equipment when successive different foods are to be used (especially raw and cooked foods). It is important to wash hands after handling raw meat, fish, poultry or vegetables.

Raw food should be kept apart from cooked food or food that required no further treatment before consumption, eg 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 ready

prepared food. Food should also be covered to prevent drying out, cross-contamination and absorption of odour.

Food preparation
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 which will be eaten without further cooking. Colour coding is an established way of ensuring separation between the two activities.

Ensure all food is kept at the correct temperature to prevent the multiplication of bacteria.

Crockery and glassware
Crockery and glassware should not be left submerged in washing up water where it may easily be broken and cause injury. Such items should be washed up individually as should knives and any utensils or implements with sharp edges.

Crockery, glassware and utensils should preferably be washed in a dishwasher, where much higher temperatures can be achieved compared with hand washing.

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

Inadvertent contact with toxic chemicals or other harmful substances should be reported immediately and the appropriate remedial action taken. Cleaning substances and materials should be stored in a suitable locker/cupboard separate from food handling areas.

Food waste, empty food containers and other garbage are major sources of pollution and disease and should be placed in proper storage facilities safely away from foodstuffs. Their discharge into the sea is prohibited except in circumstances specified in Annex V of the MARPOL Convention.

14.2 Slips, falls and tripping hazards

Suitable footwear, preferably with slip-resistant soles, should be worn at all times. A large proportion of injuries to catering staff arise because they wear unsuitable footwear such as sandals, plimsolls or flip-flops, which do not grip greasy decks or protect the feet from burns or scalds if hot or boiling liquids are spilt.

Decks, and particularly stairs, should be regularly maintained so that cracks and worn areas do not cause a trip hazard. Tiled galley decks should be treated with a non-slip compound to prevent slips in heavy weather.

Decks and gratings should be kept clear from grease, rubbish and ice to avoid slipping. Any spillage should be cleared up immediately.

Broken glass or crockery should be cleared away with a brush and pan – never with bare hands.

The area of deck immediately outside the entrance to refrigerated rooms should always be kept free to grasp the handrail.

Care should always be taken when using stairs and companionways; one hand should always be kept free to grasp the handrail.

Trays, crates and cartons should not be carried in such fashion that sills, storm steps or other obstructions in the path are obscured from view.

Lifts that involve reaching up too high or too low should be avoided. Personnel should not stand on unsecured objects to reach articles that are out of reach.

14.3 Galley stoves, steam boilers and deep fat fryers

Ships using oil fired stoves should operate safety procedures according to manufacturers' instructions, particularly when lighting the stove. Instructions should be clearly displayed in the galley.

Catering staff should not attempt to repair electric or oil-fired ranges or electric microwave ovens. Defects should always be reported so that proper repairs may be made. The equipment should be kept out of use and a warning notice displayed until it has been repaired.

The indiscriminate use of water in hosing down and washing equipment in the galley can be very dangerous, particularly when there are electrical installations. Whenever the galley deck is washed down, power to an electric range and all electric equipment should be switched off and isolated from the supply and water kept from contact with the electric equipment.

Range guard rails should always be used in rough weather. Pots and pans should never be filled to the extent that the contents spill over when the ship rolls.

All catering staff should be fully instructed in avoiding burns from hot surfaces on hot serving tables, bain marie, steamers and tilting pans.

Dry cloths or pot holders and oven gloves (long enough to cover the arms) should always be used to handle hot pans and dishes. Wet cloths conduct heat quickly and may scald the hands.

No one should be directly in front of an oven when the door is opened – the initial heat blast can cause burns.

The steam supply to pressure cookers, steamers and boilers should be turned off and pressure released before their lids are opened.

14.4 LPG appliances

Suitable means for detecting the leakage of gas should be provided and securely fixed in the lower part of the galley as gas is heavier than air. A gas detector should incorporate an audible and a visible alarm, and should be tested frequently. A suitable notice, detailing the action to be taken when an alarm is given by the gas detection system should be prominently displayed.

Equipment should be fitted, where practicable, with an automatic gas shut-off device that operates in the event of flame failure.

When gas burning appliances are not in use the controls should be turned off. If they are not going to be used again for some length of time, the main regulators close to the storage bottles should be shut.

A safe system of working, training and supervision over lighting and operating procedures should be established.

Defects in joints, valves and connections can be detected by smell. Catering staff should not attempt to repair electric, oil or gas appliances.

14.5 Deep fat frying

Water should never be poured into hot oil; the water turns to steam, throwing the oil considerable distances. This can result in severe burns or possibly start a fire.

If fat catches fire in a container, the flames should be smothered using a fire blanket if practicable and the container removed from the source of heat. Otherwise a suitable fire extinguisher should be used. In no circumstances should water be used.

The flash point of the cooking medium should be no lower than 315°C (600°F).

Deep fat fryers should be provided with suitable safety lids which should be kept in position when the fryers are not in use.

To minimise the risk of fire from failure of the control thermostat, all deep fat fryers should be fitted with a second thermostat set to provide a thermal cut-off.

Electrically operated deep fat fryers should be switched off immediately after use.

A safe system of work for cleaning and draining fat fryers should be established.

A strict schedule of cleaning for galley uptakes/grills should be established so that fat deposits are not allowed to accumulate.

A notice should be prominently displayed detailing the action to be taken in the event of a deep fat fryer fire.

14.6 Microwave ovens

When microwave ovens are used, it is important to ensure that the food is cooked thoroughly and evenly. This is particularly important with deep frozen foods that should be thoroughly defrosted before cooking. The instructions issued by the oven manufacturers should be followed carefully in conjunction with the information on the packaging of the foodstuff.

No microwave oven should be operated if the oven door or its interlock is out of use, the door broken or ill-fitting or the door seals damaged. Each microwave oven should carry a permanent notice to this effect. Microwave radiation checks should be carried out at regular intervals.

14.7 Catering equipment

Except under the supervision of an experienced person, no one should use catering equipment unless trained in its use and fully instructed in the precautions to be observed.

Dangerous parts of catering machines should be properly guarded and the guards kept in position whenever the machine is used.

Any machine or equipment that is defective in its parts, guards or safety devices should be reported and taken out of service, with power disconnected, until repaired.

When a power-operated machine has to be cleaned or a blockage in it removed, it should be switched off and isolated from the power supply. Some machines will continue to run down for a while thereafter, and care should be taken to see that dangerous parts have come to rest before cleaning is begun.

A safe procedure for cleaning all machines should be established and carefully followed. Every precaution should be taken where cutting edges, eg on slicing machines, are exposed by the

necessary removal of guards to allow thorough cleaning. Guards should be properly and securely replaced immediately the job is done.

Unless properly supervised, a person under 18 years of age should not clean any power operated or manually driven machine with dangerous parts that may move during the cleaning operation.

Appropriate implements, not fingers, should be used to feed materials into processing machines.

Electrical equipment should not be used with wet hands.

All electrical equipment should be regularly inspected by a competent person.

14.8 Knives, saws, choppers

Sharp implements should be treated with respect and handled with care at all times. They should not be left lying around working areas where someone may accidentally cut themselves. They should not be mixed in with other items for washing up but cleaned individually and should be stored in a safe place.

Knives should be kept tidily in secure racks or sheaths when not in use.

The handles of knives, saws and choppers should be securely fixed and kept clean and free from grease. The cutting edges should be kept clean and sharp.

Proper can openers in clean condition should be used to open cans; improvisations are dangerous and may leave jagged edges on the can.

Chopping meat requires undivided attention. The chopping board must be firm, the cutting area of the meat well on the block and hands and body clear of the line of strike. There must be adequate room for movement and no obstructions in the way of the cutting stroke. Particular care is required when the vessel is moving in a seaway.

Foodstuffs being chopped with a knife should not be fed towards the blade with outstretched fingers. Fingertips should be sent inwards towards the palm of the hand with the thumb overlapped by the forefinger. The knife blade should be angled away from the work and so away from the fingers.

A falling knife should be left to fall, not grabbed.

A meat saw should be guided by the forefinger of the free hand over the tope of the blade. The use of firm even strokes will allow the blade to feel its way, if forced, the saw may jump possibly causing injury.

14.9 Refrigerated rooms and store rooms

All refrigerated room doors should be fitted with means both of opening the door and of sounding the alarm from the inside.

A routine testing of the alarm bell and checking of the door clasps and inside release should be carried out regularly, at least at weekly intervals.

Those using the refrigerated room should make themselves familiar with the operation, in darkness, of the inside release for the door and the location of the alarm button.

All refrigerated room doors should be fitted with an arrangement of adequate strength to hold the door open in a seaway and should be secured open while stores are being handled. These doors are extremely heavy and can cause serious injury to a person caught between the door and the jamb.

Anyone going into a refrigerated room should take the padlock, if any, inside with them. Another person should be informed.

Cold stores or refrigerated rooms should not be entered if it is suspected that there has been a leakage of refrigerant. A warning notice to this effect should be posted outside the doors.

All stores and crates should be stowed securely so that they do not shift or move in a seaway.

When wooden boxes or crates are opened, protruding fastenings should be removed or made safe.

Metal hooks not in use should be stowed in a special container provided for the purpose. Where hooks cannot be removed they should be kept clear.

SECTION 3

WORK ACTIVITIES

MARITIME NEW ZEALAND

CHAPTER 15: SAFE SYSTEMS OF WORK

This chapter suggests some control measures which may be taken to protect those who may be put at risk in some key areas on board ship. Such measures should be based on the findings of the hazard identification process.

15.1 Working aloft and outboard

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

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

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

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

Other than emergency situations personnel should **not work over the side** while the vessel is underway. If such work has to be undertaken lifeboats or rescue boats should be ready for immediate use. Any such work should be closely monitored and watched by a responsible person.

Before work is commenced near the **ship's whistle**, the officer responsible should ensure that power is shut off and warning notices posted on the bridge and in the machinery spaces.

Before work is commenced on the **funnel**, the officer responsible should ask the duty engineer to ensure that emission of steam, harmful gases and fumes are reduced as far as practicable.

Before work is commenced in the vicinity of **radio aerials**, the officer responsible should inform the radio room or person in charge of radio equipment so that no transmissions are made whilst there is risk to personnel. A warning notice should be put up in the radio room.

Where work is to be done near the **radar scanner**, the officer responsible should inform the officer on watch so that the radar and scanner are isolated. A warning notice should be put on the set until the necessary work has been completed.

On completion of the work of the type described above, the person responsible should, where necessary, inform the appropriate person that the precautions taken are no longer required and that warning notices can be removed.

Work aloft should not be carried out in the vicinity of **cargo working**, unless it is essential. Care must always be taken to avoid risks to anyone below. Warning notices should be displayed. Tools and stores should be sent up and lowered by line in suitable containers which should be secured in place to keep tools or material not being used.

No one should place **tools** where they can be accidentally knocked down and may fall on someone below, nor should tools be carried in pockets from which they may easily fall. When working aloft it is often best to wear a belt designed to hold tools securely in loops.

15.2 Portable ladders

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

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

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

When portable extending ladders are in use, there should be sufficient overlap between the extensions.

Personnel negotiating a ladder should use both hands, and not attempt to carry tools or equipment in their hands.

Planks should not be suspended on rungs of ladders to be used as staging, nor should ladders be used horizontally for such purposes.

Working from ladders should be avoided as far as possible, but where necessary, and for heights greater than 2 m above base level, personnel must use a safety harness with lifeline secured above the work position.

15.3 Cradles and stages

As a guide, cradles should be at least 430 mm wide and fitted with guard rails or stanchions with taut ropes to a height of one metre from the floor. Toe boards add safety.

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

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

Ancillary equipment, lizards, blocks and gantlines should be thoroughly examined before use.

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

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

The **anchoring points** for lines, blocks and lizards must be of adequate strength and, where practicable, be permanent fixtures to the ship's structure. Integral lugs should be hammer tested. Portable rails or stanchions must not be used as anchoring points. Any anchoring points should be treated as lifting points and should be inspected/tested in accordance with the appropriate chapter of this Code.

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

Where personnel working from a stage are required to raise or lower themselves, great care must be taken to keep movements of the stage small and closely controlled.

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 which is adequate for the purpose.

On each occasion that a bosun's chair is rigged for use, the chair, gantlines and lizards must be thoroughly examined, and renewed if there is any sign of damage, and load tested at least 4 times the load they will be required to lift before a person is hoisted.

When a chair is to be used for riding topping lifts or stays, it is essential that the bow of the shackle, and not the pin, rides on the wire. The pin in any case should be seized.

When it is necessary to haul a person aloft in a bosun's chair it should be done only by hand; a winch should not be used.

If a worker is required to lower themself while using a bosun's chair, they should first frap both parts of the gantline together with a suitable piece of line to secure the chair before making the lowering hitch.

The practice of holding on with one hand and making the lowering hitch with the other is dangerous.

It may be prudent to have someone standing by to tend the lines.

15.4 Working from punts

Punts should be stable and provided with suitable fencing. Unsecured trestles and planks should not be used to give additional height.

The person in charge should have due regard to the strength of tides and other hazards, such as wash from passing vessels, before a punt is put to use.

When work is to be done at or near the stern or other propeller aperture, the person in charge should inform the duty engineer and deck officers so that warning notices are put up in the engine room, at the controls and on the bridge.

The duty engineer and deck officers should also be informed by the person in charge when seafarers are working below ship's side discharges so they are not used until the work is completed. Notices to this effect should be attached to the relevant control valves and not taken off until those working are reported clear.

15.5 Work in machinery spaces

The HSE Act requires hazards to be managed. Such management requires dangerous parts of ship's machinery to be isolated if they cannot be eliminated. A secure guard fitted to safeguard personnel would fulfil this obligation.

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

High noise levels

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

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

Oil leakages, tanks and bilges

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

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

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

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

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

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

Cleaning and spare gear

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

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

15.6 Boilers

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

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

- there should be no loose oil on the furnace floor

- the oil should be at the correct temperature for the grade of oil being used; if not, the temperature of the oil must be regulated before lighting is attempted
- the furnace should be blown through with air to clear any oil vapour
- the torch, specially provided for the purpose, should always be used for lighting a burner unless an adjacent burner in the same furnace is already lit; other means of ignition, such as introducing loose burning material into the furnace, should not be used. An explosion may result from attempts to relight a burner from the hot brickwork of the furnace
- if all is in order, the operator should stand to one side, insert the lighted torch and turn the fuel on. Care should be taken that there is not too much oil on the torch which could drip and possible cause a fire
- if the oil does not light immediately, the fuel supply should be turned off and the furnace ventilated by allowing air to blow through for two or three minutes to clear any oil vapour before a second attempt to light is made. During this interval the burner should be removed and the atomizer and tip inspected to verify that they are in good order
- if there is a total flame failure while the burner is alight, the fuel supply should be turned off.

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

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

15.7 Unmanned machinery spaces

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

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

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

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

Unmanned machinery spaces should be adequately illuminated at all times.

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

15.8 Refrigeration machinery

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

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

The compartment in which refrigeration machinery is fitted should be adequately ventilated and illuminated. Where fitted, both the supply and exhaust fans to and from compartments in which refrigeration machinery is situated should be kept running at all times. Inlets and outlets should be kept unobstructed.

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

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

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

CHAPTER 16: PERMIT TO WORK SYSTEMS

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected.

This chapter covers permits-to-work, which are suggested control measures for particular operations.

16.1 Permit-to-work systems

There are many types of operation on board ship where the routine actions of one person may inadvertently endanger another or when a series of action steps need to be taken to ensure the safety of those engaged in a specific operation. It is necessary, before the work is done, to identify the hazards and then to ensure that they are eliminated or effectively controlled.

Ultimate responsibility rests with the employer to see that this is done.

The permit-to-work system consists of an organised and pre-defined safety procedure. A permit-to-work does not in itself make the job safe, but contributes to safety.

The particular circumstances of individual ships will determine when permit-to-work systems should be used.

In using a permit-to-work, the following principles apply:

- the permit should be relevant and accurate. It should state the location and details of the work to be done, the nature and results of any preliminary tests undertaken, the measures undertaken to make the job safe and the safeguards that need to be taken during the operation
- the permit should specify the period of its validity (which should not exceed 24 hours) and any time limits applicable to the work which it authorises
- only the work specified on the permit should be undertaken
- before signing the permit, the authorising officer should ensure that all measures specified as necessary have in fact been taken
- the authorising officer retains responsibility for the work until he has either cancelled the permit or formally transferred it to another authorised person who should be made fully conversant with the situation. Anyone who takes over, either as a matter of routine or in an emergency, from the authorising officer, should sign the permit to indicate transfer of full responsibility
- the person responsible for carrying out the work should countersign the permit to indicate his understanding of the safety precautions to be observed
- the person completing the work should notify the responsible officer that the work has been done and get the permit cancelled.

The annex to this chapter gives examples of permits-to-work for various types of activity. These should be adapted to the circumstances of the individual ship or the particular job to be carried out, in the light of the hazard identification process.

An example of a Regional Council permit-to-work for intended “hot work” can be found on the *Navigation and Safety Bylaws* document on the Greater Wellington Regional Council’s website at: www.gw.govt.nz/story_images/1051_A4bylawsfinal200_s1894.pdf

ANNEX 16.1 SUGGESTED MINIMUM HEADINGS FOR PERMITS-TO-WORK

Separate permits may be developed for each of the types of activity below. Note: the authorising officer should indicate the sections applicable by ticks in the left-hand boxes next to headings, deleting any sub-heading not applicable.

The appropriate details should be inserted when the “Sections for other work” or “Additional precautions” are used. The authorised person should tick each applicable right-hand box as they make their check.

Work to be done: (description)

Location: (eg designation of space, machinery)

Authorised person in charge:

Period of validity of permit: (should not exceed 24 hours)

Crew detailed: (names)

Authorising officer:
(Signed) (Time) (Date)

Has a hazard identification process of the proposed work been carried out?

ENTRY INTO ENCLOSED OR CONFINED SPACE

		Checked
1	Space thoroughly ventilated	1
2	Atmosphere tested and found safe	2
3	Space secured for entry	3
4	Rescue and resuscitation equipment available at entrance	4
5	Testing equipment available for regular check	5
6	Responsible person in attendance at entrance	6
7	Communication arrangements made between person at entrance and those entering	7
8	Access and illumination adequate	8
9	All equipment to be used is of appropriate type	9
10	Personal protective equipment to be used: Hard hat, safety harness as necessary	10
11	When breathing apparatus is being used: (i) Familiarity of user with apparatus is confirmed (ii) Apparatus has been tested and found to be satisfactory	11(i) 11(ii)

MACHINERY OR EQUIPMENT

		Checked
1	Removed from service/isolated from sources of power or heat	1
2	All relevant personnel informed	2
3	Warning notices displayed	3

HOT WORK

		Checked
1	Area clear of dangerous material and gas-free	1
2	Adjacent areas checked	2
3	Ventilation adequate	3
4	Fire watchman posted/instructed	4
5	Equipment in good order	5
6	Fire appliances in good order and accessible	6
7	Personal protective equipment, eg hard hats, overalls, leather gauntlets/ apron, safety spectacles, visor	7

WORKING ALOFT/OVERSIDE

		Checked
1	Duty officer informed	1
2	Warning notices posted	2
3	On-deck supervisor identified	3
4	Equipment in good order	4
5	Work on funnel – advise duty engineer – isolate whistle if appropriate	5
6	Work near radar scanners/radio aerials – isolate radar and scanner/radio room notified – notices placed to stop use of radar/radio	6
7	Work overside – advise duty officer/engineer – lifebuoy and line ready	7
8	Personal protective equipment required – safety helmet, safety harness and line attached to strong point, lifejacket	8
9	As necessary, all tools to be taken aloft secured by lanyard/bag/belt	9

WORK IN UNMANNED MACHINERY SPACES

		Checked
1	Permission from engineer officer in charge	1
2	Reporting procedures established and checked	2
3	Warning notices in place	3
4	Bridge notified	4
5	Machinery space adequately lit	5

OTHER WORK

	Checked
1	1
2	2
3	3
4	4

FURTHER CONTROL MEASURES IDENTIFIED BY HAZARD IDENTIFICATION

	Checked
1	1
2	2
3	3

Certificate of checks

I am satisfied that all precautions have been taken and that safety arrangements will be maintained for the duration of the work.

Authorised person in charge:
(Signed)

Cancellation of certificate

The work has been completed/cancelled and all persons under my supervision, materials and equipment have been withdrawn.

Authorised person in charge:
(Signed) (Time) (Date)

CHAPTER 17: ENTERING ENCLOSED OR CONFINED SPACES

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights suggested control measures for entry into enclosed or confined spaces.

The atmosphere of any enclosed or confined space is potentially dangerous. The space may be deficient in oxygen and/or contain flammable or toxic fumes, gases or vapours. Where possible, alternative means of working that avoid entering the space should be found.

Should there be any unexpected reduction of ventilation of those spaces that are usually continuously or adequately ventilated then such spaces should be treated as dangerous spaces.

If a deficiency of oxygen is suspected in any space, or that toxic gases, vapours or fumes could be present, the space should be treated as dangerous.

17.1 Precautions on entering dangerous enclosed or confined spaces

The following precautions should be taken before a potentially dangerous space is entered so as to make the space safe for entry without breathing apparatus and to ensure it remains safe whilst persons are within the space.

1. A competent person should make an assessment of the space and a responsible officer to take charge of the operation should be appointed – see 17.2.
2. The potential hazards should be identified – see 17.3.
3. The space should be prepared and secured for entry – see 17.4.
4. The atmosphere of the space should be tested – see 17.5.
5. A “permit-to-work” system should be used – see 17.6.
6. Procedures before and during the entry should be instituted – see 17.7 and 17.8.

Where the procedures listed above have been followed and it has been established that the atmosphere in the space is or could be unsafe, then the additional requirements including the use of breathing apparatus specified in 17.12 should also be followed.

No one should enter any dangerous space to attempt a rescue without taking suitable precautions for their own safety otherwise they put their own lives at risk and may prevent the person they intended to rescue being brought out alive.

17.2 Duties and responsibilities of a competent person and of a responsible officer

A **competent person** is a person capable of making an informed assessment of the likelihood of a dangerous atmosphere being present or arising subsequently in the space. This person should have sufficient theoretical knowledge and practical experience of the hazards that might be met to be able to assess whether precautions are necessary.

This assessment should include consideration of any potential hazards associated with the particular space to be entered. It should also take into consideration dangers from neighbouring or connected spaces as well as the work that has to be done within the space.

A **responsible officer** is a person appointed to take charge of every operation where entry into a dangerous space is necessary. This officer may be the same as the competent person or another officer. Both the competent person and/or the responsible officer may be a shore-side person.

It is for the responsible officer to decide on the basis of the hazard identification process the procedures to be followed for entry into a potentially dangerous space. These will depend on whether the assessment shows:

- there is a minimal risk to the life or health of a person entering the space then or at any future time
- there is no immediate risk to health and life but a risk could arise during the course of work in the space, or
- the risk to life or health is immediate.

Where the assessment shows that there is no immediate risk to health or life but that a risk could arise during the course of the work in the space, the precautions described in sections 17.3 to 17.8 should be taken as appropriate.

Where the risk to health or life is immediate, then the additional requirements specified in section 17.10 are necessary.

For inland water vessels such as harbour craft either or both the competent person and the responsible officer may only be available from shore-based personnel. No entry into a potentially dangerous space should be made in these circumstances until such suitably qualified persons are available.

17.3 Identifying potential hazards

Oxygen deficiency

If an empty tank or other confined space has been closed for a time the oxygen content may have been reduced owing to a number of reasons:

- rusting may have occurred due to oxygen combining with steel
- oxygen absorbing chemicals may have been present
- oxygen absorbing cargoes may have been carried or gases from volatile cargoes may have displaced the oxygen in tanks
- hydrogen may have been produced in a cathodically-protected cargo tanks used for ballast
- oxygen may have been displaced by the use of carbon dioxide or other fire-extinguishing or fire-preventing media, or inert gas in the tanks or inter-barrier spaces of tankers or gas carriers.

Toxicity of oil cargoes

Hydrocarbon gases are flammable as well as toxic and may be present in fuel or cargo tanks that have contained crude oil or its products.

Hydrocarbon 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 components in the vapour of some oil cargoes, such as benzene and hydrogen sulphide are very toxic.

Toxicity of other substances

Cargoes carried in chemical tankers or gas carriers may be toxic.

There is the possibility of leakage from drums of chemicals or other packages of dangerous goods where there has been mishandling or incorrect stowage or damage due to heavy weather.

The trace components in inert gas such as carbon monoxide, sulphur dioxide, nitric oxide and nitrogen dioxide are very toxic.

The interaction of vegetable or animal oils or sewage with sea water may lead to the release of hydrogen sulphide which is very toxic.

Hydrogen sulphide or other toxic gases may be generated where the residue of grain or similar cargoes permeates into or chokes bilge pumping systems.

The chemical cleaning, painting or the repair of tank coatings may involve the release of solvent vapours.

Flammability

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 if there has been leakage into the space.

Other hazards

Although the inhalation of contaminated air is the most likely route through which harmful substances enter the body, some chemicals can be absorbed through the skin.

Some of the cargoes carried in chemical tankers and gas carriers are irritant or corrosive if permitted to come into contact with the skin.

The disturbance of rust, scale or sludge residues of cargoes of animal, vegetable or mineral origin, or of water that could be covering such substances may lead to the release of toxic or flammable gases.

17.4 Preparing and securing the space for entry

When opening the entrance to a potentially dangerous space, precautions should be taken in case gases (unpressurised or pressurised) are released from the space.

The space should be isolated and secured against the ingress of dangerous substances by blanking off pipelines or other openings and by closing valves. Valves should then be tied or some other means used to indicate that they are not to be opened and notices placed on the relevant controls. The officer on watch should be informed.

Where necessary, any sludge or other deposit liable to give off fumes should be cleaned out. This may in itself lead to the release of gases, and precautions should be taken.

The space should be thoroughly ventilated either by natural or mechanical means and then tested 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.

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

17.5 Testing the atmosphere of the space

Testing of a space should be carried out only by persons trained in the use of equipment.

Testing should be carried out before entry and at regular intervals thereafter.

If possible, the testing of the atmosphere before entry should be made by remote means. If this is not possible, the person selected to enter the space to test the atmosphere should only do so in accordance with the additional precautions specified in 17.10, which include the wearing of breathing apparatus.

Where appropriate, the testing of the space should be carried out at different levels.

Some monitoring equipment is designed for personal use purely to provide a warning against oxygen deficiency and hydrocarbon concentrations when there is a change in conditions. This should not be used as a means to determine whether a dangerous space is safe to enter.

Testing for oxygen deficiency

A steady reading of at least 20% oxygen by volume on an oxygen content meter should be obtained before entry is permitted.

A combustible gas indicator cannot be used to detect oxygen deficiency.

Testing for flammable gases and vapours

The combustible gas indicator (sometimes called an explosimeter) detects the amount of flammable gas or vapour in the air. An instrument capable of providing an accurate reading at low concentrations should be used to judge whether the atmosphere is safe for entry.

Combustible gas detectors are calibrated on a standard gas. When testing for other gases and vapours reference should be made to the calibration curves supplied with the instrument. Particular care is required should accumulations of hydrogen be suspected.

In deciding whether the atmosphere is safe to work in, a “nil” reading on a suitably sensitive combustible gas indicator is desirable but, where the readings have been steady for some time, up to 1% of lower flammable limit may be accepted, eg for hydrocarbons in conjunction with an oxygen reading of at least 20% by volume.

Direct measurement of trace components of inert gas (see “Toxicity of other substances”) is not required when the gas freeing of the atmosphere of a tank reduces the hydrocarbon concentration from about 2% by volume to 1% of lower flammable limit or less in conjunction with a steady oxygen reading of at least 20% by volume, because this is sufficient to dilute the components to a safe concentration.

If, before the commencement of gas freeing, the hydrocarbon concentration of a tank containing inert gas is below 2% by volume due to excessive purging by inert gas, then additional gas freeing is necessary to remove toxic products at the safe level without specialised equipment and trained personnel. If this equipment is not available for use, the period of gas freeing should be considerably extended.

Testing for toxic gases

The presence of certain gases and vapours on chemical tankers and gas carriers is detected by fixed or portable gas or vapour detection equipment.

The readings obtained by this equipment should be compared with the occupational exposure limits for the contaminant given in international industry safety guides.

These occupational exposure limits provide guidance for the level of exposure to toxic substances that should not be exceeded if the health of the persons is to be protected. However, it is necessary to know for which chemical a test is being made in order to use the equipment correctly and it is important to note that not all chemicals may be tested by these means.

When a toxic chemical is encountered for which there is no means of testing then the additional requirements specified in 17.10 should also be followed.

A combustible gas indicator will probably not be suitable for measuring levels of gas at or around its occupational exposure limit, where there is solely a toxic, rather than a flammable, risk. This level will be much lower than the flammable limit, and the indicator will probably not be sufficiently sensitive to give accurate readings.

17.6 Use of control systems

Entry into a dangerous space should be planned in advance and use should preferably be made of a “permit-to-work” system. See Chapter 16 for arrangements to be followed in a “permit-to-work” system and a sample “permit-to-work” at the chapter’s Annex.

For situations where a well established safe system of work exists, a checklist may be accepted as an alternative to a full “permit-to-work” provided that the principles of the “permit-to-work” system are covered and the risks arising in the dangerous space are low.

17.7 Procedures and arrangements before entry

Access to and within the space should be adequate and well illuminated.

No source of ignition should be taken or put into the space unless the master or responsible officer is satisfied that it is safe to do so.

In all cases rescue equipment should be positioned ready for use at the entrance to the space. Rescue equipment means breathing apparatus, together with fully charged spare cylinders of air, lifelines and rescue harnesses, and torches or lamps approved for use in a flammable atmosphere, if appropriate. A means of hoisting an incapacitated person from the confined space may be required.

The number of personnel entering the space should be limited to those who actually need to work in the space. When necessary a rescue harness should be worn to facilitate recovery in the event of an accident.

At least one attendant should be detailed to remain at the entrance to the space while it is occupied.

An agreed and tested system of communication should be established between any person entering the space and the attendant at the entrance, and between the attendant at the entrance to the space and the officer on watch.

Before entry is permitted it should be established that entry with breathing apparatus is possible. Any difficulty of movement within any part of the space, or any problems if any incapacitated person had to be removed from the space, as a result of breathing apparatus or lifelines or rescue harnesses being used, should be considered and any risks minimised.

Lifelines should be long enough for the purpose and capable of being firmly attached to the harness, but the wearer should be able to detach them easily should they become tangled.

17.8 Procedures and arrangements during entry

Ventilation should continue during the period that the space is occupied and during temporary breaks. In the event of a failure of the ventilation system any personnel in the space should leave immediately.

The atmosphere should be tested periodically while the space is occupied and personnel should be instructed to leave the space should there be any deterioration of the conditions.

If unforeseen difficulties develop, the work in the space should be stopped and the space evacuated so that the situation can be re-assessed. Permits should be withdrawn and only re-issued, with any appropriate revisions, after the situation has been re-assessed.

If any personnel in a space feel in any way adversely affected they should give the pre-arranged signal to the attendant standing by the entrance and immediately leave the space.

Should an emergency occur the general (or crew) alarm should be sounded so that back-up is immediately available to the rescue team. Under no circumstances should the attendant enter the space before help has arrived and the situation has been evaluated to ensure the safety of those entering the space to undertake the rescue.

If air is being supplied through an air line to the person who is unwell, a check should be made immediately that the air supply is being maintained at the correct pressure.

Once the casualty has been reached, the checking of the air supply must be the first priority. Unless the casualty has been gravely injured, eg a broken back, the person should be removed from the dangerous space as quickly as possible.

17.9 Procedures on completion

On expiry of the “permit-to-work”, everyone should leave the space and the entrance to the space should be closed or otherwise secured against entry or alternatively, where the space is no longer a dangerous space, declared safe for normal entry.

17.10 Additional requirements for entry into a space where the atmosphere is suspect or known to be unsafe

If the atmosphere is considered to be suspect or unsafe to enter, the space should only be entered if it is essential for testing purposes, for the safety of life or of the ship, or for the working of the ship. Breathing apparatus should always be worn.

The number of persons entering the space should be the minimum compatible with the work to be performed.

Except in the case of an emergency, or where impracticable because movement in the space would be seriously impeded, two air supplies should be available. The wearer should use the continuous supply provided from outside the space while working. If it becomes necessary to change over to the self-contained supply, the user should immediately leave the space.

Precautions should be taken against any disruption to the air supply while the individual is inside the enclosed space. Special attention should be given to supplies originating from the engine room.

Where remote testing of the space is not reasonably practicable, or where a brief inspection only is required, a single air supply may be acceptable provided that the wearer of breathing apparatus can be hauled out immediately in the case of an emergency.

In addition to rescue harnesses, wherever practicable lifelines should be used. A person stationed at the entrance who has been trained in how to pull an unconscious person from a dangerous space should attend lifelines. If hoisting equipment would be required for any rescue, arrangements should be made to ensure that personnel would be available to operate it as soon as necessary.

When appropriate, portable lights and other electrical equipment should be of a type approved for use in a flammable atmosphere.

Protective clothing should be worn if there is any likelihood that chemicals, whether in liquid, gaseous or vapour form, may come into contact with the skin and/or eyes.

17.11 Training, instruction and information

Section 13 of the HSE Act requires employers to provide any necessary training, instruction and information to employees to ensure that they do not cause any harm to themselves or others.

This should include:

- recognition of the circumstances and activities likely to lead to the presence of a dangerous atmosphere when entering dangerous spaces
- the hazards associated with entry into dangerous spaces, and the precautions to be taken
- the use and maintenance of equipment and clothing required for entry into dangerous spaces
- instruction and drills in rescue from dangerous spaces.

17.12 Breathing apparatus and resuscitation equipment

No one should enter a space where the atmosphere is unsafe or suspect without wearing breathing apparatus that they are trained to use, even to rescue another person.

Breathing apparatus for those working in a dangerous space will usually comprise a continuous supply from outside the space and a self-contained supply to enable the wearer to escape to a safe atmosphere in the event of difficulty with, or failure of, the continuous supply. It should not be necessary to remove any part of the equipment or any protective clothing to change over to the self-contained supply.

Equipment for use with two air supplies may consist of:

- a conventional self-contained breathing apparatus of the open circuit compressed air type that has been tested for use with air line connections; or
- a compressed air line breathing apparatus incorporating an emergency self-contained supply. The compressed air line breathing apparatus should be of the demand valve type. The emergency self-contained supply should comply with the relevant parts of the appropriate Standard.

The capacity of the self-contained supply should be sufficient for the wearer to escape to a safe atmosphere. When determining this capacity it should be recognised that, under stress or in difficult conditions, the wearer's breathing rate may be in excess of the nominal breathing rate of 40 litres per minute.

The responsible officer should make sure that the supply of air from outside the space is continuous and is available only to those working in the space. Pipeline or hoses supplying air should be placed so that they are not likely to be so distorted that supply might be interrupted or damaged.

If the purpose for which such air lines are used is not immediately apparent to personnel engaged in the entry, then notices should be posted at appropriate positions.

Where a mechanical pump is being used it should frequently be checked carefully to ensure that it continues to operate properly. Any air pumped directly into a pipeline or put into reserve bottles must be filtered and should be as fresh as possible.

Pipelines or hoses used to supply air should be thoroughly blown through to remove moisture and it is essential that where the air supply is from a compressor sited in a machinery space, the engineer of the watch is informed so that the compressor is not shut down until the work has been completed.

Everyone likely to use breathing apparatus must be instructed by a competent person in its proper use.

The master, or responsible officer, and the person about to enter the space should undertake the full pre-wearing check and donning procedures recommended in the manufacturer's instructions. In particular they should check that:

1. there will be sufficient clean air at the correct pressure
2. low pressure alarms are working properly
3. the facemask fits correctly against the user's face so that, combined with pressure of the air coming into the mask, 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 may prevent the formation of an air-tight seal between a person's face and the facemask
4. the wearer of the breathing apparatus understands whether or not their air supply may be shared with another person and if so is also aware that such procedures should only be used in an extreme emergency
5. when work is being undertaken in the space, the wearer should keep the self-contained supply for use when there is a failure of the continuous supply from outside the space.

When in a dangerous space:

- no one should remove their own breathing apparatus
- the breathing apparatus should not be removed unless it is necessary to save their life.

It is recommended that resuscitators of an appropriate kind should be provided where any person may be required to enter a dangerous space. Where entry is expected to occur at sea, the ship should be provided with appropriate equipment. Otherwise entry should be deferred until the ship has docked and use can be made of shore side equipment.

Maintenance of equipment for entry into dangerous spaces

All breathing apparatus, rescue harnesses, lifelines, resuscitation equipment and any other equipment provided for use in, or in connection with, entry into dangerous spaces, or for use in emergencies, should be properly maintained, inspected periodically and checked for correct operation by a competent person and a record of the inspections and checks kept.

All items of breathing apparatus should be inspected for correct operation before and after use.

Equipment for testing the atmosphere of dangerous space, including oxygen meters, should be kept in good working order and, where applicable, regularly serviced and calibrated. Due regard should be paid to manufacturers' recommendations, which should always be kept with the equipment.

CHAPTER 18: BOARDING ARRANGEMENTS

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights some areas that may require attention in respect of boarding arrangements.

18.1 Positioning of boarding equipment

The angles of inclination of a gangway or accommodation ladder should be kept within the limits for which it was designed. Gangways should not be used at an angle of inclination greater than about 30º from the horizontal and accommodation ladders should not be used at an angle greater than about 55º from the horizontal, unless specifically designed for greater angles.

When the inboard end of the gangway or accommodation ladder rests on or is flush with the top of the bulwark, a bulwark ladder should be provided. It is recommended that any gap between the bulwark ladder and the gangway or accommodation ladder should be adequately fenced to a height of at least 1 metre.

Gangways and other access equipment should not be rigged on ship's rails unless the rail has been reinforced for that purpose.

The means of access should be checked to ensure that it is safe to use after rigging. There should be further checks to ensure that adjustments are made when necessary due to tidal movements or change of trim and freeboard. Guard ropes, chains etc should be kept taut at all times and stanchions should be rigidly secured.

Each end of a gangway or accommodation or other ladder should provide safe access to a safe place or to an auxiliary safe access.

The means of access should be sited clear of the cargo working area and so placed that no suspended load passes over it. Where this is not practicable, access should be supervised at all times.

A lifebuoy should be available and ready for use at the point of access aboard the ship.

18.2 Lighting and safety of movement

In normal circumstances, the boarding equipment and the immediate approaches to it should be effectively illuminated from the ship or the shore. Where the dangers of tripping or falling are greater than usual because of bad weather conditions or where the means of access is obscured, eg by the presence of coal dust, consideration should be given to a higher level of lighting.

The means of boarding and its immediate approaches should be kept free from obstruction and, as far as is reasonably practicable, kept clear of any substance likely to cause a person to slip or fall. Where this is not possible, appropriate warning notices should be posted and if necessary the surfaces suitably treated.

18.3 Portable and rope ladders

Where, exceptionally, a portable ladder is used for the purpose of access to the ship, it is very important that the ladder is checked regularly by a competent person, and that account is taken of vessel movement and tide changes.

When it is necessary to use a portable ladder for access it should be used at an angle of between 60º and 75º from the horizontal. The ladder should extend at least 1 m above the upper landing place unless there are other suitable handholds. It should be properly secured against slipping or shifting sideways or falling and be so placed as to afford a clearance of at least 150 mm behind the rungs.

When a portable ladder is resting against a bulwark or rails, suitable safe access to the deck should be provided.

A rope ladder should never be secured to rails or to any other means of support unless the rails or support are so constructed and fixed as to take the weight of a man and a ladder with an ample margin of safety.

A rope ladder should be left in such a way that it either hangs fully extended from a securing point or is pulled up completely. It should not be left so that any slack will suddenly pay out when the ladder is used.

Where the freeboard is 9 m or more, a rope ladder should be used in conjunction with an accommodation ladder, leading aft and positioned in such a way as to provide safe and easy access from the rope ladder to the bottom platform.

18.4 Safety nets

When a ship is being loaded or unloaded alongside a quay or another ship, adequate and safe means of access to the ship is required. It should be properly installed, secured and adjusted to suit the tidal conditions.

Access to the ship from a wharf must be by means of a gangway with nets slung from the ship's side to the opposite side of the gangway or by means of an enclosed solid structure or by other means that will prevent a person falling from the gangway and landing on the wharf or in the water.

18.5 Maintenance of equipment for means of access

Any equipment used for boarding must be properly maintained, and should be inspected by a competent person at appropriate intervals. Any defects affecting the safety of any access equipment, including access provided by a shore authority, should be reported immediately to a responsible person and should be made good before further use.

Aluminium equipment should be examined for corrosion

18.6 Special circumstances

In some circumstances it may not be practical to rig proper safe boarding arrangements by conventional means, for example, where there is frequent movement of the ship during cargo operations. On such occasions boarding should be carefully supervised and consideration given to providing alternative means of access.

Small boats or tenders used between the shore and the ship should be safe and stable, be suitably powered, correctly operated and properly equipped with the necessary safety equipment and, if not, a ship's boat should be approved for that purpose.

Where a vessel is moored alongside another vessel, there should be co-operation between the two vessels in order to provide suitable and safe boarding arrangements. The ship lying outboard should generally provide the access. However, if there is a great disparity in freeboard, then it should be provided by the ship with the higher freeboard.

Care should be taken at all times but particularly at night, when boarding or leaving a ship, or when moving through the dock area. The edges of the docks, quay etc should be avoided and any sign prohibiting entry to an area should be strictly observed.

Where there are designated routes they should be followed exactly. This is particularly important in the vicinity of container terminals or other areas where rail traffic, straddle carrier or other mechanical handling equipment is operating, as the operators of such equipment have restricted visibility, placing anyone walking within the working area at risk.

Transfer of personnel between two unsecured ships at sea is potentially a particularly dangerous manoeuvre. A hazard identification process of the transfer arrangements should be undertaken and appropriate safety measures put into place to ensure the safety of those involved.

Both vessels should be properly equipped and/or modified to allow the boarding to be undertaken without unnecessary risk. A proper embarkation point should be provided, and the boarding procedure clearly agreed. The relative movements of both vessels in any seaway and varying sea, tide and swell conditions make the judgement of when to effect a transfer crucial.

The master responsible for the transfer operation should have full sight of the area of transfer and he/she, and at least one designated crew member should be able to communicate at all times with the crew member making the transfer. It is recommended that vessels undertaking ship to ship transfers should carry equipment designed to aid in the rapid recovery of a casualty from the waters.

18.7 Pilot ladders and hoists

Where a pilot hoist is provided, personnel engaged in rigging and operating it should be fully instructed in the safe procedures to be adopted and the equipment should be tested prior to use.

The pilot ladder and any accommodation ladder used in conjunction with it should conform to the Maritime Rules Part 53, Pilot Transfer Arrangements and Ship-Helicopter Pilot Transfers.

In addition to the general points in this chapter, in order to minimise the danger to pilots when boarding and leaving ships, particular attention should be given to the following points:

- pilot ladders should be rigged in such a manner that the steps are horizontal, and so that the lower end is at a height above the water to allow ease of access to and from the attendant craft
- the ladder should rest firmly against the side of the ship
- when an accommodation ladder is used in conjunction with a pilot ladder, the pilot ladder should extend at least 1000 mm above the bottom platform or to the height of the handrail or handrope
- the rigging of pilot ladders and the embarkation and disembarkation of pilots must be supervised by a responsible officer of the ship, who should be in contact with the bridge
- a lifebuoy with self-igniting light should be kept available at the point of access to the ship
- at night, the pilot ladder and ship's deck should be lit by a forward-shining, overside light.

It is very important that the ship offers a proper lee to the pilot boat. The arrangements for boarding should preferably be sited as near amidships as possible, but in no circumstances should they be in a position that could lead to the pilot boat running the risk of passing underneath overhanging parts of the ship's hull structure. Further information is contained in the Maritime Rules Part 53.

ANNEX 18.1 CONSTRUCTION OF MEANS OF ACCESS

General

It is recommended that on ships of 30 metres in length or over, gangways be carried and on ships of 120 metres in length or over, accommodation ladders be carried.

Access equipment should be of good construction, sound material and of adequate strength, free from patent defect and properly.

Gangways should be fitted with suitable fencing along their entire length.

Accommodation ladders

An accommodation ladder should be designed so that:

- it rests firmly against the side of the ship
- the angle of slope is no more than about 55º. Treads and steps should provide a safe foothold at the angle at which the ladder is used
- it is fitted with suitable fencing (preferably rigid handrails) along its entire length, except that fencing at the bottom platform may allow access from the outboard side
- the bottom platform is horizontal, and any intermediate platforms are self-levelling.

When a bulwark ladder is to be used, it should be properly and safely secured.

Rope ladders

A rope ladder should be of adequate width and length and so constructed that it can be efficiently secured to the ship.

- The steps must provide a slip-resistant foothold of not less that 400 mm x 115 mm x 25 mm and must be so secured that they are firmly held against twist, turnover or tilt.
- The steps must be horizontal and equally spaced at intervals of not less than 300 mm or greater than 380 mm apart.
- The side ropes, which should be a minimum of 20 mm in diameter, should be equally spaced.
- It should be of a strength durability and grip that is equivalent to manila and protected against actinic degradation.
- There should be no shackles, knots or splices between rungs.
- Ladders of more than 1.5 m in length must be fitted with spreaders not less than 1.8 m long. The lowest spreader must be on the fifth step from the bottom and the interval between spreaders must not exceed nine steps. The spreaders should not be lashed between steps.

Access for pilots

In addition to the standards above, every pilot ladder should be positioned and secured so that:

- it is clear of any possible discharges from the ship
- it is, where practicable, within the mid-ship half-section of the ship
- it is firmly secured to the ship's side
- the person climbing it can safely and conveniently board the ship after climbing no more than 9 m.

Where replacement steps are fitted, they should be secured in position by the method used in the original construction of the ladder. No pilot ladder should have more than two replacement steps secured in position by a different method. Where a replacement step is secured by means of grooves in the sides of the step, such grooves should be in the longer sides of the step.

Two man-ropes of not less than 28 mm and not more than 32 mm in diameter, properly secured to the ship should be provided.

Safe, convenient and unobstructed access should be provided to anyone embarking or disembarking between the ship and the head of the pilot ladder.

Where access to the ship is by gateway in the rails or bulkhead, adequate handholds should be provided. Shipside doors used for this purpose should not open outwards.

Where access is by bulwark ladder, the ladder should be securely attached to the bulwark rail or landing platform. Two handhold stanchions should be provided, between 700 mm and 800 mm apart, each of which should be rigidly secured to the ship's structure at or near its base and at another higher point. The stanchions should be not less than 32 mm in diameter and extend no less than 1.20 m above the top of the bulwarks.

If a trap door is fitted in the bottom platform of an accommodation ladder to allow access to the pilot ladder, the opening should be no less than 750 mm square, and the after part of the bottom platform should be fenced as the rest of the ladder. In this case, the pilot ladder should extend above the lower platform to the height of the handrail.

Pilot hoists

Detailed construction standards for pilot hoists are contained in Maritime Rules Part 53.

ANNEX 18.2 CORROSION OF ACCOMMODATION LADDERS AND GANGWAYS

Aluminium alloys are highly susceptible to galvanic corrosion in a marine atmosphere if they are used in association with dissimilar metals. Great care should be exercised when connecting mild steel fittings, whether or not they are galvanised, to accommodation ladders and gangways constructed of aluminium.

Plugs and joints of neoprene, or other suitable material, should be used between mild steel fittings, washers, etc and aluminium. The plugs or joints should be significantly larger than the fittings or washers.

Repairs using mild steel doublers or bolts made of mild steel or brass or other unsuitable material should be considered as temporary. Permanent repairs, or the replacement of the means of access, should be undertaken at the earliest opportunity.

The manufacturers' instructions should give guidance on examination and testing of the equipment. However, close examination of certain parts of accommodation ladders and gangways is difficult due to their fittings and attachments. It is essential, therefore, that the fittings are removed periodically for a thorough examination of the parts most likely to be affected by corrosion.

Accommodation ladders and gangways should be turned over to allow for a thorough examination of the underside. Particular attention should be paid to the immediate perimeter of the fittings; this area should be tested for corrosion with a wire probe or scribe.

Where the corrosion appears to have reduced the thickness of the parent metal to 3 mm, back plates should be fitted inside the stringers of the accommodation ladder or gangways.

CHAPTER 19: MANUAL HANDLING

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights some areas that may require attention in respect of manual handling.

The assessment should take full account not only of the characteristics of the load and the physical effort required, but also of the working environment (eg ship movement, confined space, high or low temperature, physical obstacles such as steps or gangways) and any other relevant factors (eg the age and health of the person, the frequency and duration of the work).

See Annex 19.1 for a fuller list of factors to be considered.

19.1 General

The term “manual handling” is used to describe any operation which includes any transporting or supporting of a load, lifting, putting down, pushing, pulling, carrying or moving by hand or by bodily force. This guidance is generally concerned with preventing musculo-skeletal injury.

There may of course be other hazards to those handling loads, for example from leakage of a hazardous substance from a package being moved, but these are dealt with in other relevant chapters.

Musculo-skeletal injuries can occur as a result of accident, poor organisation or an unsatisfactory working method.

19.2 Role of employers

So far as reasonably practicable, the employer must take appropriate measures or provide the means to avoid the need for any manual handling operations which may cause injury to workers, for example by re-organisation of the work, or automating or mechanising the operation.

Before instructing personnel to lift or carry by hand where there is a risk of injury, employers should consider whether alternative means of doing the same job would reduce the risk of injury.

Where there is no practical alternative to manual handling, it is recommended that the employer:

- carry out an assessment of the manual handling operations, taking into account the factors and questions in Annex 19.1
- take appropriate steps to reduce the risk of injury
- provide workers with a general indication, and where it is available, precise information on:
  - the weight of each load
  - where the centre of gravity of any load is not positioned centrally, the heaviest side of the load
- provide workers with proper training and information on how to handle loads correctly and the risks to their health and safety from incorrect handling.

Means of reducing the risk of injury may include:

- re-organisation of work stations (to enable workers to maintain good posture while lifting and carrying)
- taking account of an individual’s capabilities when allocating tasks.

There are often severe limitations in a ship on the improvements that can be made, but the employer should ensure that, as far as reasonably practicable, risks have been minimised.

Instruction for personnel may involve experienced and properly trained personnel demonstrating best practice especially to new recruits.

19.3 Advice to seafarers

Workers must make full and proper use of any system of work provided by the employer. Personnel should:

- use any mechanical aids provided
- follow instructions; and
- take sensible precautions to ensure that they are aware of any risk of injury from the load before picking it up.

The proper procedure to follow when manually lifting and carrying, is:

- assess the load to be lifted, taking account of any information provided by the employer
- look for sharp edges, protruding nails or splinters, for surfaces that are greasy or otherwise difficult to grip an for any other features which may prove awkward or dangerous, eg sacks of ship's stores may be difficult to get off the deck
- ensure that the deck or area over which the load is to be moved is free from obstructions and not slippery.

The diagram in the following annex illustrates some important points in lifting techniques that include:

- a **firm and balanced stance** should be taken close to the load with the feet a little apart, not too wide, so that the lift will be as straight as possible
- a **crouching position** should be adopted, knees bent and maintaining the natural curve of the back to ensure that the legs do the work. It helps to tuck in the chin while gripping the load and then raise the chin as the lift begins
- the load should be **gripped with the whole of the hand** – not fingers only. If there is insufficient room under a heavy load to do this, a piece of wood should be put underneath first
- the size and shape of the load are not good guides to its weight or weight distribution. If this information is not available a careful **trial lift** should be made and help should be provided if there is any doubt as to whether the load can be managed by one person
- the load should be **lifted by** straightening the legs, keeping it close to the body. The heaviest side should be kept closest to the trunk. The body should not be twisted as this will impose undue strain on the back and other parts of the body
- if the lift is to a high level, it may be necessary to do it in **two stages**; first raising the load onto a bench or other support and then completing the lift to the full height, using a fresh grip (Fig. 2).

When two or more people are handling a load, it is preferable that they should be of similar stature. The actions of lifting, lowering and carrying should, as far as possible, be carried out in unison to prevent strain and any tendency for either person to overbalance (Fig. 3).

The procedure for **putting a load down** is the reverse of that for lifting, the legs should do the work of lowering – knees bent, back straight and the load close to the body. Care should be taken not to trap fingers. The load should not be put down in a position where it is unstable. If precise positioning is necessary, the load should be put down first, then slid into the desired position.

A load should always be carried in such a way that it does not obscure vision, so allowing any obstruction to be seen.

The risk of injury may be reduced if lifting can be replaced by controlled pushing or pulling. For example, it may be possible to slide the load or roll it along. However, uncontrolled sliding or rolling, particularly of large or heavy loads, may introduce fresh risks of injury. Particular care must be taken if:

- stooping or stretching is likely
- your hands when on the load are not between waist and shoulder height
- the deck area is insecure or slippery
- force is applied at an angle to your body
- the load may make sudden or unexpected movements.

For **pulling and pushing**, a secure footing should be ensured, and the hands applied to the load at a height between waist and shoulder wherever possible (Fig. 4). A further option, where other safety considerations allow, is to push with the worker's back against the load, using the strong leg muscles to exert the force (Fig. 5).

Suitable shoes or boots should be worn for the job. Protective toecaps help to guard toes from crushing if the load slips; they can sometimes also be useful when putting the load down to take the weight while hands are removed from underneath.

Clothing should be worn which does not catch in the load and which gives some body protection.

Where the work is very strenuous, for example due to load weight, repetitive effort over a period or environmental factors such as a confined space or an extreme of temperature, rest should be taken at suitable intervals, to allow muscles, heart and lungs to recover. Fatigue makes accidents more likely on work of this type.

Whenever possible, manual lifting and carrying should be organised in such a way that each person has some control over their own rate of work.

ANNEX 19.1 FACTORS TO BE CONSIDERED

The following are examples of the factors that the employer should think about when making an assessment of manual handling operations or providing instruction for personnel.

1. Do the tasks involve:

- activity which is too strenuous?
- holding or manipulating loads at distance – from trunk?
- unsatisfactory or unstable bodily movement or postures, especially:
  - twisting the trunk
  - stooping
  - reaching upward?
- excessive movement of loads, especially:
  - excessive lifting or lowering distances?
  - excessive carrying distances?
- risk of sudden movement of loads?
- frequent or prolonged physical effort, particularly affecting the spine?
- insufficient rest or recovery periods?
- a rate or work imposed by a process?
- climbing up or down stairs?
- handling while seated?
- use of special equipment?
- team handling?

2. Are the loads:

- heavy?
- bulky or unwieldy, or difficult to grasp?
- unstable, or with contents likely to shift?
- likely, because of the contours and/or consistency, to injure workers, particularly if the individual collides with someone or something?
- wet, slippery, very cold or hot and therefore difficult to hold?
- sharp?
- potentially damaging/dangerous if dropped?

3. Does the working environment have:

- space constraints preventing handling loads at a safe height or with good posture?
- uneven, slippery or unstable deck surface?
- variations in level of deck surfaces (eg door sills) or work surfaces?
- extremes of temperature or humidity?
- has account been taken of the sea state, wind speed and the unpredictable movement of the deck?
- are there steps, stairs or ladders or self-closing doors to be negotiated?
- is the area adequately lit?
- is movement or posture hindered by personal protective equipment or by clothing?

4. Is the individual:

- physically unsuited to carry out the task, either because of the nature of the tasks or because of a need to protect them from a danger which specifically affects them? ie does the job require unusual strength, height etc? Is there a hazard to those who might reasonably be considered unsuited to the task? Does it pose a risk to those who are pregnant or have a health problem?
- wearing unsuitable clothing, footwear or other personal effects?
- inadequately experienced or trained?
- inadequately equipped?

ANNEX 19.2 GRAPHIC ILLUSTRATIONS OF MANUAL HANDLING TECHNIQUES

Fig 1

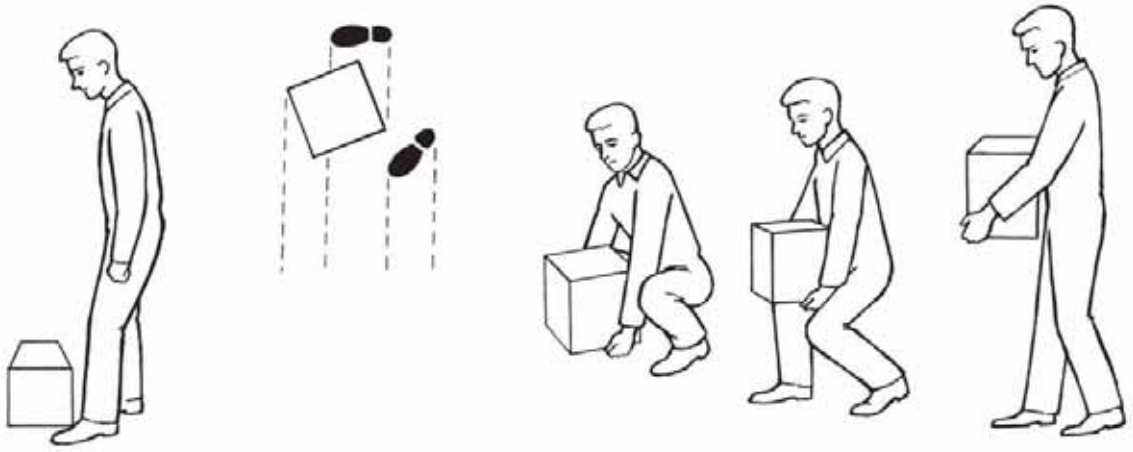


Fig 2

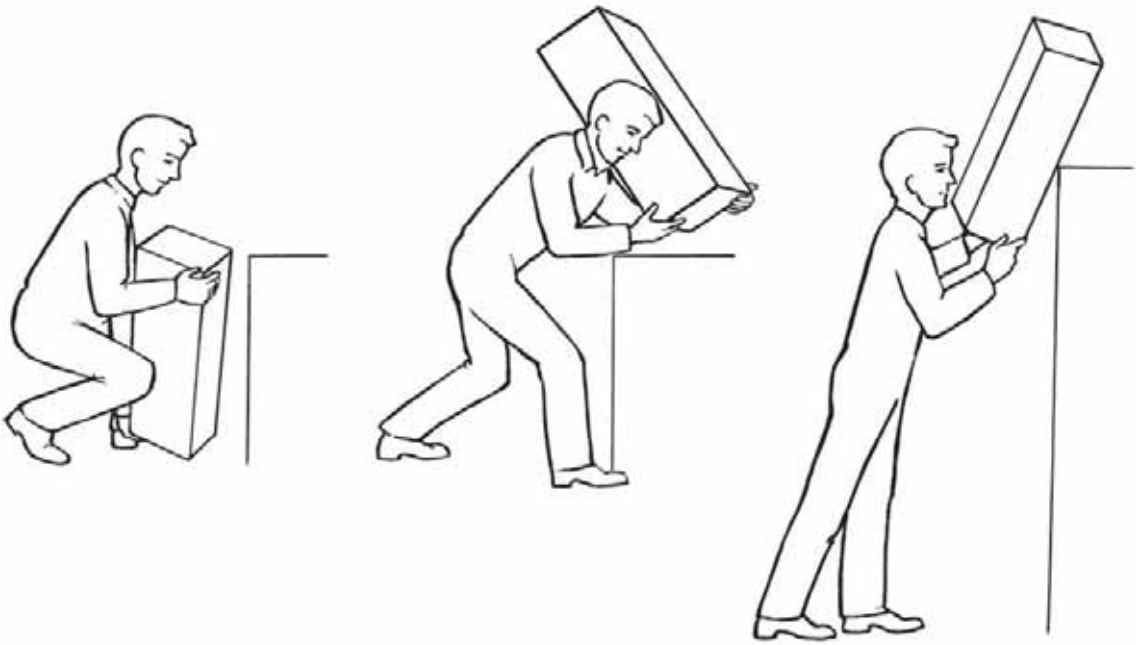


Fig 3

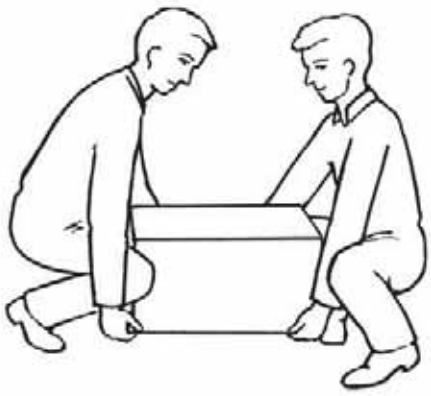


Fig 4

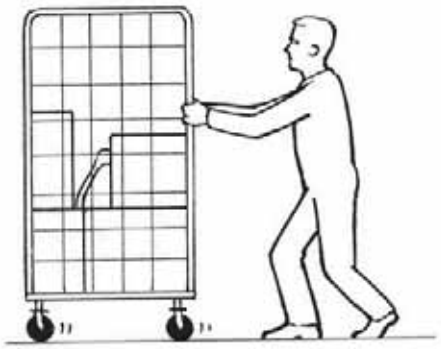
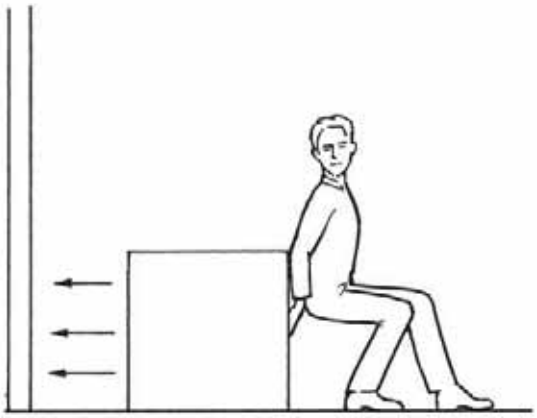


Fig 5



CHAPTER 20: USE OF WORK EQUIPMENT

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights some areas that may require attention in respect of use of work equipment.

Under New Zealand Maritime Rule Part 40B, the owner of a ship must ensure that the ship has electrical installations that comply with the applicable requirements of Part A and Part D of Chapter II-I of SOLAS.

20.1 Use of tools and equipment

This section gives general advice about different kinds of equipment including powered and hand tools. Later sections cover some types of equipment that pose particular risks. Lifting equipment is dealt with in Chapter 21 because of the serious hazards it presents.

Tools should be used only for the purpose for which they were designed. Personnel should ensure that they use the correct tools or equipment for a task. Use of unsuitable tools or equipment may lead to accidents.

Loose clothing or jewellery should never be worn while using machinery, as there is a risk that it may become caught in moving parts and long hair should be tied back and covered with a hair net or safety cap.

Personal protective equipment should be worn as required by Section 19 of the HSE Act 1992.

Only those competent to use equipment should do so. New recruits should always be shown how to use any equipment that may injure them or another person if it is carelessly or incorrectly handled or used.

Incorrect use of tools and equipment can cause accidents, as well as damage to the equipment in question. Instructions for use should always be consulted and followed, where they are available.

When not in use equipment should be stowed in a tidy and correct manner. Any cutting edges should be protected.

20.2 Hand tools

Damaged or worn tools should not be used and cutting edges should be kept sharp and clean. A competent person should carry out repairs and dressing of tools.

Wherever practicable, a tool in use should be directed away from the body, so that if it slips it does not cause injury. However, when using a spanner more control is gained by pulling towards the body. When using a tool with a cutting edge, both hands should be kept behind the blade.

A chisel is best held between thumb and base of index finger with thumb and fingers straight, palm of hand facing towards the hammer blow. A saw should not be forced; it should be pushed with a light, even movement.

20.3 Portable power operated tools and equipment

Power operated equipment may be dangerous unless properly maintained, handled and used and should only be used by competent persons. The flexible cables of electric tools should comply with the relevant Standard.

Before work begins, personnel should ensure that power supply leads and hoses are in good condition, laid safely clear of all potentially damaging obstructions and do not obstruct safe passage. Where they pass through doorways, the doors should be secured open.

The risk of electric shock is increased either by perspiration or in locations which are damp, humid or have large conductive surfaces. In such conditions power tools should be operated from low voltage supplies (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.

The risk associated with portable electric tools also applies to portable electric lamps. The supply to these should not exceed 24 volts.

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 fatal shock.

Chain linkages or similar devices should be fitted between sections of pneumatic hose to prevent whip-lash in the event of breakage. Alternatively, safety valves can be used which close off the lines.

Accessories and tool pieces (drill bit, chisel etc) should be absolutely secure in the tool. In particular, retaining, springs, clamps, locking levers and other built-in safety devices on pneumatic tools should be replaced after the tool piece is changed. Accessories and tool pieces should not be changed while the tool is connected to a source of power.

Correct safety guards for appliances should be securely fixed before starting any operation. They should only be removed when the machinery is not operating. However, 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 a safe system of work and precautions to take
- a warning notice should be conspicuously posted.

During temporary interruptions to work, eg meal breaks and also at completion of a task, equipment should be isolated from power sources and left safely or stowed away correctly.

Where the work operation causes high noise levels, hearing protection should be worn. Where flying particles may be produced, the face and eyes should be protected.

The vibration caused by reciprocating tools (eg pneumatic drills, hammers, chisels) or high speed rotating tools can give rise to a permanent disablement of the hands known as “dead” or “white” fingers. Initially this appears as a numbness of the fingers and an increasing sensitivity to cold, but in more advanced stages, the hands become blue and the fingertips swollen. Those prone to the disability should not use such equipment. Others should be advised not to use them for more than 30 minutes without a break.

20.4 Workshop and bench machines (fixed installations)

Fixed installations should only be operated by competent personnel. The operator should check a machine every time before use and ensure that all safety guards and devices are in position

and operative, that all tool pieces (eg drill bits, cutting blades) are in good condition, and that the work area is adequately lit and free from clutter.

No machine should be used when a guard or safety device is missing, incorrectly adjusted or defective or when it is itself in any way faulty. If any defect is identified, the machine should be isolated from its source of power until it has been repaired.

During operations, personnel should ensure that work pieces are correctly secured in position, machine residues (eg swarf, sandings) do not build up excessively, and are disposed of in a correct and safe manner.

Whenever machinery is left unattended, even if only briefly, the power supply should be switched off and isolated, and the machinery and any safety guards should be rechecked before resuming work.

20.5 Abrasive wheels

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

Manufacturers' instructions should be followed on the selection of the correct type of wheel for the job in hand. Generally, soft wheels are more suitable for hard material and hard wheel for soft material.

Before a wheel is mounted, it should be brushed clean and closely inspected to ensure that it has not been damaged in storage or transit. The soundness of a vitrified wheel can be further checked by suspending it vertically and tapping it gently. If the wheel sounds dead it is probably cracked, and should not be used.

A wheel should not be mounted on a machine for which it is unsuitable. It should fit freely but not loosely to the spindle; if the fit is unduly tight, the wheel may crack as the heat of the operation causes the spindle to expand.

The clamping nut should be tightened only sufficiently to hold the wheel firmly. When the flanges are clamped by a series of screws, the screws should be first screwed home with the fingers and diametrically opposite pairs tightened in sequence.

The speed of the spindle should not exceed the stated maximum permissible speed of the wheel.

A strong guard, enclosing as much of the wheel as possible, should be provided and kept in position at every abrasive wheel (unless the nature of the work absolutely precludes it use) both to contain wheel parts in the event of a burst and to prevent an operator having contact with the wheel.

Where a work rest is provided, it should be properly secured to the machine and should be adjusted as close as practicable to the wheel, the gap normally being not more than 1.5 mm.

The side of a wheel should not be used for grinding; it is particularly dangerous when the wheel is appreciably worn.

The work piece should never be held in cloth or pliers.

When dry grinding operations are being carried on or when an abrasive wheel is being trued or dressed, suitable transparent screens should be fitted in front of the exposed part of the wheel or operators should wear properly fitting eye protectors.

20.6 Hydraulic/pneumatic/high pressure jetting equipment

Personnel using hydraulic/pneumatic/high pressure systems should have received adequate instruction and be competent to use such equipment. Manufacturers' operating guidelines should be followed at all times. Equipment should not be operated at pressures that exceed manufacturers' recommendations.

Before starting work, personnel should ensure that the equipment and supply systems are in sound condition and that incorporated safety devices are in place and functioning correctly. Where equipment is defective or suspect, systems should be shut down, isolated and depressurised to allow effective replacement or repair. Competent personnel should carry out such repairs using approved components only.

Before activating a pressure system, and also when closing down, the recommended checks should be made to ensure that no air pockets or trapped pressure are in the system, as these may cause erratic operation.

When handling hydraulic fluid, personnel should ensure that:

- the correct grade is used, when topping up systems
- spills are cleaned up immediately
- any splashes of such fluid onto the skin are cleaned off immediately – many such fluids are mineral based
- naked lights are kept away from equipment during service/test periods – hydraulic fluids may give off vapours which may be flammable.

Operators using high pressure jetting equipment should wear the correct protective equipment. Such systems may involve use of a heated supply source and protection against splashing and scalding may be needed. Warning notices should be displayed on approaches to areas where such work is being undertaken to warn other personnel. Care should be taken to ensure that the direction of such jetting is safe.

When compressed air is used, the pressure should be kept no higher than is necessary to undertake the work.

Compressed air should not be used to clean the working space, and in no circumstances should it be directed at any part of a person's body.

20.7 Hydraulic jacks

Jacks should be inspected before use to ensure that they are in a sound condition and that the oil in the reservoir reaches the minimum recommended level.

Before a jack is operated, care should be taken to ensure that it has an adequate lifting capability for the work for which it is to be used and that its foundation is level and of adequate strength.

Jacks should be applied only to the recommended or safe jacking points on equipment.

Equipment under which personnel are required to work should be properly supported with chocks, wedges or by other safe means – never by jacks alone.

Jack operating handles should be removed if possible when not required for raising or lowering the jack.

20.8 Ropes

The safety of the ship or an individual crew member is often dependent on the rope that is being used.

There are many types of rope available (both man-made and natural fibre) each with different properties and resistance to contamination by substances in use about the ship that may seriously weaken the rope.

The following table is a guide to the resistance of the main rope types but is indicative only of the possible extent of deterioration. In practice, much depends on the precise formulation of the material, the amount of contamination the rope receives and the length of time and the temperature at which it is exposed to contamination. In some cases, damage may not be apparent even on close visual inspection.

	Resistance to chemicals of rope made of:			
SUBSTANCE	**MANILA OR SISAL**	**POLYAMIDE (NYLON)**	**POLYESTER**	**POLYPROPYLENE**
Sulphuric (battery) acid	None	Poor	Good	Very good
Hydrochloric acid	None	Poor	Good	Very good
Typical rust remover	Poor	Fair	Good	Very good
Caustic soda	None	Good	Fair	Very good
Liquid bleach	None	Good	Very good	Very good
Creosote, crude oil	Fair	None	Good	Very good
Phenols, crude tar	Good	Fair	Good	Good
Diesel oil	Good	Good	Good	Good
Synthetic detergents	Poor	Good	Good	Good
Chlorinated solvents, eg trichloroethylene used in some paint and varnish removers	Poor	Fair	Good	Poor
Other organic solvents	Good	Good	Good	Good

Ropes should be stored away from heat and sunlight, if possible in a separate compartment that is dry and well ventilated, away from containers of chemicals, detergents, rust removers, paint strippers and other substances capable of damaging them.

Mooring ropes should be covered by tarpaulins or, if the ship is on a long voyage, stowed away. Any accidental contamination should be reported immediately for cleansing or other action.

Man-made fibre ropes have high durability and low water absorption and are resistant to rot. Mildew does not attack man-made fibre ropes but moulds can form on them. This will not normally affect their strength.

Polypropylene ropes, which have the best all round resistance to attack from harmful substances, are generally preferred. However, they may be subject to degradation in strong

sunlight (“actinic degradation”), and should not be exposed for long periods. They should also be of a type providing grip comparable to that of manila or sisal ropes.

New rope, 3-strand fibre rope and wire should be taken out of a coil in such a fashion as to avoid disturbing the lay of the rope.

Rope should be inspected internally and externally before use for signs of deterioration, undue wear or damage.

When using **steel wire** rope the following characteristics should be taken into consideration:
- strength
- rotation resistance
- fatigue resistance
- resistance to wear and abrasion
- resistance to crushing
- resistance to corrosion
- rope extension.

It is important that wires are properly installed, maintained and lubricated as appropriate to their use.

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. Annex 20.1 gives further information regarding bulldog grips.

20.9 Characteristics of man-made fibre ropes

Safe handling of man-made fibre ropes requires techniques that differ from those for handling natural fibre ropes.

Man-made fibre ropes are relatively stronger than those of natural fibre and so for any given breaking strain have appreciably smaller circumferences, but wear or damage will diminish strength to a greater extent than would the same amount of wear or damage on a natural fibre rope.

Recommendations for substitution of natural fibre ropes by man-made fibre ropes are given in the following table (diameter given for 3-strand, size no for 8-strand plaited).

MANILA		**POLYAMIDE (NYLON ETC)**		**POLYESTER (TERYLENE ETC)**		**POLYPROPYLENE**	
Dia	Size	Dia	Size	Dia	Size	Dia	Size
48 mm	(6)	48 mm	(6)	48 mm	(6)	48 mm	(6)
56 mm	(7)	48 mm	(6)	48 mm	(6)	52 mm	(6.5)
64 mm	(8)	52 mm	(6.5)	52 mm	(6.5)	56 mm	(7)
72 mm	(9)	60 mm	(7.5)	60 mm	(7.5)	64 mm	(8)
80 mm	(10)	64 mm	(8)	64 mm	(8)	72 mm	(9)
88 mm	(11)	72 mm	(9)	72 mm	(9)	80 mm	(10)
96 mm	(12)	80 mm	(10)	80 mm	(10)	88 mm	(11)
112 mm	(14)	88 mm	(11)	88 mm	(11)	96 mm	(12)

Careful inspection of man-made fibre ropes for wear externally and internally is necessary. A high degree of powdering between strands indicates excessive wear and reduced strength. Ropes with high stretch suffer greater inter-strand wear than others. Hardness and stiffness in some ropes, polyamide (nylon) in particular, may also indicate overworking.

Unlike natural fibre ropes, man-made fibre ropes give little or no audible warning of approaching breaking point.

Rope of man-made material stretches under load to an extent that varies according to the material. Polyamide rope stretches the most.

Stretch imparted to man-made 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, personnel 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.

Man-made 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.

The method of making eye splices in ropes of man-made fibres should be chosen according to the material of the rope.

- Polyamide (nylon) and polyester (terylene) 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 be at least three but not 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 man-made fibre ropes because strands may be damaged during application of the mechanical fastening and the grip of the fastenings may be much affected by slight unavoidable fluctuations in the diameter of the strands.

Man-made fibre stoppers of like material (but not polyamide) should be used on man-made fibre mooring lines, preferably using the “West Country” method (double and reverse stoppering).

20.10 Work with visual display units (VDUs)

Personnel should be given adequate individual training in the use and capabilities of VDUs. This training should be adapted to the needs and ability of the person and the type of equipment.

Any person using VDUs regularly or frequently and for lengthy periods should be given an eye test by a qualified person before beginning such work and at regular intervals thereafter. If either the eye test of examination by an ophthalmologist shows that the person needs special glasses for this work these should be provided.

VDUs should be so positioned that there is sufficient room to move, as necessary, around the equipment. Care should be taken to ensure that cables and wiring do not cause a hazard by obstructing movement.

Lighting should be adequate for the task, with glare and reflection cut to a minimum, and the display on screen should be clear and easy to read. The operator should adjust the brightness and contrast to suit the lighting. When appropriate the operator should be given short rest periods away from the equipment.

There should be adequate leg room and the chair should be comfortable and stable, with adjustable seat height and back rest. The chair should be adjusted by each user to a comfortable position for working – arms approximately horizontal and eyes at the same level as the top of the screen. The keyboard and screen should be adjusted to a comfortable position for keying and viewing.

Exceptionally, certain forms of medication may impair working efficiency on a VDU. Personnel should be aware of this possibility and should seek medical advice if necessary.

20.11 Personnel lifts and lift machinery

Before a lift is put into normal service it must be tested and examined by a competent person and a certificate or report issued.

Regular examination must be carried out by a competent person thereafter and a certificate or report issued. More detailed examination and testing of parts of the lift installation must be carried out at periodic intervals.

A person chosen to act as a competent person must have such practical experience and theoretical knowledge and actual experience of the type of lift which they have to examine, as will enable them to detect defects or weaknesses and to assess their importance in relation to the safety of the lift.

An initial hazard identification process must be made to identify hazards associated with work on each lift installation, including work requiring access to the lift trunk. Safe working procedures must be drawn up for each lift installation. Persons who are to be authorised to carry out work on or inspection of the lift installation must comply with these procedures.

The specific areas that the hazard identification process should address should include, as appropriate:

- whether there are safe clearance above and below the car at the extent of its travel
- whether a car top control station is fitted and its means of operation
- the working conditions in the machine and pulley rooms.

Based on the findings of the hazard identification process, it is recommended that a permit-to-work system, as described in Chapter 16, be adopted when it is necessary for personnel to enter the lift trunk or to override the control safety systems. It is strongly recommended that no person should work alone on lifts.

Any work carried out on lifts must only be performed by authorised persons familiar with the work and the appropriate safe working procedures. These procedures must include provision for both the safety of persons working on the lift and others who may also be at risk such as intending passengers.

Appropriate safety signs must be prominently displayed in the area and also on control equipment such as call lift buttons. Barriers must be used when it is necessary for lift landing doors to remain open to the lift trunk.

Experience indicates that the most important single factor in minimising risk of accidents is the avoidance of misunderstanding between personnel. A means of communication to the authorising officer and between those involved in working on the lift must be established and maintained at all times. This might be by telephone, portable-hand held radio or a person-to-person chain. Whatever the arrangement, action should only be taken as a result of the positive receipt of confirmation that the message is understood.

Before attempting to gain access to the trunk, whenever possible the mains switch should be locked in the OFF position (or alternatively the fuses should be withdrawn and retained in a safe place) and an appropriate safety sign must be positioned at the point of such isolation. This should include both main and emergency supplies.

In addition, the landing doors should not be allowed to remain open longer than necessary; the machine room should be protected against unauthorised entry and after completion of work a check must be made to ensure that all equipment used in the operation has been cleared from the well.

When it is necessary for personnel to travel on top of a car, safety can be enhanced considerably by the use of the car top control station (comprising a stopping device and an inspection switch/control device). Account should be taken of the arrangement and location of the control station, ie whether the stopping device can be operated before stepping on to the car top. Persons must not travel on the top of the lift car if no stopping device is fitted.

20.12 Laundry equipment

All personnel required to work in the laundry or use any part of the equipment there must be fully instructed on the proper operation of the machinery. A person under 18 years of age should not work on industrial washing machines, hydro-extractors, calendars or garment presses unless they are fully instructed as to precautions to be observed, and have received sufficient training in work at the machine or are under close supervision by a suitably experienced person.

Equipment should be inspected before use for faults and damage. Particular attention should be paid to the automatic cut-off or interlocking arrangements on washing machines, hydro-extractors etc and the guards and emergency stops on presses, calendars, mangling and wringing machines.

Any defect or irregularity found during inspection, or apparent during operation of the equipment, should be reported immediately and the use of the machine discontinued until any necessary repairs or adjustments have been carried out. A notice warning against use should be displayed prominently on the defective machine.

Frequent and regular inspection, with thorough checking of all electrical equipment and apparatus, is also necessary to ensure the standard of maintenance essential for laundries.

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.

ANNEX 20.1 BULLDOG GRIPS

The use of bulldog grips is discouraged, and they must not be used on lifting wires.

Do not use where the rope is likely to be subjected to very strong vibrations.

Do not use with plastic coated wire rope.

Where they are used, it is important they are installed correctly as per the manufacturer's instructions.

The "U" of the grip must be placed on the dead end of the rope as illustrated, and the distance between grips being approximately 6 rope diameters.

The minimum number of grips is dependant on the rope diameter; after being in service for several hours the grips should be re-tightened, and re-checked for tightness periodically. Correctly fitted grips would be expected to hold at least 80% of the minimum breaking load of the rope

CHAPTER 21: LIFTING PLANT

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected by lifting plant.

Chapter 20 provided general principles, however, this chapter gives more specific guidance based on the Maritime Rule Part 49 governing this type of equipment and highlights areas that may require more attention.

21.1 General requirements

To ensure their stability when lifting, lifting appliances should be:

- securely anchored, or
- adequately ballasted or counterbalanced, or
- supported by outriggers.

If counterbalance weights are moveable, effective precautions should be taken to ensure that the lifting appliance is not used for lifting in an unstable condition. In particular all weights should be correctly installed and positioned.

Lifting appliances with pneumatic tyres should not be used unless the tyres are in a safe condition and inflated to the correct pressures. Means to check this should be provided.

The operator should check safety devices fitted to lifting appliances before work starts and at regular intervals thereafter to ensure that they are working properly.

Controls

Controls of lifting appliances should be permanently and legibly marked with their function and their operating directions shown by arrows or other simple means, indicating the position or direction of movement for hoisting or lowering, slewing or luffing etc.

Make-shift extensions should not be fitted to controls nor any unauthorised alteration made to them. Foot-operated controls should have slip-resistant surfaces.

No lifting device should be used with any locking pawl, safety attachments or device rendered inoperative. If, exceptionally, limit switches need to be isolated in order to lower a crane to its stowage position, the utmost care should be taken to ensure the operation is completed safely.

Operation

A powered appliance should always have a person at the controls while it is in operation; it should never be left to run with a control secured in the ON position.

If any powered appliance is to be left unattended with the power on, loads should be taken off and controls put in “neutral” or “off” positions. Where practical, controls should be locked or otherwise inactivated to prevent accidental restarting. When work is completed, power should be shut off.

The person operating any lifting appliance should have no other duties which might interfere with their primary task. They should be in a proper and protected position, facing controls and, so far as is practicable, with a clear view of the whole operation.

Where the operator of the lifting appliance does not have a clear view of the whole of the path of travel of any load carried by that appliance, appropriate precautions should be taken to prevent danger.

Generally this requirement should be met by the employment of a competent and properly trained signaller designated to give instructions to the operator. A signaller includes any person who gives directional instructions to an operator while they are moving a load, whether by manual signals, by radio or otherwise.

The signaller should have a clear view of the path of travel of the load where the operator of the lifting appliance cannot see it.

Where necessary, additional signallers should be employed to give instructions to the first signaller.

Every signaller should be in a position that is:
- safe; and
- in plain view of the person to whom they are signalling unless an effective system of radio or other contact is in use.

All signallers should be instructed in and should follow a clear code of signals, agreed in advance and understood by all concerned in the operation.

Examples of hand signals recommended for use with lifting appliances on ships are shown in Annex 21.1 Code of hand signals.

If a load can be guided by fixed guides, or by electronic means, or in some other way, so that it is as safely moved as if it was being controlled by a competent team of driver and signallers, signallers will not be necessary.

Use of lifting equipment

Loads should if possible not be lifted over a person or any access way, and personnel should avoid passing under a load that is being lifted.

No person should be lifted by lifting plant except where the plant has been designed or especially adapted and equipped for the purpose or for rescue or in similar emergencies.

All loads should be properly slung and properly attached to lifting gear, and all gear properly attached to appliances.

The use of lifting appliances to drag heavy loads with the fall at an angle to the vertical is inadvisable because of the friction and other factors involved and should only take place in exceptional circumstances where the angle is small, there is ample margin between the loads handles and the safe working load of the appliance, and particular care is taken. In all other cases winches should be used instead. Derricks should never be used in union purchase for such work.

Any lifts by two or more appliances simultaneously can create hazardous situations and should only be carried out where unavoidable. They should be properly conducted under the close supervision of a responsible person, after thorough planning of the operation. Section 21.4 provides guidance on the use of derricks in union purchase.

Lifting appliances should not be used in a manner likely to subject them to excessive over-turning moments.

Ropes, chains and slings should not be knotted.

A thimble or loop splice in any wire rope should have at least three tucks with a whole strand of rope and two tucks with one half of the wires cut out of each strand. The strands in all cases should be tucked against the lay of the rope. Any other form of splice, which can be shown as efficient as the above, can also be used.

Lifting gear should not be passed around edges liable to cause damage without appropriate packing.

Where a particular type of load is normally lifted by special gear, such as plate clamps, other arrangements should only be substituted if they are equally safe.

The manner of use of natural and man-made fibre ropes, magnetic and vacuum lifting devices and other gear should take proper account of the particular limitations of the gear and the nature of the load to be lifted.

Wire ropes should be regularly inspected and treated with suitable lubricants. These should be thoroughly applied so as to prevent internal corrosion as well as corrosion on the outside. The ropes should never be allowed to dry out.

Lifting operations should be stopped if wind conditions make it unsafe to continue with them.

Cargo handling equipment that is lifted onto or off ships by crane or derrick should be provided with suitable points for the attachment of lifting gear, so designed as to be safe in use. The equipment should also be marked with its own gross weight and safe working load.

Before any attempt is made to free equipment that has become jammed under load, every effort should first be made to take off the load safely. Precautions should be taken to guard against sudden or unexpected freeing. Others not directly engaged in the operation should keep in safe or protected positions.

When machinery and, in particular, pistons are to be lifted by means of screw-in bolts, the eye-bolts should be checked to ensure that they have collars, that the threads are in good condition and that the bolts are screwed hard down on to their collars. Screw holds for lifting bolts in piston heads should be cleaned and the threads checked to see that they are not wasted before the bolts are inserted.

Safe working load (SWL)

A load greater than the safe working load should not be lifted unless:

- a test is required by Rule Part 49.5
- the weight of the load is known and is the appropriate proof load
- the lift is a straight lift by a single appliance
- the lift is supervised by the competent person who would normally supervise a test and carry out a thorough inspection
- the competent person specifies in writing that the lift is appropriate in weight and other respects to act as a test of the plant, and agrees to the detailed plan of the lift
- no person is exposed to danger thereby.

Any grab fitted to a lifting appliance should be of an appropriate size, taking into account the safe working load of the appliance, the additional stresses on the appliance likely to result from the operation, and the material being lifted.

In the case of a single sheave block used in double purchase the working load applied to the wire should be assumed to equal half the load suspended from the block.

The safe working load of a lift truck means its actual lifting capacity, which relates the load which can be lifted to, in the case of a fork lift truck, the distance from the centre of gravity of the load from the heels of the forks. It may also specify lower capacities in certain situations, eg for lifts beyond a certain height.

21.2 Use of winches and cranes

The drum end of wire runners or falls should be secured to winch barrels or crane drums by proper clamps or U-bolts. The runner or fall should be long enough to leave at least three turns on the barrel or drum at maximum normal extension. Slack turns of wire or rope on a barrel or drum should be avoided as they are likely to pull out suddenly under load.

When a winch is changed from single to double gear or vice versa, any load should first be released and the clutch should be secured so that it cannot become disengaged when the winch is working.

Steam winches should be so maintained that the operator is not exposed to the risk of scalding by leaks of hot water and steam.

Before a steam winch is operated, the cylinders and steam pipes should be cleared of water by opening the appropriate drain cocks. The stop valve between winch and deck steam line should be kept unobstructed. Adequate measures should be taken to prevent steam obscuring the driver's vision in any part of a working area.

Ships' cranes should be properly operated and maintained in accordance with manufacturers' instructions. Companies, employers and masters, as appropriate, should ensure that sufficient technical information is available including the following information:

- length, size and safe working load of falls and topping lifts
- safe working load of all fittings
- boom limiting angles
- manufacturers' instructions for replacing wires, topping up hydraulics and other maintenance as appropriate.

Power operated rail mounted cranes should have the following facilities incorporated in their control systems:

- facilities to prevent unauthorised start-up
- an efficient braking mechanism that will arrest the motion along the rails, and where safety constraints require, emergency facilities operated by readily accessible controls or automatic systems should be available for braking or stopping equipment in the event of failure of the main facility
- guards that reduce as far as possible the risk of the wheels running over persons' feet, and which will remove loose materials from the rails.

When a travelling crane is moved, any necessary holding bolts or clamps should be replaced before operations are resumed.

Access to a crane should be always by the proper means provided. Cranes should be stationary while accessing.

21.3 Use of derricks

Ships' derricks should be properly rigged and employers and masters should ensure that rigging plans are available containing the following information:

- position and size of deck eye-plates
- position of inboard and outboard booms
- maximum headroom (ie permissible height of cargo hook above hatch coaming)
- maximum angle between runners
- position, size and safe working load of blocks
- length, size and safe working load of runners, topping lifts, guys and preventers
- safe working load of shackles
- position of derricks producing maximum forces

- optimum position for guys and preventers to resist maximum forces as above
- combined load diagrams showing forces for a load of 1 tonne or the safe working load
- guidance on the maintenance of the derrick rig.

The operational guidance in the remainder of this section applies generally to the conventional type of ship's derrick. For other types, such as the "Hallen" and "Stulken" derricks, manufacturers' instructions should be followed.

Runner guides should be fitted to all derricks so that when the runner is slack, the bight is not a hazard to persons walking along the decks. Where the rollers are fitted to runner guides, they should rotate freely.

Before a derrick is raised or lowered, all persons on deck in the vicinity should be warned so that no person stands in, or is in danger from, bights of wire and other ropes. All necessary wires should be flaked out.

When a single span derrick is being raised, lowered or adjusted, the hauling part of the topping lift or bull-wire (ie winch end whip) should be adequately secured to the drum end. (See 21.2 Use of winches and cranes).

The winch driver should raise or lower the derrick at a speed consistent with the safe handling of the guys.

Before a derrick is raised, lowered or adjusted with a topping lift purchase, the hauling part of the span should be flaked out for its entire length in a safe manner. Someone should be available to assist the person making fast to the bitts or cleats. Where the hauling part of a topping lift purchase is led to a derrick span winch, the bull-wire should be handled in the same way.

To fasten the derrick in its final position, the topping lit purchase should be secured to bitts or cleats by first putting on three complete turns followed by four crossing turns and finally securing the whole with a lashing to prevent the turns jumping off due to the wire's natural springiness.

When a derrick is lowered on a topping lift purchase, someone should be detailed for lifting and holding the pawl bar, ready to release it should the need arise; the pawl should be fully engaged before the topping lift purchase or bull-wire is released. The person employed on this duty should not attempt or be given any other task until this operation is complete; in no circumstances should the pawl bar be wedged or lashed up.

A derrick with a topping winch, and particularly one that is self-powered, should not be topped hard against the mast, table or clamp in such a way that the initial heave required to free the pawl bar prior to lowering the derrick cannot be achieved without putting an undue strain on the topping lift purchase and its attachments.

A heel block should be secured additionally by means of a chain or wire so that the block will be pulled into position under load but does not drop when the load is released.

The derrick should be lowered to the deck or crutch and properly secured whenever repairs or changes to the rig are to be carried out.

If heavy cargo is to be dragged under deck with ship's winches, the runner should be led directly from the heel block to avoid overloading the derrick boom and rigging. Where a heavy load is to be removed, a snatch block or bull wire should be used to provide a fair-lead for the runner and to keep the load clear of obstructions.

21.4 Use of derricks in union purchase

When using union purchase the following precautions should be strictly taken to avoid excessive tensions:

- the angle between the married runners should not normally exceed 90º (or 120º in special circumstances)
- the cargo sling should be kept as short as possible so as to clear the bulwarks without the angle between the runners exceeding 90º (or 120º in special circumstances)
- derricks should be topped as high as practicable consistent with safe working
- the derricks should not be rigged further apart than is absolutely necessary.

The following examples will show how rapidly loads increase on derricks, runners and attachments as the angle between runners increases:

- at 60º included angle, the tension in each runner would be just over half the load;
- at 90º the tension would be nearly three-quarters of the load;
- at 195º the tension would be nearly 12 times the load.

When using union purchase, winch operators should wind in and pay out in step, otherwise dangerous tensions may develop in the rig.

An adequate preventer guy should always be rigged on the outboard side of each derrick when used in union purchase. The preventer guy should be looped over the head of the derrick, and as close to and parallel with the outboard guy as available fittings permit. Each guy should be secured to individual and adequate deck or other fastenings.

Narrow angles between derricks and outboard guys and between outboard guys and the vertical should be avoided in union purchase as these materially increase the loading on the guys. The angle between the outboard derrick and its outboard guy and preventer should not be too large and may cause the outboard derrick to jack-knife. In general, the inboard derrick guys and preventer should be secured as nearly as possible at an angle of 90º to the derrick.

21.5 Use of stoppers

Where fitted, mechanical topping lift stoppers should be used. Where chain stoppers are used, they should ALWAYS be applied by two half-hitches in the form of a cow hitch suitably spaced with the remaining chain and rope tail backed round the wire and held taut to the wire.

A chain stopper should be shackled as near as possible in line with the span downhaul and always to an eye plate, not passed round on a bight which would induce bending stresses similar to those in a knotted chain.

No stopper should be shackled to the same eye plate as the lead block for the span downhaul; this is particularly hazardous when the lead block has to be turned to take the downhaul to the winch or secure it to bitts or cleats.

The span downhaul should always be eased to a stopper and the stopper should take the weight before turns are removed from the winch, bitts or cleats.

21.6 Overhaul of cargo gear

When a cargo block or shackle is replaced, care should be taken to ensure that the replacement is of the correct type, size and safe working load necessary for its intended use.

All shackles should have their pins effectively secure or seized with wire.

A special check should be made on completion of the work to ensure that all the split pins in

blocks etc have been replaced and secured.

On completion of the gear overhaul, all working places should be cleaned of oil or grease.

21.7 Trucks and other vehicles/appliances

Where vehicles/work-trucks or other mechanical appliances are used aboard the vessel to carry personnel, they should where possible be constructed so as to prevent them overturning, or should be equipped or adapted to limit the risk to those carried by one or more of the following protection measures:

- an enclosure for the driver
- a structure ensuring that, should the vehicle overturn, safe clearance remains between the ground and the parts of the vehicle where people are located when it is in use
- a structure restraining the workers on the driving seat so as to prevent them from being crushed.

These protection structures may be an integral part of the vehicle/work equipment. They are not required when the work equipment is stabilised or where the equipment design makes roll-over impossible.

Personnel other than the driver should not be carried on a truck unless it is constructed or adapted for the purpose. Riding on the forks of a truck is particularly dangerous. The driver should be careful to keep all parts of the body within the limits of the width of the truck or load.

Trucks for lifting and transporting should be used only by competent persons and only when the ship is in still water; they should never be used when vessels are in a seaway.

Appliances powered by internal combustion engines should not be used in enclosed spaces unless the spaces are adequately ventilated. The engine should not be left running when the truck is idle.

When not in use or left unattended whilst the vessel is in port, trucks for lifting and transporting should be aligned along the length of the ship with brakes on, operating controls locked and, where applicable, the forks tilted forward flush with the deck and clear of the passageway. If the trucks are on an incline, their wheels should be chocked. If not to be used for some time, and at all times whilst at sea, appliances should be properly secured to prevent movement.

No attempt should be made to handle a heavy load by the simultaneous use of two trucks. A truck should not be used to handle a load greater than its marked capacity or to move insecure or unsafe loads.

Tank containers should not be lifted directly with the forks of for lift trucks, because of the risks of instability and of damaging the container with the ends of the forks. Tank containers may be lifted using fork lift trucks fitted with suitably designed side or top lifting attachments but care should be exercised due to the risk of surge in partly filled tanks.

21.8 Defect reporting and testing – advice to competent person

There is a legal requirement for lifting plant to be tested every five years Maritime Rule Part 49.5 gives the details.

The requirements for testing a lifting plant will be met if before use one of the following appropriate tests is carried out:

- roof of loading the plant concerned; or

- in appropriate cases by testing a sample to destruction; or
- in the case of re-testing after repairs or modifications, such a test that satisfies the competent person who subsequently examines the plant (the re-testing of ships' lifting appliances may be effected by means of a static test, eg by dynamometer where appropriate; or
- in the case of a lift truck, the test should be a functional test to verify that the truck is able to perform the task for which it was designed. This test should include a check to ensure that all controls function correctly and that all identification and capacity plates are fitted and contain correct information. A dynamic test should include travelling and manoeuvring, stacking, a lowering speed check and tilt leakage test with the rated load including relevant attachments where appropriate. Following the test the truck should be examined to ensure that it has not defects which would render it unsuitable for use.

The breaking load of any steel wire rope forming part of a lifting appliance or loose cargo gear must be indicated by a certificate of test details of which are maintained in the register of equipment required by Maritime Rule Part 49.9.

Upon the completion of any test of a lifting appliance or item of loose cargo gear in accordance with Maritime Rules 49.5(1) and 49.5(2), the competent person must conduct a thorough examination of that lifting appliance or item of loose cargo gear.

Where the design of a lifting appliance is such that compliance with 49.5(3) is, in the opinion of a competent person, impracticable, the test and thorough examination may be dispensed with, provided that the manufacturer's specification, schedule of examination and maintenance manual are available to the competent person and the examination and maintenance procedures carried out are recorded in the ship's register of equipment by a competent person.

Any defect found in any lifting plant, including plant provided by a shore authority, should be reported immediately to the master or to another responsible person who should take appropriate action.

The owner or master of a ship must ensure that every lifting appliance on the ship and every item of loose cargo gear carried by the ship is thoroughly examined by a competent person at least once in every 12 months.

Similar principles apply to cargo securing devices as to lifting equipment. The crew and persons employed for the securing of cargoes should be instructed in the correct application and use of the cargo securing gear on board the ship.

For guidance on the securing of cargoes and handling of security devices refer to the ship's approved Cargo Securing Manual.

The following sets of coded signals are accepted national signals in New Zealand.

ANNEX 21.1 CODE OF HAND SIGNALS

The following sets of coded signals are example of those implemented by the EU Directive 92/58/EEC, but where there are accepted national signals in common use (as indicated*) these too are acceptable.

MEANING	DESCRIPTION	ILLUSTRATION
	A. General hand signals	
START Attention Start of command	Both arms are extended horizontally with the palms facing forward.	
TAKING THE STRAIN or INCHING THE LOAD	The right arm points upwards with the palm facing forwards. The fingers clenched and then unclenched.	* 
STOP Interruption End of movement	The right arm points upwards with the palm facing forwards.	
END of the operation (operations cease)	Both hands are clasped at chest height.	
	OR Both arms extended at 45˚ downwards and lower arms crossed back and forth sharply across torso.	* 

	B. Vertical movements	
RAISE	The right arm points upwards with the palm facing forwards and slowly makes a circle,	
LOWER	The right arm points downwards with the palm facing inwards and slowly makes a circle.	
DERRICKING THE JIB	Signal with one hand. Other hand on head.	 Jib up  Jib down
TELESCOPING THE JIB	Signal with one hand. Other hand on head.	 * Extend jib  * Retract jib
VERTICAL DISTANCE	The hands indicate the relevant distance.	

	C. Horizontal movements	
MOVE FORWARDS (Travel to me)	Both arms are bent with the palms facing upwards and the forearms make slow movements towards the body.	
MOVE BACKWARDS (Travel from me)	Both arms are bent with the palms facing downwards and the forearms make slow movements away from the body.	
RIGHT To the signalman's (in the direction indicated)	The right arm is extended more or less horizontally with the palm facing downwards and slowly makes small movements to the right.	
LEFT To the signalman's (in the direction indicated)	The left arm is extended more or less horizontally with the palm facing downwards and slowly makes small movements to the left.	
HORIZONTAL DISTANCE	The hands indicate the relevant distance.	
SLEWING (In direction indicated)	Both arms close to side extending one arm 90° from elbow.	 *  *

	D. Danger	
DANGER EMERGENCY STOP	Both arms point upwards with the palms facing forwards.	
	E. Other	
SECURE Secure the load	Both arms are crossed closely to the chest with hands clenched.	 *
TWISTLOCKS Twistlock on/off	The left arms points upwards. Rotate wrist of left hand clockwise signalling twist on, and anticlockwise for signalling twist off.	 *
	F. Operating instructions	
QUICK	All movements faster.	
SLOW	All movements slower.	

CHAPTER 22: MAINTENANCE

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights some areas which may require attention in respect of maintenance.

22.1 General

No maintenance work or repair which might affect the supply of water to the fire main or sprinkler system should be started without the prior permission of the master and chief engineer.

No alarm system should be isolated without the permission of the master and chief engineer.

Means of access to fire fighting equipment, emergency escape routes and watertight doors should never be obstructed.

Safety guards on machinery or equipment should only be removed when the machinery is not operating. 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
- a warning notice should be conspicuously posted.

Solvents used for cleaning can be toxic, and should always be used in accordance with the manufacturers' instructions. The area should be well ventilated, and in confined spaces, smoking should be prohibited.

22.2 Floor plates and handrails

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.

Whenever floor plates or handrails are removed, warning notices should be posted, the openings effectively fenced or guarded and the area well-illuminated.

22.3 Maintenance of machinery

Before machinery is serviced or repaired, measures should be taken to prevent it being turned on or started automatically or from a remote control system:

- electrically-operated machinery should be isolated from the power supply
- steam-operated machinery should have both steam and exhaust valves securely closed and, where possible, the valves locked or tied shut or some other means employed to indicate that the valves should not be opened. The same care is required when dealing with heated water under pressure as is required when working on steam-operated machinery or pipe work
- in all cases, warning notices should be posted at or near the controls giving warning that the machinery concerned is not to be used.

Where valves or filter covers have to be removed or similar operations have to be performed on pressurised systems, that part of the system should be isolated by closing the appropriate valves. Drain cocks should be opened to ensure that pressure is off the system.

ANNEX 28.1

Safety Signs as required by the MS & FV (Safety Signs & Signals) Regulations 2001 & Merchant Shipping Notice MSN 1763

PART 1 - PROHIBITORY SIGNS

Symbol	Meaning
	**Prohibition –** Do not do

EXAMPLES

No Smoking

Smoking and naked flames forbidden

No access for pedestrians

Do not extinguish with water

Not drinkable

No access for Unauthorised persons

No access for Industrial vehicles

Do not touch

When joints of pipes, fittings etc. are being broken, the fastenings should not be completely removed until the joint has been broken and it has been established that no pressure remains within.

Before a section of the steam pipe system is opened to the steam supply, all drains should be opened. Steam should be admitted very slowly and the drains kept open until all the water has been expelled.

Maintenance or repairs to, or immediately adjacent to, moving machinery should be permitted only in circumstances where no danger exists or where it is impracticable for the machinery to be stopped. Close-fitting clothing should be worn and longhair should be covered. The officer in charge should consider whether it is necessary in the interests of safety for a second person to be in close attendance while the work is being carried out.

Heavy parts of dismantled machinery temporarily put aside should be firmly secured against movement in a seaway and, as far as practicable, be clear of walkways. Sharp projections on them should be covered when reasonably practicable.

Spare gear, tools and other equipment or material should never be left lying around, especially near to stabiliser or steering gear rams and switchboards.

A marlin spike, steel rod, or other suitable device should be used to align holes in machinery being reassembled or mounted; fingers should never be used.

When guards or other safety devices have been removed from machinery, they should be replaced immediately the work is completed and before the machinery or equipment is tested.

An approved safety lamp should always be used for illuminating spaces where oil or oil vapour is present. Vapour should be dispersed by ventilation before work is done.

22.4 Boilers

Boilers should be opened only under the direction of an engineering officer. Care should be taken to check, after emptying that the vacuum is broken before manhole doors are removed. Even if an air cock has been opened to break the vacuum, the practice should always be to loosen the manhole door nuts and break the joint before the removal of the dogs and knocking in the doors. The top manhole doors should be removed first. Personnel should stand clear of hot vapour when doors are opened.

Personnel should not enter any boiler, boiler furnace or boiler flue until it has cooled sufficiently to make work in such places.

Before entry is permitted to a boiler which 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 blow down 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.

The above precautions should be maintained whilst personnel remain in the boiler.

Personnel cleaning tubes, scaling boilers, and cleaning back ends, should wear appropriate protective clothing and equipment including goggles and respirators.

A boiler is a confined space, and therefore potentially a dangerous space. Special care should be exercised before a boiler is entered that has not been in use for some time or where chemicals have been used to prevent rust forming. The atmosphere may be deficient in oxygen and tests should be carried out before any person is allowed to enter.

See Chapter 17 for advice on entering enclosed spaces.

22.5 Auxiliary machinery and equipment

Before work is started on an electric generator or auxiliary machine, the machine should be stopped and the starting air valve or similar device should be secured so that it cannot be operated.

A notice should be posted warning that the machine is not to be started nor the turning gear used.

To avoid the danger of motoring and electric shock to any person working on the machine, it should be isolated electrically from the switchboard or starter before work is commenced. The circuit-breaker should be opened and a notice posted at the switchboard warning personnel that the breaker is to be closed. Where practicable, the circuit-breaker should be locked open.

No attempt should be made to start a diesel engine without first barring round with the indicator cocks open. The barring gear should then be disengaged before starting the engine.

Oily deposits of flammable material should never be allowed to build up in the way of diesel engine relief valves, crankcase explosion doors or scavenge belt safety discs.

Flammable coatings should never be applied to the internal surfaces of air starting reservoirs.

When testing a diesel engine fuel injector, or other high pressure parts of injection equipment, jets should not be allowed to spray unprotected skin.

Oxygen should on no account be used for starting engines. To do so would probably cause a violent explosion.

22.6 Main engines

Where necessary suitable staging, which is adequately secured, should be used to provide a working platform.

Before anyone is allowed to enter or work in the main engine crankcase or gear case, the turning gear should be engaged and a warning notice posted at the start position. 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 personnel 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.

22.7 Refrigeration machinery and compartments

No one should enter a refrigerated chamber without first informing a responsible officer (see section 15.9). Should it be known or suspected that the refrigerant has leaked into any compartment, no attempt should be made to enter that compartment without appropriate precautions being taken.

Personnel charging or repairing refrigeration plants should fully understand the precautions to be observed when handling the refrigerant.

When refrigerant plants are being charged through a charging connection in the compressor suction line, it is sometimes the practice to heat the cylinder to evaporate the last of the liquid refrigerant. This should be done only 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. Advice on the handling and storage of gas cylinders is given in the next chapter.

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.

Further advice on working with refrigeration plant is given Chapter 15.

22.8 Steering gear

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 the vessel is at sea, the ship should be stopped and suitable steps taken to immobilise the rudder by closing the valves on the hydraulic cylinders or by other appropriate and effective means.

22.9 Hydraulic and pneumatic equipment

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 upon 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.

Absolute cleanliness is essential to the proper and safe operation of hydraulic and pneumatic systems; the working area and tools, as well as the system and its components, should be kept clean during servicing work. Care should also be taken to 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 put into operation within the system.

Since vapours from hydraulic fluid may be flammable, naked lights should be kept away from hydraulic equipment being tested or serviced.

A jet of hydraulic fluid under pressure should never be allowed to spray onto unprotected skin. Any hydraulic fluid spilt on the skin should be thoroughly washed off.

22.10 Electrical equipment

The risks of electric shock are much greater on board ship than they are normally ashore because wetness, high humidity and high temperature (including sweating) reduce the contact resistance of the body.

In those conditions, severe and even fatal shocks may be caused at voltages as low as 60V. It should also be borne in mind that cuts and abrasions significantly reduce skin resistance.

A notice of instructions on the treatment of electric shock should be posted in every place containing electrical equipment and switchgear. Immediate treatment of an unconscious patient is essential.

Fuses

Before any work is done on electrical equipment, fuses should be removed or circuit breakers opened to ensure that all related circuits are dead. 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 finished. A check should be made that any interlocks or other safety devices are operative.

High voltage equipment

Additional safety 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 1KV). The work should be carried out by, or under the direct supervision of, a competent person with sufficient technical knowledge and a permit-to-work system should be operated.

Some parts of certain types of equipment may remain live even when the equipment is switched off. Power should always be cut off at the mains.

Flammable materials should never be left or stored near switchboards.

Precautions on or near live 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
- the working position adopted should be safe and secure to avoid accidental contact with the 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 a dry insulating mat 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 contacts with the skin. Metal fittings on clothing or footwear are also dangerous.

Meter probes should have 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 dead.

22.11 Main switchboards

The internal cleaning and maintenance of the main switchboard must only be carried out while it is in a “dead” condition; after a full hazard identification process has been carried out, as described in Chapter 1; and, a formal permit-to-work issued, as described in Chapter 16.

The hazard identification process will identify the actions and checks required to make the switchboard safe, and these actions and checks will be identified in the permit-to-work.

The major checks to be listed on the permit-to-work will identify and verify that the necessary inter-connections to and from; and/or within, the main switchboard are disconnected. These will include but are not limited to the:

- shore power supply
- emergency generator
- emergency power supply.

The internal cleaning and internal maintenance of the main switchboard would, in general, be an integral part of a ship's dry-dock programme or that of an extended maintenance programme.

22.12 Storage batteries – general

When a battery is being charged it “gases”, giving off both hydrogen and oxygen. Because hydrogen is easily ignited in concentrations ranging from 4% to 75% in air, battery containers and compartments should be kept adequately ventilated to prevent an accumulation of dangerous gas.

Smoking and any type of open flame should be prohibited in a battery compartment. A conspicuous notice to this effect should be displayed at the entrance to the compartment.

Lighting fittings in battery compartments should be properly maintained at all times, with protective glasses in position and properly tightened. If cracked or broken glasses cannot be replaced immediately, the electric circuit should be isolated until replacements are obtained.

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

Portable electric lamps and tools, and other portable power tools that might give rise to sparks should not be used in battery compartments.

The battery compartment should not be used as a store for any materials or gear not associated with the battery or its operation.

A short circuit of even one cell may produce an arc or sparks that may cause an explosion of any hydrogen present. Additionally, the very heavy current which can flow in the short circuiting wire or tool may cause burns due to rapid overheating of the metal.

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

All battery connections should be kept clean and tight to avoid sparking and overheating. Temporary clip-on connections should never be used as they may be worked loose due to vibration and cause a spark or short circuit.

Metal tools, such as wrenches or spanners, should never be placed on top of batteries as they may cause sparks or short circuits. The use of insulated tools is recommended.

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

The battery chargers and all circuits fed by the battery should be switched off when leads are being connected or disconnected. If a battery is in sections, it may be possible to reduce the voltage between cells in the work area, and hence the severity of an accidental short circuit or electric shock, by removing the jumper leads between sections before work is begun.

It should be understood that while individual cell voltages may not prevent a shock risk, dangerous voltages can exist when numbers of cells are connected together in a series. A lethal shock needs a current of only tens of milliamps and particular care should be exercised when the voltage exceeds 50V.

Battery cell vent plugs should be screwed tight while connections are being made or broken.

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

Lids of battery boxes should be fastened while open for servicing and properly secured again when the work is finished.

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

Alkaline and lead-acid batteries should be kept in separate compartments or separated by screens. Where both lead-acid and alkaline batteries are in use, great care should be exercised to keep apart the materials and tools used in servicing each type, as contamination of the electrolyte may cause deterioration of battery performance and mixing of the two electrolytes produce a vigorous chemical reaction which could be very dangerous.

Both acid and alkaline electrolytes are highly corrosive. Immediate remedial action should be taken to wash off any accidental splashes on the person or on the equipment. Hands should always be washed as soon as the work is finished.

Batteries should always be transported in the upright position to avoid spillage of electrolyte. A sufficient number of men should be employed since the batteries are heavy and painful strains or injury can otherwise easily result.

22.13 Storage batteries – lead acid

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 when acid is handled.

Copious quantities of clean fresh water should be used to neutralise acid on skin or clothes

An eyewash bottle should be to hand in the compartment 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 round the terminals of batteries are injurious to skin or eyes. They should be removed by brushing, away from the body. Terminals should be protected with petroleum jelly.

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

22.14 Storage batteries – alkaline

The general safety precautions with this type of battery are the same as 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, but in the case of accident the affected parts should be washed with plenty of clean fresh water.

Burns should be treated with boracic powder or a saturated solution of boracic powder. Eyes should be washed out thoroughly with water followed immediately with a solution of boracic powder (at the rate of one teaspoonful to 1/2 litre of water). This solution should be always readily accessible when the electrolyte is handled.

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

22.15 Work on apparatus on extension runners or on the bench

Chassis on extension runners should be firmly fixed, either by self-locking devices or by use of chocks, before any work is done.

Where units are awkward or heavy for one person to handle easily, assistance should be sought. Strain, rupture or a slipped disc can result from a lone effort.

Any chassis on the bench should be firmly wedged or otherwise secured to prevent it overbalancing or moving. Should a live chassis overbalance, no attempt should be made to grab it.

Temporary connections should be soundly made. Flexible extension cables should have good insulation and adequate current carrying capacity.

22.16 Servicing radio and associated electronic equipment – general

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

Work should not be taken within the marked safety radius of a Satellite Terminal Antenna unless its transmitter has been rendered inoperative.

Eyes are particularly vulnerable to microwave and ultraviolet radiation. Care should be taken to avoid looking directly into a radar aerial and waveguide while it is in operation or where arcing or sparking is likely to occur.

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 modulator 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.

Vapours of some solvents used for degreasing are toxic, particularly carbon tetrachloride which should never be used. Great care should be exercised when using solvents particularly in confined spaces; there should be no smoking. Manufacturer's instructions should be followed.

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

Radio transmitters and radar equipment should not be operated when men are working in the vicinity of aerials; the equipment should be isolated from mains supply and radio transmitters earthed. When equipment has been isolated, warning notices should be placed on transmitting and radar equipment and at the mains supply point, to prevent apparatus being switched on until clearance has been received from those concerned that they have finished the outside work.

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

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

22.17 Additional electrical hazards from radio equipment

Where accumulators are used they should be disconnected at source; otherwise precautions should be taken 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 embodies 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 EHT section of a transmitter or other HT apparatus, with the mains switched off, all HT 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 electrolyte 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 a electrolyte capacitor is discharged by a short circuit.

Work at or near live equipment should be avoided if possible but where it is essential for the safety of the ship or for testing purposes then the additional precautions described in 22.10 should be taken.

22.18 Valves and semi-conductor devices

Valves being removed from equipment which has recently been operating should be grasped with a heat resistant cloth; in case of large valves, eg power amplifier, OP and modulators, which reach a high temperature in operation, cooling down time should be allowed before they are removed. Severe burns can result if they touch bare skin.

Cathode ray tubes and large thermionic valves should be handled with care; although they implode when broken, there is still a risk of severe cuts from sharp-edged glass fragments. Some special purpose devices contain vapour or gas at high pressure, eg Trigatron, but these are usually covered with a protective fibre network to contain the glass should they explode.

Beryllia (berylim oxide) dust is very dangerous if inhaled or if it penetrates the skin through a cut or abrasion. It may be present in some electronic components. Cathode ray tubes, power transistors, diodes and thyristors containing it will usually be identified by the manufacturer's information provided, but lack of such information should not be taken as a positive indication of its absence. Those heat sink washers which contain it are highly polished and look like dark brass. These items should be carefully stored in their original packaging until required.

Physical damage to components of this kind whether they are new or defective is likely to produce dangerous dust; abrasion should be avoided, they should not be worked by tools and encapsulations should be left intact. Excessive heat can be dangerous, but normal soldering with thermal shunt is safe. Damaged or broken parts should be separately and securely packed, following the manufacturer's instructions for return or disposal.

Personnel handling parts containing beryllia should wear protective clothing, including gloves, to prevent beryllia coming into contact with the skin. Tweezers should be used where practicable. If the skin does become contaminated with the dust, affected parts, particularly any cuts, should be cleaned without delay.

CHAPTER 23: HOT WORK

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights areas that may require attention in respect of hot work.

23.1 General

Welding and flame-cutting elsewhere than in the workshop should generally be the subject of a "permit-to-work" (see Chapter 16).

Operators should be competent in the process, familiar with the equipment to be used and instructed where special precautions need to be taken.

Where portable lights are needed to provide adequate illumination, they should be clamped or otherwise secured in position, not hand-held, with leads kept clear of the working area.

Harmful fumes can be produced during these operations from galvanising paint and other protective materials. Oxygen in the atmosphere can be depleted when using gas cutting equipment and noxious gases may be produced when welding or cutting.

Special care should therefore be taken when welding and flame-cutting in enclosed spaces to provide adequate ventilation. The effectiveness of the ventilation should be checked at intervals while the work is in progress, and if appropriate local exhaust ventilation should be considered. In confined spaces, breathing apparatus may be required.

Suggested procedures for lighting up and shutting down are at Annex 23.1.

23.2 Personal protective equipment

Personal protective equipment complying with the relevant Standard specifications or their equivalent must be worn by the operator and by those assisting with the operation to protect them from particles of hot metal and slag, and their eyes and skin from ultraviolet and heat radiation.

The operator should normally wear:

- welding shields or welding goggles with appropriate shade of filter. Goggles are only recommended for gas welding and flame cutting
- leather gauntlets
- leather apron (in appropriate circumstances)
- (long-sleeved natural fibre boiler suit or other approved protective clothing.

Clothing should be free of grease and oil and other flammable substances.

23.3 Pre-use equipment check

Welding and flame-cutting equipment should be inspected by a competent person before it is used to ensure that it is in a serviceable condition.

In cold weather moisture trapped in the equipment may freeze and, for example, cause valves to malfunction. It is recommended that equipment be thawed out with hot water and cloths, never with naked flames.

23.4 Precautions against fire and explosion

Before welding, flame-cutting or other hot work is begun, a check should be made that there are no combustible solids, liquids or gases, at, below or adjacent to the area or work, which might be ignited by heat or sparks from the work.

Such work should never be undertaken on surfaces covered with grease, oil or other flammable or combustible materials.

Where necessary, combustible materials and dunnage should be moved to a safe distance before commencing operations. Such places should also be free of materials that could release flammable substance for example if disturbed.

When welding is to be done in the vicinity of open hatches, suitable screens should be erected to prevent sparks dropping down hatchways or hold ventilators.

Port holes and other openings through which sparks may fall should be closed where practicable.

Where work is being done close to or at bulkheads, decks or deckheads, the far side of the divisions should be checked for materials and substances which may ignite, and for cables, pipelines or other services which may be affected by the heat.

Cargo tanks, fuel tanks, cargo holds, pipelines, pumps and other spaces that have contained flammable substances should be certified as being free of flammable gases before any repair work is commenced.

The testing should include, as appropriate, the testing of adjacent spaces, double bottoms and cofferdams. Further tests should be carried out at regular intervals and before hot work is recommenced following any suspension of the work. When preparing tankers and similar ships all tanks, cargo pumps and pipelines should be thoroughly cleaned and particular care taken with the draining and cleaning of pipelines that cannot be directly flushed using the ship pumps.

Welding and flame-cutting operations should be properly supervised and kept under regular observation. Suitable fire extinguishers should be kept at hand ready for use during the operation. A person with a suitable extinguisher should also be stationed to keep watch on areas not visible to the welder that may be affected.

In view of the risk of delayed fires resulting from the use of burning or welding apparatus, frequent checks should be made for at least two hours after the work has stopped.

23.5 Electric welding equipment

In order to minimise personal harm from electric shock, electric welding power sources for shipboard use should have a direct current (DC) output not exceeding 70V, with a minimum ripple. Further information on DC power sources is given later in this chapter.

When DC equipment is not available, then 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 work piece before an arc is struck between them) does not exceed 25V 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 manufacturers. This requirement can be affected by adverse sea conditions.

A “go-and-return” system using two cables from the welding set should be adopted the welding return cable should be firmly clamped to the workpiece.

Earthing of the workpiece is used to provide protection against internal insulation failure of the welding transformer, by keeping the workpiece at or near earth potential until the protective device (eg a fuse) operates to cut off the main supply.

Where the welding circuit is not adequately insulated from the earthed referenced mains supply, the workpiece should be earthed. The “return” cable of the welding set and each workpiece should be separately earthed to the ship’s structure. The use of a single cable with hull return is not recommended.

The workpiece earthing conductor should be robust enough to withstand possible mechanical damage and should be connected to the workpiece and a suitable earth terminal by bolted lugs or secure screw clamps.

Note: some manufacturers may recommend earthing as one of their measures to reduce the electrical interference. This is not a safety related measure, but the manufacturers’ advice should be followed.

If an alternative method of protecting against welding transformer insulation failure is used, the hazards caused by stray welding currents can be avoided by not earthing the workpiece or the welding output circuit. It should be noted, that other equipment connected to the workpiece may require earthing for safe operation (eg electrical pre-heating systems).

The lead and return cables should be of the minimum length practicable for the job and of an appropriate cross-section to avoid voltage drop in transmission

Cables should be inspected before use; if the insulation is impaired or conductively reduced, they should not be used.

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

Electrode holders should be fully insulated so that no live part of the holder is exposed to touch, and, where practicable, 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 operator get into difficulties and also for isolating the holder when electrodes are changed.

The direct current output from power sources should not exceed 70V open circuit. The ripple on the output from the power source should not exceed the values of the table below. The ripple magnitudes are expressed as percentages of the DC, and the ripple peak is that with the same polarity as the DC.

RIPPLE FREQUENCY HZ	**50/60**	**300**	**1200**	**2400**
Max. RMS O/C voltage ripple (%)	5	6	8	10
Max. peak O/C voltage ripple (%)	10	12	16	20

The conditions in the table above are normally met by DC generators incorporating commutators and by rectifier power sources having a 3 phase bridge rectifier operating from a 3 phase 50/60 Hz supply. Rectifier power sources should not be operated from a power supply of less than 50Hz.

Should it be necessary to use a power source with a DC output having a ripple magnitude in excess of those stated in the table, for example a single phase rectifier power source, then a voltage limiting device should be incorporated in the power source to ensure that the idling voltage does not exceed 42V.

23.6 Precautions to be taken during electric arc welding

In addition to the protective clothing specified in 23.2 the welding operator should wear non-conducting safety footwear. Clothing should be kept as dry as possible as some protection against electric shock – it is particularly important that gloves should be dry as wet leather is a good conductor.

An assistant should be in continuous attendance during welding operations. The 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 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 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 operator if welding is done in hot or humid conditions because body sweat and damp clothing greatly reduce body resistance. Under such conditions, the operation should be deferred until such time that an adequate level of safety can be achieved.

Under no circumstances should welders work while standing in water or with any part of their body immersed.

The electrode holder should be isolated from the current supply before a used electrode is removed and before a new electrode is inserted. This precaution is necessary because some electrode coatings have extremely low resistance. Even a flux coating that is normally insulating can become damp from sweating hands and thus potentially dangerous.

When the welding operation 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 with bare hands.

Spare electrodes should be kept dry in their container until required for use.

23.7 Compressed gas cylinders

Compressed gas cylinders should always be handled with care, whether full or empty. They should be properly secured and stored in a location appropriate to their intended use and risks which inadvertent release of gas may present.

The cylinders should be so secured as to be capable of quick and easy release, for example, in the case of fire. If available, cylinder trolleys should be used to transport cylinders from one place to another.

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

Where two or more cylinders of either oxygen or a fuel gas (such as acetylene) are carried the oxygen and the fuel gas should be stowed in separate, well-ventilated compartments that are not subject to extremes of temperature.

The space in which acetylene or other fuel gas cylinders are stowed should have no electrical fittings or other sources of ignition and prominent and permanent NO SMOKING signs should be displayed in the entrance and within the space. Empty cylinders should be segregated from the full ones and so marked.

The following special precautions need to be taken in the case of cylinders of oxygen and acetylene or other fuel gases:

- cylinders valves, controls and associated fittings should be kept free from oil, grease and paint; controls should not be operated with oily hands
- gas should not be taken from such cylinders unless the correct pressure reducing regulator has been attached to the cylinder outlet valve
- cylinders found to have leaks that cannot be stopped by closing the outlet valve should be taken to the open deck away from any sources of heat or ignition and slowly discharged to the atmosphere.

23.8 Gas welding and cutting

While this section deals almost exclusively with oxygen and acetylene, other fuel gases may be used and similar precautions should be taken.

The pressure of oxygen used for welding should always be high enough to prevent acetylene flowing back into the oxygen line.

Acetylene should not be used for welding at a pressure exceeding 1 atmosphere gauge as it is liable to explode, even in the absence of air, when under excessive pressure.

Non-return valves should be fitted adjacent to the torch in the oxygen and acetylene supply lines.

Flame arrestors should be provided in the oxygen and acetylene supply lines and will usually be fitted at the low pressure side of regulators although they may be duplicated at the torch.

Should a backfire occur (ie the flame returns into the blowpipe and continues burning in the neck or mixing chamber) the recommended first action is to close the oxygen valve on the blowpipe – to prevent internal burning – followed immediately by shutting off the fuel gas at the blowpipe valve.

Items 3-6 of the shutting down procedure in Annex 23.1 may then be followed. When the cause of the backfire has been discovered, the fault rectified and the blowpipe cooled down, the blowpipe may be re-lit.

If there is a flashback into the hose and equipment, or a hose fire or explosion, or a fire at the regulator connections or gas supply outlet points, the first action should be to isolate the oxygen and fuel gas supplies at the cylinder valves or gas supply outlet points – but only if this can be done safely. Further action should follow in accordance with the vessel's fire drill requirements.

A watch should be kept on acetylene cylinders to ensure they are not becoming hot. If they are, this could be a sign of acetylene decomposition and there is increased risk of explosion. The cylinder stop valve should be closed immediately, which may limit or reduce the decomposition but is unlikely to stop it.

Emergency action, such as evacuating the area and prolonged cooling by immersion or with copious amounts of water will still be required. Consideration should be given to jettisoning the cylinder overboard although movement of the cylinder can promote rapid decomposition, and cooling should continue while it is being moved. Any acetylene cylinder suspected of overheating should be approached with extreme caution because an impact could set off an internal ignition which might cause an explosion

Only acetylene cylinders of approximately equal pressures should be coupled.

In fixed installations, manifolds should be clearly marked with the gas they contain.

Manifold hose connections including inlet and outlet connections should be such that the hose cannot be interchanged between fuel gases and oxygen manifolds and headers.

Only those hoses specially designed for welding and cutting operations should be used to connect any oxy-acetylene blowpipe to gas outlets.

Any length of hose in which a flashback has occurred should be discarded.

The connections between hose and blowpipe, and between hoses should be securely fixed.

Hoses should be arranged so that they are not likely to become kinked or tangled or be tripped over, cut or otherwise damaged by moving objects or falling metal slag, sparks etc; a sudden jerk or pull on the hose is liable to pull the blowpipe out of the operator's hands or cause a cylinder to fall or a hose connection to fail. Hoses in passageways should be covered to avoid them becoming a tripping hazard.

Soapy water should be used for testing leaks in hoses. If there are leaks that cannot easily be stopped, the gas supply should be isolated and the leaking components taken out of service, replaced or repaired.

If the leak is at a cylinder valve or pressure regulator ("bull-nose") connection, the cylinder should be removed to a safe place in the open air. If it is a fuel-gas cylinder, it should be taken well clear of any source of ignition.

Excessive force should never be used on cylinder valve spindles or hexagon nuts of regulator connections in an attempt to stop a leak. Neither are sealing tape nor other jointing materials recommended for use in an attempt to prevent leaks between metal-metal surfaces that are designed to be gas tight. With an oxygen cylinder this could result in initiation of a metal-oxygen fire.

Blowpipes should be lit with a special friction igniter, stationary pilot flame or other safe means.

Should a blowpipe-tip opening become clogged, it should be cleaned only with the tools especially designed for that purpose.

When a blowpipe is to be changed the gases should be shut off at the pressure-reducing regulators.

To prevent a build-up of dangerous concentrations of gas or fumes during a temporary stoppage or after completion of the work, supply valves on gas cylinders and gas mains should

be securely closed and blowpipes, hoses and moveable pipes should be removed to lockers that open on to the open deck.

Oxygen should never be used to ventilate, cool or blow dust off clothing.

23.9 Further information

Detailed advice on the selection and standards for equipment used in hot work is contained in the NZS 4781:1973 *Code of practice for safety in welding and cutting*.

The New Zealand Department of Labour also publishes a booklet for guidance on health and safety in welding. See the website: www.osh.govt.nz

ANNEX 23.1 HOT WORK, LIGHTING UP AND SHUTTING DOWN PROCEDURES

These procedures are appropriate for oxy-fuel gas equipment and, with little modification, also for air-aspirated blowpipes.

Lighting up

1. Ensure that the pre-use equipment checks have been made.
2. Check that the outlets of adjustable pressure regulators are closed, ie that the pressure-adjusting screw of the regulator is in the fully unwound (anti-clockwise) position.
3. Check that the blowpipe valves are closed.
4. Slowly open the cylinder valves (or gas supply point isolation valves) – to avoid sudden pressurisation of any equipment.
5. Adjust pressure regulators to the correct outlet pressures. Or, check that the pressures in distribution pipework are suitable for the equipment and process.
6. Open the oxygen valve at the blowpipe and allow the flow of oxygen to purge* air out of oxygen hose and equipment, if necessary, reset the pressure regulator to ensure correct working oxygen pressure.
7. Close the oxygen valve at the blowpipe.
8. Open the fuel gas valve at the blowpipe and allow the gas flow to purge* air or oxygen from the fuel gas hose and equipment, if necessary, reset the pressure regulator to ensure correct working fuel gas pressure.
9. Light the fuel gas immediately and preferably with a spark lighter.
10. Open the oxygen valve at the blowpipe and adjust it and the fuel gas valve to give the correct flame setting.

* Purging is important because it removes flammable gas mixtures from the hoses and equipment that could result in explosions and fires when the blowpipe is first lit. It should be carried out in a well-ventilated area, and it may take from several seconds to a minute or more depending on the length of the hose and gas flow rates.

Shutting down

1. Close the fuel gas valve at the blowpipe.
2. Immediately close the oxygen valve at the blowpipe.
3. *Close the cylinder valves or gas supply point isolation valves for both oxygen and fuel gas.
4. Close the outlets of adjustable pressure regulators by winding out the pressure-adjusting screws.
5. Open both blowpipe valves to vent the pressure in the equipment.
6. Close the blowpipe valves.

* Step 3 is not necessary when the equipment is to be used again in the immediate future.

ANNEX 23.2 EARTHING OF ARC WELDING SYSTEMS

TRANSFORMER CASING	
Earthed	Class I Appliance
Not earthed	Class II Appliance

TRANSFORMER SECONDARY	
Earthed	This is an obsolete type of equipment and should be taken out of service. Failure of the weld return connection might not be noticed, and damage to other earthed metallic paths could result.
Isolated	The absence of a weld return conductor will prevent welding being carried out. However, a failure of isolation within the welding set could cause the work item to become live so the workpiece should be earthed.
Isolated with double or reinforced insulation	This is the most important standard to which equipment is being built. Because of the strengthened insulation, the workpiece need not be earthed. Therefore to prevent the possibility of stray weld return currents in the supply system earth conductors, it is recommended that the workpiece is not earthed.

ANNEX 23.3. HOT WORK, HOSES AND CONNECTIONS/ASSEMBLIES

Hoses

Rubber hoses complying with the New Zealand standards are recommended for use in gas welding and cutting processes, which are often carried out in aggressive working environments.

Hoses satisfying these standards are reinforced with an outer protective cover designed to be resistant to hot surfaces, molten slag or sparks, and made with linings that resist the action of hydrocarbons (for LPG hoses) acetone or dimethyl formamide (for acetylene hoses) and ignition in an atmosphere of oxygen (for all services).

Hoses meeting these standards are recommended for LPG vapour-phase applications other than welding or cutting. Hose made of thermoplastics materials is not generally suitable for welding and cutting, because it does not have the same resistance to hot surfaces or hot particles as reinforced rubber hose.

Connections

Hose connections (comprising hose nipples and “bull nose” hose connections) should comply with the appropriate New Zealand standard.

Hose connections may also be made with a quick-action coupling – a male probe fitted to the end of the hose and a female connector with a self-sealing valve usually fitted to a fixed piece of equipment or gas supply outlet point. The probe is pushed into the female fitting where it locks in position and automatically opens the internal valve. Connections of this type are simple and quick to operate and there is no need to use a spanner to tighten any nuts.

Problems are that the male probe may become damaged, eg from being dragged along the ground or over-use and cause the coupling to leak, and there is a possibility of connecting the hose to the wrong gas outlet.

Both should be avoided if couplings comply with the appropriate standard. These require hard material of to be used for the probes, and their design dimensions are intended to prevent interchangeability between oxygen and fuel gas connections.

Hose assemblies

Worm drive or similar clips are not recommended for fastening hoses.

CHAPTER 24: PAINTING

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights some areas which may require attention in respect of painting.

24.1 General

Paints may contain toxic or irritant substances, and the solvents may give rise to flammable and potentially explosive vapours, which may also be toxic. Paints containing organic pesticides can be particularly dangerous.

Personnel using such paints should be warned of the particular risks arising from their use. If the manufacturer's instructions are not given on the container, information should be obtained at the time of supply about any special hazards, and also whether special methods of application should be followed.

The following precautions should always be taken.

24.2 Preparation and precautions

Painted surfaces should always be rubbed down wet to reduce dust from the old paint that may be toxic if inhaled. Where the dust is known to contain lead, other dust treating methods should be used. Dust masks should be worn as protection against other dusts.

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 as fumes will contain metallic lead in a readily absorbed form.

Rust removers are acids and contact with unprotected skin should be avoided. Eye protection should be worn against splashes. If painting aloft or otherwise near ropes, care should be taken to avoid splashes on ropes, safety harnesses and lines. (see Chapter 20.8 on the effect of such contamination on ropes).

Interior and enclosed spaces should be well ventilated, both while painting is in progress and until the paint has dried.

There should be no smoking or use of naked lights in interior spaces during painting or until the paint has dried hard. Some vapours even in low concentrations may decompose into more harmful substances when passing through burning tobacco.

When painting is done in the vicinity of machinery or from an overhead crane gantry, 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. Close-fitting clothing should be worn.

24.3 Use of paint spraying equipment

As there are many different types of paint spraying equipment in use, operatives should comply with the manufacturers' instructions for use.

Airless spray-painting equipment is particularly hazardous since the paint is ejected at a very high pressure and can penetrate the skin or cause serious eye injuries. Spray should not be allowed to come into contact with the face or unprotected skin.

Suitable protective clothing such as a combination suit, gloves, cloth hood and eye protection should be worn during spraying.

Paints containing lead, mercury or similarly toxic compounds should not be sprayed in interiors.

A suitable respirator should be worn according to the nature of the paint being sprayed. In exceptional circumstances it may be necessary to use breathing apparatus (see section 4.8).

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.

As an additional precaution against the hazards of a hose bursting, a loose sleeve, for example a length of 2 to 3 m of old air hose, may be slipped over that portion of the line adjacent to the gun and paint container.

CHAPTER 25: ANCHORING, MOORING AND TOWING OPERATIONS

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected.

This chapter highlights some areas that may require attention in respect of anchoring, mooring and towing operations. It is particularly important that the hazard identification process considers the consequences of the failure of any element of the equipment.

25.1 Anchoring and weighing anchor

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 party should wear appropriate safety clothing – safety helmets, safety shoes and goggles as a minimum protection from injury from dirt, rust particles and debris that 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 party 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 very large ships with heavy anchors and cables, the anchor should be walked out all the way to avoid excessive strain on the brakes (and on the bitter end if the brakes fail to stop the anchor and chain).

Where the anchor is let go from the stowed position, if upon release of the brake, the anchor does not run, personnel should NOT attempt to shake the cable, but the brake should be re-applied, the windlass placed in gear, and the anchor walked out clear prior to release.

Cable should stow automatically. If, for any reason, it is necessary for personnel to enter the cable locker, they should stand in a protected position and, as far as possible, have constant communication with the windlass operator.

Anchors housed and not required should be properly secured to prevent accidental release.

25.2 Making fast and casting off

During mooring and un-mooring operations a sufficient number of personnel should always be available at each end of the vessel to ensure a safe operation.

A responsible officer should be in charge of each of the mooring parties, and a suitable means of communication between the responsible officers and the vessel's bridge team established. If this should involve use of portable radio, then the ship should be clearly identified by name to prevent misinterpretation. All personnel involved in such operations should wear suitable protective clothing.

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 corrected as soon as possible. Particular attention should be paid to the risk of oil leaks from winches, and 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 be made that corrosion has not weakened them.

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.

Careful thought should be given to the layout of moorings, so that leads are those most suited without creating sharp angles and ropes and wires are not fed through the same leads or bollards. Pre-planning of such operations is recommended.

Personnel should not in any circumstances stand in a bight of rope or wire. Operation of winches should preferably by undertaken by competent personnel to ensure that excessive loads do not arise on moorings.

When moorings are under strain all personnel in the vicinity should remain in positions of safety, ie avoiding all "snap-back" zones. Immediate action should be taken to reduce the load should any part of the system appear to be under excessive strain. Care is needed so that ropes or wires will not jam when they come under strain, so that if necessary they can quickly be slackened off.

Where moorings are to be heaved on a drum end, one person should be stationed at the drum end, backed up by a second person backing and coiling down the slack. In most circumstances three turns on the drum end are sufficient to undertake a successful operation. A wire on a drum end should never be used as a check wire.

A wire should never be led across a fibre rope on a bollard. Wires and ropes should be kept in separate fairleads or bollards.

When stoppering off moorings, the following applies:

- natural fibre rope should be stoppered with natural fibre
- man made fibre rope should be stoppered with man made fibre stopper (but not polyamide)
- the "West Country" method (double and reverse stoppering) is preferable for ropes

- wire moorings should be stoppered with chain, using two half hitches in the form of a cow hitch, suitably spaced with the tail backed up against the lay of wire, to ensure that the chain neither jams nor opens up the lay of the wire.

25.3 Mooring to buoys

Where mooring to buoys is undertaken from a ship's launch or boat, personnel engaged in the operation should wear lifejackets and a lifebuoy with attached lifeline should be kept readily available in the boat.

Means should be provided to enable a person who has fallen into the water to climb back on board the launch or boat. If a boarding ladder with flexible sides is used, it should be weighed so that the lower rungs remain below the surface.

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.

25.4 Towing

Guidance on port towage operations is given in Chapter 33.

Equipment used for towing should be adequately maintained and inspected before use, as during towing operations excessive loads may be applied to ropes, wires, fairleads, bitts and connections.

Prior to towing operations being undertaken, the master should establish suitable means of communication, exchange relevant information (eg speed of vessel), and agree a plan for the tow with the tug master.

All personnel involved should be adequately briefed in their duties and in safety precautions to be taken. They should be equipped with personal protective equipment including safety helmets and safety shoes.

Personnel should (wherever possible) agree with the tug crew the area where the heaving line is to be thrown, to allow them to move clear.

Once the tow is connected, non-essential personnel should keep clear of the operational area. If anyone is required to remain in this area or to attend to towing gear during the towing operation, they should take extreme care to keep clear of bights of wire or rope and the whiplash area should a line break. Exposure time should be kept to a minimum.

During operations, communications should be maintained between:
- the towing vessel and both the bridge team and the foredeck of the vessel under tow; and
- the tow party and the bridge team.

In all communications there should be clear identification of the parties involved to prevent misunderstandings. The tug master should be kept informed of engine movements, proposed use of thrusts etc.

When letting go of a tow line, personnel should keep well clear of the tow eye, which should be lowered under the control of a messenger to reduce the risk of injury to those involved.

CHAPTER 26: HATCH COVERS AND ACCESS LIDS

Based on the findings of the hazard identification process, appropriate control measures should be put into place to protect those who may be affected. This chapter highlights some areas that may require attention in respect of hatch covers and access lids.

26.1 General

Information governing the use of hatches is given in Chapter 7.

Before vessel departure, weather deck hatch covers should be secured in the correct closed position. While the vessel is at sea they should be regularly inspected to ensure that integrity is being maintained.

All hatch covers should be properly maintained. Defective or damaged covers should be replaced/repaired as soon as possible. All covers and beams should only be used if they are a good fit and overlap their end supports to an extent which is adequate but not excessive.

All personnel involved with the handling and/or operation of hatch covers must be properly instructed in their handling and operation. All stages of opening or closing hatches should be supervised by a responsible person. When hatches are open, the area around the opening and in the hatchways should be appropriately illuminated and guard-rails erected. Guard-rails should be tight with stanchions secured in position, and properly maintained. No hatch cover should be replaced contrary to information showing the correct replacement position.

Where lifting appliances are used, they should be attached to hatch covers from a safe position and without personnel being exposed to the danger of falling or being trapped.

No loads should be placed over, or work take place on, any section of hatch cover unless it is known that the cover is properly secured and can safely support the load.

Partly opened unguarded hatches should never be covered with tarpaulins; this would present a serious hazard for any person walking across the hatch.

Hatch covers should not be used for any other purpose.

26.2 Mechanical hatch covers

The manufacturers' instructions for the safe operation, inspection, maintenance and repair of the type of mechanical hatch cover fitted should always be followed.

During operations, personnel should keep clear of the hatches and the cover stowage positions. The area should be kept clear of all items which might foul the covers or the handling equipment.

Special attention should be paid to the trim of the vessel when handling mechanical covers. The hatch locking pins or preventers of rolling hatch covers should not be removed until a check wire is fast to prevent premature rolling when the tracking is not horizontal.

Hatch wheels should be kept greased and free from dirt and the coaming runways and the drainage channels kept clean. The rubber sealing joints should be properly secured and be in good condition so as to provide a proper weather tight seal.

All locking and tightening devices should be secured in place on a closed hatch at all times when at sea. Securing cleats should be kept greased. Cleats, top-wedges and other tightening devices should be checked regularly whilst at sea.

Hatch covers should be properly secured immediately after closing or opening. They should be secured in the open position with chain preventers or by other suitable means. No one should climb on to any hatch cover unless it is properly secured.

26.3 Non-mechanical hatch covers and beams

Each non-mechanical hatchway should be provided with an appropriate number of properly fitting beams and hatch covers, pontoons or slab hatches adequately marked to show the correct replacement position, and with an adequate number of properly fitting tarpaulins, batten bars, side wedges and locking bars so that the hatch will remain secure and weather tight for all weather conditions.

Unless hatches are fitted with coamings to a height of at least 760 mm they should be securely covered or fenced to a height of 1 m when not in use for the passage of cargo.

Manually handled hatch covers should be capable of being easily lifted by two people. Such hatch covers should be of adequate thickness and strength and provided with hand grips. Wooden hatch boards should be strengthened by steel bands at each end. One person should not attempt to handle hatch covers unaided unless the covers are designed for single-handed operation.

Hatch boards, hatch beams, pontoon hatches, hatch slabs and tarpaulins should be handled with care and properly stowed, stacked and secured so as not to endanger or impede the normal running of the vessel. Hatch boards should be removed working from the centre towards the sides, and replaced from the sides towards the centre. Personnel hauling tarpaulins should walk forwards and **not** backwards so they can see where they are walking.

A derrick or crane should be used to handle beams. Pontoons or slab hatches should be positioned directly over them to lessen the risk of violent swinging once the weight has been taken.

Appropriate gear of adequate strength should be specially provided for the lifting of the beams, pontoons and slab hatches. Slings should be of adequate length, secured against accidental dislodgement while in use and fitted with control lanyards. The angle between arms of slings at the lifting point should not exceed 120º, to avoid undue stress. The winch or crane should be operated by a competent person under the direction of a ship's officer or other experienced person.

Beams and hatch covers remaining in position in a partly opened hatchway should be securely pinned, lashed, bolted or otherwise properly secured against accidental dislodgement.

Hatch covers and beams should not be removed or replaced until a check has been made that all persons are out of the hold or clear of the hatchway. Immediately before beams are to be removed, a check should be made that pins or other locking devices have been freed.

No one should walk out on a beam for any purpose.

Hatch covers should not be used in the construction of deck or cargo stages or have loads placed on them liable to damage them. Loads should not be placed on hatch coverings without the authority of a ship's officer.

26.4 Steel-hinged inspection/access lids

Inspection/access hatch lids should be constructed of steel or similar material, and hinged so they can be easily and safely opened or closed. Those on weather decks should be seated on

watertight rubber gaskets and secured weather tight by adequate dogs, side cleats or equivalent tightening devices.

When not secured, inspection/access hatch lids should be capable of being easily and safely opened from above and, if practicable, from below.

Adequate hand grips should be provided in accessible positions to lift inspection/access hatches by hand without straining or endangering personnel.

Heavy or inaccessible hatch lids should be fitted with counter-weights so that they can be opened by one or two persons. Where a counter-weight cannot be fitted due to inaccessibility, the hatch lids should be supplied with a purchase or pulley with eye-plates or ringbolts fitted in appropriate positions so that the hatch can be opened and closed without straining or endangering personnel.

The hatch lids when open should be easily and safely secured against movement or accidental closing. Adequate steel hooks or other means should be provided.

26.5 Access to holds/cargo spaces

Entry to holds/cargo spaces should only be undertaken on the authority of a responsible ships' officer, who should ensure prior to granting authority that the space has been adequately ventilated and, where appropriate, tested for noxious gases/oxygen content (see Chapter 17).

Entry should be made where at all possible through the permanent means of access. Where this is not possible, portable ladders may be used (see Chapter 15). When necessary, lifelines and safety harness should be available and used.

CHAPTER 27: HAZARDOUS SUBSTANCES

Many substances found on ships are capable of damaging the health and safety of those exposed to them. They include not only substances containing hazard warning labels (eg dangerous goods cargoes and ships' stores) but also dusts, fumes and fungal spores from goods, plant or activities aboard ship.

The employer's hazard identification process will identify where personnel are working in the presence of substances hazardous to health and safety, and evaluate any risks from exposure. Appropriate measures should be taken to remove, control or minimise the risk.

Employers should instruct and inform personnel so that they know and understand the risks arising from their work, the precautions to be taken and the results of any monitoring of exposure.

The hazard identification process will also provide information to determine whether health surveillance is appropriate.

As an aid to the identification of hazards and the assessment of risks from dangerous goods, reference may be made to the International *Maritime Dangerous Goods Code* or to the chemical data sheets contained in the *Tanker Safety Guides (Gas and Chemical)* issued by the International Chamber of Shipping. Information concerning hazardous cargoes carried in bulk should be available where applicable to allow the assessment to be made.

In the case of ship's stores, reference should be made to the manufacturers' instructions and data sheets, which may be supplied with the goods.

27.1 Prevention or control of exposure

The first consideration should always be to prevent exposure by removing the substance, eg by substituting a less harmful one.

Where this is not practicable, prevention or control of exposure may be achieved by any combination of the following:

- total or partial enclosure of the process and handling systems
- use of plant, processes and systems of work which minimise the generation of, or suppress and contain, spills, leaks, dust fumes and vapour of hazardous substances
- the limitation of the quantities of a substance at the place of work
- keeping the number of persons who might be exposed to a substance to a minimum, and reducing the period of exposure
- prohibiting eating, drinking and smoking in areas that may be contaminated by the substance
- hygiene measures, including providing adequate washing and laundering facilities and regular cleaning of walls/bulkheads and other surfaces
- the designation of those areas that may be contaminated and the use of suitable and sufficient warning signs
- the safe storage, handling and disposal of hazardous substances and use of closed and clearly labelled containers.

These measures should be applied to reduce the risk to the minimum, but where they do not adequately control the risk to health, personal protective equipment should also be provided.

Employers should take reasonable steps to ensure that any control measures are properly used and maintained. Where appropriate, exposure levels should be monitored and recorded.

Personnel should comply fully with the control measures in force.

For certain substances very specific control measures apply, eg asbestos, benzene. In cases where failure of the control measures could result in risk to health and safety, or where their adequacy or efficiency is in doubt, the exposure of personnel should be monitored and a record kept for future reference.

27.2 Asbestos dust

All types of asbestos have a fibrous structure and can produce harmful dust if the surface exposed to the air is damaged or disturbed. The danger is not immediately obvious because the fibres, which can damage the lungs and can cause lung cancer, are too small to be seen with the naked eye.

Asbestos that is in good condition is unlikely to release fibres, but where the material is damaged or deteriorating, or work is undertaken on it, airborne fibres can be released. Dry asbestos is much more likely to produce dust than asbestos that is thoroughly wet or oil-soaked. Asbestos is particularly likely to occur on older vessels in insulation and panelling, but certain asbestos compounds may also be found on other vessels in machinery components such as gaskets and brake linings.

Ship owners should advise masters of any location where asbestos is known or believed to be present on their ship. Masters and/or safety officers should keep a written record of this information and note any other position where asbestos is suspected, however, they should not probe or disturb any suspect substance. Crew members who work regularly near asbestos or a substance likely to contain it should be warned and report any deterioration in its condition such as cracking or flaking.

The condition of old asbestos may deteriorate and where reasonably practicable consideration should be given to its removal. This should be carried out in port by a specialist removal contractor to ensure adequate protective procedures.

In 1995 the New Zealand Department of Labour produced a booklet entitled *Guidelines for the Management and Removal of Abestos*. It should be consulted where work involving asbestos removal is contemplated.

If it is essential to carry out emergency repairs liable to create asbestos dust while the ship is at sea, strict precautions including the use of the appropriate protective clothing and respiratory protective equipment should be observed in accordance with the booklet mentioned above.

See also the general guidance on the assessment and control of risks from hazardous substances in Chapter 12 of this Code.

27.3 Dangerous goods

All dangerous goods and substances carried as cargo on ships have to be classified, packaged and labelled for transport in accordance with the International Maritime Dangerous Goods (IMDG) Code.

Examples of the labels to be affixed to packages and containers of dangerous goods are given in the IMDG Code. These depict by colour, name and pictogram the particular dangers of that substance, eg flammability, toxicity and corrosiveness.

27.4 Use of chemical agents

A chemical from an unlabelled package or receptacle should never be used unless its identity has been positively established.

Chemicals should always be handled with the utmost care. Eyes and skin should be protected from accidental exposure or contact.

Manufacturers' or suppliers' advice on the correct use of the chemicals should always be followed. Some cleaning agents, even though used domestically, eg caustic soda and bleaches, may burn the skin.

Chemicals should not be mixed unless it is known that dangerous reactions will not be caused.

27.5 Dry-cleaning operations

The principal hazard presented by a dry-cleaning solvent is that it is highly volatile, producing a vapour which is anaesthetic. Effective mechanical ventilation should therefore be provided in any compartment containing dry-cleaning plant. Smoking should be prohibited in compartments when the solvent is present.

Dry cleaning solvent is also a potential cause of skin damage, and suitable personal protective equipment should be worn.

A responsible person should be appointed to take overall responsibility for the security and operation of the dry-cleaning plant, and access should be controlled.

27.6 Safe use of pesticides

The following guidance should be read in conjunction with International Maritime Organisation recommendations.

Where pesticides are used in the cargo spaces of ships or cargo units, safety procedures should be in accordance with the IMO publication *Recommendations on the Safe Use of Pesticides* (1996). A copy of this publication should be retained on board and kept accessible for all crew members.

Where space and surface spraying operations are being carried out by the crew, the master should ensure that the appropriate protective clothing, gloves, respirators and eye protection are being worn.

Ship's personnel should not handle fumigants and such operations should be carried out only by qualified operators. Fumigation should only be carried out with the agreement of the ship's master.

The master should choose to allow an in-transit fumigation only after first referring to the requirements of the ship's own national administration, and seeking the approval of the administration of the state of the vessel's next destination or port of call.

The master should provide safe working conditions and ensure that at least two members of his crew including one officer have received the appropriate training. They should be familiar with the recommendations of the fumigant manufacturer concerning the methods of detection of the fumigant in air, its behaviour and hazardous properties, symptoms of poisoning, relevant first-aid treatment and special medical treatment and emergency procedures.

The "Fumigation Warning" sign should be conspicuously displayed on cargo units or spaces under fumigation. A watchman should be posted to prevent access to areas of risk by unauthorised personnel.

CHAPTER 28 USE OF SAFETY SIGNS

Safety signs should be used to indicate hazards or control measures to be taken where the hazard cannot otherwise be removed.

28.1 Signs and notices

The international standards for safety signs are explained in the following paragraphs.

Permanent signs are used to:
- give prohibitions, warnings and mandatory requirements
- mark emergency escape routes
- identify first aid facilities
- show the location of fire fighting equipment.

Red signs mean either:
- stop doing something or don't do it (prohibition)
- stop/shut down or evacuate
- or they mark the location and type of fire-fighting equipment.

Signs of prohibition are based on a red circular band with a red diagonal bar and white backing. The symbol for the prohibited action is shown in black behind the red diagonal bar, eg "No smoking" with a cigarette depicted.

A sign indicating fire-fighting equipment is a red square or rectangle, with information given in words or by a symbol in white. Alternatively an IMO sign is a square or rectangle, with information given in words or by a symbol in red.

Yellow signs are advisory and mean be careful, or take precautions.

Warning signs are based on a yellow triangle with a black border.The symbol for the hazard is shown in black, eg poisoning risk with black skull and crossbones on the yellow background.

Blue signs are mandatory and mean take specific action.

Mandatory signs are based on a blue disc. The symbol for the precaution to be taken is shown in white, eg "Goggles to be worn" with a man's head with goggles depicted.

If no suitable symbol is available, appropriate wording may be used instead, eg "Keep Clear".

Green signs mean:
- emergency escape; or
- first aid sign.

The sign is a green square or rectangle, with safety information shown by words or a symbol in white, eg a white arrow on a green background points to an emergency exit.

If more information is needed to make clear the meaning of any symbols used in a safety sign or notice, then a supplementary sign with text only may appear below the sign, eg "Not Drinking Water".

The supplementary sign should be oblong or square and either:
- white with text in black; or
- the same background colour as the safety colour used on the sign it is supplementing, with the text in the relevant contrasting colour.

Shore based personnel and passengers may not be aware that they are colour blind, and colour should not be used as a sole indicator.

Where a language other than English is extensively used on a ship, any text used in conjunction with a sign should usually be displayed also in that language.

Examples of signs in everyday use can be found by reference to the *Australian Safety Signs for Occupational Environment* NZS/AS 1319:1944.

Safety signs relating to fire protection appliances, lifesaving appliances and means of escape can be found in the document ISO 17631:2002, which generally conform to those set out in IMO Resolution A 654 (16) and IMO Resolution A 770 (18). They comply with Regulation III / 9.2.3 of the 1974 SOLAS Convention.

28.2 Occasional signs

Illuminated signs, acoustic signals, hand signals and spoken signals may also be used for temporary hazards or circumstances.

Illuminated signs and acoustic signals must be tested regularly to ensure that they are working. Acoustic signs should comply with the IMO Code on Alarms and Indicators 1992.

The internationally understood hand signals for use of lifting appliance are given in Chapter 21.

Spoken signals should comply with the IMO Standard for Marine Navigational Vocabulary. This is particularly important when communicating with another ship or with shore-side workers abroad, where English is not much used.

28.3 Electrical wiring

The cores of electrical cables should be readily identifiable throughout their length by colours or numbers. Although various standards (British, other national or international) exist for colour coding of cores, the colours specified in the standards differ.

The colours found on any ship will therefore depend on the country of building or of manufacture of the cables. Care should therefore always be taken to make a positive identification of cable duty, and colours should be used primarily as a means of conductor tracing.

Particular care is required when connecting plugs to domestic equipment that has been brought on to a ship, as a wrong connection could prove fatal. New equipment should be supplied with cable to the international standard, ie brown for “live”, blue for “neutral” and yellow/green for “earth”, but older equipment and that purchased abroad may have other colours.

28.4 Gas cylinders

Gas cylinders used on New Zealand ships should be marked and colour coded according to the relevant New Zealand Standard Specification or equivalent.

Each cylinder should be clearly marked with the name of the gas and its chemical formula or symbol. The cylinder body should be coloured according to contents, with, where necessary, a secondary colour band painted around the neck of the cylinder to denote the particular hazards of the gas (flammability, toxicity etc).

Examples of such colour coding on gas cylinders commonly used on board ship follow.

NAME OF GAS	CHEMICAL FORMULA OR SYMBOL	GROUND COLOUR OF CONTAINER	COLOUR OF BAND
Oxygen	O2	Black	None
Carbon dioxide	CO2	Black	None
Compressed air	None (mixed gases)	French grey	None
Nitrogen	N2	French grey	Black
Acetylene	C2H2	Maroon	None
Propane	None (mixed gases)	Signal red	None
Butane	None (mixed gases)	None specified	Signal red

Medical gas cylinders carried on board should similarly be marked in accordance with the relevant Standard specification or equivalent. The name of the gas or gas mixture contained in the cylinder should be shown on a label affixed to it. The chemical symbol of the gas should be given on the shoulder of the cylinder.

The cylinder should also be colour-coded according to the contents as shown in the following examples.

NAME OF GAS	SYMBOL	COLOUR OF BODY	COLOUR OF VALVE
Oxygen	O2	Black	White
Compressed air (for breathing app)	AIR	Grey	White and black

28.5 Pipelines

The following colour coding system is recommended for adopting for the main common pipeline services.

PIPE CONTENTS	BASIC IDENTIFICATION COLOUR	BS COLOUR REFERENCE BS 4800	COLOUR CODE BAND	BS COLOUR REFERENCE BS 4800
Water (Fresh)	Green	12D 45	Blue	18E 53
Water (Salt)	Green	12D 45	None	
Water (Fire Extinguishing)	Green	12D 45	Safety red	04E 53
Compressed air	Light blue	20E 51	None	
Steam	Silver grey	10A 03	None	
Oil (Diesel Fuel)	Brown	06C 39	White	
Oil (Furnace Fuel)	Brown	06C 39	None	
Oil (Lubricating)	Brown	06C 39	Emerald green	14E 53

The basic identification colour should be applied on the pipe either on its whole length or as a colour band at regular intervals on the pipe. The colour should similarly be applied at junctions, both sides of valves, service appliances, bulkheads etc, or at any other place where identification might be necessary. Valves on pipelines used for fire fighting should be painted red.

Where applicable, the colour code banding should be in approximately 100 mm widths at regular intervals along the length of the pipe on the basic identification colour or painted between two

basic identification colour bands each of a width of about 150 mm as shown in the following examples:

PIPE CONTENTS	BASIC COLOUR (150 MM APPROX)	COLOUR CODE (100 MM APPROX)	BASIC COLOUR (150 MM APPROX)
Water (Fresh)	Green	Blue	Green
Water (Fire extinguishing)	Green	Safety red	Green
Diesel fuel	Brown	White	Brown

Care should be taken to ensure that when replacing or repainting pipes or valves, the correct colour is used.

When it is necessary to know the direction of the flow of the fluid, this should be indicated by an arrow situated in the proximity of the basic identification colour and painted white or black in order to contrast clearly with that colour.

Such a system as recommended above would be useful, for instance, in tracing a run of pipes but should not be relied upon as a positive identification of the contents of the pipe; a check should always be made before opening up and precautions taken against the contingency that the content is other than that expected.

Other pipeline systems on ships, such as cargo pipelines, may be colour coded in a similar fashion but no specific recommendations are made here because a comprehensive system to cover the needs of all types of ship would require so wide a range of colours that contrasts would be small and easily obscured by fading or dirt.

Colour coding of pipelines may vary from ship to ship and seafarers moving from one ship to another should check with a competent officer what the colours mean on each particular vessel.

28.6 Portable fire extinguishers

Portable fire extinguishers must comply with Maritime Rule Part 42B or an equivalent alternative standard.

ANNEX 28.1

Safety Signs as required by the MS & FV (Safety Signs & Signals) Regulations 2001 & Merchant Shipping Notice MSN 1763

PART 1 - PROHIBITORY SIGNS

Symbol	Meaning
	**Prohibition –** Do not do

EXAMPLES

No Smoking

Smoking and naked flames forbidden

No access for pedestrians

Do not extinguish with water

Not drinkable

No access for Unauthorised persons

No access for Industrial vehicles

Do not touch

PART 2 - WARNING SIGNS

Symbol	Meaning
	

EXAMPLES

Flammable material
Or high temperature (a)

Explosive material

Toxic material

Corrosive material

Radioactive material

Overhead load

Industrial vehicles

Danger: electricity

General danger

Laser beam

Oxidant material

Non-ionising radiation

a) in the absense of a specific sign for high temperatue.

Strong magnetic field

Obstacles

Drop

Biological risk (a)

Low temperature

Harmful or irritant Material (b)

a) Pictorgram laid down in Council Directive 90/679/EEC of 26th November 1990 on protection of workers from the risks relate to exposure to biological agents at work (Seventh individual Directive within the meaning of article 16(1) of Directive 89/391/EEC) OJ. No 1,374, 31.12.1990, pl.

b) The background to this sign may exceptionally be amber if justified in order to differentiate it from a similar road safety sign.

PART 3 - MANDATORY SIGNS

Symbol	Meaning
	

EXAMPLES

Eye protection
Must be worn

Safety helmet
Must be worn

Ear protection
Must be worn

Respiratory equipment
Must be worn

Safety boots
Must be worn

Safety gloves
Must be worn

Safety overalls
Must be worn

Face protection
Must be worn

Safety harness
Must be worn

Pedestrians must
Use this route

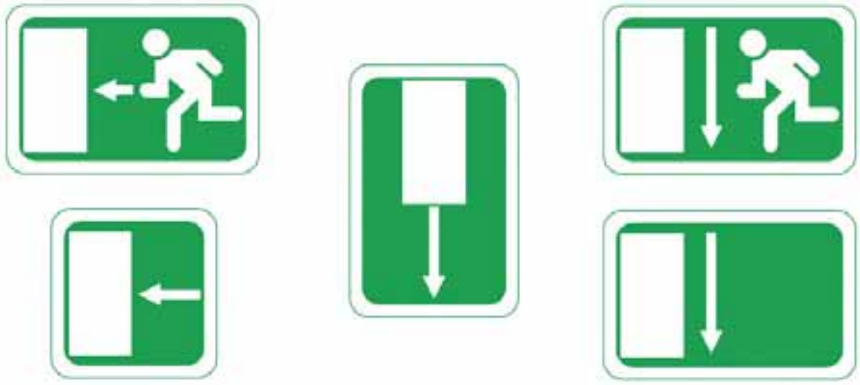
General mandatory sign (to be accompanied where necessary by another sign)

PART 4 - EMERGENCY ESCAPE, FIRST AID SIGNS AND SAFE CONDITION

Symbol	Meaning
	**Emergency Escape, First Aid and Safe Condition –** The safe way

EXAMPLES

Emergency exit/escape route



Supplementary information signs

This way

First aid signs

First-aid post | Stretcher | Safety shower | Eyewash

Safe condition sign

Emergency telephone for first-aid or escape

Emergency stop for machinery

PART 5 - FIRE FIGHTING SIGNS

Symbol

Meaning

EXAMPLES

Smoking and naked flames forbidden

No access for pedestrians

This way
(supplementary information sign)

Firm alarm

Fire extinguisher

SECTION 4

SAFETY OF SPECIALIST SHIPS

MARITIME NEW ZEALAND

CHAPTER 29: DRY CARGO SHIPS

This chapter concerns both packages and dry bulk cargoes, with the exception of cargoes carried in roll-on, roll-off ships that are covered in Chapter 32.

29.1 Stowage of cargo

All cargoes should be stowed and secured in a manner that will avoid exposing the ship and persons on board to unnecessary risk. The safe stowage and securing of cargo depends upon proper planning execution and supervision by properly qualified and experienced personnel.

The planned procedures for the handling of cargo should be agreed with berth or terminal operators in advance of loading or unloading.

In the case of dry bulk cargo (excluding grain), procedures should follow the IMO Code *of Practice for the Safe Loading and Unloading of Bulk Carriers*, with the associated IMO *Ship/ Shore Safety Check List*. For grain, there is more detailed guidance in the *International Code for the Safe Carriage of Grain in Bulk*.

Loading, stowage and securing of cargo other than bulk cargo is to be carried out in accordance with the ship's approved Cargo Securing Manual. Handling and safety instructions for securing devices are contained in sections 3.1 and/or 4.1 of the manual. Further guidance is contained in the IMO *Code of Practice for Cargo Stowage and Securing* (IMO Resolution A.714/17). Cargo securing should be completed before the ship proceeds to sea.

All cargo should be stowed having due regard to the order of discharge. When planning the position of cargo and the order of loading and unloading, the effects that these operations will have upon access and the safety of personnel should be considered.

The following points should be taken into account:

- cargo information, including gross mass of the cargo units and any special properties detailed on board or in the shipping documents, should be recorded and used in planning
- wherever practicable, where more than one port is involved for loading or unloading, cargo should be loaded in layers rather than in tiers, so as to avoid the development of high vertical walls of cargo
- care should be taken not to overstow lighter cargoes with heavier cargoes that may lead to a collapse of the stow
- wherever practicable, cargo should be stowed so as to leave safe clearance behind the rungs of hold ladders and to allow safe access as may be necessary at sea
- the need to walk across or climb onto deck cargo, where this may involve an approach to an unprotected edge with risk of falling, should be minimised
- care should be taken to avoid large gaps next to cargo where it is stacked against corrugated bulkheads.

Deck cargo should be stowed in accordance with the statutory regulations, and kept clear of hatch coamings to allow safe access. Access to safety equipment, fire fighting equipment (particularly fire hydrants) and sounding pipes should also be kept free.

Any obstructions in the access way such as lashings or securing points should be painted white to make them more easily visible. Where this is impracticable and cargo is stowed against ship's rails or hatch coamings to such a height that the rails or coamings do not give effective protection to personnel from falling overboard or into the open hold, temporary fencing should be provided (see Chapter 13.4: Guarding of openings).

Suitable safety nets or temporary fencing should be rigged where personnel have to walk or climb across built-up cargo, and are therefore at risk of falling.

When deck cargo is stowed against and above ship's rails or bulwarks, a wire rope pendant or a chain, extending from the ring bolts or other anchorage on the decks to the full height of the deck cargo, should be provided and used to save personnel having to go overside to attach derrick guys and preventers directly to the anchorages on the deck.

Where beams and hatch covers have to be removed at intermediate ports before surrounding deck cargo is unloaded, an access space at least one metre wide should be left adjacent to any part of the hatch or hatchway that is to be opened. If on deck this is impracticable, fencing or lifelines should be used to enable seafarers to remove and replace beams and hatch coverings in safety (see Chapter 13.4: Guarding of openings).

In the 'tween decks, guidelines should be painted around 'tween deck hatchways at a distance of one metre from the coamings.

29.2 Dangerous goods and substances

Maritime Rules Part 24A sets out requirements for carriage of dangerous goods. The provisions of the International Maritime Dangerous Goods (IMDG) Code together with those contained in Rules Part 24A should be observed. The IMDG Code contains details of classification, documentation and packaging and advice on such application as will meet the requirements of the rules. In particular, it lists and gives details of many dangerous substances.

The general introduction and the introductions to individual classes of the IMDG Code contain many provisions to ensure 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, some of which are general for all classes and other particular to certain classes only.

It is important that reference should be made to this information before handling dangerous goods. Some of the requirements are highlighted in subsequent paragraphs. Where any doubts exist, advice should be sought from Maritime New Zealand.

Dangerous substances should be loaded or unloaded only under the supervision of a competent responsible officer. Suitable precautions, such as the provision of special lifting gear, should be taken to prevent damage to receptacles containing dangerous substances.

Dangerous substances should not be loaded other than in accordance with the rules, ie in accordance with the IMDG Code, and if applicable the ship's document of compliance for the carriage of dangerous goods. In the case of certain solid dangerous substances shipped in bulk, loading should be carried out in accordance with Appendix B of the *Code of Safe Practice for Solid Bulk Cargoes* published by the International Maritime Organisation (IMO). In addition, the *Emergency Procedures for Ships Carrying Dangerous Goods*, published by the IMO, should be consulted to ensure that appropriate emergency equipment is carried.

Additional New Zealand requirements govern the loading and unloading of explosives.

In compartments containing cargo that has an explosion or fire risk (eg explosives or flammable liquids) all electrical circuits and equipment (including any portable equipment) should meet the recommendations of the IMDG Code. Smoking and naked flames should be prohibited while cargo handling is in progress, except in authorised places, which should be clearly marked.

Emergency response procedures should be established. The application of such measures is under the control of the master of the ship and will depend on the circumstances of the incident and location of the ship. The equipment necessary for the execution of the emergency response should be immediately available and the crew trained and practised in its use.

These procedures should include:

- cases of accidental exposure
- the possibility of fire.

Personnel who are required to handle consignments containing dangerous substances should be able to identify dangerous goods from the labelling and promptly report any leakage, spillage or any other incident which occurs involving exposure to dangerous substances.

Those required to handle dangerous substances, should be provided with and wear personnel protective equipment (including breathing apparatus, where necessary) appropriate to the hazard involved.

In the event of accidental exposure to dangerous substances, reference should be made to the *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods* (MFAG) published by IMO.

Appropriate measures should be taken promptly to render harmless any spillage of dangerous substances. Particular care should be taken when dangerous substances are carried in refrigerated spaces where any spillage may be absorbed by the insulating material. Insulation affected in this way should be inspected and renewed if necessary.

Where there is a leakage or escape of dangerous gases or vapours from the cargo, personnel should leave the danger area and the area should be treated as an enclosed or confined space (see Chapter 17).

Personnel required to deal with spillages or to remove defective packages should be provided with and wear suitable breathing apparatus and protective clothing as the circumstances dictate. Suitable rescue and resuscitation equipment should be readily available in case of an emergency (see Chapter 4).

Guidance on the assessment and control of risks from substances hazardous to health is also given in Chapter 27. Further guidance on the handling and stowage of dangerous goods is contained in the *Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas* published by IMO.

29.3 Carriage of containers

Containers are simply packages of pre-stowed cargo and section of Chapters 21 and 26 may also be relevant to their safe working.

Where a container holds dangerous goods the relevant guidance contained in 29.2 should be followed. For guidance on control of substances hazardous to health refer to Chapter 27.

Freight containers should comply with the International Convention for Safe Containers 1972 (CSC). They should not be loaded beyond the maximum net weight indicated on the Safety Approval Plate, and should be in a safe condition for handling and carriage.

The equipment used for lifting a container should be suitable for the load, and safely attached to the container. The container should be free to be lifted and should be lifted slowly to guard against the possibility of the container swinging or some part of the lifting appliances falling, should the contents be poorly secured, unevenly loaded and poorly distributed or weight of contents incorrectly declared.

The process of loading and securing of goods into a container should follow the IMO/ILO/UN Guidelines for Packing of Cargo Transport Units (CTUs). Special care should be taken when lifting a container the centre of gravity of which is mobile, eg a tank container, bulk container or a

container with contents which are hanging.
Safe means of access to the top of a container should be provided to release lifting gear, and to fix lashings, and personnel so engaged should, where appropriate, be protected from falling by use of a properly secured safety harness or other suitable means. Where containers are stacked account should be taken of the appropriate strength features and stacking induced stress. Containers should be lashed individually.

On ships not specially constructed or adapted for their carriage, containers should, wherever possible, be stowed for and aft, and should be securely lashed. Containers should not be stowed on decks or hatches unless it is known that the decks or hatches are of adequate overall and point load-bearing strength. Adequate dunnage should be used.

The system of work should be such as to limit the need to work on container tops. Where the design for securing of containers and the checking of lashings makes access onto the container tops necessary, it should be achieved by means of the ship's superstructure or by a purpose-designed access platform or personnel cages using a suitably adapted lifting appliance. If this is not possible, an alternative safe system of work should be in place.

To allow access to the tops of over-height, soft top or tank containers where necessary for securing or cargo handling operations, solid top or "closed containers" should be stowed between them whenever practicable.

Where the ship's electrical supply is used for refrigerated containers, the supply cables should be provided with proper connections for the power circuits and for earthing the container. Before use the supply cables and connections should be inspected and any defects repaired and tested by a competent person. Supply cables should only be handled when the power is switched off. Where there is a need to monitor and repair refrigeration units during the voyage, account should be taken of the need to provide safe access in a seaway when stowing these containers.

Personnel should be aware that containers may have been fumigated at other points in the transport chain, and there may be a residual hazard from the substances used.

29.4 Working cargo

For regulations and guidance on lifting equipment and lifting operations, including examination and testing requirements, see Chapters 7 and 21 of this Code.

Safety arrangements prior to working cargo should ensure that adequate and suitable lifting plant is available, in accordance with the register of lifting appliances and cargo gear, and that all plant and equipment, and any special gear necessary is available and used. Cargo gear should be checked regularly throughout the cargo operation for damage or malfunction.

Repair or maintenance work, such as chipping, spray painting, shot-blasting or welding, should not be undertaken in a space where cargo operations are in progress, if such work could create a hazard to personnel working in the space.

Loads being lowered or hoisted should not pass or remain over any person engaged in any work in the cargo space area, or over means of access. Personnel should take care when using access ladders in hatch squares whilst cargo operations are in progress.

Cargo information for goods should always provide the gross mass of the cargo or of the cargo units. Where loads of significant gross mass are not marked with their weight, the loads should be check-weighted unless accurate information is available as provided by the shipper or packer of the goods.

A signaller should always be employed at a hatchway when cargo is being worked unless the crane driver or winchman has a completely unrestricted view of the load or total working area.

The signaller should be in a position where he has a total view of the operation, where this is not possible then additional signallers should be used to assist. Guidance for signallers is given in Chapter 21.

Before giving a signal to hoist, the signaller should receive clearance from the person making up the load that it is secure, and should ascertain that no one else would be endangered by the hoist. Before giving the signal to lower, they should warn personnel in the way and ensure all are clear.

Loads should be raised and lowered smoothly, avoiding sudden jerks or “snatching”. When a load does not ride properly after being hoisted, the signaller should immediately give warning of danger and the load should be lowered and adjusted as necessary.

Hooks, slings and other gear should not be loaded beyond their safe working loads. Strops and slings should be of sufficient size and length to enable them to be used safely and be so applied and pulled sufficiently tight to prevent the load or any part of the load from slipping and falling. Loads (sets) should be properly put together and properly slung before they are hoisted or lowered.

Before any heavy load is swung, it should be given a trial lift in order 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, strops or other fastenings of packages of cargo, unless these fastenings have been specifically provided for lifting purposes
- the rims (chines) of barrels or drums for lifting purposes, unless the construction or condition of the barrels or drums is such as to permit lifting to be done safely with properly designed and constructed can hooks.

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 other 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 the slings should not normally exceed 90º, as this reduces the safe working load of the sling. Where this is not reasonably practicable, the angle may be increased up to 120º provided that the slings have been designed to work at the greater angles. However, it should be noted that at 120º, each sling leg is taking stress equivalent to the whole mass of the load.

Trays and pallets (unit loads) should be hoisted with four-legged slings and where necessary, nets and other means should be used to prevent any part of the load falling.

Bundles of long metal goods such as tubes, pipes and rails, should be slung with two slings necessary, nets and other means should be used to prevent any part of the load falling.

Logs should be loaded or discharged using wire rope slings of adequate size; tongs should not be used except to break out loads.

Cargo buckets, tubs and similar appliances should be carefully fitted so that there is no risk of the contents falling out and be securely attached to the hoist (eg 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.

Loose goods such as small parcels, carboys and small drums should be loaded or discharged in suitable boxes or pallets with sufficiently high sides, and lifted using four-legged slings.

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 personnel and obstructions.

”One-trip slings”, that is, slings which have not been used previously for lifting and are fitted to the load prior to loading, should not be taken back on board ship after the load is discharged at the end of the voyage, but should be left on shore for disposal.

When work is interrupted or has ceased for the time being, the hatch should be left in a safe condition, with either guard rails or the hatch covers in position.

29.5 Lighting in cargo spaces

During cargo operations cargo spaces should be adequately lit, avoiding strong contrasts of light and shadow or dazzle (see section Chapter 6).

Open or naked lights should not be used. Portable lights should be adequately guarded, suitable for the task, and firmly secured in such a manner that they cannot be accidentally damaged. Portable lights should never be lowered or suspended by their electrical leads, and leads should be run so that they are clear of loads, running gear and moving equipment.

29.6 General precautions for personnel

Personnel undertaking duties in cargo spaces should move with caution over uneven surfaces or over loose dunnage and be alert to protrusions such as nails.

Where vessels have been built with corrugated bulkheads precautions such as suitable rails, grids or nets should be erected to prevent cargo handlers or other personnel from falling into the space between the rear of the corrugation and the stowed cargo.

Where work is being undertaken on or near the cargo “face”, the “face” should be secured against collapse, especially where bagged cargo may be bleeding from damage. Where it is necessary to mount a “face” a portable ladder should be used, properly secured against slipping or shifting sideways, or held in position by other personnel. When work is undertaken in areas where there is a risk of falling, safety nets should be erected. Such nets should not be secured to hatch covers.

Personnel should be aware that cargoes may have been fumigated at other points in the transport chain, and there is a risk that toxic fumes may build up in enclosed spaces.

CHAPTER 30: TANKERS AND OTHER SHIPS CARRYING BULK LIQUID CARGOES

30.1 General

Masters, officers and ratings appointed to work on tankers or similar vessels must meet the minimum training and qualifications requirements specified in regulation V/1 of the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers*, 1978, as amended in 1995.

Training in emergency procedures and in the use of any special emergency equipment should be given as appropriate to members of the crew at regular intervals. The instruction should include personal first aid measures for dealing with accidental contact with harmful substances in the cargo being carried and inhalation of dangerous gases and fumes.

Because of the risks of ill effects arising from contamination by certain liquid cargoes, especially those carried in chemical tankers and gas carriers, personnel should maintain very high standards of personal cleanliness and particularly so when they have been engaged in cargo handling and tank cleaning.

Those on board responsible for the safe loading and carriage of the cargo should have all the relevant information about its nature and character before it is loaded and about the precautions which need to be observed during the voyage. The remainder of the crew should be advised of any precautions which they too should observe.

High risks required the strict observance of rules restricting smoking and the carriage of matches or cigarette lighters.

Spillages and leakages of cargo should be attended to promptly. Oil-soaked rags should not be discarded carelessly where they may be afire hazard or possibly ignite spontaneously. Other combustible rubbish should not be allowed to accumulate.

Cargo handling equipment, testing instruments, automatic and other alarm systems should be maintained to a very high standard of efficiency at all times. Where electrical equipment is to be used in the cargo area it should be of approved design and “certified safe”.

The safety of this equipment depends on maintenance of high order, which should be carried out only by competent persons. Unauthorised personnel should not interfere with such equipment. Any faults observed, such as loose or missing fastenings or covers, severe corrosion, cracked or broken lamp glasses should be reported immediately.

Work about the ship which might cause sparking or which involves heat should not be undertaken unless authorised after the work area has been tested and found gas-free, or its safety is otherwise assured.

Where any enclosed space has to be entered, the precautions given in Chapter 17 should be strictly observed. Dangerous gases may be released or leak from adjoining spaces while work is in progress and frequent testing of the atmosphere should be undertaken. “Permit-to-work” procedures should generally be adopted – see Chapter 17.

30.2 Oil and bulk ore/oil carriers

Tankers and other ships carrying petroleum or petroleum products in bulk, or in ballast after carrying these cargoes, are at risk from fire or explosion arising from ignition of vapours from the cargo which may in some circumstances penetrate into any part of the ship.

Additionally, vapours may be toxic, some in low concentrations, and some liquid products, especially petrol (gasoline) treated with tetra-ethyl or tetra-methyl-lead, are harmful in contact with the skin.

Guidance on the general precautions which should be taken is given in publications of the International Chamber of Shipping:

- *International Safety Guide for Oil Tankers and Terminals*
- *Safety in oil tankers*, a handbook for crew members.

Companies are additionally required, under the ISM Code, to have their own safety regulations. These publications should be available on board and the guidance conscientiously followed.

30.3 Liquefied gas carriers

Guidance on the general precautions that should be taken on these vessels is given in the *Tanker safety guide (liquefied gas)* and *Safety in liquefied gas tankers* (a handbook for crew members) published by the International Chamber of Shipping.

The IMO Code for the *Construction and equipment of ships carrying liquefied gases in bulk* contain guidance on operational aspects and are mandatory under the relevant Merchant Shipping regulations.

It should be noted that cargo pipes, valves and connections and any point of leakage at the gas cargo may be intensely cold. Contact may cause severe cold burns.

Pressure should be carefully reduced and 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 it can be closely supervised and is sited as far away from the manifold area as possible. Crew members should be aware of the location of eye wash equipment and safety showers.

30.4 Chemical 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 side by side simultaneously.

The products carried range from the so-called non-hazardous to those which are extremely flammable, toxic or corrosive or have a combination of these properties, or which possess other hazardous characteristics.

The ship arrangements and the equipment for cargo handling may be complex and require a high standard of maintenance and the use of special instrumentation, protective clothing and breathing apparatus for entry into enclosed spaces.

The IMO has produced codes (the IBC Code and the BCH Code) for the construction and equipment of ships carrying dangerous chemicals in bulk. The Codes are statutory under Merchant Shipping regulations. They contain some operational guidance, and the associated index of dangerous chemicals carried in bulk contains reference to the *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods* (MFAG) published by IMO.

Guidance on general operational procedures and precautions that should be followed on chemical tankers is given in the Tanker *Safety Guide (Chemicals)* and the *Safety in Chemical Tankers*, both published by the International Chamber of Shipping. These publications, together with the codes referred to above and any special safety requirements issued by the company, should be available on board.

Many products carried on chemical tankers are loosely referred to as alcohols. Drinking these could lead to serious injury and death, and strict controls should be exercised when carrying such cargoes in order to prevent pilfering.

CHAPTER 31: SHIPS SERVING OFFSHORE OIL AND GAS INSTALLATIONS

31.1 General

Ships serving offshore oil and gas installations are often expected to operate in adverse weather conditions. Cargo operations should not be undertaken, except in an emergency, if there is any danger of the crew being injured by water on deck or shifting cargo. For the avoidance of doubt, an emergency does not mean when an installation is short of water, food or drilling equipment.

The master of the vessel has the final responsibility for ensuring that any operation is carried out with proper regard to the safety of all those on board and that measures are taken to minimise risks.

The offshore installation manager controls the entry of all vessels into the 500 m zone around the installation and can modify or terminate any support vessel activity that they regard as hazardous to the installation or persons on it.

The crane driver may also terminate a cargo operation on safety grounds.

Where a vessel has open stern and deck gangway doors and a low freeboard, particular care should be taken against loss of watertight integrity by ensuring that scuttles, deadlights, hatches and ventilators are securely closed. Freeing ports should be kept clear and unobstructed to ensure the rapid drainage of water trapped on the deck.

While work is being done on the deck the ship's heading and speed should be adjusted to provide as safe a working platform as possible. A look-out should be kept to give warning of imminent oncoming, quartering or following seas, or the operation suspended until the risk of shipping seas is over.

At all times work is being done on the deck, there should be an efficient means of communication between bridge, crane and crew. This should be by a hand-held radio on an uncluttered working frequency, backed up by a tannoy system.

During hours of darkness, sufficient lighting should be provided at access ways and at any work location, to ensure that obstructions are clearly visible, that persons working on deck can be clearly seen from the bridge and installation and that the operation may be carried out safely.

Lighting should be so placed that it does not dazzle the navigational watch and does not interfere with prescribed navigation lights.

If working on deck cannot be avoided during bad weather, lifelines should be rigged on the working deck to facilitate safe movement. Decks should as far as practicable be kept free from ice, slush and any substance or loose material likely to cause slips and falls.

Personnel working in cold and wet conditions should wear waterproof garments over warm clothing. The need to avoid undue exhaustion and hands and limbs becoming numbed should be taken into account when making the necessary arrangements for relief at suitable intervals.

If it is necessary for someone to work in an exposed position they should, where practicable, wear a safety harness and lifeline, and one of the approved types of self-inflating buoyancy aids that would not unduly hamper or impede working movements.

Safety helmets and high visibility garments should be worn during work on deck.

Advice on mooring and casting off is given in Chapter 25.

Further advice and guidance on offshore support vessel operations may be found in the UKOOA/ Chamber of Shipping *Guidelines for the Safe Management and Operation of Offshore Support Vessels*. A copy of the document is available on the website: www.british-shipping.org

31.2 Carriage of cargo on deck

The safe securing of all deck cargoes should be checked by a competent person before the vessel proceeds on passage. The master is responsible for ensuring that it is correctly stowed and adequately secured for the intended voyage. Areas on the deck that are not to be used for cargo stowage should be clearly marked or otherwise indicated.

To aid unloading at sea to be carried out safely, independent cargo units should, as far as practicable, be individually lashed. Where it is not practical to lash individual pieces of cargo, then groups of lifts intended for the same delivery location should be secured together. Lashings should, where practicable, be of a type that can be easily released and maintained.

All lashings should be checked at least once during each watch whilst at sea. Personnel engaged in the operation should be closely supervised from the bridge, particularly in adverse weather conditions. At night in bad weather, an Aldis lamp or searchlight should be used to aid remote checking of lashings to avoid placing personnel at risk.

Where fitted, pipe posts to restrain the movement of tubulars should be used.

Discarded rope and damaged and unserviceable equipment and cargo should not be jettisoned at sea but retained for disposal ashore. Such materials and articles can foul propellers or cause damage to fishing gear.

31.3 Lifting, hauling and towing gear

All mixed and running gear should be carefully maintained in good order and regularly inspected to detect wear, damage and corrosion. Statutory requirements for the use, maintenance and thorough examination of lifting plant are explained in Chapters 7 and 21. More frequent inspections should be made where gear has hard use or is much exposed to sea and weather.

In all operations that may impose large loads or shock strains upon the gear, precautions should be taken against sudden failure which may cause injury to personnel. As far as practicable, the system should be so defined that the weakest element is at a point where failure is likely to cause least danger.

While gear is under load, personnel essential for the operation should keep in protected positions to the greatest practicable extent. Others not engaged in the operations should keep clear of the working area.

31.4 Preparation for cargo handling

It is important to plan in advance, both at the shore terminal and offshore to aid effective cargo securing. The objective of pre-planning is the safe and practical restraint of cargo carried on the deck of offshore support vessels so that personnel, ship and cargo may be reasonably protected at all stages of carriage, and during cargo operations offshore.

The master and the offshore liaison manager or their representatives must establish liaison prior to unloading or backloading of cargo.

The order of loading/discharging and stowage arrangements should be pre-planned in order to avoid wherever possible the “slotting-in” of containers and the necessity for any person to climb on top of the cargo.

The master should ensure he/she is provided with details of any unusual items of cargo, including dangerous goods, cargoes requiring special sea-fastening arrangements, or heavy lifts before loading.

31.5 Approaching installation and cargo handling at installation

The master should pre-plan their approach to the installation with the vessel set up prior to the final approach to take account of the prevailing wind and tide.

In the event that it is necessary to drop anchor personnel should never stand forward of the windlass when letting go anchors at the installation. This is particularly important in vessels of this type because of the length of chain and the loads thus imposed. Care should be taken when stowing the anchor cable in the locker (see Chapter 25).

In bad weather and under certain conditions of trim, considerable amounts of water may be shipped over the after-deck when the vessel is approaching an installation stern-on under power. Personnel should be alert to this possibility and remain in positions of shelter and safety until it is safe to proceed onto the deck.

Life-saving equipment, including lifebuoy, boathook and heaving line should be readily available at a suitable position on the stern and other points of particular danger when mooring and while cargo handling is in progress.

In applying the guidance of Chapter 21 to cargo handling, it should be borne in mind that the transfer of cargo at sea is at any time a difficult operation and the risks are greatly increased when heavy or bulk items are being handled from a combined deck space in a seaway.

The master has the authority to decide the sequence of cargo discharge to and back loading from the installation.

When cargo is being unloaded at the installation, the lashings of each individual item or cargo should not be released until the item is about to be lifted; there are grave risks if all cargo lashings are removed before loading operations are begun.

Once unlashed, cargo should be secured against movement as much as possible, until lifted.

Personnel should be at all times alert to the danger of being hit or crushed should items of cargo swing during a lift or become dislodged through sudden movement of the ship. For this reason, all personnel should seek positions of safety as far as practicable during the lifting and lowering of cargo. If, in some circumstances, cargo hooks have to be held until the strain is taken, as when pipes are to be unloaded, crew members thus engaged should immediately move to a safe position before the actual lift is effected.

Lifts should be speedily effected to hoist the load well off the deck and swung clear of the ship as quickly as possible.

If any backloading has to take place from the installation during off-loading of cargo from the vessel, care should be taken to ensure that the cargo taken on board is immediately secured against movement until it can be properly stowed.

It is essential that an efficient means of communication, preferably by radio link, is established by the installation crane operator and the working deck officer who should at all times be in visual contact with each other.

31.6 Transfer of personnel by ship to installation by "personnel baskets"

The following procedures should be observed for the transference of personnel from ship to installation by "personnel baskets":

- two people should steady the equipment when it is lowered to the deck
- luggage should be secured within the net of the basket
- personnel to be transferred should wear lifejackets and other PPE suitable for the water and sea conditions
- personnel transferring should be evenly distributed around the based board to ensure maximum stability
- personnel should stand outside the basket with feet apart on the board and the basket securely gripped with both arms looped through
- when the officer in charge is satisfied that all is ready, and at an appropriate moment having regard to the movement of the ship in a seaway, the basket should be lifted clear of the vessel and then swung up and out as quickly as possible before being carefully hoisted up to the installation
- throughout the operation, a lifebuoy, boathook and heaving line should be kept immediately available on board the vessel for use in the case of emergencies
- the arrangements for rescue and recovery of persons near the installation set out in the Installations Emergency Response Plan should be in place
- radio communication should be set up between ship, Stand By Vessel and installation.

31.7 Transfer of personnel by boat

The master of the ship providing the boat should be responsible for the operation. Consideration should be given to the effect of prevailing conditions on the safety of the transfer.

The boat should be reliably powered.

The boat must be crewed by no less than two experienced persons, at least one of whom must be experienced in handling the boat. Lifejackets and if necessary suitable protective clothing, must be worn by all personnel.

A safety rope should be provided for all personnel ascending or descending over the side by ship's ladder.

All personnel to be transferred should be briefed by a responsible deck officer. Boarding and disembarkation should be carried out in an orderly manner under the coxswain's direction.

The boat's coxswain should ensure an even and safe distribution of passengers. Passengers should not stand up or change their positions during the passage between ships save under instructions from the coxswain.

The parent vessel should establish communication with the receiving vessel prior to the commencement of the operation and should maintain continuous visual contact with the boat concerned throughout the transfer. It is recommended that the boat should carry a VHF radio.

If the transfer of personnel involves a stand by vessel, the master should bear in mind that his vessel must at all times be ready to fulfil its stand by vessel duties.

Where transfer is to or from an installation, personnel should be aware that ladders and platforms can be very slippery or rough with shells at water level.

31.8 Anchor handling

Handling installation anchors at sea can be a particularly hazardous and arduous task. The vessel should be controlled in such a manner to minimise the risks concerned, in particular to avoid as far as possible an anchor wire under heavy load whipping from quarter to quarter across the deck.

During bad weather lifelines should be rigged on the working deck to facilitate safe movement. Decks as far as practicable be kept free from ice, slush and any substance or loose material likely to cause slips and falls.

The provisions of section 31.3 on the need for personnel to keep to protected positions are particularly important during the handling of anchors and anchor buoys. Lifelines should be provided.

Anchor buoys being lifted aboard should be kept clear of the working area and lashed immediately upon landing to prevent movement.

Care should be taken when stoppering of wires.

When anchors are let go over the stern, all personnel should be well forward of the stern and in protected positions.

CHAPTER 32: SPECIALIST SHIPS – RO-RO FERRIES

This chapeter gives general advice for the safety of personnel working on the vehicle decks of roll on roll off (ro-ro) ferries. Where other documents or chapters of this Code apply, these are cross-referenced and should also be read.

32.1 General

The movement, stowage and securing of vehicles on vehicle decks and ramps should be supervised by a responsible ship's officer assisted by at least one competent person.

Smoking and naked flames should not be permitted on any vehicle decks. Conspicuous "No smoking" or "No Smoking/Naked Lights" signs should be displayed.

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.

Passengers and drivers should not be permitted to remain on vehicle decks without the express authority of a responsible ship's officer. The period prior to disembarkation when passengers and drivers are requested to return to their vehicles should be kept to a minimum.

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, eg coupled with fire patrols of passenger accommodation.

32.2 Ventilation

Vehicle decks should have adequate ventilation at all times, with special regard to hazardous substances.

On passenger vessels, ventilation fans in closed ro-ro spaces must normally be run continuously whenever vehicles are on board. An increased number of air changes may be required when vehicles are being loaded or unloaded, or where flammable gases or liquids are stowed in a closed ro-ro space. Merchant Shipping regulations specify the special requirements for cargo space ventilation.

To reduce the accumulation of fumes, 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.

During loading and discharging ventilation may be improved by keeping both bow and stern doors open, provided that there is adequate freeboard at these openings. When there is doubt about the freshness of the atmosphere, arrangements should be made for testing of the atmosphere to ensure the maintenance of 21% oxygen and a carbon monoxide content below 50ppm in the atmosphere of the space.

32.3 Fire safety/prevention

Fire detection systems should be switched on whenever vehicle decks are unattended. Deck and engine crew should be trained in the use of the drencher systems and their operation. Continuous monitoring of vehicle decks by CCTV or regular fire patrols should also be in place.

All fire doors should be kept closed on vehicle decks when the vessel is at sea.

32.4 Noise

Personnel working on vehicle decks should not be exposed to the equivalent of 90dB(A) or greater when averaged over an eight hour day. Hearing protection should be available for use when the noise level is equivalent to or exceeds 85dB(A) averaged over an 8-hour day, and should be worn when it is equivalent to or exceeds 90dB(A) averaged over an 8-hour day.

32.5 Safe movement

Pedestrians should be warned of vehicle movements when entering or crossing car or vehicle decks and keep to walkways when moving about the ship.

As far as possible, routes used by vehicles should be separated from pedestrian passageways, and the use of ship's ramps for pedestrian access should be avoided. Ramps which are used by vehicles should not be used for pedestrian access unless there is suitable segregation of vehicles and pedestrians. Segregation can be achieved through the provision of a suitably protected walkway, or by ensuring that pedestrians and vehicles do not use the ramp at the same time. Maritime Rule Part 24B gives further information.

Crew members should exercise great care when supervising the driving, marshalling and stowing of vehicles to ensure that no person is put at risk. The following precautions should be taken:

- crew should be easily identifiable by passengers
- communications between deck officer and rating should be clear and concise to maintain the safety of passengers and vehicles
- there should be suitable traffic control arrangements, including speed limits, and where appropriate the use of signallers. Collaboration may be necessary with shore side management where they also control vehicle movements on board ship
- hand signals used by loading supervisors and personnel directing vehicles should be unambiguous
- adequate illumination should be provided
- personnel directing vehicles should keep out of the way of moving vehicles, and particularly those that are reversing by standing to the side, and where possible should remain within the driver's line of sight. Suitable high visibility clothing should be worn by all personnel working on vehicle decks. Extra care should be taken at the "ends" of the deck where vehicles may converge from both sides of the ship
- crew members should be wary that vehicles may lose control on ramps and sloping deck, especially when wet, and that vehicles on ramps with steep inclines may be susceptible to damage. Ramps should have a suitable slip resistant surface
- where fitted, audible alarms should be sounded by vehicles that are reversing
- safe systems of work should be provided to ensure that all vehicle movements are directed by a competent person
- personnel moving about the ship should be aware of moving ramps, moveable decks etc.

Where possible such ramps and decks should be fitted with audible and visual alarms.

32.6 Inspection of vehicles

Before being accepted for shipment, every freight vehicle should be inspected externally by a competent and responsible person or persons to check that it is in a satisfactory condition for shipment, eg:

- its suitability for securing to the ship in accordance with the approved cargo securing manual (see also Chapter 29.1)
- where practicable, the securing of the load to the vehicle
- a check to ensure the deck or doorway is high enough for vehicles to pass through, and

that vehicles have adequate clearance for ramps with steep inclines
- any labels, placards and marks which would indicate the carriage of dangerous goods.

It is important to ensure, so far as is reasonably practicable, that on each vehicle the fuel tank is not so full as to create a possibility of spillage. No vehicle showing visual signs of an overfilled tank should be loaded.

Personnel should be aware of hazardous units as detailed on the stowage plan and indicated by labels, placards and marks, and should be on guard against the carriage of undeclared dangerous goods.

32.7 Stowage

Shippers' special advice or guidance regarding handling and stowage of individual vehicles should be observed.

Vehicles should:
- so far as possible, be aligned in a fore and aft direction
- be closely stowed athwartships so that, in the event of any failure in the securing arrangements or from any other cause, the transverse movement is restricted. However, sufficient distance should be provided between vehicles to permit safe access for the crew and for passengers getting into and out of vehicles and going to and from accesses serving vehicle spaces
- be so loaded that there are no excessive lists or trims likely to cause damage to the vessel or shore structures.

Vehicles should not be:
- parked on permanent walkways
- parked so as to obstruct the operating controls of bow and stern doors, entrances to accommodation spaces, ladders, stairways, companionways or access hatches, fire-fighting equipment, controls to deck scupper valves and controls to fire dampers in ventilation trunks
- stowed across water spray fire curtains, if these are installed.

Safe means of access to securing arrangements, safety equipment, and operational controls should be properly maintained. Stairways and escape routes from spaces below the vehicle deck should be clearly marked with yellow paint and kept free from obstruction at all times.

Parking brakes of each vehicle or each element of a vehicle, where provided, should be applied and the vehicle should, where possible, be left in gear.

Semi-trailers should not be supported on their landing legs during sea transport unless the landing legs are specially designed for that purpose and so marked, and the deck plating has adequate strength for the point loadings.

Uncoupled semi-trailers should be supported by trestles or similar devices placed in the immediate area of the drawplates so that the connection of the fifth-wheel to the kingpin is not restricted.

Drums, canisters and similar thin walled packaging are susceptible to damage if vehicles break adrift in adverse weather, and should not be stowed on the vehicle deck without adequate protection.

Depending on the area of operation the predominant weather conditions and the characteristics of the ship freight vehicles should be stowed so that the chassis are kept as static as possible by not allowing free play in the suspension.

This can be done by securing the vehicles to the deck as tightly as the lashing tensioning device will permit or by jacking up the freight vehicle chassis prior to securing or, in the case of compressed air suspension systems, by first releasing the air pressure where this facility is provided.

Since compressed air suspension systems may lose air, adequate arrangements should be made to prevent the slackening off of lashings as a result of air leakage during the voyage. Such arrangements may include the jacking up of the vehicle or the release of air from the suspension system where this facility is provided.

32.8 Securing of cargo

Securing operations should be completed before the ship proceeds to sea.

Within the constraints laid down in the approved cargo securing manual, the master has the authority to decide on the application of securings and lashings and the suitability of the vehicles to be carried. In making this decision, the principles of good seamanship, experience in stowage, good practice and the IMO *Code for Cargo Stowage and Securing* (CSS Code) and Maritime Rule Part 24B should be considered.

Personnel appointed to carry out the task of securing vehicles should be trained in the use of the equipment to be used and in the most effective methods for securing different types of vehicles.

Securing operations should be supervised by competent personnel who are conversant with the contents of the Cargo Securing Manual. Freight vehicles of more than 3.5 tonnes should be secured in all circumstances where the expected conditions for the intended voyage are such that movement of the vehicles relative to the ship could be expected.

During the voyage the lashings should be regularly inspected to ensure that vehicles remain safely secured. Personnel inspecting vehicle spaces during a voyage should exercise caution in order to avoid being injured by moving or swaying vehicles. If necessary, the ship's course should be altered to reduce movement or dangerous sway when lashings are being adjusted. The officer of the watch should always be notified when an inspection of the vehicle deck is being made.

When wheel chocks are being used to restrain a semi-trailer they should remain in place until the semi-trailer is properly secured to the semi-trailer towing vehicle.

No attempt should be made to secure a vehicle until it is parked, the brakes, where applicable, have been applied and the engine has been switched off.

When vehicles are being stowed on an inclined deck, the wheels should be chocked before lashing commences and in particular:

- the tug driver should not leave the cab to disconnect or connect the trailer brake lines – a second person should do this
- the parking brake on the tug should be engaged and in good working condition
- as well as wheel chocks, at least two lashings holding the unit against the incline should be left in place until the trailer's braking system is charged and operating correctly.

Where personnel are working in shadow areas or have to go under vehicles to secure lashings, hand lamps and torches should be available for use.

Personnel engaged in the securing of vehicles should take care to avoid injury from projections on the underside of the vehicles.

Wherever possible, lashings should be attached to specially designed securing points on

vehicles, and only one lashing should be attached to any one aperture, loop or lashing ring at each securing point.

When tightening lashings, care should be exercised to ensure that they are securely attached to the deck and to the securing points of the vehicle.

Hooks and other devices which are used for attaching a lashing to a securing point should be applied in a manner which prevents them from becoming detached if the lashing slackens during the voyage.

Lashings should be so attached that, provided there is safe access, it is possible to tighten them if they become slack.

Lashings on a vehicle should be under equal tension.

Where practicable, the arrangement of lashings on both sides of a vehicle should be the same, and angled to provide some fore and aft restraint, with an equal number of pulling forward as are pulling aft.

The lashings are most effective on a vehicle when they make an angle with the deck of between 30 and 60 degrees. When these optimum angles cannot be achieved additional lashings may be required.

Crossed lashings should, where practicable, not be used for securing freight vehicles because this arrangement provides no restraint against tipping over at moderate angles of roll of the ship. Lashings should pass from a securing point on the vehicle to a deck securing point adjacent to the same side of the vehicle. Where there is concern about the possibility of low co-efficients of friction on vehicles such as solid wheeled trailers, additional crossed lashings may be used to restrain sliding. The use of rubber mats should be considered.

Lashings should not be released for unloading before the ship is secured at the berth, without the master's express permission.

Personnel should release lashings with care to reduce the risk of injury when the tension is released.

To avoid being damaged during loading and unloading all unused securing equipment should be kept clear of moving vehicles on the vehicle deck.

A competent appointed person should inspect securing equipment to ensure that it is in sound condition at least once every six months and on any occasion when it is suspected that lashings have experienced loads above those predicted for the voyage. Defective equipment should be taken out of service and placed where it cannot be used inadvertently. Unused lashing equipment should be securely stowed away from the vehicle deck.

32.9 Dangerous goods

This section should be read in conjunction with Chapter 27: Hazardous substances. For guidance on dealing with emergencies involving dangerous goods, see Chapter 10: Emergency procedures and the IMDG Code and Maritime Rule Part 24A.

Prior to loading, freight vehicles carrying dangerous goods should be examined externally for damage and the signs of leakage or the shifting of contents. Any freight vehicle found to be damaged, leaking or with shifting contents should not be accepted for shipment. If a freight vehicle is found to be leaking after loading, a ship's officer should be informed and personnel kept well clear until it is ascertained that no danger to personnel persists.

Freight vehicles carrying dangerous goods and adjacent vehicles should always be secured.

Tank vehicles, and tank containers on flat-bed trailers, containing products declared as dangerous goods should be given special attention. Pre-voyage booking procedures should ascertain that tanks have been approved for the carriage of their contents by sea.

32.10 Specialised vehicles

Gas cylinders used for the operation and business of vehicles such as caravans should be adequately secured against movement of the ship, with the gas supply cut off for the duration of the voyage. Leaking and inadequately secured or connected cylinders should be refused for shipment.

The following vehicles, trailers and loads should be given special consideration:

- tank vehicles or tank containers containing liquids not classified as dangerous goods. These may be sensitive to penetration damage and may act as a lubricant. These vehicles must always be secured
- tracked vehicles and other loads making metal to metal contact with the deck – where possible rubber mats or dunnage should be used
- loads on flat-bed trailers
- vehicles with hanging loads such as chilled meat or floated glass
- partially filled tank vehicles.

Freight vehicles carrying livestock require special attention to ensure that they are properly secured, adequately ventilated and stowed so that access to the animals is possible. Further guidance is contained in the Maritime Rule Part 24A.

Where vehicles are connected to electrical plug-in facilities, personnel should take the appropriate precautions as described in Chapters 7 and 20 of this Code for working with any electrical equipment.

32.11 Use of work equipment

Ships' ramps, car platforms, retractable car-decks and similar equipment should be operated only by competent persons authorised by a responsible ship's officer, in accordance with the company's work instructions. Safe systems of work should be provided to ensure that the heath and safety of crew or passengers is not put at risk. Ramps etc should not be operated unless the deck can be seen to be clear of people, and if any person appears on the deck while the ramp is moving, the operations should be stopped immediately.

Training in the use of such equipment should consist of theoretical instruction enabling the trainee to appreciate the factors affecting the safe operation of the plant, and supervised practical work.

Moveable deck ramps should be kept clear of passengers when being raised or lowered. When cars are lowered on the ramps of moveable decks they should be suitably chocked.

No person should be lifted by ramps, retractable car decks or lifting appliances except where the equipment has been designed or especially adapted for that purpose.

Retractable car-decks and lifting appliances should be securely locked when in the stowed position.

After all vehicles have been loaded, the car deck hydraulics should be isolated, so that they cannot be accidentally activated during the voyage, and the bridge should be informed.

The ship's mobile handling equipment, which is not fixed to the ship, should be secured in its stowage position before the ship proceeds to sea.

32.12 Housekeeping

All walkways should be kept clear.

All vehicle decks, ships' ramps and lifting appliances should, so far as is reasonably practicable, be kept free of water, oil, grease or any liquid which might cause a person to slip or which might act as a lubricant to a shifting load. Any spillage of such liquid should be quickly cleaned up; sand boxes, drip trays and mopping up equipment should be available for use on each vehicle deck.

Personnel should be careful to avoid electrical points and fittings when washing down vehicle decks.

All scuppers should be kept clear of lashing equipment, dunnage and so on.

CHAPTER 33: PORT TOWAGE INDUSTRY

This section covers crews engaged on tugs that are involved in towage operations within port/ harbour limits and provides general guidance on safety. Where other documents or sections of this Code apply these are referenced and should be read in conjunction with this chapter.

Before beginning towing operations, a comprehensive plan of action should be prepared, taking account of all relevant factors, including the state of the sea, visibility and the findings of the risk assessment.

33.1 Watertight integrity

The watertight integrity of the tug should be maintained at all times. When a tug is engaged on any towage operation all watertight openings should be securely fastened.

All watertight openings should be marked with a sign stating that they are to remain closed during towage operations. Any such openings used whilst moving about the tug during a towage operation should be re-secured immediately after use. Signs should conform with Chapter 28 of this Code.

33.2 Testing and inspection of towing equipment

Towing hooks and alarm bells, if fitted, should be inspected daily.

The emergency release mechanisms on towing hooks and winches should be tested, both locally and where fitted remotely, at frequent intervals to ensure correct operation.

All towing equipment in use should be inspected for damage before undertaking and after completing a tow.

33.3 Connecting and disconnecting the towing gear

Before commencing a tow the master should determine which towing gear is suitable for the operation and instruct the crew accordingly.

When receiving heavy lines, the tug crew should be aware of the risk of injury through being struck by a “Monkey’s Fist” or other weighted object attached to the line. They should stand clear of and where possible indicate the area that the heaving line is to be thrown up to.

When connecting to a tow, the crew on deck should ensure that the towing gear is clear of any obstructions, able to run freely and is released from the tug in a controlled manner.

During disconnection, the crew on deck should be aware of the risk of injury if the towing gear is released from the tow in an uncontrolled manner and avoid standing directly below. They should also be aware that any towing gear which has been released and is still outboard may “foul” on the tug’s propeller(s), steelworks or fendering, causing it to come tight unexpectedly.

33.4 Use of bridle/gog rope during towing operations

A suitable bridle/gog rope/wire should be used where it is identified, through the position of the tug in assisting the tow or the nature of the operation, that the tow line is likely to reach such an angle to the fore and aft line of the tug that a “girting” situation may arise.

33.5 Crew safety during towing operations

Once the towing gear is connected, the deck crew should indicate this to the master and then clear the area and, if required to remain on deck, stand in a safe position. If the crew are required to attend the towing gear during a towing operation, the length of time exposed should be kept to a minimum.

During towage operations the towing gear, equipment and personnel should be continuously monitored and any change in circumstances immediately relayed to the master. This is particularly important on tugs where the master has a restricted view of those areas/personnel.

During all towing operations, where a tug is made fast to the tow, the crew should be aware that the tow may have to be released in an emergency situation, and that this may occur without any warning.

Tug crews should wear appropriate personal protective equipment – see Chapter 4.

33.6 Communications

Prior to undertaking the tow, relevant information should be exchanged and an effective means of communication established between the tug and the tow. Secondary/alternative means of communication when possible should also be agreed.

Internal communications are equally important and the tug master should ensure that the crew are aware of the intended operation, including any special circumstances or instructions, and that an effective means of communication is established between the master and crew during the towing operation.

33.7 Interaction

Interaction and its effects on the tug and its handling are well known and appreciated in port/harbour towage. Masters and crew are reminded that these effects increase with speed.

In areas where interaction exists, and when manoeuvring alongside a tow, the master should be aware of the possibility of underwater obstructions such as bulbous bows, stabiliser fins etc, and areas of the ship's sides, such as pilot doors, which are to be avoided. The use of bow thrusts by the tow may present a hazard to the tug.

When in close proximity to or coming alongside a tow, the crew should be aware of interaction and the effect it may have on the tug. This may take the form of sudden movement or contact and result in loss of balance or movement of equipment and other objects.

33.8 Escorting

Escorting as a regular operation is becoming common within the port towage industry. It should only be carried out after investigating the suitability of the tug for the operation and agreeing a plan.

This type of operation is carried out in the "passive" and "active" modes; passive when running free in close attendance and active when fast to the tow.

If active escort is being undertaken the form of towage can be "direct" or "indirect", depending on the speed of the tow. When fast, masters should be aware that increased loads can be applied to towing gear, especially when operating in the indirect mode.

APPENDIX

MARITIME
NEW ZEALAND

APPENDIX: PUBLICATIONS AND WEBSITES

1. Maritime New Zealand (MNZ)

Website: www.maritimenz.govt.nz
Email: enquiries@maritimenz.govt.nz

MNZ produce a range of publications that include newsletters, guidelines, codes, advisory circulars and safety bulletins. For the latest publications, check out the website or email us (see above).

Maritime New Zealand Health and Safety – A Guide
Port Operations – Code of Practice for Health and Safety in

Maritime Transport Act 1994

Maritime Rules:
Part 24A Carriage of Cargoes – Dangerous Goods
Part 40B Design, Construction and Equipment SOLAS Ships
Part 49 Ships' Lifting Appliances
Part 47 Load Lines
Part 23 Operating Procedures and Training
Part 53 Pilot Transfer Arrangements and Ship-Helicopter Pilot Transfers

2. Department of Labour

Website: www.dol.govt.nz
Website: www.osh.govt.nz (takes you directly into the "Health and safety" section)

Health and Safety in Employment Act 1992

Port Operations - Code of Practice for Health and Safety in
Visual Display Units in the Place of Work - Approved Code of Practice for the Safe Use of
Management of Substances Hazardous to Health in the Place of Work - Approved Code of Practice
Healthy Work: Managing Stress in the Workplace

3. International Maritime Organization (IMO)

The IMO has over 250 titles available. Ph +44 (0)20 7735 7611
Email: publications-sales@imo.org Website: www.imo.org

Code for the construction and equipment of ships carrying dangerous chemicals in bulk (BCH Code) (1990 edn)
IMO sales no: IMO-772E ISBN 92-801-1302-X

Code for the construction and equipment of ships carrying liquefied gases in bulk (1983 edn)
IMO sales no: IMO-782E ISBN 92-801-1165-5

Code of safe practice for solid bulk cargoes (1998 edn)
IMO sales no: IMO-260-E ISBN 92-801-1463-8

Code of Safe Practice for Cargo Stowage and Securing
IMO sales no: IMO-292E ISBN 92-801-12902

1994/5 *Amendments to the Code of Safer Practice for Cargo Stowage and Securing*
IMO sales no: IMO-292-E ISBN 92-801-13283

International Code for the safe carriage of grain in bulk (1991 edn)
IMO sale no: IMO-240-E ISBN 92-801-1275-9

Code for existing ships carrying liquefied gases in bulk (1976 edn)
IMO sales no: IMO-788E ISBN 92-801-1051-9

Emergency Procedures for ships carrying dangerous goods; see Supplement to IMDG Code

International code for the construction and equipment of ships carrying dangerous chemicals in bulk (IBC Code) (1990 edn)
IMO sale no: IMO-100E ISBN 92-801-1315-1

International code for the construction and equipment of ships carrying liquefied gases in bulk (IGC Code) (1983 edn)
IMO sales no: IMO-104E ISBN 92-801-1277-5

International Maritime Dangerous Goods Code (IMDG Code)
(1990 edition comprise 4 loose-leaf volumes)
IMO sales no: IMO-200E ISBN 92-801-1314-3

International Maritime Dangerous Goods Code: Supplement
The contents of the 1990 supplement are emergency procedures (EmS); medical first aid guide (MFAG); solid chemical in bulk (BC Code); reporting procedures; packing cargo transport units; use of pesticides in ships
IMO sales no: IMO-210-E ISBN 92-801-1316-X

Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG); see Supplement to IMDG Code

Code on Alarms and Indicators 1995 (1996 edition)
IMO sales no: IMO-867-E ISBN 92-801-1421-2

Recommendations for entering enclosed spaces aboard ships A864 (20)
(Also issued as MSC/Circ.744).

4. International Chamber of Shipping

12 Carthusian Street, London EC1M 6EZ Ph +44 20 7417 8844
Email: ics@marisec.org Website: www.marisec.org

Tanker safety guide (chemicals)	ISBN 0-948691506
Tanker safety guide (liquefied gas) (1996)	ISBN 0-906270030

The following publications are ordered direct from Witherby and Co (Marine Publishing), Ph +44 20 7251 5341 Email: books@witherbys.co.uk, www.witherbys.co.uk

International safety guide for oil tankers and terminals (5th edition)	ISBN 1856090817
Safety in chemical tankers (1977 booklet)	ISBN 1856090817
Safety in liquefied gas carriers (1980 booklet)	ISBN 0-854930264
Safety in oil tankers (1978 booklet)	**ISBN 0-84930272**

5. International Shipping Federation

12 Carthusian Street, London EC1M 6EZ Ph +44 20 7417 8844 Email: isf@marisec.org.
Website: www.marisec.org

Pirates and Armed Robbers – A Master's Guide