18 PROVISION, CARE AND USE OF WORK EQUIPMENT

18.1 General

18.1.1 The term ‘work equipment’ applies to any machinery, appliance, apparatus, tool or installation provided for use at work. The exception to this is any safety equipment or apparatus provided in compliance with the International Convention for the Safety of Life at Sea (SOLAS) requirements, which is subject to other merchant shipping regulations.

18.1.2 Work equipment provided on board is generally the responsibility of the Company. Where any work equipment is provided from ashore, responsibility for its condition rests with the shore provider. However, the Company has responsibility to ensure that it is appropriately maintained while on board and used safely.

18.1.3 All work equipment should comply with any relevant standards laid down by merchant shipping or general UK regulations. Any equipment not covered by regulations or type approvals should comply with the appropriate British or European Standard or its nearest international equivalent. See Annex 18.1 and Annex 18.3 for more details of the standards that apply.

18.2 Duty of seafarers and workers

Reg. 34

18.2.1 All seafarers and workers should comply fully with all instructions or training that they have been given in respect of the use of any work equipment.

18.2.2 No one should operate any item of work equipment unless they are competent, and authorised, to do so. Seafarers unfamiliar with the equipment on board should always be trained in its proper use before they are allowed to use it.

18.2.3 Personnel should ensure that they use the correct tools or equipment for a task. Tools should be used only for the purpose for which they were designed. Use of unsuitable tools or equipment may lead to accidents and incidents.

18.2.4 Loose clothing or jewellery should never be worn while using machinery, because there is a risk that it may become caught in moving parts. For the same reason, long hair should always be tied back and covered with a hair net or safety cap. Personal protective equipment (PPE) should be provided and worn as required by the Merchant Shipping and Fishing Vessels (Personal Protective Equipment) Regulations 1999 and merchant shipping notice MSN 1870(M+F).

S.I.1999/2205
MSN 1870(M+F)

18.3 Hand tools

18.3.1 Damaged or worn tools should not be used, and cutting edges should be kept sharp and clean. Repair and dressing of tools should be carried out by a competent person.

18.3.2 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.

18.3.3 A chisel is best held between thumb and base of index finger with thumb and fingers straight, with palm of hand facing towards the hammer blow.

18.3.4 A saw should not be forced through the material being cut: it should be pushed with a light, even movement.

18.4 Risk assessment and specific risks

Reg. 9

18.4.1 A risk assessment should be carried out and safety measures put in place for the safe operation of the equipment and all expected circumstances. In conducting a risk assessment, the risks listed below should be considered as appropriate to the equipment and to protect those who may be at risk whilst using work equipment.

18.4.2 Where any seafarer using work equipment is, or could be, exposed to one or more of the risks or hazards listed, the Company should ensure that any significant risks to their health and safety are prevented by the provision of appropriate work equipment or protective devices, or where that is not practicable, adequately controlled by appropriate means.

18.4.3 Specific risks and hazards that should be considered include:

- mechanical risks such as crushing, impact, trapping, entanglement, cutting or friction;
- non-mechanical risks such as noise, vibration, electrical hazards, temperature and radiation;
- any article or substance falling or being ejected from work equipment;
- rupture or disintegration of parts of work equipment;
- work equipment overheating or catching fire;
- the unintended or premature discharge of any article or any gas, dust, liquid, vapour or other substance that is produced, used or stored in the work equipment;
- the unintended explosion of the work equipment or any article or substance produced, used or stored in it; and
- work equipment being struck by lightning while being used.

18.4.4 Where a specific risk to health or safety is identified in relation to a particular item of work equipment, its use and any repairs, modifications or maintenance must only be carried out by seafarers who have been specifically designated to perform the particular task. These seafarers shall be competent and shall have been provided with appropriate training, either as a result of the seafarer's overall training for the position currently held, or provided by other qualified persons on board or ashore, including the manufacturer of the equipment.

18.5 Stability of work equipment

Reg. 23

18.5.1 Where the safe use of any work equipment depends on its stability, it should be stabilised by use of clamps or other appropriate method.

18.5.2 In deciding the most appropriate method for stabilising work equipment, the potential movement of a ship under all conditions should be taken into account.

18.6 Dangerous parts of work equipment

Reg. 13

18.6.1 Every dangerous or exposed working part of work equipment is to be provided with appropriate guards or protection devices. Such guards or protection devices are to be maintained and/or replaced as necessary and are to be kept in position when the relevant parts are in motion.

18.6.2 When not in use, equipment should be stowed in a tidy and correct manner. Any cutting edges should be protected.

18.6.3 All guards or protection devices provided should:

- be of substantial construction;
- not give rise to any additional hazard;
- not be easily removed;
- be situated at a sufficient distance from the danger zone;
- not restrict the view of the operator of the equipment more than is necessary; and
- be so constructed or adapted that they allow operations necessary to fit or replace parts and for the carrying out of maintenance work, but restrict access only to the area where work is to be carried out and, where possible, without having to dismantle the guard or protection device.

18.6.4 The reference in section 18.6.3, bullet point four, to a danger zone means the zone within or around work equipment where the presence of a seafarer would expose them to a significant risk to their health or safety.

18.7 Maintenance

Regs 7 and 25

18.7.1 All work equipment is to be maintained in good repair and efficient working order in accordance with the manufacturer's instructions.

18.7.2 Maintenance should include regular inspections by a competent person. When there is any suspicion that any work equipment is not working properly, or has been subject to any treatment likely to cause damage, it should be taken out of service until it can be inspected and any necessary repairs or maintenance undertaken.

18.7.3 The decision on what maintenance work is required rests with the Company/competent person, in accordance with the manufacturer's instructions; however, the following should normally form part of a maintenance routine:

- Greasing of bearings, etc. should be thorough and frequent because bearings and other moving parts that are dry will impose additional loads that can lead to failure.
- The condition of all ropes and chains should be checked regularly for wear, damage or corrosion, and replaced as necessary.
- Regular function tests should be carried out on all controls, emergency stop controls, brakes, safety devices, etc. to ensure that they are operating correctly. Such checks should be carried out before the equipment is used.

18.7.4 As far as possible, maintenance operations on powered equipment should be carried out while the equipment is shut down. Where this is not possible, appropriate protective measures must be put in place to enable such maintenance operations to be carried out safely without exposing the person carrying out such maintenance, or any other person, to any significant risk to their health and safety. Such protective measures may include:

- keeping exposure of the dangerous part to the minimum necessary;
- authorisation of the exposure by a responsible ship's officer or other responsible person;
- permitting only a competent person to carry out the operation;
- ensuring that any person working close to the machinery has enough clear space and adequate light while they are working;
- ensuring that any person operating close to the machinery has adequate instruction in safe systems of work for that machinery, the dangers arising from its operation and the precautions to be taken; and
- the placing and display of a conspicuous warning notice on or close to the machinery.

18.7.5 Where any machinery has a maintenance log, the log should be kept up to date.

18.8 Inspection

Reg. 8

When to inspect

18.8.1 Where the safety of work equipment depends on the installation conditions, the equipment should be inspected by a competent person after the initial installation, or after re-assembly at a new site or in a new location, and before being put into service for the first time. This is to ensure that it has been installed correctly, in accordance with the manufacturer's instructions, and is safe to use. In this context, inspection means the carrying out of such

visual or more rigorous inspection by a competent person and may include testing when it is considered appropriate.

18.8.2 Any work equipment exposed to conditions causing deterioration should be inspected by a competent person at suitable intervals. On each occasion that exceptional circumstances have occurred that may jeopardise the safety of the work equipment, an additional inspection should take place to enable any necessary remedial action to be taken to ensure its continuing safety. In this context, exceptional circumstances include modification work, accidents, exposure to extreme weather, any use which falls outside the equipment's design parameters and prolonged periods of inactivity.

18.8.3 Any work equipment used for lifting loads, including personnel, is also subject to the provisions of the Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations 2006, which set out specific requirements for the inspection, testing and thorough examination of such lifting equipment. This is dealt with in detail in Chapter 19, Lifting equipment and operations, of this Code.

How to inspect

18.8.4 Inspections should cover factors such as the standard of welding or other fixing and materials used, together with the strength of any part of the ship that supports it and to which it is attached. Account should also be taken of any inspection requirements or guidance produced by the manufacturer. Work equipment should be re-inspected at regular intervals, not exceeding five years or more frequently if recommended by the manufacturer, to ensure that no deterioration in its installation has occurred.

18.8.5 Structures should be examined frequently for corrosion, cracks, distortion or wear of bearings, securing points, etc. Hollow structures, such as gantries or masts, should also be checked for water trapped inside them. If water is found, the structure should be drained, suitably treated where practicable, and then sealed to prevent further ingress of water.

18.8.6 The results of all inspections are to be recorded and all such records are to be retained, readily available for inspection, until such time as a further inspection has been undertaken and recorded.

18.8.7 Where any ship's work equipment is to be used outside the ship, or work equipment from outside the ship is obtained for use on the ship, it must be accompanied by physical

evidence that the last inspection required to be carried out under the Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations 2006 has actually been carried out. In this context, used outside the ship includes equipment used on the quayside, dock or jetty, the ship's boats, pontoons or on board another ship; it also applies to equipment operated by workers who are not employed by the Company.

18.9 Information and instructions

Reg. 10

18.9.1 Incorrect use of tools and equipment can cause accidents and incidents, as well as damage to the equipment in question.

18.9.2 All seafarers and any managers or supervisors who use work equipment should have access to all necessary health and safety information and written instructions, including manufacturers' instructions, relating to the use of that equipment. These should be in an easily understood form and should include information and, where appropriate, written instructions on the conditions in which the work equipment may be used and its method of use. This should include foreseeable abnormal situations and the action to be taken if such a situation occurs; and information on any conclusions drawn from previous experience of using that work equipment.

18.9.3 Where any seafarer likely to use any item of work equipment does not understand the language in which such information and instructions are provided, appropriate measures should be taken to ensure that the information/instructions are provided in the working language of the vessel or in a language that the seafarer understands.

18.10 Training

Reg. 11

18.10.1 All seafarers who use work equipment, or who supervise its use, should have received adequate training covering the method of use of the equipment, any risks that may arise from its use and any precautions to be taken.

18.10.2 Similarly, seafarers specifically designated to carry out repairs, modifications, maintenance or servicing to work equipment, or who supervise such work, should have received adequate training for that purpose when the use of that equipment may involve a specific health and safety risk to the person using it, e.g. electrical equipment or mechanical cutting equipment.

18.10.3 In accordance with the International Safety Management (ISM) Code for Merchant Shipping, all such training is to be recorded and should indicate when full competence is achieved.

18.10.4 All instruction or information must be in the working language of the vessel.

18.11 Electrical equipment

18.11.1 Isolation equipment and PPE appropriate to the ship's electrical installation should be carried, supplied and used as and when required.

18.12 High or very low temperatures

Reg. 16

18.12.1 Where any equipment, parts of equipment or anything produced by, used by, or stored in such equipment has the potential to burn, scald or cause any other injury to any seafarer by virtue of being at a high or low temperature, appropriate measures should be taken to prevent injury.

18.12.2 Appropriate measures may include guards or barriers to the hazardous parts of the equipment, isolation of the equipment or the provision of PPE.

18.13 Controls

Reg. 18

18.13.1 Any seafarer operating the controls of any work equipment should be able to ensure from the control position that no other seafarer will be exposed to any significant risk to their health and safety as a result of the starting up or use of that equipment. Where such an arrangement is not reasonably practicable, appropriate systems of work must be introduced to ensure that no seafarer is exposed to any significant risk to their health and safety as a result of the starting up or use of the equipment. This may include audible, visible or other suitable warning devices, as required by sections 18.15 or 18.16 so that any seafarers likely to be affected are aware that the equipment is about to be started. See Annex 18.3 for more details.

18.13.2 Any seafarers who are in the position where they would be exposed to a risk to their health and safety as a result of the starting or stopping of work equipment must be given sufficient time and suitable means to get out of the way prior to the starting or stopping of the equipment.

18.14 Lighting

Reg. 24

18.14.1 Adequate lighting, appropriate for the work to be undertaken, should be provided at any place where work equipment is used.

18.15 Markings

Reg. 26

MGN 556(M+F)

18.15.1 Where any health and/or safety markings are required to comply with the requirements of the Merchant Shipping and Fishing Vessels (Safety Signs and Signals) Regulations 2001, such markings that comply with MGN 556(M+F) and Chapter 9, Safety signs and their use, of this Code are to be provided and applied to the equipment in such a way that they are clearly visible to any person using or in the vicinity of that equipment.

18.16 Warnings

Reg. 27

18.16.1 Where any work equipment is required to be fitted with warning signs, warning devices, etc., their meaning should be clear and they should be easily seen or heard.

18.17 Portable power-operated tools and equipment

18.17.1 Power-operated equipment may be dangerous unless properly maintained, handled and used, and should only be operated by competent persons. The flexible cables of electric tools should comply with the relevant British or International 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.

18.17.2 The risk of electric shock is increased by perspiration and locations that are damp, humid or have large conductive surfaces. In such conditions, power tools should be operated from low voltage supplies, i.e. no more than 55 volts AC with a maximum of 30 volts to earth or 50 volts DC.

18.17.3 When 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.

18.17.4 The risk associated with portable electric tools also applies to portable electric lamps. The supply to these should not exceed 110 volts.

18.17.5 Double-insulated tools should not be used on ships outside the accommodation because water can provide a contact between live parts and the casing, increasing the risk of a fatal shock. An earth leakage circuit breaker may also fail to operate when used with such tools because there may be no earth wire in the power supply cable fitted to the tool.

18.17.6 Chain linkages or similar devices should be fitted between sections of pneumatic hose to prevent whiplash in the event of breakage. Alternatively, safety valves that close off the lines can be used.

18.17.7 Accessories and tool pieces (drill bits, 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 power source.

18.17.8 Correct safety guards should be securely fixed to appliances requiring them and should be checked for security before starting any operation. Such guards should only be removed when the equipment is not operating. If removal whilst operating 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.

18.17.9 During temporary interruptions to work (e.g. meal breaks, and on completion of a task), equipment should be isolated from power sources and left safely or stowed away correctly.

18.17.10 When a work operation causes high noise levels, hearing protection should be worn. When flying particles may be produced, the face and eyes should be protected (see Chapter 8, Personal protective equipment).

18.17.11 The vibration caused by reciprocating tools (pneumatic drills, hammers, chisels, etc.) or high-speed rotating tools can give rise to a permanent disablement of the hands known as 'dead' or 'white' fingers. In its initial stages, 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. Seafarers subject to the symptoms described should not use such equipment. Other seafarers should be advised not to use them for more than 30 minutes without a break, unless the risk assessment indicates a lesser period of use. Further information is given in Chapter 12, Noise, vibration and other physical agents.

18.18 Workshop and bench machines (fixed installations)

18.18.1 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 (drill bits, cutting blades, etc.) are in good condition, and that the work area is adequately lit and free from clutter.

18.18.2 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 power source until it has been repaired.

18.18.3 During operations, personnel should ensure that work pieces are correctly secured in position, and that machine residues (swarf, sandings, etc.) do not build up excessively and are disposed of in a correct and safe manner.

18.18.4 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 re-checked before resuming work.

18.19 Abrasive wheels

18.19.1 Abrasive wheels should be selected, mounted and used only by competent persons and in accordance with manufacturers' instructions. They are relatively fragile and should be stored and handled with care.

18.19.2 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 wheels for soft material.

18.19.3 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.

18.19.4 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.

18.19.5 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.

18.19.6 The speed of the spindle should not exceed the stated maximum permissible speed of the wheel.

18.19.7 A strong guard, enclosing as much of the wheel as possible, should be provided and kept in position at every abrasive wheel, both to contain wheel parts in the event of a burst and to prevent an operator having contact with the wheel (see also section 18.17.8 above).

18.19.8 When a work rest is provided, it should be properly secured to the machine and adjusted as close as practicable to the wheel, the gap normally being not more than 1.5 mm (1/16 inch).

18.19.9 The side of a wheel should not be used for grinding: it is particularly dangerous when the wheel is appreciably worn.

18.19.10 The work piece should never be held in a cloth or pliers.

18.19.11 When dry grinding operations are being carried out and when an abrasive wheel is being trued or dressed, suitable transparent screens should be fitted in front of the exposed part of the wheel and operators should wear properly fitting eye protectors. Eye protection should always be worn for grinding operations.

18.20 Hydraulic/pneumatic/high-pressure jetting equipment

18.20.1 Seafarers using hydraulic/pneumatic/high-pressure systems should have received adequate training 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.

18.20.2 Before starting work, seafarers 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. Such repairs should only be carried out by authorised competent personnel using approved components.

18.20.3 Before activating a pressure system, and also when closing it down, the recommended checks should be made to ensure that no air pockets or trapped pressure are in the system, because these may cause erratic action of the equipment.

18.20.4 When handling hydraulic fluid, personnel should ensure that:

- the correct grade is used when topping up systems;
- spillages are cleaned up immediately;
- any splashes of such fluid onto skin areas 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 that may be flammable.

18.20.5 In the event of a high-pressure release of oil, air or any other substance that penetrates the skin, medical advice should be sought immediately.

18.20.6 Seafarers using high-pressure jetting equipment should wear the correct protective equipment. Such systems may involve use of a heated supply source and operators should therefore guard against splashing and scalding. Warning notices should be displayed on approaches to areas where such work is being undertaken to warn other seafarers of the use of a high-pressure system in the area. Finally, seafarers should take great care in ensuring that the direction of such jetting is safe.

18.20.7 When compressed air is used, the pressure should be kept no higher than is necessary to undertake the work satisfactorily.

18.20.8 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.

18.21 Hydraulic jacks

18.21.1 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.

18.21.2 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.

18.21.3 Jacks should be applied only to the recommended or safe jacking points on equipment.

18.21.4 Equipment under which seafarers are required to work should be properly supported with chocks, wedges or by other safe means – never by jacks alone.

18.21.5 Jack operating handles should be removed if possible when not required to be in position for raising or lowering the jack.

18.22 Use of mobile work equipment

Reg. 30

18.22.1 Where mobile work equipment is to be used on board a ship:

- no ship's powered vehicle or powered mobile lifting appliance shall be driven in the course of a work activity except by a competent person who is authorised to do so;
- where work equipment is moving around in a work area, appropriate traffic rules are drawn up and followed for the safety of seafarers and others;
- seafarers on foot should, so far as is reasonably practicable, be prevented from entering the area of operation of self-propelled work equipment;
- where work cannot be done properly unless seafarers on foot are present, appropriate measures are in place to prevent them from being injured by the work equipment.

18.22.2 Seafarers should be carried on mobile work equipment only when safe facilities are provided for this purpose. The speed of the work equipment should be adjusted as necessary for the safety of the seafarers.

18.22.3 Mobile work equipment fitted with a combustion engine should not be used in working areas unless sufficient ventilation can be guaranteed, so that the operation of the combustion engine presents no risk to the health or safety of seafarers.

18.23 Carrying of seafarers on mobile work equipment

Reg. 28

18.23.1 No seafarer is to be carried on any mobile work equipment unless it is designed for that purpose. In this context, designed for that purpose includes being fitted out in such a way as to minimise risks to the safety of any seafarer, including any risks from wheels or tracks. Such equipment must also incorporate measures to prevent it rolling over or, where that is not possible, reduce the risks to health or safety of seafarers should it roll over whilst being used. Such measures could include:

- stabilisation of the work equipment to prevent it rolling over;
- provision of a protection structure so that the work equipment cannot fall on its side;
- provision for a structure giving sufficient clearance around the seafarers being carried if the work equipment can overturn further than that; or
- any device that is equally effective in providing protection for the seafarers being carried.

18.23.2 Where there is a risk of any seafarer being carried by mobile work equipment being crushed in the event of it rolling over, it should be fitted with a restraining system for the person. This does not apply to a fork-lift truck with a structure as described in section 18.23.1, bullet points two and three.

18.24 Overturning of fork-lift trucks

Reg. 29

18.24.1 Any fork-lift truck to which section 18.23.2 applies and which carries a seafarer must be adapted or equipped to minimise the risk to health or safety from its overturning. In deciding what adaptations are required, account should be taken of the manner and conditions in which the fork-lift truck is being used.

18.24.2 Any seafarer operating a fork-lift truck must have received appropriate safety training including that relating to the individual type of fork-lift truck.

18.25 Self-propelled work equipment

Reg. 31

18.25.1 When any self-propelled work equipment could present a hazard to health and safety while in motion:

- it should be fitted with a means (e.g. a key-operated switch) for preventing it from being started by an unauthorised person;
- where there is more than one item of rail-mounted work equipment in motion at the same time, it should be fitted with appropriate facilities for minimising the consequences of a collision;
- it should be fitted with braking and stopping devices;
- it should be fitted with emergency facilities operated by a readily accessible control or automatic system for braking and stopping if the main device fails;
- where the driver's direct field of vision is inadequate to ensure safety, there are adequate devices for improving their vision;
- if used in the dark:
  - it is to be fitted with lighting appropriate to the work to be carried out; and
  - it is sufficiently safe for such use;
- if it or anything carried or towed by it involves a risk from fire and is liable to injure seafarers, it should carry appropriate fire-fighting appliances, unless such appliances are kept sufficiently close to it.

18.26 Remote-controlled self-propelled work equipment

Reg. 32

18.26.1 Where any remote-controlled self-propelled equipment could endanger the safety of seafarers while it is in motion, it must be set up in such a way that it stops automatically once it leaves its control range. Additionally, features to guard against the risk of crushing or other impact should be incorporated.

18.27 Drive units and power take-off shafts

Reg. 33

18.27.1 Where the seizure of a drive unit or power take-off could present a risk to seafarers, appropriate measures including the provision of guards or other protection devices referred to in section 18.6.1 should be taken.

18.28 Ropes and wires

18.28.1 The safety of a ship or individual crew member is often dependent on the rope that is being used.

18.28.2 Many types of rope of both man-made and natural fibre are available, each with different properties and with different 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 of rope; 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**	**Polyethylene (HMPE)**	**Aramid**
Sulphuric (battery) acid	None	Poor	Good	Very good	Good	Poor
Hydrochloric acid	None	Poor	Good	Very good	Very good	Good
Typical rust remover	Poor	Fair	Good	Very good		
Caustic soda	None	Good	Fair	Very good	Very good	Good
Liquid bleach	None	Good	Very good	Very good	Very good	Good
Creosote, crude oil	Fair	None	Good	Very good		
Phenols, crude tar	Good	Fair	Good	Good	Very good	Good
Diesel oil	Good	Good	Good	Good		
Synthetic detergents	Poor	Good	Good	Good		
Chlorinated solvents, e.g. trichloroethylene (used in some paint and varnish removers)	Poor	Fair	Good	Poor	Very good	Good
Other organic solvents	Good	Good	Good	Good	Very good	Very good

18.28.3 Ropes should be stored away from heat, sunlight and extreme cold, 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.

18.28.4 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.

18.28.5 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.

18.28.6 New rope, three-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.

18.28.7 Ropes should be inspected internally and externally before use for signs of deterioration, undue wear or damage.

18.28.8 When using steel wire ropes, it is important that they are properly installed, maintained and lubricated as appropriate to their use. Manufacturers' guidelines and recommendations for use should be followed. When 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 or mooring wires. Annex 18.2 gives further information regarding bulldog grips.

18.29 Characteristics of man-made fibre ropes

18.29.1 Safe handling of man-made fibre ropes requires techniques that differ from those for handling natural fibre ropes.

18.29.2 Man-made fibre ropes are relatively stronger than those of natural fibre and so for any given breaking strain have appreciably smaller circumferences; however, wear or damage will diminish strength to a greater extent than the same amount of wear or damage would on a natural fibre rope. Recommendations for substitution of natural fibre ropes by man-made fibre ropes are given in the following table:

Manila		**Polyamide (nylon, etc.)**		**Polyester (terylene)**		**Polypropylene**	
Diameter (mm)	**Size**	**Diameter (mm)**	**Size**	**Diameter (mm)**	**Size**	**Diameter (mm)**	**Size**
48	6	48	6	48	6	48	6
56	7	48	6	48	6	52	6.5
64	8	52	6.5	52	6.5	56	7
72	9	60	7.5	60	7.5	64	8
80	10	64	8	64	8	72	9
88	11	72	9	72	9	80	10
96	12	80	10	80	10	88	11
112	14	88	11	88	11	96	12

Diameter given for three-strand, size number for eight-strand plaited.

18.29.3 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.

18.29.4 Unlike natural fibre ropes, man-made fibre ropes give little or no audible warning of approaching breaking point.

18.29.5 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 backlash and an item of running gear breaking loose may be projected with lethal force. Snatching of such ropes should be avoided; when 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, but it can nevertheless still happen without warning.

18.29.6 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 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.

18.29.7 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 fibre ropes need four full tucks in the splice each with the completed strands of the rope, followed by two tapered tucks for which the strands are halved and quartered for one tuck each respectively. The length of the splicing tail from the finished splice should be equal to at least three rope diameters. The portions of the splice containing the tucks with the reduced number of filaments should be securely wrapped with adhesive tape or other suitable material.

- Polypropylene ropes should have at least three but 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.

18.29.8 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.

18.29.9 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).

18.30 Laundry equipment

18.30.1 All seafarers required to work in a laundry, or use any part of the equipment there, must be fully instructed on the proper operation of the machinery. When a seafarer is under 18 years of age, they should not work on industrial washing machines, hydro-extractors, calender presses or garment presses unless they have been fully trained in the operation of the machine and the precautions to be observed and, if appropriate, are closely supervised by a competent person.

18.30.2 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, calender presses, 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 such time as any necessary repairs or adjustments have been carried out. A notice warning against use should be displayed prominently on the defective machine.

18.30.3 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.

18.30.4 Machines should not be overloaded and loads should be distributed uniformly.

18.30.5 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.