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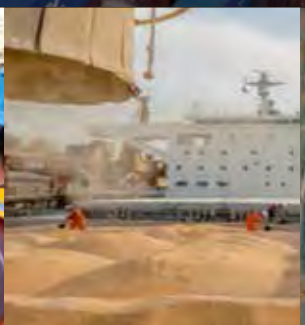
Safety and health in ports



Safety and health in ports

(Revised 2016)


contents

ILO code of practice

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Preface

The revised 2016 edition of the ILO Code of practice on safety and health in ports was adopted by a Meeting of Experts held in Geneva from 21 to 30 November 2016, in accordance with a Governing Body decision at its 323rd Session (March 2015). The meeting was attended by 24 experts and their advisers – eight experts nominated by the Governments of Brazil, China, Germany, Kenya, Republic of Korea, the Netherlands, Nigeria and the United States; eight nominated by the Employers' group of the Governing Body; and eight nominated by the Workers' group of the Governing Body. Expert observers from other governments, and observers from intergovernmental and non-governmental organizations, also attended the meeting.

The text revises and updates the 2005 edition of: Ilo code of practice safety and health in ports, which had replaced two former ILO publications: *Guide to safety and health in dock work* (1976) and *Safety and health in dock work, An ILO code of practice* (second edition, 1977).

This code of practice is not a legally binding instrument. It is not intended to replace national laws and regulations or to affect the rights of workers provided by ILO instruments. It is designed to provide practical guidance to governments, ILO constituents and all those responsible for or involved in the management, operation, maintenance and development of ports.

It is hoped that this code will help to raise the profile of safety and health issues in ports in all parts of the world, and contribute to the health, morale and well-being of port workers.

Alette van Leur
Director
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Sectoral codes of practice

ILO sectoral codes of practice are reference tools setting out principles that can be reflected in the design and implementation of policies, strategies, programmes, legislation, administrative measures and social dialogue mechanisms, in particular in economic sectors or cluster of sectors. Sectoral codes of practice are adopted by Meetings of Experts comprising governments, employers and workers. They can be implemented progressively to take into account different national settings, cultures, and social, economic, environmental and political contexts.

Sectoral codes of practice draw their principles from the ILO's international labour standards (Conventions and Recommendations) and other sources, including Declarations, codes of conduct and other policy guidance adopted and endorsed by the International Labour Conference (ILC) or the Governing Body (GB). They also draw on other international agreements and policy in the sector concerned, as well as relevant trends and developments in regional and national law and practice.

Sectoral codes of practice focus on the issues that are priorities for governments, employers and workers, and that are unique to particular economic sectors and industries. While international labour standards normally deal with more general principles of labour law and practice, sectoral codes of practice specify the principles and processes that could be implemented to promote decent work in particular workplaces or contexts. They benefit from the expertise of practitioners in the relevant sectors to capture good industry practices and innovations.

Sectoral codes of practice are not legally binding. They are not subject to ratification or supervisory mechanisms established

under the ILO's international labour standards. Sectoral codes of practice can therefore be aspirational in scope and expand on principles laid down in international labour standards and other international agreements and policy, all the while recognizing that they can be adapted to different national systems and circumstances. ILO standards and other tools or guidance adopted and endorsed by the ILC and/or GB therefore form the foundation on which sectoral codes of practice build further. It is therefore understood that sectoral codes of practice are based on the full principles, rights, and obligations set out in international labour standards, and nothing set out in these Codes of Practice should be understood as lowering such standards.

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List of abbreviations

ACEP	approved continuous examination programme
ACT	automated container terminal
AGV	automated guided vehicle
APELL	Awareness and Preparedness for Emergencies at Local Level (UNEP/IMO)
ARMG	automated rail-mounted gantry crane
ASC	automated stacking crane
IMSBC Code	*International Maritime Solid Bulk Cargoes Code* (IMO)
BLU Code	*Code of Practice for the Safe Loading and Unloading of Bulk Carriers* (IMO)
CCTV systems	closed-circuit television surveillance systems
CSC	International Convention for Safe Containers, 1972 (IMO)
CTU	cargo transport unit
CTU Code	*Code of Practice for Packing of Cargo Transport Units* (IMO/ILO/UNECE)
EmS	*Emergency Schedules (supplement to the IMDG Code)*
FIBC	flexible intermediate bulk container
IAPH	International Association of Ports and Harbours
ICS	International Chamber of Shipping
IEC	International Electrotechnical Commission
ILO	International Labour Organization

IMDG Code	*International Maritime Dangerous Goods Code* (IMO)
IMO	International Maritime Organization
ISGOTT	*International Safety Guide for Oil Tankers and Terminals* (ICS/IAPH)
ISO	International Organization for Standardization
ISPS Code	*International Ship and Port Facility Security Code* (IMO)
LED	light-emitting diode
Lift-AGV	lift-automated guided vehicle
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MEWP	mobile elevating work platforms (or "cherry pickers")
MFAG	*Medical First Aid Guide (supplement to the IMDG Code)*
OECD	Organisation for Economic Co-operation and Development
OCIMF	Oil Companies International Marine Forum
OCR	optical character recognition
OSH	occupational safety and health
PAH	polycyclic aromatic hydrocarbons
PDP	ILO Portworker Development Programme
PFD	personal flotation device
PPE	personal protective equipment
PSN	Proper Shipping Name
RMG	rail-mounted gantry crane

ROPS	rollover protection structure
ro–ro	roll-on–roll-off – ferry-type vessel onto which goods and containers can be driven, usually via a ramp
RTG	rubber-tyred gantry crane
SATL	semi-automatic twistlock
SIGTTO	Society of International Gas Tankers and Terminal Operators
SOLAS	International Convention for the Safety of Life at Sea, 1974
sto–ro	a vessel with a capacity for break-bulk cargo, as well as vehicles or trailer-borne cargo, as in the forest products trade
STS	ship-to-shore
SWL	safe working load
TOS	Terminal Operation System
UN ECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme


contents

1. Purpose, introduction, scope and definitions

1.1. Purpose and implementation

1. This code is intended to be a concise set of recommendations based on good practice in the industry. The advice should be useful to all bodies and persons concerned with safety and health in port work. These include government authorities, employers, workers and their representatives, manufacturers and suppliers of equipment, and professional bodies dealing with occupational safety and health.

2. It is appreciated that not all the provisions of the code will necessarily be applicable as they stand to all countries and all regions. In some cases, provisions may need to be adapted to local conditions.

3. Although much of the guidance in the code reflects long-established standards in the industry, advice on various matters has been updated to reflect modern standards in ports and other industries, for example lighting and the height of fencing.

4. It is recognized that, although there should be no difficulty in applying the revised recommendations in the code to new equipment, there may be difficulties in applying some of them to existing equipment. Wherever it is practical to do so, such equipment should be brought into compliance with the code as soon as practicable, for example during a major refit or replacement.

5. It is recognized that employers, workers or their representatives should cooperate and consult each other in respect

of safety and health matters. Subject to this, the code should encourage employers and workers to do so with a view to promoting and practising a preventative safety and health culture and continuously improving the safety and health of all workers in the port facility.

1.2. Introduction

1.2.1. General overview of the port industry

6. The international port industry dates from the earliest days of civilization. Since that time, the port industry has developed steadily over the years, though cargo-handling methods that were both arduous and dangerous remained largely unchanged until the introduction of containers and roll-on roll–off ("ro–ro") systems in the 1960s. Technical developments have continued since then, including the introduction of increasingly sophisticated cargo-handling equipment with greatly increased capacity and reach. While many of these changes in cargo-handling methods have resulted in significant improvements for the safety of portworkers, some changes have introduced new hazards and port work is still regarded as an occupation with very high accident rates. Moreover, privatization in the industry has led to considerable changes in the organization of ports and the employment of people in them, including increased use of non-permanent workers. Fortunately, systems for identifying and managing risks have also been developed and the need for investment in the training and skills of portworkers has been increasingly recognized.

7. Each port needs to develop working practices that will safeguard the safety and health of portworkers in the light of its own specific circumstances. These can be based on guidelines, such as those included in this code of practice, and on the well-established general principles set out in the relevant

ILO instruments, in particular the Occupational Safety and Health (Dock Work) Convention, 1979 (No. 152), and Recommendation, 1979 (No. 160); the Occupational Safety and Health Convention, 1981 (No. 155) and Recommendation, 1981 (No. 164); the Protocol of 2002 to the Occupational Safety and Health Convention, 1981; and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187), and Recommendation, 2006 (No. 197). A full list is given in the references at the end of this code.

1.2.2. Reasons for the publication of this code

8. This ILO code of practice, which supersedes *Safety and health in ports*, is in line with the general spirit of the Global Strategy on Occupational Safety and Health, adopted by the 91st Session of the International Labour Conference in June 2003. The fundamental pillars of the Global Strategy are the building and maintenance of a national preventative safety and health culture and the introduction of a system approach to occupational safety and health (OSH) management.

9. The first edition of *Safety and health in dock work* was published in 1958 and complemented the Protection against Accidents (Dockers) Convention (Revised), 1932 (No. 32), which had replaced the earlier 1929 Convention. In 1976, a separate volume, *Guide to safety and health in dock work*, was published as a complement to the code of practice. A second, updated edition of the code was published in 1977 to take into account developments in the industry during the preceding 20 years. In 1979, Convention No. 32 was revised by the adoption of the Occupational Safety and Health (Dock Work) Convention (No. 152) and Recommendation (No. 160). Since 1979, Convention No. 152 has been ratified by a number of countries and used as the basis for legislation relating to port work in many others.

10. The second edition of the code, and the guide, did not reflect the requirements of Convention No. 152 and Recommendation No. 160, as they had been written earlier. Furthermore, technical developments had continued to take place in the port industry and some of the advice contained in these two documents had become obsolete. In addition, there was little advice on health matters, despite the considerably increased attention that has rightly been given to such matters in recent years. Accordingly, it was considered that the time had come to revise the code and the guide and combine them in one publication, to make it easier to use and to help in the implementation of the Convention and its complementary Recommendation. The Governing Body decided that Convention No. 152 is still up to date and should be promoted.[1] It is hoped that this revised version of *Safety and health in ports* will help to raise the profile of safety and health in ports in all parts of the world and encourage more countries to ratify Convention No. 152, or otherwise implement its provisions.

11. The third edition of the code of practice on safety and health in ports was published in 2005. Since that time the field of occupational safety and health has continued to evolve. This code, revised in 2016, provides current recommendations to make positive impacts on the reduction of hazards and risks, the health of workers and on productivity.

1.3. Scope

12. The scope of this code reflects that of Convention No. 152 and Recommendation No. 160. It covers all aspects of work in ports where goods or passengers are loaded onto or unloaded from ships, including work incidental to such loading

[1] See GB.270/LILS/WP/PRS/1/2, paras 128–134.

or unloading activities in the port area. It is not limited to international trade and is equally applicable to domestic operations, including those on inland waterways.

13. The final part of the code gives some brief guidance on matters that are not directly covered by Convention No. 152, but are nevertheless essential to the safe and proper operation of a port.

14. This code generally includes the material that was included in the previous code and the guide, with a few exceptions. General guidance on offices and workshops has been omitted, while guidelines on warehouses and fire precautions in ports have been shortened, since the precautions to be taken and the standards to be achieved are no different from those in any other industry, in accordance with national provisions. The chapter on nuclear-powered merchant vessels included in the guide has also been omitted. When that chapter was written, it was expected that the number of such ships would increase considerably. This has not happened. However, the size of certain ships has increased significantly in the intervening period.

15. Although in many ports certain working practices have been replaced by newer methods, older conventional methods continue to be used in other ports and limited advice on such methods has been retained in this code.

16. A very wide range of different cargo-handling activities is carried out in ports. It is not practical to cover all of them in detail in one volume. However, this code is intended to cover the most common activities. Where appropriate, reference is made to other international publications.

17. It is necessary to take special additional precautions in connection with the loading and unloading of goods onto or from ships at offshore oil and gas installations or wind turbine

installations. These are beyond the direct scope of this code, but much of the guidance contained in it will be relevant to such operations.

1.4. Women working in ports

18. Women are now part of the workforce in ports. As such, employers, in consultation with worker representatives and in accordance with national laws, should develop gender-sensitive OSH policies and programmes based on sex-disaggregated data and ensure that all workers have equal treatment and access to OSH services,[2] including participation in OSH decision-making at all levels.

1.5. Innovations in ports

19. Before technological or other innovations, and/or new work practices involving such innovations, are introduced in ports that may impact on safety and health of portworkers, the following should apply:

- It has been well established on the basis of evidence and data that the new operations can be done in a safe and proper manner and that safe working conditions are maintained.
- Consultations on safety and health aspects have taken place between employers and workers and their representatives, and agreement on these matters has been reached between them on the introduction of the innovations in question, with the involvement, as appropriate, of the competent authority of the State.

[2] The Occupational Safety and Health Convention, 1981 (No. 155).

- Mechanisms have been established for monitoring the safe use of any technology; such monitoring should involve employers and workers, and their representatives.
- Relevant national laws and regulations, as well as all safety and health standards, have been complied with and the guidance in this ILO code of practice should be taken into account.
- Sufficient information and appropriate training should be provided.

1.6. Definitions

20. The definitions of the terms in this paragraph are those in Convention No. 152. As such, they apply throughout this code:

- *Port work* covers all and any of the part of the work of loading or unloading of any ship, as well as any work incidental thereto.
- *Access* includes egress.
- *Authorized person* – A person authorized by the employer, the master of the ship or a responsible person to undertake a specific task or tasks, and possessing the necessary technical knowledge and experience.
- *Competent person* – A person possessing the knowledge and experience required for the performance of a specific duty or duties and acceptable as such to the competent authority.
- *Lifting appliance* – Covers all stationary or mobile cargo-handling appliances, including shore-based power-operated ramps, used on shore or on board ship for suspending, raising or lowering loads or moving them from one position to another while suspended or supported.

- *Loose gear* – Covers any gear by means of which a load can be attached to a lifting appliance but which does not form an integral part of the appliance or load.
- *Responsible person* – A person appointed by the employer, the master of the ship or the owner of the gear, as the case may be, to be responsible for the performance of a specific duty or duties, and who has sufficient knowledge and experience and the requisite authority for the proper performance of the duty or duties.
- *Ship* – Covers any kind of ship, vessel, barge, lighter or hovercraft, excluding ships of war.
- *Portworker* – Any person engaged in port work.
- *Port security advisory committee (PSAC)* – A committee established by the member State or the designated authority responsible, inter alia, to act as a security consultative body and to be involved in the continuous development and implementation of the port security plan.
- *Safety and health adviser* – A person with sufficient skills, knowledge and experience who assists a port employer and workers in assessing, designing, planning and implementing safety activities and helps maintain an effective OSH management system.
- *Port facility* – A specific location in a port where passengers or commodities are transferred between land and ships or between two ships, including wharves, piers, sheds, warehouses, yards and docks.
- *Port authority* – A governmental or quasi-governmental public authority for a special-purpose district usually formed by a legislative body (or bodies) to operate ports and other transportation infrastructure.

- *Port employer* – Employers of portworkers and workers who perform non-port work in the port facility.

21. The following definitions also apply for the purposes of this code unless otherwise stated:

- *Competent authority* means any minister, national regulatory body or other authority empowered to issue regulations, orders or other instructions having the force of law. Such authorities may include enforcing authorities such as government departments, local authorities or institutions, and port authorities.
- *Container* means a container as defined by the International Maritime Organization (IMO) in the International Convention for Safe Containers (CSC), 1972. Containers are rigid, rectangular, reusable cargo units intended for the intermodal road, rail or sea transport of packaged or bulk cargo by one or more means of transport without intermediate reloading. Containers may be general cargo containers, such as general-purpose containers, open top, platform or platform-based containers, specific purpose containers such as tank containers, thermal containers or dry bulk containers, or named cargo-type containers. Most containers now in use are ISO series 1 freight containers. Requirements for their specification and testing are contained in the ISO 1496 *Series 1 freight containers – Specification and testing* family of standards. The term does not include a swap body, containers specifically designed for transport by air, any vehicle, cargo in a container, or the packaging of cargo; however, it does include containers when carried on a trailer or chassis.
- *Port area* means any port and surrounding area that is used for purposes incidental to the loading and

unloading of passengers or cargo onto or from ships. In many cases, port areas may be defined by public or private legislation. Such areas may include factories or other enterprises unrelated to cargo-handling operations. This code is not intended to apply to the operation of such enterprises.

- *Explosion-protected* refers to any equipment that is constructed and installed in such a way that it is not liable to ignite a flammable or explosive atmosphere. Such equipment should be certified as complying with an appropriate standard acceptable to the competent authority.
- *Factor of safety* is the numerical value obtained by dividing the minimum breaking load or tension of an item of equipment by its certificated safe working load.
- *Heavy lift derrick* is a ship's derrick that is specially rigged for use from time to time in order to lift loads greater than those that may be lifted by the ship's light or general-purpose lifting gear.
- *Legal requirements* are the requirements of any relevant international, national, local or port instruments, laws, by-laws, regulations or rules.
- *Ship's derrick crane* refers to a ship's derrick having a boom which may be raised, lowered and slewed transversely while supporting a load, by means of winches which either form an integral part of the arrangement or are used primarily with it.
- *Skeletal trailer* is a chassis used for moving containers, the longitudinal members of the chassis consisting typically of one or two longitudinal beams that are fitted at or near their end with transverse members to which the wheels and corner fittings are attached.

- *Transporter* is a rail-mounted or rubber-tyred gantry crane equipped with a horizontal bridge between its legs from which is operated a trolley or trolleys used with such items of equipment as grabs, magnets and container spreaders. Transporters are capable of straddling several rows of containers.

22. The following definitions apply for the purposes of Chapters 4 to 7:

- *In-service* describes a lifting appliance when handling loads up to its safe working loads in permissible wind speeds and other conditions specified by the manufacturer.
- *Inspection* refers to a visual inspection by a responsible person carried out in order to determine whether, as far as can be ascertained, the equipment is safe for continued use.
- *Limiting device* is a device that automatically stops a lifting appliance motion or function when it reaches a prescribed limit (including limit or micro switches).
- *Out of service* means that the lifting appliance is without load on the load-lifting attachment and is either not required for use or is out of use under conditions specified by the manufacturer.
- *Personnel carrier* means a device that is attached to a lifting appliance for the purpose of lifting people.
- *Safe working load limiter* is a device that automatically prevents a lifting appliance from handling loads that exceed its safe working load by more than a specified amount.
- *Safe working load indicator* is a device that automatically provides acoustic and/or visual warnings when the load

on a lifting appliance approaches or exceeds the safe working load by a specified amount.

- *Radius indicator* is a device that automatically shows the current operating radius of a lifting appliance and indicates the safe working load corresponding to that radius.
- *Safe working load* is the maximum gross load that may be safely lifted by a lifting appliance or item of loose gear in a given condition (sometimes referred to as "rated load" or "working load limit").
- *Thorough examination* means a detailed visual examination by a competent person, supplemented if necessary by other suitable means or measures, in order to arrive at a reliable conclusion as to the safety of the item of equipment examined.

23. The following definitions apply for the purposes of automated container terminals:

- *Automated container terminal* (ACT) refers to a terminal where some or all cargo-handling operations have been automated. Terminal operations can be automated at the gate, the cranes and the yard for transport between ship-to-shore (STS) cranes and the yard.
- *Automated gantry crane* is a remotely controlled STS gantry crane that moves containers between vessels and the landside.
- *Automated guided vehicle* (AGV) is an automatic vehicle for the horizontal transport of containers between the quay and the stacking area (yard).
- *Automated rail-mounted gantry crane* (ARMG) is a crane used to position containers in the stacking area.

- *Automated stacking cranes* (ASCs) allow the fully automated handling of container stackyards.
- *Lift-automated guided vehicles* (Lift-AGVs) are automated guided vehicles that can lift and stack containers.
- *Optical character recognition* (OCR) is a technology for automated identification and tracking that is used to automatically identify a container by its unique reference number, eliminating the need for personnel to perform this task manually at the terminal gate or during the handling process.
- *Terminal Operation System* (TOS) is an IT system that plans and manages the movement of cargo with the goal of increasing reliability and efficiency and optimizing performance.

24. Other terms used in this code are defined in the particular section to which they relate.

25. All documents referenced in this code are subject to amendment and the most recent version prevails. References to non-ILO material are for information only.


contents

2. General provisions

2.1. Responsibilities

2.1.1. General requirements

1. Safety and health in ports is the responsibility of *everyone* who is directly or indirectly concerned with work in ports and those who need to cooperate to develop safe and healthy systems of work and ensure that they are put into practice. The introduction of new ideas and concepts in cargo handling demands that special attention be paid to safety and health requirements. The guidance given in this code of practice relates to both new and existing working practices.

2. National laws or regulations should designate responsibility for the following and make appropriate persons, whether employers, owners, ship masters or others, as the case may be, responsible for compliance with the following OSH measures:

(a) providing and maintaining workplaces, equipment and methods of work that are safe and without risk of injury to health;

(b) providing and maintaining safe means of access to workplaces;

(c) providing the information, training and supervision necessary to ensure the protection of workers against risks of accident or injury to health arising out of or in the course of their employment and ensure the participation of workers in the development of training programmes;

(d) providing workers with personal protective equipment (PPE) and protective clothing and any life-saving appliances reasonably required where adequate protection against risks of accident or injury to health cannot be provided by other means;

(e) providing and maintaining suitable and adequate first-aid and rescue facilities with trained personnel; and

(f) developing and establishing proper procedures to deal with emergency situations which may arise at the port.

2.1.2. Competent authority

3. The competent authority should formulate, implement and periodically review a coherent national policy on safety and health in ports, taking into account national conditions and practice and in consultation with the most representative organizations of employers and workers concerned.

4. Such a policy would take due account of relevant international regulations, standards and systems, including the guidance contained in this code of practice.

5. The competent authority should establish and from time to time review laws, regulations and standards for safety and health in ports, in consultation with the most representative organizations of employers and workers concerned, and relevant professional bodies.

6. The competent authority should establish mechanisms to ensure compliance with national laws and regulations which clearly define the bodies responsible for enforcement and duty holders. The system of enforcement should provide for corrective measures and adequate penalties for violations of national laws and regulations concerning the policy.

7. The competent authority should ensure that guidance is provided to employers, workers and their representatives to help them comply with their legal obligations under the policy. The competent authority should provide assistance to employers, workers and their representatives with respect to their OSH responsibilities, obligations and rights.

8. The competent authority should establish, apply, and periodically review a system for the recording and notification by employers of occupational accidents, diseases and dangerous occurrences in ports.

9. The competent authority should have a system for investigating occupational accidents, diseases and dangerous occurrences as appropriate. Such investigations should make use of relevant reports and other available information.

10. When more than one authority is responsible for safety and health in ports, it is essential that they ensure all portworkers are covered and that they liaise in order to ensure that their requirements are consistent with the relevant international instruments.

11. It is highly desirable that OSH regulations in each country be based on relevant international texts, including instruments adopted by the International Labour Organization (ILO), the International Maritime Organization (IMO) and the International Organization for Standardization (ISO). The legal requirements relating to port work should implement the provisions of Convention No. 152 and should apply to ships of all flags when in a port.

12. Legal requirements should be framed in goal-setting terms, specifying the objectives to be achieved, rather than being prescriptive, thus allowing flexibility in the methods of achieving the objectives. This code will help competent authorities to publish guidance on how the objectives of their legal requirements based on Convention No. 152 can be achieved.

2.1.3. Port employers

13. Port employers should:

(a) set out in writing the OSH policy and the programmes and other arrangements needed for its implementation;

(b) define the various OSH responsibilities, accountability and authority levels of directors, managers, supervisors, portworkers and others and communicate these clearly to portworkers, visitors and any other persons working in ports, as appropriate;

(c) ensure that portworkers and their representatives are consulted and participate fully in the implementation of the OSH policy;

(d) define the necessary OSH competence requirements for all workers and establish training at no cost, which should take place during work hours, if possible, to ensure that all managers, supervisors, portworkers and their representatives are competent to perform their safety and health duties;

(e) ensure that portworkers have sufficient information, in a form and language that they understand, concerning OSH risks and arrangements for controlling them, including emergency arrangements;

(f) establish and maintain appropriate documentation and communication arrangements;

(g) identify hazards and assess risks, controlling them in accordance with the principles described below;

(h) act on information supplied to them by portworkers or other workers regarding any unsafe, unhealthy or illegal working practice;

(i) organize first-aid and emergency prevention, preparedness and response arrangements;

(j) ensure compliance with OSH requirements by contractors and subcontractors working in ports;

(k) develop, establish and review procedures to monitor, measure and record OSH performance, taking into consideration the results of the investigations of occupational accidents,

diseases and dangerous occurrences, OSH compliance audits and reviews of the OSH system; and

(l) identify and implement preventative and corrective actions and opportunities for continual improvement.

14. Port employers should make necessary arrangements to provide for adequate and competent supervision of work and working practices.

15. If not carrying out the port work themselves, they should cooperate with the bodies and persons that are doing so in order to ensure that the prescribed OSH measures are given appropriate effect.

16. Whenever two or more employers undertake activities simultaneously at one workplace, they should collaborate in order to comply with the prescribed OSH measures, without prejudice to the responsibility of each employer for the safety and health of all workers. In appropriate circumstances, the competent authority should prescribe general procedures for this collaboration.

2.1.4. Contractors and labour or service providers

17. Contractors and labour or service providers not engaged in port work should cooperate with port authorities and other bodies working in port areas to protect the safety and health of all persons who may be affected by their activities and to establish a preventative safety and health culture. In particular, contractors and labour or service providers should ensure that:

- OSH criteria, such as a record of good OSH performance and an adequate OSH management system, are included in procedures for the evaluation and selection of contractors;
- contracts specify OSH requirements, as well as sanctions and penalties in case of non-compliance. Contracts

should include the right for supervisors mandated by the port authorities to stop work whenever a risk of serious injury is apparent and to suspend operations until the necessary remedies have been put in place. Contracts should include the right of the port authorities to terminate contractors who fail to meet OSH requirements;

- the same safety and training requirements apply to contractors and their workers as to portworkers and such training is provided to them prior to commencing work and as work progresses, as necessary;
- all workers are able to communicate in and understand the working language of the port reasonably well and are registered as regular workers either with the port or port terminal and/or portworker employers or associations of employers and/or labour organizations, if any are located within the vicinity of the port;
- arrangements for reporting work-related injuries and diseases, ill health and incidents among the contractors' workers while performing work for the port authorities are clearly specified;
- all plant and equipment that they supply or use is of sound construction and properly maintained in a safe condition; and
- they supply such information as is necessary to others who may be affected by their activities.

18. Port authorities should ensure that:

- the OSH performance of contractor activities on-site is regularly monitored; and
- on-site OSH procedures and arrangements are followed by the contractor(s).

2.1.5. Management

19. Port employers should provide managers and supervisors with technical and other training, including on their responsibility to consult workers and their representatives, in order to enable them to fulfil their OSH responsibilities.

20. The management of port authorities or shipping companies that provide cargo-handling equipment for use in port work should strictly observe the relevant legal requirements and should be responsible for the safety of the equipment which they provide.

21. Management should ensure that appropriate corrective action is taken as soon as any faults in plant or equipment or any hazards are reported to them, such action including the stoppage of workplaces or equipment if necessary.

22. Management should ensure a safe working environment. Such an environment should include zero tolerance of any form of workplace violence and harassment. In order to achieve this goal, management should develop a policy, in consultation with workers and their representatives, that aims to establish a system of education and prevention; a stress-free and confidential complaint mechanism; a fair and effective resolution process; and a system for recording incidents. In helping to establish such policy, management should use the guidelines provided in the ILO code of practice *Workplace violence in services sectors and measures to combat this phenomenon,* and the sample sexual harassment policy appended to the ILO code of practice *Safety and health in agriculture*, provided in Appendix I.

23. It is essential that management comply with its own rules at all times, in order to be in a stronger position to demand such compliance from the workers.

2.1.6. Supervisors

24. Supervisors are an important level of management and the guidance relating to management also applies to them. However, supervisors occupy a particularly important position in the management chain as the representatives of management with whom portworkers are most likely to come into contact and by whom they are most likely to be influenced.

25. It is imperative that supervisors are fully aware of the need for port work to be carried out safely as well as efficiently, and are trained and competent to ensure that this happens in practice.

26. In particular, supervisors should:

- bring to the attention of the portworkers the hazards and risks of the work they carry out and the need to follow safe systems of work;
- ensure that portworkers are provided with and use when necessary the correct protective clothing and equipment, which should be issued and maintained in good and efficient working condition;
- ensure that any defects in plant or procedures or other hazards, which they see or are reported to them, are dealt with promptly.

2.1.7. Portworkers

27. OSH is also a matter for all portworkers, who should:

- comply with established safe methods;
- cooperate with port employers in ensuring safety in ports;
- use and take care of PPE, protective clothing and any facilities made available to them, and not misuse anything provided for their own protection or the protection of others;

- participate actively in safety and health training;
- take all reasonable steps to eliminate or minimize the risk to themselves and to others resulting from their actions, inactions or their use of machinery at work; and
- inform their supervisor and, where appropriate, the workers' representative or a competent authority inspector without delay of any situation where the worker has reasonable cause to believe there is a danger. When they consider any operation or equipment to be defective or dangerous, such operation or equipment should not be further used until it has been checked and approved for further use;
- cooperate with ships' officers to ensure that their activities do not give rise to hazards to the safety or health of crew members;
- refrain from careless or reckless practices or actions that are likely to result in accidents or injuries to health;
- cooperate in the training of new workers, giving them the benefit of their experience;
- not interfere with, remove, alter or displace any safety devices and other appliances provided for their personal protection or that of others, or interfere with any procedure or safe system of work, except in an emergency or with proper authorization; and
- be aware that other persons might be affected by their actions when carrying out port work. In some countries, portworkers have a legal responsibility for the safety and health of others, as well as themselves.

28. Workers' organizations should be considered active partners in the development and implementation of OSH policies and programmes for portworkers. To this end, they should

also be provided with adequate means and assistance, as agreed by employers. In some cases, information given to portworkers by their own unions can have a much greater effect than information from other sources.

2.1.8. Ships' officers

29. Ships' officers should cooperate with shore personnel as necessary. This should include:

- providing safe means of access to the ship and to any place on the ship where portworkers need to work;
- ensuring that any ship's equipment that will be used by portworkers is of sound construction and properly maintained;
- providing such information as is necessary to portworkers on the ship;
- ensuring that the activities of the ship's crew do not give rise to hazards to safety or health on the ship; and
- ensuring that if the crew work together with portworkers, joint safe systems of work are followed to protect the safety and health of all involved.

2.1.9. Self-employed persons

30. Self-employed persons are responsible for the safety and health of themselves and others who may be affected by their actions.

31. Self-employed persons should ensure that they are appropriately trained and competent to carry out their work, and should do that work in accordance with local legal requirements. It is essential that they liaise and cooperate with port authorities, employers and other relevant bodies, as appropriate.

2.1.10. Safety and health advisers

32. Safety and health advisers should assist management in implementing OSH policy and should give advice on safety and health matters to managers, supervisors and workers and their representatives, as appropriate.

33. The work of a safety and health adviser, in consultation with the safety and health committee and other safety and health professionals, or, in the absence of such a committee, with the workers' representative, may include but is not limited to involvement in:

- development, implementation and periodic review of OSH policy;
- development and implementation of OSH programmes;
- OSH management system;
- risk-assessment and risk-reduction process;
- analysis of OSH data;
- investigation of work-related injuries, ill health, diseases and incidents;
- awareness-raising campaigns;
- OSH training;
- labour inspectorate inspections;
- updating or replacement of existing equipment; and
- monitoring and implementation of any new legal requirements, codes of practice or industry guidelines.

2.1.11. Other persons at work

34. Any other persons who may be present at work in port areas in addition to persons who carry out cargo-handling operations (e.g. hauliers, ships' crew members, pilots, ships'

agents, immigration and customs officers, inspectors, and members of the emergency services) should cooperate with the management of the port authority and other organizations with which they are working, and should comply with all relevant legal requirements.

2.1.12. Passengers and other non-workers

35. Passengers and other members of the general public who may be present in port areas but do not carry out port work should be separated from port operations and instructed on the actions they should take by means of notices, verbal instructions or otherwise, and should comply with such instructions.

2.2. OSH management systems

2.2.1. Design of OSH management systems

36. The positive impact of introducing OSH management systems at the enterprise level; on the reduction of hazards and risks, the health of workers and on productivity, is now recognized internationally by governments, employers and workers. In particular, their introduction helps to promote positive attitudes towards OSH and also a preventative OSH culture, at the enterprise level and more widely. During the design of the OSH management systems at work, account should be taken of methodologies relating to continuous improvement cycles.

37. While OSH management systems need to be adapted to port work and appropriate to the size of the port and nature of port work, many elements of the ILO *Guidelines on occupational safety and health management systems, ILO–OSH 2001*, are generic and can be used in the design and application of OSH management systems in ports, whatever its size and nature of work and activities.

2.2.2. Hazard identification and risk assessment

38. The port employer should identify, evaluate systematically and record the hazards and risks to the safety and health of portworkers that may arise during the course of their work. Special attention should be given to such factors as sex, age, disability and reproductive health.

39. The identification of hazards in the workplace should take into account:

(a) the situation or events or combination of circumstances that have the potential or have been proven to give rise to injury or illness;

(b) the nature of potential injury or illness relevant to the activity, product or service;

(c) those likely to be harmed;

(d) past injuries, incidents and illness; and

(e) the hazards and risks of cargoes and equipment.

40. The identification process should also include consideration of:

(a) the way in which work is organized, managed, carried out and any changes that occur in this process;

(b) the design of workplaces, work processes, materials, plant and equipment;

(c) the fabrication, installation, commissioning, handling and disposal of materials, workplaces, plant and equipment:

(i) the purchasing of goods and services;

(ii) the contracting of plant, equipment, services and labour including contract specification and responsibilities to and of contractors; and

(d) the inspection, maintenance, testing, repair and replacement of plant and equipment.

41. A risk assessment involves a careful examination of the working environment in order to identify hazards (physical, chemical, biological, ergonomic, and organizational) and to evaluate the potential harm that they could cause. Evaluation of risk takes into consideration both the likelihood of the hazard causing harm to persons and the severity of such harm if it were to occur.

42. A risk assessment involves five steps, namely:

(a) identification of hazards;

(b) identification of who might be harmed and how;

(c) evaluation of the risks and how to control them;

(d) recording the results of the assessment and setting priorities for improvement; and

(e) reviewing and updating the assessment, as necessary.

43. There are many established methods and techniques for carrying out risk assessments. Some use a numerical weighting system to determine priorities for action. For each hazard identified, a numerical value is assigned to the likelihood of the hazard causing harm, as well as to the severity of the consequences. This can be expressed on a rising scale from low to high as follows:

Likelihood:

(1) rare: has rarely if ever happened;

(2) unlikely: is possible, but is not expected to happen;

(3) possible: could be expected to happen once a year;

(4) likely: will probably occur, but is not persistent; and

(5) almost certain: occurs regularly.

Severity:

(1) insignificant: no injury or ill health;

(2) minor: short-term impact;

(3) moderate: semi-permanent injury or ill health;

(4) major: disabling injury or ill health; and

(5) catastrophic: potentially fatal.

44. The degree of risk can be represented in the following manner: Risk = Likelihood × Severity.

45. By determining the level of risk associated with each hazard identified in the working environment, employers and workers and their representatives can identify areas for priority action. For example, a risk that rarely arises (1) and has insignificant consequences (1) would have the lowest priority (1) (i.e. 1 × 1 = 1), whereas a hazardous event that occurs regularly (5) and has potentially fatal consequences (5) would have the highest priority for action (25) (i.e. 5 × 5 = 25). The higher the level of risk, the more important it is to apply controls that eliminate, reduce or minimize exposure to the hazard.

46. Priority areas of action can also be determined by evaluating particular hazards in the port. Two questions need to be considered for each hazard: "How often is a person exposed to the hazard?" and "What is the likely outcome?". The likelihood of an event occurring is expressed as daily, weekly, monthly or rarely, whereas the severity of the consequences varies from the most severe (death or permanent disability) to the least severe (minor injury requiring only first aid). From these two factors, priority of action can be determined as high, moderate or low.

47. It would be useful to record the results of the assessment in narrative form, specifying the port work or workplace being assessed, the main hazards and those at risk, the level of risk and the measures required to eliminate, reduce or minimize exposure. An example of a risk assessment form is shown below.

Sample safety and health risk assessment form

Safety and health risk assessment form

Name of the employer and enterprise

Address

Work activity or workplace being assessed	Identify the main hazards and those at risk of injury or ill health	Assess the likelihood of risk and severity of injury or ill health	Risk reduction measures to be put into place
Lift truck use	1. Rollover of lift truck especially when on slopes. At risk: the driver, unauthorized riders or those working close by.	1. Risk of death or serious injury can be high in certain places.	1. The lift truck should be equipped with a rollover protection structure (ROPS) and seat belt. All lift truck operators should be trained in the safe use of lift truck and particularly rollover prevention and required to follow safe work practices. The one seat, one rider rule should be enforced without exception.

Sample safety and health risk assessment form

Safety and health risk assessment form

Name of the employer and enterprise

Address

Work activity or workplace being assessed	Identify the main hazards and those at risk of injury or ill health	Assess the likelihood of risk and severity of injury or ill health	Risk reduction measures to be put into place
	2. Being run over by lift truck, especially when reversing. At risk: those working close by and bystanders.	2. Risk of being run over is high in areas of poor vision and close to domestic buildings.	2. All lift truck operators should be alert to the presence of co-workers and bystanders and ensure that they are kept at a safe distance. Horns and flashing lights should be fitted, especially for larger lift trucks. If fitted, they should be used.
	3. High noise levels from the lift truck engine. At risk: the driver.	3. Risk of noise-induced hearing loss is high over prolonged periods of exposure.	3. Sound-proofed safety cabs should be fitted, which may also serve as a ROPS.
	4. High whole-body vibration levels from the lift truck chassis. At risk: the driver.	4. Risk of back pains and other musculo-skeletal disorders is high over prolonged periods of exposure.	4. Driver seating should be ergonomically designed.

48. The assessment should be reviewed whenever there has been a significant change in the work to which it relates or when there is reason to suspect that it is no longer valid. The review should be incorporated in to a system of management accountability which ensures that control action shown to be necessary by the initial assessment is in fact taken.

2.2.3. Planning and implementation of controls

49. Based on the results of the risk assessment and other available data, such as the results of monitoring of the workers' health and of the working environment, the port employer should:

(a) define OSH objectives for the reduction of such risks to as low a level as possible;

(b) devise and implement corresponding preventative measures, based on an appropriate order of prevention; and

(c) develop, approve and implement a "safe workplan" before any operation starts.

50. These activities should include the routine application of site inspection and planning, as well as of the principles of work organization.

2.2.4. Hierarchy of controls

51. Preventative and protective measures should be implemented in the following order of priority:

(a) eliminate or substitute the hazardous agent with a less hazardous one, such as a less hazardous or non-hazardous substance or low-voltage electrical hand tools;

(b) reduce the hazard/risk at source through the use of engineering controls, such as providing sound-proofed safety cabs for vehicles or interlocking guards with machinery;

(c) minimize the hazard/risk by using safe working procedures or other organizational measures, such as restricting entry into enclosures that are in construction; and

(d) where unacceptable risks remain, provide suitable PPE, such as protective clothing, respiratory protective equipment, hearing protectors, and ensure that it is properly used and maintained.

52. PPE often provides the least effective means of protection and should be considered as a last resort.

2.2.5. Monitoring, evaluation and improvement

53. Control measures should be monitored and reviewed at regular intervals and, if necessary, revised, especially when circumstances change or if new information becomes available about the risks posed or the suitability of existing control measures. Control measures should also be reviewed and, if necessary, revised following work-related injuries, ill health, diseases and incidents.

54. The monitoring and evaluation of OSH performance should reinforce commitment to accident and disease prevention and promote a preventative OSH culture within the organization.

55. Further information about performance monitoring and measurement is available in the ILO *Guidelines on occupational safety and health management systems, ILO–OSH 2001*, section 3.11.

2.3. Organization of OSH management systems

2.3.1. Organization for safety and health in ports

56. The close interdependence of productivity and safety and health at work should be recognized by all who work in ports.

57. In each port, a permanent service responsible for OSH should be established by the competent authority which clearly spells out who is responsible for:

- promotion of OSH throughout the port and prevention of occupational accidents and diseases;
- inspection of workplaces;
- investigation into the causes of accidents that lead to death, serious injury or serious material damage;
- informing port employers (and management) and portworkers of such accidents and the lessons to be learned from them;
- informing port employers (and management) of incidents involving non-compliance with safety regulations;
- making formal reports on breaches of legal requirements and submitting them to the competent authority;
- where necessary, drawing the attention of the relevant competent authority to urgent cases in which its immediate action or advice may be required;
- at regular intervals, drawing up reports of relevant activities, including accident statistics and practical advice on safety and health;
- development of capacity-building programmes on OSH for port employers and portworkers, where appropriate;
- the promotion of a preventative safety and health culture; and
- the establishment of safety and health committees with the help of employers and portworkers.

2.3.2. Safety and health committees

58. In order to facilitate cooperation between management and workers and their representatives, where appropriate and

necessary, and in accordance with national practice, workers' safety delegates, workers' safety and health committees, and/or joint safety and health committees should be appointed or established. In joint safety and health committees, workers should have at least equal representation with employers' representatives.

59. The composition and functions of a safety and health committee depend on the number of employers and workers in the port and the organization of work in it. All departments in the port facility, such as maintenance, equipment operators, clerical staff and clerks, should be represented in the committee. Particular attention should be paid to problems associated with the increasing mobility of labour and the use of contract or other non-permanent workers in ports. The committee should be composed of representatives of employers (management) and workers in equal numbers. Where a recognized union exists, the workers' representative in the committee should be either appointed or elected by the workers. Where a union does not exist, the workers' representative should be elected by the workers. Management should inform the workers of their rights about health and safety committees and facilitate an election. Committees can be set up to cover an entire port, as well as individual facilities or enterprises.

60. In accordance with the Occupational Safety and Health Recommendation, 1981 (No. 164), safety and health committees should:

- be given adequate information on safety and health, matters, enabled to examine factors affecting OSH, and encouraged to propose measures on the subject;
- be consulted when major new safety and health measures are envisaged and before they are carried out, and seek to obtain the support of the workers for such measures;

- be consulted in planning alterations of work processes, work content or organization of work, which may have safety or health implications for the workers;
- be given protection from dismissal and other measures prejudicial to them while exercising their functions in the field of OSH as workers' representatives or as members of safety and health committees;
- be able to contribute to the decision-making process at the level of the undertaking regarding matters of safety and health;
- have access to all parts of the workplace and be able to communicate with the workers on safety and health matters during working hours at the workplace;
- be free to contact labour inspectors;
- be able to contribute to negotiations in the undertaking on OSH matters;
- have reasonable time during paid working hours to exercise their safety and health functions and to receive training related to these functions; and
- have recourse to specialists to advise on particular safety and health problems.

61. Further, the functions of safety and health committees may include:

- participating in the development of policies and rules setting out OSH management systems and revising them, as necessary; and giving priority to the more hazardous activities or operations as identified in risk assessments;
- participating in all proposals submitted for the improvement of working methods in the interest of protecting and promoting safety and health;

- consideration of reports of inquiries into accidents and incidents, diseases and dangerous occurrences, the results of safety audits, committee site inspection reports and reports on occupational illness-related absenteeism and drawing lessons from them with a view to preventing recurrence;
- participating in the preparation and dissemination of information to portworkers and employers about hazards inherent in the work and ways of protecting themselves against or eliminating such hazards. This may include the preparation of safety leaflets, posters, electronic communications and so on; and
- participating in the monitoring of the effectiveness of safety and health training.

62. To perform these functions, the committee should be kept regularly informed of all dangerous incidents, accidents and occupational diseases that occur. It should also be informed of dangerous and unhealthy working conditions that are found, before they result in an accident or an incident of ill health.

63. In addition to a port safety and health committee, separate committees, affiliated to the port committee, should be set up by individual employers. A representative of the port authority should attend some meetings of these committees.

64. In some countries there is also a national port safety and health committee consisting of representatives of the relevant competent authorities, port employers and portworkers. This permits the systematic supply of information to all interested parties and enables them to learn from relevant incidents and experiences in many ports. Such committees may be called upon to advise the competent authority on safety and health policies and associated measures in ports. These committees have been

found to be of considerable mutual benefit by all who have taken part in them.

65. The safety and health committee should cooperate with the port security advisory committee, where one exists, as appropriate.

66. In the event of a conflict, safety and health should be paramount.

2.3.3. Safety and health representatives

67. The function of safety and health representatives is to represent other workers in OSH matters. In some countries, they may be appointed in accordance with national legal requirements and have a number of additional functions.

68. Safety and health representatives may be appointed by recognized trade unions or, where they do not exist, elected by groups of workers.

69. Safety and health representatives should take an active part in the work of safety and health committees by providing a channel for the flow of information both from workers to management and from management to workers. Such information should not be restricted to a particular group of workers but disseminated to all relevant workers.

70. Safety and health representatives should be encouraged to raise safety and health concerns with the committee. However, they should not "save up" reports of defective equipment or other obvious hazards that need attention for the committee meeting. Such reports should be brought to the attention of the appropriate person and dealt with accordingly. They should only be raised with the committee if appropriate action has not been taken or when other members of the committee can benefit from lessons that can be learned from the report.

2.4. OSH reporting and investigation

2.4.1. In-house reporting

71. All cases of occupational incidents, accidents, injuries, illness and diseases affecting portworkers should be reported to the appropriate person in accordance with in-house OSH policies, instructions and procedures. Every effort should be made to encourage individuals to report incidents without repercussions because the report has been made.

72. Port employers should ensure that a written record is kept of all reports in accordance with national legal requirements.

73. Port employers should also identify other types of incidents or accidents that should be reported to them. These may be incidents resulting in certain damage to plant or property, or that have the potential to cause significant injury or damage (often termed "near misses").

2.4.2. OSH statutory reporting

74. All occupational accidents to portworkers causing loss of life, injury or incapacity for work, and all incidences of occupational disease, should be reported promptly to the relevant competent authority, in accordance with national legal requirements.

75. Certain other accidents or incidents, often termed "dangerous occurrences", may also be required to be reported to the competent authority, whether or not they have resulted in injury. These, and occupational diseases, are specified in national legal requirements or by the competent authority. Examples may include the collapse of cranes or derricks, explosions and serious fires.

76. The notification report should contain the information required and be filed in accordance with national laws, regulations and policies.

77. The competent authority should undertake an investigation into the causes and circumstances of any fatality and serious accident in accordance with national policy and legislation.

78. The scene of a fatal accident should, as far as practicable, be left undisturbed until it has been visited by a representative of the competent authority.

79. After a dangerous failure of plant or gear, the plant or gear should, as far as practicable, be kept available for inspection by the competent authority.

2.4.3. Investigation

80. All incidents and accidents should be investigated in coordination with the safety and health committee. In the absence of such a committee, workers and their representatives should be involved in determining the cause of the incident or accident and the action to be taken to prevent the occurrence of any similar accident in the future.

81. The formality and depth of the investigation should be proportional to the severity or potential severity of the accident. Often, only a minor change in circumstances can make the difference between an accident resulting in no injury, very minor injury, or a fatality. It should not be necessary to wait for a serious injury to occur before appropriate steps are taken to control a hazard. Action taken after a "near miss" can prevent future injuries and losses resulting from damage.

82. The names of witnesses should be recorded and any relevant photographs taken should be identified, captioned and dated.

83. The investigation should consider all the relevant evidence. This may include the site where the incident occurs, plant, the type of cargo being handled or substances being used,

systems of work, responsibilities and people involved, including their physical or mental condition, training and competencies.

84. It is important to investigate not only the *direct* cause of an accident, but also to determine the *underlying* cause or causes, which are often the real cause of an accident. Human factors have been found to be relevant to a high proportion of accidents.

2.5. Selection and training

85. Employers should ensure that portworkers have received the necessary training, information and instructions to perform the work competently and safely, consistent with the ILO *Guidelines on training in the port sector* (2012).[1]

86. Portworkers should be instructed on how to obtain and use the information provided in order to prevent accidents.

87. In-house training programmes organized by port employers should be developed in consultation with portworkers and their representatives. Training programmes should:

(a) cover all portworkers;

(b) be conducted by competent persons and provided during paid working hours;

(c) include effective and timely initial and refresher training at appropriate intervals, in consultation with the affected workers;

(d) include participant evaluation for comprehension and retention of the matters taught; and

[1] Available at: http://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/normativeinstrument/wcms_214609.pdf.

(e) be reviewed periodically by the safety and health committee, where one exists, or by employers in consultation with portworkers and their representatives, modified as necessary and adequately documented.

2.5.1. Selection of portworkers

88. The provisions of the ILO Discrimination (Employment and Occupation) Convention, 1958 (No. 111), should be fully applied in the selection process in order to eliminate any possible discrimination.

89. Portworkers should only be engaged following an appropriate selection process, in accordance with national legislation.

90. The criteria for selection should include the following, which are essential for safe port work, especially for operators of mechanical equipment:

- a portworker needs to be physically capable to perform the job assigned;
- normal reflexes;
- good eyesight;
- good hearing;
- the ability to comprehend and communicate in the working language of the port;
- the ability to comprehend terminal signage; and
- the ability to follow safety instructions.

91. Further training is necessary after selection if the worker is not already appropriately trained and fully competent for the type of work to which he or she is to be assigned.

92. Portworkers should be able to work in teams. It should be recognized that:

- their acts and behaviour will have a direct influence on those of other portworkers;
- the safety and output of other workers will depend on their own vigilance, work and knowledge; and
- the safety of others may be dependent on their own safety.

93. Modern selection methods enable selection to be based on objective tests of medical fitness and aptitude, as appropriate. It is desirable for port occupational health staff and personnel officers, as well as relevant operational management, to be involved in the selection of portworkers.

94. No person under 18 years of age should be employed in port work, except as permitted by the competent authority in accordance with national legal requirements.

95. The main resources necessary for training portworkers are suitable premises and equipment, training material, teaching staff and appropriate remuneration of trainees.

2.5.2. Training needs

96. All portworkers should be trained to develop the knowledge, psychomotor and attitude skills which they need to enable them to do their work safely and efficiently, as well as to develop general safety awareness. Portworkers should be made aware of the potential effects of their actions on others, as well as the specific hazards of their work and methods to control them. Training should include both general induction training and training relevant to their specific work.

97. Consideration should be given to the need for continuation or refresher training in addition to initial training. This may be necessary to deal with technological advances and the introduction of new plant or working practices. It may also be

necessary to eradicate bad practices that have developed with time and to remind workers of basic principles.

98. Records should be maintained of the training that each portworker has received and the competencies that have been attained.

2.5.3. Induction training

99. General induction training should be given to all persons who work in ports, or who may visit ports. This training should cover the general hazards associated with ports, which are often quite different from those encountered in other industries.

100. The training should also include site-specific hazards and relevant local rules, emergency arrangements and the need to cooperate with other persons working in the port.

101. Visitors should be given information including, for instance, by a leaflet setting out basic information, including the action to be taken in an emergency.

102. Persons with previous relevant training may not need to be required to repeat the general part of the induction training; however, they should receive the relevant site specific information in all cases.

2.5.4. Job-specific training

103. The need for structured training, rather than just working alongside a more experienced worker, has increased following the mechanization of port work.

104. Job-specific training, including knowledge of cargo-handling methods, should be provided for all portworkers working with cargo, not just those operating plant or other equipment.

105. Training itself does not confer competence, therefore national vocational qualifications in relevant port work

competencies should be developed. The holding of a relevant certificate of competency can assist potential employers in the selection of portworkers. However, the holding of such a certificate should not relieve an employer from the duty to check that the necessary skills have been maintained and can be put into practice.

106. Port authorities should be aware of the ILO Portworker Development Programme (PDP). This has been developed to give international guidance on vocational training for portworkers.

2.5.5. Training methods

107. Training should generally include both theoretical training in a classroom and practical training. Training of portworkers should normally be carried out in ports to allow demonstrations of working practices by experienced personnel and to bring trainees into close contact with future workplaces. Trainers should be qualified and competent to deliver the training.

2.5.6. Evaluation of training

108. Attendance at a training course does not guarantee that a trainee has gained the necessary skills. Where appropriate, training courses should conclude with a suitable test that demonstrates that the trainee has reached the necessary level of skills. Successful trainees should be given a certificate specifying the skills and, where appropriate, the level attained.

2.6. Information for portworkers

109. Relevant information on matters that are likely to affect their safety or health should be available to all portworkers. The information should be given to them in writing or made available to them by other means, including posting in working areas

and mess rooms and canteens. New means of communication could support the distribution of relevant information.

110. The information should include relevant safe systems of work, material safety data sheets relating to dangerous cargo that they handle or dangerous substances that they use during their work that could be harmful to their health, and reference to relevant port safety and health legal requirements.

2.7. Special facilities for disabled persons

111. Special facilities for disabled persons relating to safety and health should be provided as appropriate according to national legal requirements.

3. Port infrastructure, plant and equipment

3.1. General provisions

3.1.1. Separation of people and vehicles

1. With the mechanization of cargo-handling operations, the design, layout and maintenance of port infrastructure and plant and equipment have become increasingly important. As vehicles and mobile plant are now one of the main elements in fatal and serious accidents in ports, people should be separated from vehicles whenever this is practicable. Port employers should develop traffic rules according to national legislation and local conditions.

3.1.2. Surfaces

2. The surface of port areas should be:

- of adequate strength to support the heaviest loads that will be imposed on them;
- level, or with only a slight slope;
- free from uncovered or unfenced openings, holes, cracks, undulations and projections; and
- skid resistant, where necessary.

3. The possible need for future repair should be considered when selecting surface materials.

4. As asphalt can be damaged by oil, fuel and other solvents, spillages should be cleaned up immediately to prevent or minimize damage.

5. Plain metal surfaces, such as those on brows or ramps, can become slippery, particularly when wet. The use of chequer

plate or other plates with raised patterns or nonslip coatings should be considered.

6. Wooden structures should be built of wood that is suitable for use at the location in question. Additional protection may be provided by the use of suitable preservatives. Wood should not be covered with asphalt or other materials that will hide its condition and may lead to accelerated hidden rot or other deterioration.

7. Plastic surface coverings can include a variety of nonslip finishes.

8. All surfaces other than ramps, etc., should be as level as reasonably practicable while providing adequate drainage. Any slope on quays or other operational areas should not exceed 1 per cent and should not slope towards the edge of a quay. Drainage systems should include appropriate interceptors to prevent maritime pollution.

9. Ramps or slopes used by lift trucks or other cargo-handling vehicles should not have a gradient steeper than 1 in 10 unless the vehicles have been designed to operate safely on such a gradient.

3.1.3. Lighting

10. In accordance with Article 9 of Convention No. 152, all places where port work is being carried out and any approaches thereto should be suitably and adequately lit. Any obstacle liable to be dangerous to the movement of a lifting appliance, vehicle or person should, if it cannot be removed for practical reasons, be suitably and conspicuously marked and, where necessary, adequately lit.

11. Different levels of lighting may be appropriate in different areas.

12. On access routes for people, plant and vehicles, and in lorry parks and similar areas, the minimum level of illumination should not be less than 10 lux.

13. In operational areas where people and vehicles or plant work together, the minimum level of illumination should not be less than 50 lux.

14. Light meters should be able to read to an accuracy of 1 lux. Meters should have a wide angle of acceptance in order to minimize errors due to directionality or low sensitivity to differing types of light sources, or be provided with the relevant correction factors.

15. Light measurements should normally be taken in the horizontal plane 1 m above the ground or other working surface. Measurements at a lower level may be necessary where there are obstructions that might conceal a tripping hazard. The meter should not be oriented towards a light source.

16. Records should be kept of all lighting measurements. These should include the date, time, weather conditions, location and details of the lighting and light meter.

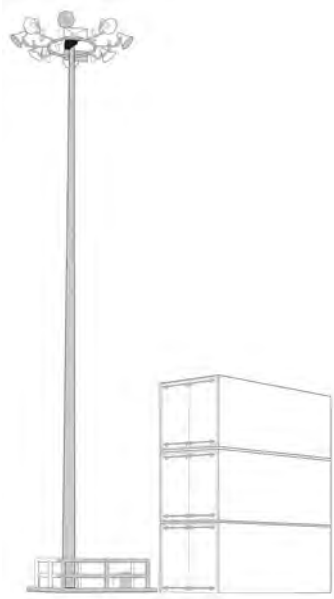
17. Higher levels of lighting may be required at particularly dangerous places, such as shore gangways, accommodation ladders, steps and other breaks in quays or where detailed work is necessary. Where a higher level of lighting is required only occasionally, it may be provided by mobile or portable equipment.

18. Lighting should be as uniform as practicable. Sharp differences in lighting levels should be avoided.

19. The choice and positioning of light sources and each installation should be planned individually.

20. Lamps emitting monochromatic light, such as sodium-vapour lamps, give a good light in foggy weather but distort

Figure 1. Tall lamp standard for illuminating a large area



colours and may lead to confusion. They should be confined to non-operational areas. In operational areas, fluorescent or other lamps, which give a light more similar to daylight, should be used.

21. Tall lamp standards (over 12 m high) carrying several lamps can each illuminate a large area, cause less obstruction and reduce areas of shadow between containers (figure 1).

22. Lamp fittings should be provided with shades and diffusers to prevent light pollution and glare. Particular attention should be paid to preventing dazzle to small ships from reflection of light on water.

23. Lamp standards should be designed to allow the lamps to be cleaned and changed in safety.

24. At ports where operations do not take place for 24 hours per day, arrangements should be made to ensure that crews of ships berthed in the port have safe access to and from their ships. This may be ensured by the provision of sensors or switches on lamp standards on authorized walking routes that turn on lights for an appropriate period.

3.1.4. Fire precautions

3.1.4.1. General requirements

25. Fire precautions in ports should be provided in accordance with national legal requirements. These should consist of:

- fire protection;
- fire alarms;
- firefighting equipment; and
- means of escape in case of fire.

26. Advice on fire-related matters should be obtained from fire authorities and insurance companies. Industry-specific advice may be available from appropriate industry organizations.

3.1.4.2. Fire protection

27. The principles of fire protection at ports are no different from those in other industries.

28. Whenever practicable, buildings and structures at ports should be constructed of non-combustible materials. Where this is not practicable, structures and construction materials that will reduce the probability of fire and limit the consequences of any that do occur should be selected. National or local legal requirements generally set out standards for buildings or compartments (subdivisions of a building), particularly those where flammable

or other dangerous substances are kept. Generally, fire separation walls should have a fire resistance of at least two hours.

29. Large buildings should be partitioned into fire resistant compartments that do not exceed 9,000 m^2 in area.

30. Fire separation walls of a building or compartment should not have holes or gaps in them. Any doors that are necessary in such walls should be fire-resistant and self-closing. Spaces where services pass through fire separation walls should be fire protected.

31. Sources of ignition should be rigorously controlled, particularly in warehouses and other places where flammable materials are likely to be present.

3.1.4.3. Fire alarms

32. An effective fire alarm system should be provided throughout port areas. This may be by "break glass" fire alarm points or otherwise. If the system involves the use of a radio or telephone system, the system should operate at all times. Automatic systems can be arranged to sound alarms in relevant areas, alert the fire authority and operate automatic fire-extinguishing appliances, as appropriate.

33. In large premises, it may not be necessary to alert all persons in the port area immediately in the event of a fire, and a staged fire alarm system that allows different areas to be alerted may be appropriate. The fire alarm system in any building should be audible throughout the entire building.

34. The fire alarm system should be maintained in a fully operational condition at all times, particularly when maintenance work or alterations to premises are in progress.

3.1.4.4. Firefighting equipment

35. Appropriate means for fighting fire should be provided throughout port areas. These should include both portable

first-aid fire extinguishers and fixed systems such as hoses and hydrants.

36. The location, type and number of firefighting equipment should be determined in accordance with national and local legal requirements.

37. Portable fire extinguishers should be grouped at clearly marked fire points. Fire points should be identified by clear and conspicuous signs or markings. These should be visible at all times and not obstructed by cargo or plant. If necessary, signs should be raised so that they can be seen above stored goods. Fire points should be located in such a way that the equipment can be brought into use quickly. Hydrants at warehouses should be close to doors.

38. All firefighting equipment and systems should be tested at regular intervals.

39. The choice of firefighting agent is determined by the type of fire that is likely to occur and the nature of materials that are likely to be involved. The use of an inappropriate firefighting agent can be extremely dangerous.

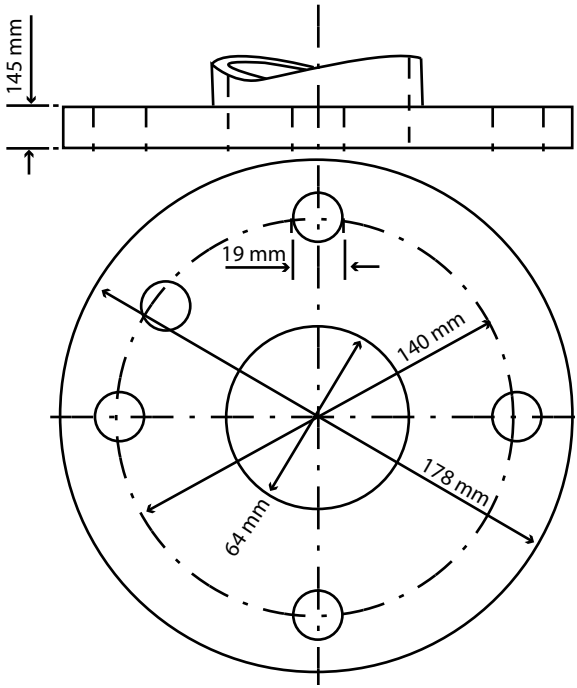
40. The most commonly used firefighting agents are:

- water;
- foam;
- carbon dioxide; and
- powders.

41. Water is the most common firefighting agent and is suitable for use on most general fires. As well as extinguishing most fires, it also cools the surrounding area thus reducing the chance of the fire re-igniting or spreading.

42. The intake of a fixed fire main that takes water from a port should be below water at all states of the tide.

Figure 2. Shore connection for international ship–shore fire connection



43. Hydrants should not be more than 80 m apart. International ship–shore connections to enable fire mains to be connected to those on ships (figure 2) should be available at all berths in accordance with IMO Resolution A.470(XII), and should conform to the dimensions in regulation II-2/19 of IMO International Convention for the Safety of Life at Sea (SOLAS), 1974.

44. Water pipes and hoses should be protected against collapse, impact by wheeled traffic or falling goods and frost.

45. Water and water-based foams should never be used to fight fires involving electrical equipment or chemicals that may react violently with it.

46. The shelf life of all chemicals used to make chemical foams should be determined and stocks renewed periodically.

47. Portable carbon dioxide extinguishers should not be used in confined or unventilated spaces. If a total flooding system is installed, it should provide an audible prewarning of discharge in the protected space. This should be distinguishable from the fire alarm and give sufficient time for persons to escape before the discharge.

3.1.5. Means of escape in case of fire

48. Adequate means of escape in case of fire should be provided from all places in ports and should lead to safe places outside buildings.

49. Escape should normally be available by at least two different routes, except where very small travel distances are involved.

50. Fire assembly points to which persons can safely go in the event of a fire should be clearly identified.

51. Suitable access routes for emergency services in the event of fire should be provided throughout the premises. These should be clearly signed and kept clear of obstructions at all times.

52. Fire drills should be conducted on a periodic basis.

3.2. Traffic routes

3.2.1. Roadways

53. Suitable roadways should provide safe access for vehicles to all parts of port areas.

54. Wherever practicable, vehicles and pedestrians should be separated.

55. The width of roadways should be suitable for the traffic that is likely to use them. This should take into account the width of vehicles and their loads, and their ability to manoeuvre. Traffic lanes should generally be at least 5 m wide. Under gantry quay cranes and in other restricted locations, a width of 7 m may be necessary to provide adequate clearances.

56. Lanes wide enough for road traffic should be provided between rail tracks and rubber-tyred gantries along quays.

57. A 2 m clearance should be left along quaysides to enable a 1 m unobstructed access for personnel to be available.

58. Roadways should be sited so as to allow the road ahead to be clearly visible for an appropriate distance. Sight lines should not be obstructed by corners of buildings, stacked goods or other obstructions.

59. Roadways should be separated from any fixed obstacles by a clearance of at least 900 mm.

60. Roadways should be unidirectional. Where this is not practicable, separation of the traffic streams by traffic cones, or otherwise, is desirable on all main traffic routes.

61. The edges of roadways should be clearly delineated by pavements or other clear markings. These should be clearly visible by both day and night. Yellow or white reflective road paint can be used for this purpose.

62. Particular attention should be paid to the design of any roundabouts (traffic circles) found to be necessary. Elongating the traffic island in the roundabout, rather than making it circular, can help to prevent overturning of vehicles.

63. Wherever practicable, the layout of roadways should be standardized throughout the port areas.

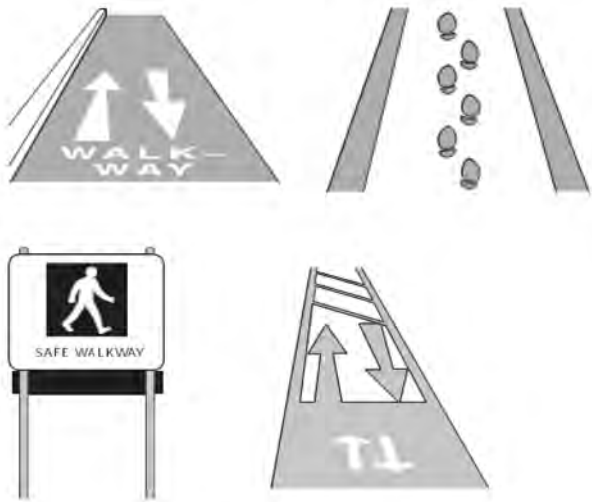
64. Provision for the safe parking of vehicles should be provided in appropriate places, taking into account operational needs, security measures where applicable, and proximity to welfare and other facilities for all workers and visitors to the port.

65. Appropriate warning signs, including speed limits should be provided on roadways in ports. These should conform to the national legal requirements for road signs. Wherever possible, standard international road signs should be used.

3.2.2. Walkways

66. Safe walkways should be provided to all parts of port areas to which persons with legitimate access have to walk. Such people include ships' crew members, pilots, passengers and contractors.

Figure 3. Examples of markings and signs on walkways



67. Wherever practicable, walkways should be separated from operational areas and vehicular traffic.

68. Walkways should be wide enough for the number of persons expected to use them at any one time.

69. The edges of walkways should be clearly delineated. The markings should be clearly visible by both day and night. Yellow or white road paint can be used for this purpose.

70. Markings to identify walkways should be clear and unambiguous (figure 3). There should be no doubt whether markings indicate a walkway, a plant crossing or other dangerous area, such as the track of plant.

71. Signs or markings should be provided at the ends of walkways and repeated at intervals along them as necessary.

72. Appropriate signs should be provided where walkways cross roadways.

73. International symbols and warning signs should be used whenever practicable. Pictorial symbols should be used on signs and on the surface of walkways to ensure that they are understood by users of all nationalities.

74. Walkways should be free of obstructions and adequately lit.

3.2.3. Other matters

75. Cycleways to separate cyclists from vehicles and pedestrians should be provided in ports where there is significant cycle traffic.

76. All permanent or temporary obstructions should be clearly marked to be visible by day and night. Holes, lamp standards and other obstructions should be securely fenced as necessary.

77. Where a hole or trench has to be temporarily covered and is to be crossed by vehicles, the covering should:

- be of adequate strength;
- have a sufficient overlap at the edge of the hole or trench and be suitably anchored;
- be of sufficient width;
- be provided with a ramp where there is an abrupt difference of levels; and
- have a notice at each end stating that vehicles should not attempt to pass other vehicles while on it.

78. If the covering is to be used by pedestrians, it should also:

- be fenced on either side; and
- have a notice at each end stating that pedestrians should give way to vehicles.

Figure 4. Low doorway markings with maximum heights

79. Overhead obstructions that may be struck by vehicles should be clearly marked. These may include overhead walkways and pipe bridges, and low doorways into buildings. Where necessary, notices specifying the maximum height of vehicles, including their loads, should be displayed (figure 4).

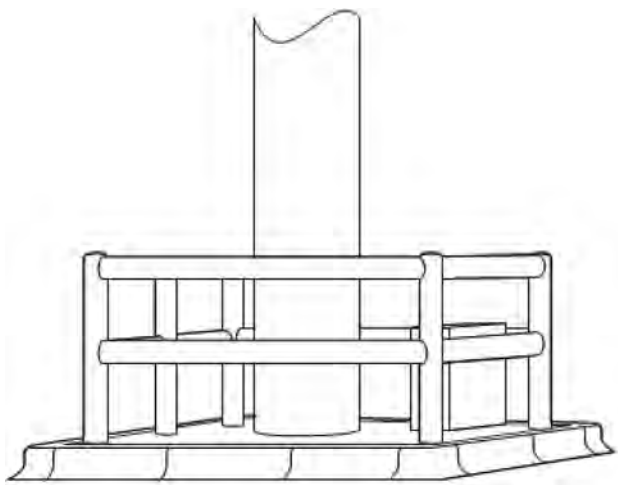
3.3. Cargo-handling areas

3.3.1. Layout

80. Cargo-handling areas should be well surfaced and, where applicable, should comply with the provisions of sections 3.1.2 (Surfaces) and 3.1.3 (Lighting), above.

81. Lamp standards and similar structures that may necessarily be present should be protected with barriers against accidental damage by cargo-handling equipment and vehicles (figure 5).

Figure 5. Barriers around lamp standard



82. The layout of cargo-handling areas should be such as to avoid the need for walkways to cross them, as far as is practicable. Any crossing points that are necessary should be marked and signed to warn both drivers and pedestrians of the potential presence of each other.

3.3.2. Edge protection

83. Secure fencing should generally be provided at all places from which a fall is likely to result in serious injury. This includes openings where there are sudden changes in level, such as the tops of steps, and open edges from which it is possible to fall more than 2 m or into water.

3.3.3. Quay edges

84. It is recognized that it is not practical to provide fencing along all the open edges of quays. Fencing should be provided at all dangerous corners and breaks in quay edges (figure 6), such as those at the sides of gangways, ramps or brows giving access to ships, pontoons or landing stages, walkways over lock gates

Figure 6. Fencing of quay corners and breaks in quay edges

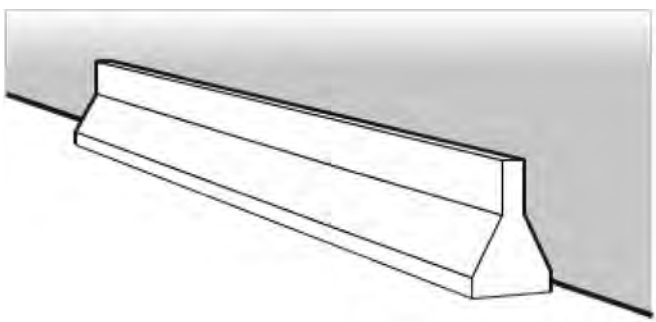
or caissons, and the edges of quays overlooking open stretches of water.

85. Fencing should be provided at quay edges where a large number of passengers are likely to be present.

86. All edges of quays on which vehicles are used close to the edge should be protected by a continuous coping wall or robust rigid barrier of sufficient strength to prevent trucks and most other vehicles from accidentally falling into the water (figure 7). In general, the wall or barrier should be as high as practicable, but not less than 300 mm high. Highway-type barriers may be suitable for the purpose. On quays where only cars and other small vehicles are used, a lower barrier may be sufficient but this should not be less than 200 mm high.

87. Gaps may be left in the wall or barrier where this is necessary to work capstans, use bollards or carry out other operations. The gaps should be no wider than is necessary and less than the width of a vehicle.

Figure 7. Quay edge protection for vehicles



88. If vehicles are only very occasionally used near a quay edge, suitable temporary arrangements may be made. These may involve the provision of a temporary barrier or the positioning of a person to signal to the driver when a vehicle is operating close to the edge of the quay.

89. Where an existing rail-mounted crane passes close to the water's edge and it is not practical to provide fencing on the quay, it may be advisable to put a fixed handrail on the crane. This should not project in such a way as to dangerously reduce the clearance between the crane and the edge of the quay or any fencing that the crane may pass.

3.3.4. Fencing

90. All permanent fencing should be robustly constructed, clearly visible and of contrasting colour.

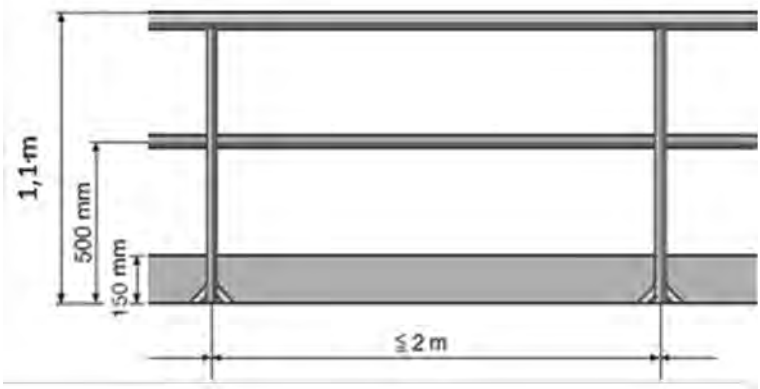
91. Fencing should generally consist of metal railings. Reinforced concrete barriers may be appropriate on structures alongside bodies of water and where there is heavy vehicular traffic for ro–ro or container operations.

92. Other fencing should depend on the nature of the hazard to be protected, the general layout of the immediate area and any nearby structures. Chains between stanchions provide only limited protection and should not be used as permanent fencing. Fencing should not stop immediately at the end of the danger zone but should continue a few metres beyond it.

93. The construction and location of fencing should allow for ships to be made fast and cast off easily.

94. Fencing should be at least 1.1 m high (figure 8). Metal railings should have a middle rail 500 mm above the quay between stanchions that are placed not more than 2 m apart. Toe boards 150 mm high should be fitted where necessary.

Figure 8. Construction of fencing



95. Movable fencing may be used around temporary hazards and on the edges of berths. It can be removed while work is going on when necessary to avoid the fencing itself becoming a hazard.

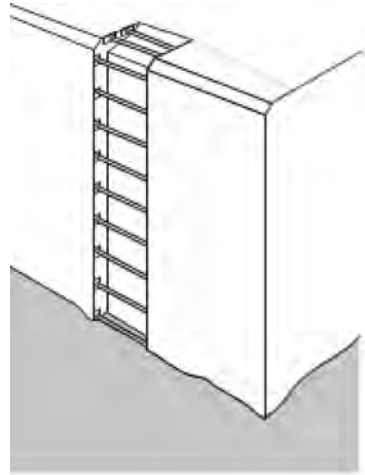
96. Movable fencing should be used to protect stairs or steps at the water's edge or the edges of gangways where permanent fencing is not practicable.

3.3.5. Quayside ladders

97. Permanent ladders should be provided at the edge of any structure in a port from which persons may fall into deep water to enable them to climb out of the water (figure 9). Such structures may include quays, jetties and dolphins and large mooring buoys.

98. Ladders should be spaced at intervals of not more than 50 m from each other or from steps, or according to national law.

Figure 9. Quayside ladder



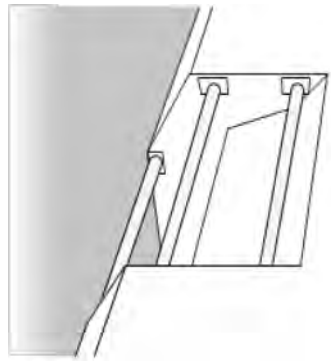
99. Ladders should conform to section 3.5.3, where appropriate.

100. The bottom rung of ladders should be at least 1 m below the lowest level of the water at any time, or on the bed of the dock if there is less than 1 m of water at low tide.

101. Where the stringers of the ladder extend above the quayside, they should be opened out sufficiently to enable a person to pass through them, and should be sloped or curved in from the quay edge.

102. Where it is not practical for the ladder to extend at least 1 m above the top of the quayside, the stringers should extend as high as is practicable. Where no such extension is practicable, adequate handholds should be provided on the surface of the quayside in front of the ladder (figure 10). If these are recessed

Figure 10. Handholds and drainage at top of quayside ladder



in the surface, the recess should be designed so that it allows drainage and does not fill with water or dirt. If handholds projecting above the surface of the quay and recesses are necessary, they should be clearly marked to draw attention to possible tripping hazards.

103. A permanent ladder should be protected on each side against damage from ships, unless it is recessed into the wall of the quay.

104. The top of a ladder recessed into a wall should never be obstructed by the edge of the quayside.

105. Ladders from the water should be conspicuous so as to be easily seen by anyone falling into the water. The tops of the ladder should be clearly visible to persons on the quayside.

106. At ports where it is not practicable to fit permanent ladders, or at quays that are used only occasionally and persons do not have to pass when no ship is berthed, temporary ladders should be provided and secured fore and aft of each ship loading or unloading.

107. Quayside ladders should be regularly maintained, painted and kept free of barnacle accumulation.

3.3.6. Life-saving equipment

108. Adequate and suitable life-saving equipment should be provided and maintained for the rescue of anyone in danger of drowning.

109. Rescue equipment should consist of lifebuoys, throwing buoys or lines, boathooks/poles of sufficient length or other suitable equipment. Throwing-lines fitted to lifebuoys or similar equipment should be of suitable size and length, and should be made of polypropylene or other suitable material so that they will float.

110. Life-saving equipment should be located at suitable places at intervals of not more than 50 m. Such locations should be near the quay edge close to the tops of ladders or steps to the water, wherever practicable, and should include landing stages.

111. The equipment should be prominently mounted at a location painted in a conspicuous colour.

112. The locations should be kept free of obstructions so as to be easily visible at all times.

113. Lifebuoys and similar equipment should be hung up or contained in a case or cupboard of adequate size and conspicuous colour. Cases and cupboards can be arranged to alert a central point when opened or when the equipment is removed. This can aid calling the emergency services and reduce theft and vandalism.

114. Where theft and vandalism are serious problems, it may be satisfactory for life-saving equipment to be kept just inside nearby sheds or other buildings, provided that its location is clearly marked and it is immediately available at all times when work is in progress.

115. Suitable notices should be displayed with life-saving equipment giving clear instructions for raising the alarm in the event of an emergency and for the resuscitation of a person rescued from drowning.

116. Facilities to enable persons who have fallen into the water to support themselves while awaiting rescue should be provided between quayside ladders. The structure of the quay may be able to serve this purpose. More often chains are used. In enclosed quays, or where there is a very small tidal range, chains looped between fixed points may be provided. Where there is a large tidal range or in locks, vertical chains should be hung on the face of the quay. At least one such chain should be provided between adjacent quayside ladders.

117. Workers should wear a personal flotation device (PFD) wherever there is a possibility that they may fall into the water while carrying out their duties.

3.4. Shoreside access to ships

3.4.1. General requirements

118. Port authorities and operators should provide safe access through port areas to and from ships. This should normally be by means of clearly signed, marked and lit walkways.

119. Port plans should be displayed at all entrances to port areas and elsewhere as necessary to enable crews and others to reach ships safely. "No-walk" zones should be clearly identified.

120. If ships berth at quays where pedestrians are prohibited, notices should be displayed at port entrances and alongside ships' gangways giving appropriate instructions. The notices should contain information about the necessary arrangements for obtaining safe transport through the port areas. Signage

design should take into account that the working language of a ship's crew often differs from that of the port facility.

121. In some circumstances the shoreside provides access to ships. Such means of access include passenger walkways and access towers to large ships. In all such cases the shore owners and operators should ensure that the equipment is of good design and construction, properly installed and maintained in a safe condition.

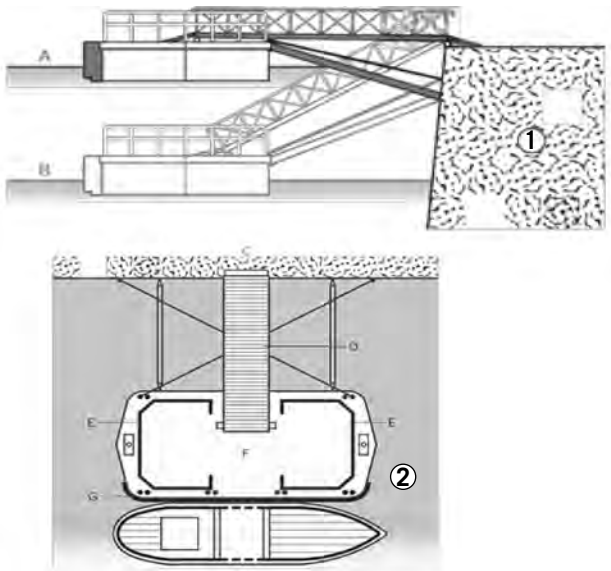
3.4.2. Shore ramps and passenger walkways

122. Shore ramps may be necessary to provide access from shore to ships (figure 11), particularly ro–ro ships, or to floating landing stages and pontoons.

123. Shore ramps include all linkspans and brows (figure 12). Linkspans may include some form of lifting appliance that raises or lowers the roadway as necessary. Brows do not include any mechanically operated lifting appliance and are only used by pedestrians.

Figure 11. Linkspans and walkways

Figure 12. Pontoon landing stage with linkspan or brow



1. Elevation. 2. Plan
A. High tide. B. Low tide. C. Embankment or quay.
D. Linkspan or brow. E. Fencing. F. Pontoon. G. Fender.

124. Passenger walkways should generally be separate from vehicle linkspans. If passenger walkways are combined with a vehicle linkspan, the walkways should be separated from the roadway, preferably by a robust fence.

125. All shore ramps and passenger walkways should be designed, constructed and installed in accordance with the relevant national legal requirements.

126. The design of shore ramps and passenger walkways should:

- cater for the maximum likely movement resulting from the tidal range, and ranging and drifting of the ship or pontoon at its moorings;
- cater for the maximum forces to which they may be subjected during mooring;
- recognize that they are likely to be subjected to forces in all three planes and torsional forces;
- include safe access to all points to which access is necessary for routine maintenance and inspection; and
- include transition flaps at their ends, as necessary.

127. Pontoons supporting shore ramps or passenger walkways should be designed to be as steady as practicable in all weather and tide conditions.

3.4.3. Landing stages

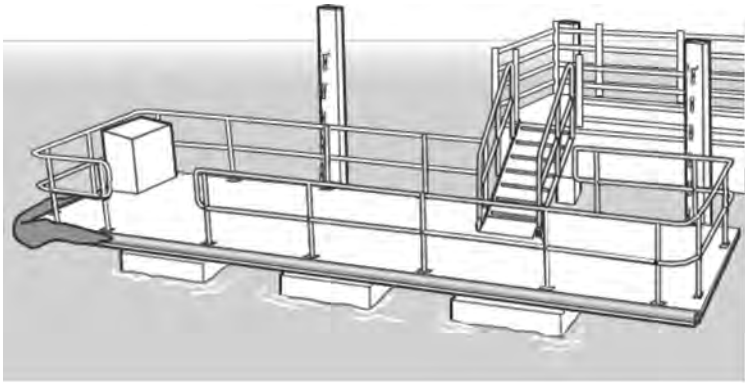
128. Landing stages should be fenced by fixed railings in a contrasting colour (figure 13). A gap of not more than 2 m may be left in the railings to permit embarking and disembarking. Hinged or movable railings or chains should be provided to bridge this gap when it is not in use.

129. Landing stages should be provided with suitable bollards, cleats or other arrangements of adequate strength to which ships may be made fast.

130. Landing stages and other pontoons should be provided with hanging chains for the support of persons in the water.

131. Appropriate lighting should be provided at all landing stages that are used during the hours of darkness (see section 3.1.3).

Figure 13. Fencing of pontoon landing stage
(for clarity, closure not shown)



132. A lifebuoy with a line should be available on the landing stage.

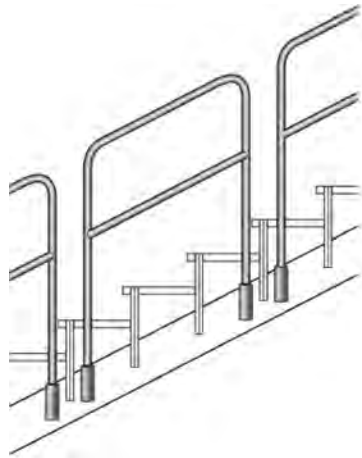
3.4.4. Steps and stairways

133. Steps and fixed stairways providing access from the water should extend at least 1 m below the lowest level of the water in the dock basin at any time or to the bed of the dock if there is less than 1 m of water at low tide.

134. Stairs and fixed stairways giving access to harbour craft should be equipped with wooden or rubber fenders. The gap between the side of the steps and the side of any craft should not exceed 300 mm unless a gangway is used for access.

135. Steps and fixed stairways should be constructed so as to minimize the accumulation of mud, dirt, marine growth or other matter that is likely to make them slippery. This can be achieved by the use of gratings or anti-slip finishes on treads.

Figure 14. Moveable fencing on steps



136. Fixed handrails should be provided on the landward side of all steps and fixed stairways. Fencing (see section 3.3.4) should be provided where necessary on the water side of all fixed stairways (figure 14). Sections of such fencing may be removable if necessary.

137. Appropriate lighting should be provided at all steps and fixed stairways that are to be used during the hours of darkness. If the general port lighting is not adequate, additional lighting on the steps should be provided (see section 3.1.3).

3.4.5. Quayside ladders

138. Quayside ladders (see section 3.3.5) may be used for access to small ships such as fishing vessels.

139. Where quayside ladders are regularly used for access to small ships, additional ladders may be necessary. Suitable bollards, mooring rings or other facilities should be provided to

which ships may be made fast to prevent the ladders being used for mooring purposes.

3.5. Access to terminal buildings, structures and plant

3.5.1. General requirements

140. The requirement to provide safe means of access applies to all places to which persons in ports need to go in the course of their work. It includes permanent and temporary means of access to all parts of buildings, structures and mobile plant.

141. Permanent fixed access should be provided to all places to which persons have to go regularly, including the cabs of mobile plant.

3.5.2. Stairways and steps

142. All stairways and steps in buildings should comply with national legal requirements.

143. The open sides of stairways and steps should be protected by suitable fencing. This should at least have a top rail 1 m above the treads of the stairs and one intermediate rail.

144. A handrail should be provided on both sides of a stairway. This can be the top rail of the fencing. An additional intermediate handrail should be provided on stairways that are 2 m or more in width.

145. The treads of stairways should have a slip-resistant surface.

146. All stairways and steps should be maintained in a safe condition. Wear-resistant nosings that can easily be replaced when necessary should be used at the edges or noses of treads of stairways that are liable to considerable wear. Care should be taken to ensure that such nosings do not project significantly in front of steps or work loose to become a danger.

3.5.3. Fixed ladders and walkways

147. All fixed ladders should be of steel construction *(see also ISO 141224–4 safety of machinery – Part 4: fixed ladders)*.

148. Rungs or treads of ladders should:

- be equally spaced at intervals of not less than 250 mm or more than 350 mm;
- provide a foothold not less than 150 mm deep and 350 mm wide;
- be horizontal; and
- if double rungs, be fitted on the same horizontal level with a clear gap of not more than 50 mm between them.

149. The stringers or uprights of ladders should:

- be smoothly finished;
- be in one continuous length where possible; if a join is necessary and a fishplate is used, it should be fitted on the inside of the stringers;
- be adequately supported from the structure at suitable intervals;
- extend at least 1 m above the landing place (figure 15); if this is not practical, an adequate handhold should be provided above the platform;
- be opened out above the platform to give a clear width of 700 to 750 mm to enable a person to pass through them (figure 16);
- be connected at their upper extremities to the guard rails of the landing platform or given other support as necessary; and
- have a clear space of not less than 75 mm on each side for the user's hand.

Figure 15. Vertical ladder through opening (figures may not show all appropriate safety equipment and are for illustrative purposes only)

150. Where a landing platform is provided, it should:

- have a minimum dimension of 750 mm in either direction not less than 1 m above the floor of the platform enabling a person to stand safely on the platform;
- be protected on any open side by a rigid guard rail 1 m above the platform, an intermediate rail 500 mm above the platform and a toe board extending to a height of not less than 150 mm above the floor of the platform;

Figure 16. Vertical ladder rising above edge

- have a floor with a non-slip surface; and
- have a minimum headroom of 2.1 m.

151. A vertical ladder more than 3 m high should be fitted with guard hoops that should:

- be uniformly spaced not more than 900 mm apart;
- have a clearance of 750 mm from the rung to the back of the hoop;

- be connected by vertical strips secured to the inside of the hoops, the strips being equally spaced around the circumference of the hoop; and
- hoops should start not more than 2.2 m above the ground.

152. A vertical ladder more than 6 m high should be provided with suitable intermediate platforms at intervals of not more than 6 m.

153. A sloping ladder should not have a slope of more than 25° to the vertical.

154. A sloping ladder with a slope of more than 15° to the vertical should be provided with:

- treads or pairs of rungs. The front of a tread should overlap the next tread by at least 16 mm. Double rungs should be on the same horizontal level with a clear gap of not more than 50 mm between them;
- suitable handrails not less than 540 mm apart, measured horizontally; and
- suitable guard hoops as for fixed ladders but with a clearance of 1 m from the front of the tread to the back of the hoop measured at right angles to the axis of the ladder.

155. All ladders and landing platforms should be adequately lighted whenever the ladder is in use.

156. Fixed walkways adjacent to roofs of fragile material should be securely fenced (see section 3.3.4).

157. Suitable warning notices prohibiting access to such roofs other than by crawling boards or other appropriate equipment should be displayed.

3.5.4. Portable ladders

158. Every portable ladder should be of sound material (rigid wood or metal, usually aluminium alloy), of good construction, of adequate strength, properly maintained and clearly identifiable, and inspected at suitable intervals by a responsible person. If dangerous defects are found, the ladder should immediately be taken out of service. Appropriate records should be kept of all inspections and repairs.

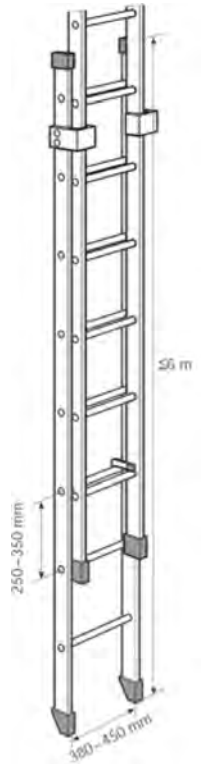
159. Every portable ladder (figure 17) should:

- have rungs equally spaced apart at intervals of not less than 250 mm or more than 350 mm;
- have rungs of a width between its uprights of not less than 380 mm or more than 450 mm;
- not exceed 6 m in a single length;
- not have more than two extending sections;
- if an extension ladder, be equipped with suitable guide brackets and an effective locking device so that each extension is securely held and locked in the desired position;
- if extended by ropes, have ropes that are securely anchored and run over pulleys having a groove suited to the rope size; and
- not exceed 15 m in length when extended.

160. The rungs of a lightweight portable metal ladder should be:

- of adequate diameter (not less than 20 mm);
- secured to the uprights in such a way as to ensure that they do not turn or otherwise work loose; and
- corrugated to minimize the danger of a person's foot slipping.

Figure 17. Dimensions of portable ladders



161. The uprights of a lightweight portable metal ladder should be:

- made in one continuous length;
- of sufficiently large cross-section to prevent dangerous deflection of the ladder in use; and

- fitted with non-slip shoes or other suitable means of reducing to a minimum the likelihood of the ladder slipping.

162. A wooden ladder should:

- have uprights made of suitable wood with the grain running lengthways;
- have rungs properly secured to the uprights; nails or spikes should not be used;
- not be painted, but may be treated with a clear varnish or other effective preservative of a type that will not conceal any defect that would otherwise be visible; and
- be provided with a sufficient number of metal cross-ties, where necessary.

3.5.5. Rope ladders

163. Rope ladders should not be used to provide access to places on shore.

3.5.6. Lifts

164. All lifts should comply with national legal requirements and be clearly marked with their maximum capacity. In passenger lifts this should be expressed in terms of both weight and the maximum number of persons.

165. At least one emergency stairway should be provided at each group of lifts.

166. Passenger lifts should be installed to provide access to the cabs of all new container quay cranes and similar large structures such as some large bulk-handling equipment. The installation should include provision for the rescue of any person in the lift in the event of a power failure or other emergency.

3.6 Terminal plant and equipment

3.6.1. General requirements

167. All terminal plant and equipment should be of good design and construction, of adequate strength, suitable for the purpose for which it is used, and maintained in a safe and efficient condition. The maintenance should be carried out on a planned preventative basis. Any modification to plant or equipment should not be carried out without the competent authority or manufacturer's advice.

3.6.2. Mobile equipment

168. Mobile equipment used in ports, including various types of vehicles which are one of the most common elements in fatalities and serious injuries in ports, should be properly maintained and kept in good order. Special attention should be paid to the maintenance of brakes and braking systems.

3.6.2.1. Internal movement vehicles

169. Internal movement vehicles (vehicles that only work within a port or belong to the ship), including skeletal trailers, should comply with appropriate minimum standards for construction and maintenance, particularly with regard to such items as tyres, brakes, lights, steering, warning signals and general vehicle safety.

170. Cargo-handling vehicles should have a high degree of stability under working conditions.

171. Vehicles should be conspicuously painted or marked and fitted with a flashing or rotating yellow beacon.

172. Safe access should be provided to the driver's cab and to other parts of the vehicle as necessary.

173. Drivers' cabs on vehicles should provide protection from adverse weather conditions, including climate control

equipment, and have good all-round visibility, with minimal obstruction of the driver's view. Where vehicles have blind spots and there is a risk of injury, closed-circuit television or other suitable detection device should be considered.

174. All exposed dangerous parts of vehicles, such as power take-offs, chain drives and hot exhausts, should be securely guarded.

175. Vehicles, including trailers used to transport containers, should be constructed in such a way that the containers are supported by their corner fittings or other parts designed for that purpose. Containers should not be supported on their side rails.

176. Consideration should be given to the fitting of speed limiters to heavy-duty tractors and other plant for handling containers or similar large cargo.

3.6.2.2. Visual display screens in vehicles

177. Visual display screens in vehicles should be fitted in a location that is not prone to glare and reflection, and will provide the minimum distraction to the driver of the vehicle while it is moving but still be easily readable. The display should be kept concise and require as little interaction from the driver as possible when the vehicle is moving.

178. Any acknowledgement required from the driver should be simple and, where possible, interaction should only require the operation of a simple button, switch or touch screen.

179. Logistical systems should be designed so that any data input or complex keyboard operation by the driver can be carried out while the vehicle is stationary.

3.6.2.3. Skeletal trailers

180. Trailers used in port operations should be constructed so as to be able to withstand the continuous impacts when loaded by cranes or other container-handling equipment.

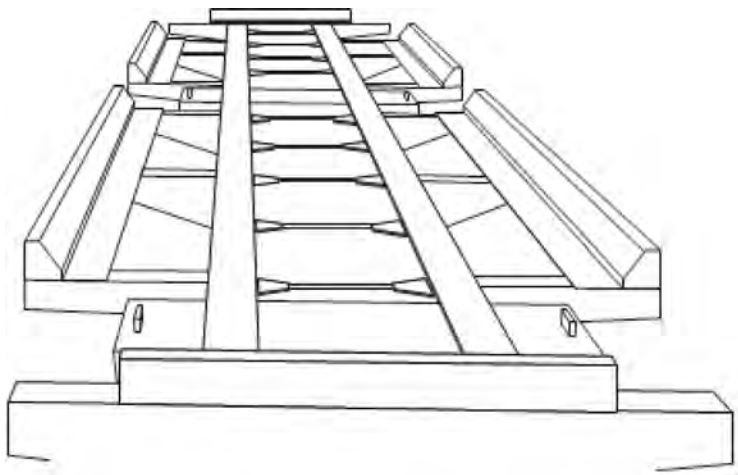
181. The safe working load (or maximum load rating) of trailers should be adequate for their use. Trailers used in container terminals may need to be constructed for a maximum load rating in excess of 50 tonnes.

182. Where trailers operate at night or in poorly lit areas, lighting and adequate reflectors for the trailers should be considered. Consideration should be given to light-emitting diode (LED) lighting systems. These have greatly improved lighting efficiency and are not prone to loading impact damage.

183. All trailers should be fitted with devices to secure or retain loads on them.

184. Skeletal trailers should be designed to prevent any protruding parts of semi-automatic twistlocks (SATLs) from becoming lodged beneath the trailer beam when lifted.

Figure 18. Container restraints on skeletal trailer



185. Trailers should preferably be painted a conspicuous colour or otherwise be conspicuously marked.

186. The braking systems on trailers should be compatible with those on the tractors that are to move them.

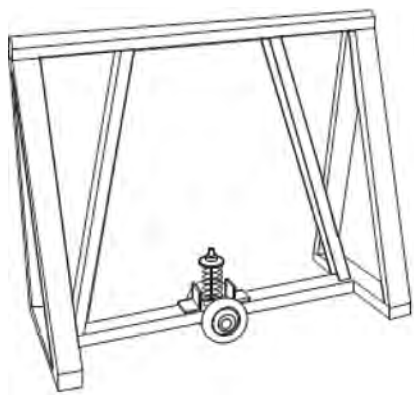
187. Trailers that do not have conventional twistlock securing devices, and are used in container terminals where loads travel only short distances at slow speeds without negotiating sharp bends on roads, should be fitted with substantial corner plates or other restraints of sufficient height to retain the load in position (figure 18).

3.6.2.4. Trestles

188. Trestles (figure 19) should be used to support trailers that are not attached to other vehicles when the trailers are:

- laden;
- being loaded or unloaded by a lift truck from a loading bay; and

Figure 19. Trestle



- stowed on board ship.

189. The correct type of trestle with adequate strength and height adjustability for the task should be selected.

190. Trestles should preferably have wheels or rollers so that they can easily be moved. Wheels or rollers on heavy duty trestles can be spring-loaded and not load-bearing when in use.

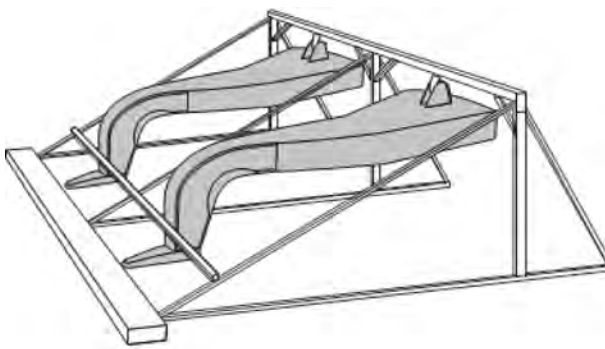
191. Trestles should be regularly inspected and maintained.

3.6.2.5. Goosenecks

192. All goosenecks should be regularly inspected and properly maintained, particular attention being given to the wear of the kingpin and the squared-off edge of the toe plate. A gooseneck with a missing or damaged toe plate should not be used.

193. Storage frames for goosenecks (figure 20) should be located so that tractor units do not have to emerge directly into a traffic stream when leaving the frame.

Figure 20. Storage frame for goosenecks



194. Storage frames for goosenecks may restrain them between vertical frames or by a shoe over the toe. Both are prone to damage and should be inspected and maintained accordingly.

195. Many roll trailers have attachment arms suitable for laden and unladen conditions. Goosenecks may be modified or purchased with corresponding attachment lugs to ensure improvement of security, particularly when pulling up gradients.

3.6.2.6. Roll trailers and cassettes

196. Port operators should ensure that arrangements with roll trailer and cassette owners include procedures for their inspection and maintenance.

197. Roll trailers, and cassettes (used for forest products), should always be stored on firm and level ground.

3.6.2.7. Hand trucks and trolleys

198. Hand trucks used for transporting gas cylinders, carboys or similar objects should be designed and constructed for that specific purpose.

199. Hand trucks or trolleys used on slopes should be provided with effective brakes.

200. If it is advisable to prevent hand trucks and trolleys from moving when they are left standing, they should be provided with effective handbrakes, chains or other appropriate devices.

201. Three-wheeled or four-wheeled hand trucks should be provided with spring clips or other locking devices by which the handles can be secured in an upright position. Portworkers should be required to use these devices when the trucks are stationary.

202. Handles of hand trucks and trolleys should be designed to protect the hands of the user. This may be by the provision of knuckle-guards.

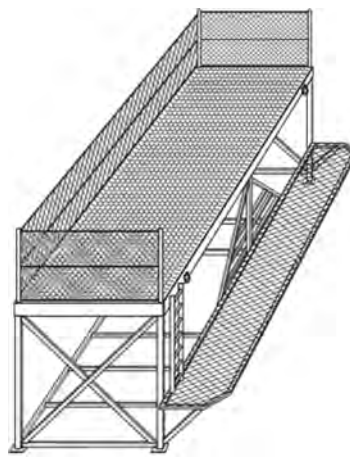
3.6.2.8. Cargo platforms

203. Cargo platforms should be robustly constructed of sound metal or wood. If the platforms are designed to be movable, perforated sheeting, expanded metal or metal grating should be used to minimize the weight of the platform. Platforms should be designed to bear the weight both of the loads to be made up or received and of the workers. A factor of safety should be allowed for the dynamic loads that will occur when cargo is landed on them.

204. Cargo platforms (figure 21) should be:

- adequately supported and, where necessary, securely fastened;
- of sufficient size to receive cargo and to ensure the safety of persons working on them;

Figure 21. Cargo platform



- provided with safe means of access, such as ladders or steps;
- securely fenced (see section 3.3.4) on any side that is not being used for receiving or delivering cargo, if the platform is more than 1.5 m high; and
- maintained in good repair.

205. Any portable trestles used to make up cargo platforms should be so placed as to be steady.

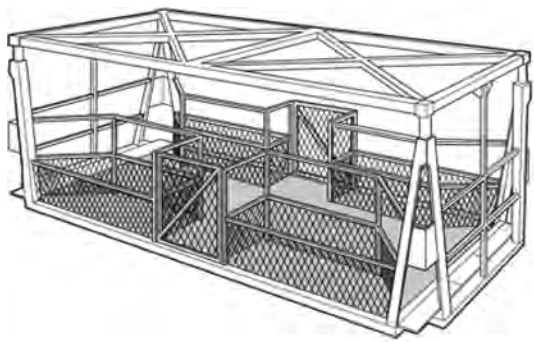
206. Cargo platforms should not be overloaded.

207. Hatch covers should not be used in the construction of cargo platforms.

3.6.2.9. Access or lashing cages

208. The framework of most access or lashing cages (figure 22) is similar to that of an ISO container. The location of corner fittings in the top framework should conform to ISO 668 *Series 1 freight containers – Classification, dimensions and ratings* to enable the cage to be lifted by a container spreader.

Figure 22. Access or lashing cage



209. Most cages are 20 or 40 feet long (6.1 m or 12.2 m) but some telescopic cages have also been built. Smaller cages, sometimes known as gondolas, are used for work in narrow aisles between stacks of containers.

210. Access or lashing cages should have:

- guard rails and toe boards (see section 3.3.4). The top rail should be recessed or an additional handrail provided inside the guard rail, in order to prevent hands being trapped between the guard rail and a container or other object. The distance between a handrail and guard rail should not be less than 90 mm in order to allow for workers wearing gloves;
- robust doors or gates that open inwards and are self-closing. Chains should not be used instead of doors;
- mesh or other suitable protection on the sides and ends of the cage to prevent accidental trapping;
- where practicable, protection from objects falling from above;
- suitable bins and hooks to stow equipment normally carried in the cage. Such equipment includes twistlocks and other inter-box connectors and twistlock poles. Covers for bins may form seats. The use of seats enables workers to be more stable during transfer to or from a quay;
- a secondary means of locking onto a spreader when the cage is in use (see section 7.8.3). The following possibilities may be considered:
  - manual attachment of a chain at each corner;
  - the use of hand-operated locking pins; or
  - provision of an additional automatically operated twistlock at both ends of the spreader; and

- a notice giving instructions for safe use.

211. The bottom corners of the cage may be recessed and the end of the cage floor may be hinged to allow safe access to twistlocks, etc., below the cage. Any area of floor where workers kneel should be suitable for the purpose and not of open-grid construction. A handrail should be provided in front of the kneeling position.

212. An emergency stop button should be provided, where possible.

213. Radio communication with the crane operator should be provided.

3.6.3. Conveyors

214. All dangerous parts of conveyor systems should be securely guarded. Enclosure of such parts also prevents the ingress of dust or other materials. The dangerous parts include:

- all drives;
- in-running nips between belts and end rollers or tension rollers;
- intakes between belts and other moving parts and stationary parts or other objects; and
- intake openings of blowers or exhaust fans for pneumatic conveyors.

215. Enclosure of intermediate lengths of belt conveyors is not always necessary but may be needed to protect the material being conveyed from the weather or from being stripped off by wind.

216. Horizontal conveyors at floor level should be protected by metal grating or otherwise guarded.

217. Emergency stopping devices should be provided at all workstations at power-driven conveyors. Trip wires should be

provided along the side of the conveyor where walkways are alongside them. These should operate stop switches fitted at intervals of not more than 50 m.

218. The controls of any system of two or more conveyors operated together should ensure that no conveyor can feed onto a stationary conveyor.

219. Conveyor systems started remotely should have audible or visual warning systems to warn workers that the system is about to start. Workers should be able to communicate with the control room. Closed-circuit video systems may be helpful.

220. Conveyor systems that can be started remotely or from more than one position should be fitted with lock-off switches in appropriate locations to protect persons cleaning or working on the system.

221. Provision should be made for the safe cleaning of conveyors and for clearing obstructions. Where appropriate, guards should be interlocked. A suitable time delay should be incorporated if the machinery has a significant overrun before stopping.

222. Walkways adjacent to open conveyors should be at least 1 m wide.

223. Suitably fenced bridges should be provided where it is necessary for workers to cross over conveyors.

224. Sheet or screen guards to catch any falling material should be provided at places where conveyors pass over workplaces or walkways.

225. Where the tops of hoppers feeding conveyors are less than 900 mm above the floor, the openings should be fenced.

226. The sides of conveyors moving solid objects should be at least 100 mm high, or half the height of the objects if greater.

227. Enclosed conveyors that convey flammable materials should be suitably explosion protected. This may be done by making the enclosure sufficiently strong to withstand and contain any explosion inside it, or by providing appropriate explosion relief venting to a safe place, preferably in the open air. The enclosure should include facilities to enable any fire in it to be tackled.

3.6.4. Electrical equipment

228. All electrical equipment and circuits should be so designed, constructed, installed, operated, protected and maintained as to prevent danger in accordance with national legal requirements. Where such requirements do not exist, reference should be made to the relevant recommendations of the International Electrotechnical Commission (IEC).

229. Suitably located efficient means for cutting off all electrical current from every part of the system should be provided as necessary and maintained in a state of good repair to prevent danger.

230. All non-current-carrying metal parts of electrical equipment should be earthed, or other suitable measures taken to prevent them from becoming live.

231. All conductors should be suitably insulated and installed to prevent danger. Cables should be installed so as to be protected against being struck by moving loads.

232. Electrical equipment that will be exposed to wet or dusty conditions should be so constructed as to be suitable for use in such conditions.

233. Electrical equipment for use in places where a potentially explosive atmosphere is likely to occur should be constructed so as to be not liable to ignite that atmosphere. It may

be possible to construct electronic and similar equipment so as to be intrinsically safe and unable to ignite the atmosphere. Other electrical equipment should be pressurized or otherwise explosion-protected to a standard appropriate for use in that atmosphere.

234. Portable floodlights, and hand lamps in particular, should be powered as far as possible from a low-voltage circuit. The voltage should not exceed 42 volts between conductors, or 24 volts between phase and neutral in the case of three-phase circuits. In accordance with the recommendation of the IEC, the no-load voltage of the circuit should not exceed 50 volts in the first case and 29 volts in the second.

3.6.5. Hand tools

235. All manual and power-operated hand tools should be of good material and construction, and maintained in a safe condition.

236. Hand tools, including those which are owned by individual workers, should be periodically inspected by a competent person. Defective tools should be immediately replaced or repaired.

3.6.6. Machinery

237. All dangerous parts of machinery and pipes containing hot fluids, including those in places where only maintenance personnel work, should be securely guarded unless their position or construction makes them as safe as they would be if they were securely guarded. Dangerous parts of machinery include motors, gears, chains, wheels and shafts.

238. Guards should be of rigid metal or other material capable of withstanding the corrosive effects of the marine environment. Wood is liable to rot and is generally not suitable.

239. Guards that are not an integral part of a machine should be securely fastened in position to prevent unauthorized removal.

240. Machinery should be designed to come to a stop if a guard that is necessary is removed. Devices ensuring this should fail to safety. Limit switches should be positively operated so as to be driven to the open position.

241. Every machine should have a stop control next to the operator's position.

242. Pipes that are likely to reach temperatures above 50°C should be insulated.

3.6.7. Mooring dolphins and bollards

243. Safe access should be provided to all mooring dolphins and bollards.

244. A ladder from the water should be provided at all dolphins.

245. All dolphins and any walkways between them should be fenced (see section 3.3.4) as far as is practicable.

246. Appropriate life-saving equipment should be provided on or immediately adjacent to mooring dolphins.

247. Where appropriate, bollards should be clearly marked with an identification number. This should be clearly visible to mooring parties both on shore and on ships.

248. The ground around all bollards should be maintained in a sound and level condition, clearly marked, lit and kept free of obstructions.

249. The adequacy of available mooring facilities should be reviewed when changes are proposed to the type or size of ships to be handled in a port.

3.6.8. Vehicle sheeting facilities

250. Suitable vehicle sheeting facilities should be provided at ports where it is necessary to sheet or unsheet vehicles, and this cannot be carried out from the ground.

251. The simplest sheeting facilities consist of two platforms between which the vehicle can be driven (figure 23). The platforms should be of the same height as the bed of most freight vehicles. The outer edges of the platforms should be fenced (see section 3.3.4) and steps for access should be provided at each end.

252. Sheeting platforms may be built as permanent structures or designed to be dismantled and re-erected elsewhere.

3.6.9. Other equipment

253. All storage racks should be of good robust construction and of adequate strength. The racking should be cross-braced

Figure 23. Vehicle sheeting platform

and firmly secured to the ground or other substantial structure to prevent collapse or overturning.

254. The racking should be clearly marked with its maximum safe load, where appropriate.

255. The construction of the rack and the weight and nature of the goods to be kept in it should be considered when determining the height/base ratio of racks.

256. Where mechanical handling equipment is used to load and unload racking, protection should be provided for exposed uprights of the racking in order to prevent damage to them that could result in the collapse of the racking. Protection of uprights at corners is particularly important.

3.7. Bulk cargo terminals

3.7.1. Bulk solids

257. Special consideration should be paid to the stresses set up by solid bulk materials, and transmitted to the walls and foundations of structures. The walls of quays, bins and rooms where such materials are kept have all been known to collapse, particularly if heavy materials such as scrap are kept near the edge. The weight of cargo-handling vehicles that will be used in the area should be included in calculations.

258. Steps should be taken to prevent or minimize the escape of dust when solid bulk materials are being handled (see section 6.19 and Chapter 9). These may include enclosure of handling equipment such as conveyors, suction legs and elevators.

259. Plant handling solid bulk materials should be explosion-protected, as necessary. Buildings in which such plant is located should be kept clean at all times.

260. Pits from which elevator systems are fed and into which persons could fall should be securely fenced (see section 3.3.4).

261. Doors on upper access compartments of silos should be interlocked with the feed to stop the filling of the compartments as soon as an access door is opened.

3.7.2. Bulk liquids and gases

262. All bulk liquid and gas installations should be located and laid out in accordance with national legal requirements and national and international industry standards and codes of practice, such as the IAPH/ICS/OCIMF *International Safety Guide for Oil Tankers and Terminals* (ISGOTT). Particular attention should be given to the location and nature of neighbouring premises, the potential effects of shipping that may pass the installation and the prevention of pollution from leakages or spillages.

263. An isolating valve should be installed in pipelines at the foot of each jetty and close to each cargo-loading arm. Where appropriate the valve should be able to be operated remotely in the event of an emergency (see section 6.11).

264. The safe operating envelope within which cargo loading arms can be safely operated should be established.

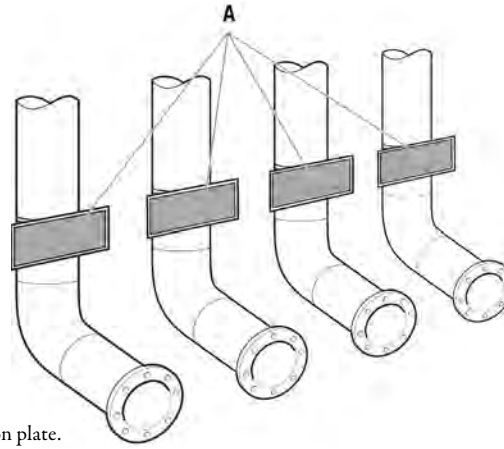
265. All hoses should be tested and thoroughly examined periodically, in accordance with the manufacturer's and industry's recommendations.

266. All shore pipelines to which cargo hoses can be connected should be clearly identified (figure 24).

267. Electrical equipment at berths where bulk liquids are handled should be of appropriate explosion-protected construction for the cargoes to be handled.

268. An international ship–shore connection (see section 3.1.4.4, paragraph 43) enabling shore fire mains to be connected to the fire main on a ship should be provided at all tanker berths.

Figure 24. Identification of shore pipelines



A. Identification plate.

3.8. Container terminals

3.8.1. Definitions

269. The following definitions apply to container terminals and to the handling of containers in ports:

- *Avenue* is a marked access route within a container stacking area for movement of transfer and stacking equipment between storage blocks. May also be referred to as an "aisleway".
- *Block* is a rectangular marked and identified storage area within a stacking area for stacking designated groups of containers. A block is divided into rows by aisles.
- *Container-handling area* is the entire area in which containerized cargo is handled or stacked.

- *Control centre* is the administrative office from which port operational activities are controlled, usually by direct radio or computer communications.
- *Grid* is part of a container terminal to which access by road vehicles is permitted in order to deliver containers to, and collect containers from, container-stacking areas. Also referred to as an "interchange area".
- *Stacking area* is a storage area of a port behind a quay, in which containers are stacked to await onward movement. Also referred to as a "container yard".
- *Straddle carrier* is a tall, wheeled frame, wide enough to move astride a container and lift it by means of a suspended spreader; used for stacking and transferring containers.
- *Slot* is a clearly marked-out sub-area of a grid in a container-handling area, just sufficient in size to accommodate one road vehicle of maximum size; or an individual storage location on a container ship, e.g. a cell in a cell guide storage system, uniquely numbered for identification. The term is also used to identify a specific bay and row on a container ship.

3.8.2. General requirements

270. Container terminals should be laid out and organized in such a way as to separate persons on foot from vehicles, so far as is practicable.

271. Runways of rail-mounted or rubber-tyred gantry cranes should be clearly marked on the ground. It should not be possible to confuse the markings with those of a safe walkway.

3.8.3. Segregation

272. Except at the quayside, the operational areas of a container-handling area should be enclosed by a fence at least 2 m

high, or other suitable means, to separate it from other activities in the port and prevent unauthorized entry. The fence should be of chain-link mesh or other suitably strong permanent construction.

273. Arrangements should be made to ensure that persons who need to enter the operational areas are able to do so safely. This may be achieved by the provision of clearly marked walkways that do not enter container-stacking areas or cross vehicular traffic routes, or by the provision of transport to their destination. Particular attention should be given to the need for access to ships at berths by ships' crews, mooring parties, pilots and other persons, and to blocks of refrigerated containers by refrigeration engineers.

274. Traffic routes in container handling and container-stacking areas should be laid out to be one-way, as far as it is practical to do so. Traffic lights should be provided, where necessary.

275. If walkways necessarily cross traffic routes, appropriate markings and signs should be provided on the walkways and traffic routes to warn both pedestrians and drivers. Where traffic lights are provided, they should give precedence to vehicles.

276. The need for the vehicles of hauliers to enter container-stacking areas should be avoided as far as is practicable. This may be done by the provision of exchange grids where vehicles are loaded or unloaded, for example by straddle carriers.

277. Each container block and row should be clearly identified by markings on the ground or elsewhere. The markings should be maintained so as to be clearly visible to vehicle and crane operators at all times.

278. Obstructions in container-stacking and container-handling areas should be kept to a minimum. Any lamp standards

or other obstructions that are necessary in such areas should be protected by robust fencing that is clearly visible.

3.8.4. Reception facilities

279. Suitable facilities should be provided at the road entrances and exits to and from container-handling areas for checking of documents and the integrity of containers, including seals.

280. The building should preferably be designed so that the checker's window is at a convenient height for the drivers of container vehicles to permit the exchange of documents without the need for the driver to leave the cab of the vehicle.

281. The provision of suitable gantries at entrances and exits enables containers to be examined for security purposes and to be checked for roof and/or upper corner fittings damages, twistlocks or other objects that have been left on the top of a container and could later fall off (figure 25). Mirrors and video cameras can also be used for these purposes.

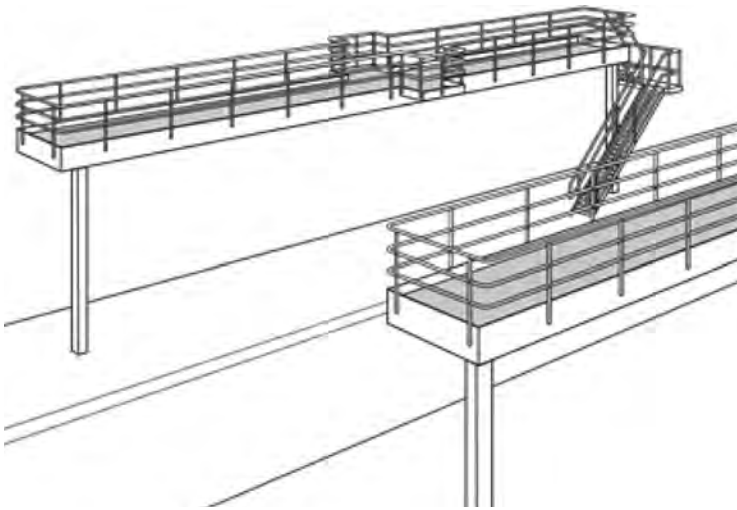
282. Passengers in container vehicles should be prohibited from entering container-handling areas. A suitable room or area should be provided where passengers can await the return of the vehicle from the container-handling area.

283. A suitable area should be designated and clearly identified where vehicle twistlocks can be released in safety.

284. Suitable, clearly signed and marked parking areas should be provided if vehicles are expected to have to wait for significant times. If a parking area is situated at the side of a roadway, it should be sited so as to ensure that parked vehicles will not obstruct or restrict vision from vehicles on the adjacent roadway.

285. Clearly marked walkways should be provided from parking areas to welfare facilities or other areas or buildings which drivers may need to visit.

Figure 25. Gantry for checking containers



3.8.5. Control rooms

286. Control rooms for container-handling areas should have a good overall view of the area.

287. An efficient clear communication system should be provided between control and all terminal vehicles. In order to minimize distractions to other drivers, the communication system should allow control to communicate with specific vehicles, rather than all vehicles all the time.

3.8.6. Grids

288. Suitable grids should be provided where straddle carriers are used to load or unload containers onto or from road vehicles.

289. The grids should be clearly marked and laid out in parallel or echelon formation with centres not less than 6 m apart.

290. Where practicable, the traffic routes for road vehicles and container-handling equipment should be laid out for a one-way traffic flow. Where this is not practicable and road vehicles have to reverse into a slot on a grid, the manoeuvring area should be sufficiently large to enable this to be carried out safely.

291. A safe area where drivers of road vehicles can stand while containers are being lifted onto or off their vehicles should be provided and clearly marked. The safe area should be located so that persons in it are clearly visible to drivers of straddle carriers as they approach it. If the area is located between slots, the size of the area should be determined in the light of the grid layout, the width of the straddle carriers and other relevant operational factors.

3.8.7. Reefer (temperature-controlled containers) storage areas

292. An area within the container storage area should be reserved only for reefer containers.

293. Stacked reefer containers should be rendered accessible for plugging/unplugging by the installation of permanent elevated platform structures that are guarded and sufficiently lit. The use of portable ladders to plug/unplug reefers should be avoided.

294. The electrical units into which reefers are plugged should be designed to ensure that portworkers are not exposed to any electrical arcs or explosions during the plugging/unplugging operation.

295. Proper PPE, such as face shields and special insulating gloves, should be worn by portworkers assigned to plug/unplug reefers. Reefers should only be plugged in or unplugged by trained portworkers.

296. The electrical system of reefer containers should be inspected for any damage or build-up of moisture before plugging/unplugging them. Portworkers assigned to that task should be sufficiently trained to detect any defects.

3.9. Passenger terminals

297. Special attention should be paid to the need to ensure the safety of passengers at cruise ship and ferry terminals.

298. Passenger access and exit routes should be clearly marked and laid out in accordance with national legal requirements. Internationally recognized visual symbols should be used.

299. Routes for foot passengers should be segregated from vehicle routes.

300. Areas to which the entry of passengers is prohibited should be clearly marked.

301. All public areas, walkways, ramps, lifts, bridges, etc., used by passengers should be clearly marked with any relevant weight or other limitations.

302. Access by passengers to the controls of ramps or other equipment should be prevented.

303. Passenger ramps that telescope mechanically to or from ship should be designed to prevent any activation in the event that the ramp is occupied by any person and/or vehicle.

304. Appropriate facilities for the safe handling of passenger luggage should be provided. Where necessary, this should include facilities for security examination.

3.10. Roll-on–roll-off (ro–ro) terminals

305. Ro–ro terminals should be fenced off whenever practicable, with access controlled at suitable gates or barriers to prevent unauthorized access.

306. Ro–ro traffic should be controlled by road traffic signs, road markings and appropriate speed limits, as necessary. Speed limit signs should be repeated at appropriate intervals.

307. Traffic signs and road markings should conform to national road traffic requirements. Pictorial signs should be used whenever they are permitted, particularly in ro–ro terminals handling international services where the national language may not be the first language of many drivers.

308. Signs reminding drivers of the side of the road on which they should drive should be displayed at ro–ro terminals handling services from countries that drive on different sides of the road or that are near other countries that do so.

309. Suitable parking areas should be provided for vehicles waiting to board ships.

310. Trailer parks should be provided for unaccompanied ro–ro traffic. These should be separate from the holding or parking areas for accompanied ro–ro traffic.

311. Trailer parks should be laid out with a one-way traffic system, whenever practicable.

312. Pedestrian walkways between holding or parking areas and personal welfare facilities, and between coach parks and passenger terminals, should not cross road traffic routes. Any crossing that is necessary should be at right angles to the traffic route, and clearly marked and signed to warn both pedestrians and vehicle drivers. Traffic lights may be necessary at crossings from coach parks or other places that are frequently used by significant numbers of pedestrians.

313. At terminals where there are a number of ro–ro berths, each berth should be clearly numbered or otherwise identified.

314. The shore approaches to ramps of ro–ro ships should generally include a clear area of at least 35 m radius from the

end of the ramp. This area should be clearly signed "Keep clear" and marked with cross-hatched yellow lines or otherwise in accordance with national requirements. Where this is not practicable, temporary signs should be used.

3.11. Warehouses and transit sheds

315. All areas and buildings where goods are kept should be designed and constructed in accordance with national legal requirements. These should take into account the possible need for water sprinklers in a building and any regional climatic factors, such as the need for additional ventilation or insulation, the need to allow for snow loadings on roofs, etc.

316. All floors should be designed with adequate strength to support the maximum load of the goods and the handling equipment that are to be used on them. The design should take into account dynamic forces that may result from the landing of loads and the operation of handling equipment, as well as the static forces. If the maximum permitted loading is less than that generally permitted in the port areas, the limit should be clearly shown on prominent notices.

317. Balconies on which goods are landed on the outside of multi-storey buildings should be about 2 m wide. If there are separate balconies at individual openings, each should be at least 4 m long and 1 m longer than the width of the opening.

318. Storage areas should be laid out with suitable traffic lanes. These should have adequate clearances to permit the safe use of the relevant handling equipment.

319. Aisles should be clearly marked off with continuous yellow lines.

320. Where vehicles are driven into warehouses or sheds, there should be adequate clearance between the vehicle and any

goods it may be carrying and the sides and tops of the entrances. If there is only limited clearance, the edges and top of the openings should be clearly highlighted by alternate black and yellow diagonal stripes or otherwise. Top markings are particularly important if lift trucks are used. There have been a number of fatalities at entrances with limited clearance when the top of the entrance has been struck by the mast of a lift truck being driven with the mast partially raised. If the width of the entrance is restricted, pedestrians and vehicles should be separated by the provision of a separate door for pedestrians. The routes for pedestrians and vehicles should be indicated by appropriate signs.

321. Wherever practicable, stairs and lifts in warehouses should be located alongside a wall in order to minimize obstruction of storage space and access routes for cargo handling equipment.

322. All openings in floors and walls should be securely fenced (see section 3.3.4).

323. The covers of openings in floors should be robustly constructed and of adequate strength to support any persons or plant that may pass over them when they are closed. Loose sheets should never be used to cover openings in floors.

324. Handholds should be provided on each side of openings in walls, floors or roofs where fencing may need to be temporarily opened to permit the passage of goods.

325. Appropriate ventilation should be provided in buildings where vehicles with internal combustion engines are used or toxic, explosive or flammable goods are kept.

326. Bare crane conductor wires should not be installed in warehouses and transit sheds. A variety of fully insulated power supply systems are now available. Existing bare crane conductor

wires should be guarded or the height of stacks of goods limited to prevent danger. If access near to bare conductors is necessary, the conductors should be isolated.

327. All doors of refrigerated chambers in warehouses should be able to be opened from the inside at all times. A bell or other suitable means for summoning help in an emergency should be provided, where necessary.

328. In countries where there is a legal requirement to maintain the low temperature of some foodstuffs throughout the transport chain, it may be necessary to construct special intermediate doors at warehouse loading bays to maintain the low temperature during loading or unloading.

3.12. Gatehouses and quay offices

3.12.1. Gatehouses

329. Gatehouses should comply with the national legal requirements for offices, particularly those relating to overcrowding, cleanliness, lighting and ventilation. They should be built to accommodate people with disabilities and have or be near welfare facilities.

330. Particular attention should be paid to the ventilation of gatehouses. Of necessity, they are usually located on major traffic routes and so exposed to considerable quantities of vehicle exhaust emissions. Consideration should be given to installing positive pressure ventilation systems. These should take in clean air from an appropriate location and discharge it through the gatekeepers' grilles adjacent to the traffic.

331. The building should be constructed in such a way that the grilles through which gatekeepers need to speak or pass documents to visitors are at a convenient height for both the gatekeeper and the visitor.

3.12.2. Quay offices

332. Quay offices should comply with the national legal requirements for offices. They should be built to accommodate people with disabilities and have or be near welfare facilities.

333. Particular attention should be paid to the location of quay offices, particularly that of small temporary offices.

334. Quay offices should not be located where they are likely to be struck by passing cargo-handling equipment or by falling containers in the event of high winds.

335. Safe walking routes should be provided to all quay offices. Where appropriate, these should be clearly marked.

3.13. Port railways

336. Port railways should be constructed, equipped and operated so as to be compatible with relevant national legal requirements governing railways, where appropriate.

337. Specialized training of railway workers should be provided in accordance with national railway legal requirements, when appropriate.

338. Ground levers working points should be so placed that persons working them are well clear of adjacent lines and the levers cause as little obstruction as possible to any person who may be put at risk.

339. Point rods and signal wires should be covered or otherwise guarded, where this is necessary to prevent danger.

340. Warning signs and fencing around obstructions on port railways should be made conspicuous by painting or otherwise.

341. All warning signs and fencing around obstructions should be appropriately illuminated when port railways are operated during hours of darkness.

342. Fouling points beyond which vehicles should not be parked should be clearly indicated. They should be positioned at points where there is sufficient space for a person to pass safely between vehicles on one line of rails and vehicles on a converging line. Small markers at ground level are often used for this purpose.

343. Areas where railway wagons are parked should be as nearly level as practicable; any gradient on such lines should not exceed 0.5 per cent (1 in 200). If the line is a dead-end siding, any gradient should be down towards the buffers or end stops.

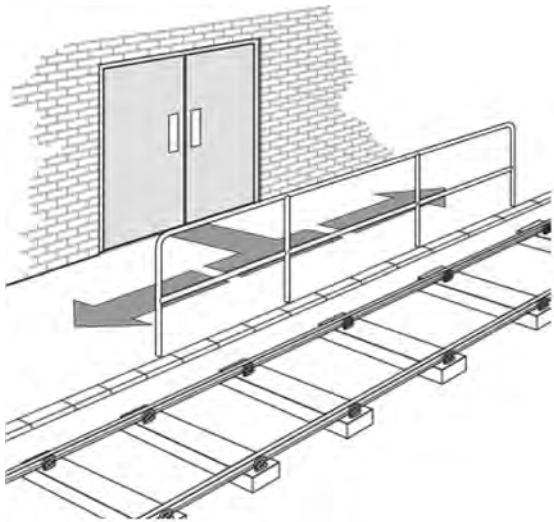
344. Working areas should, where applicable, comply with the provisions of sections 3.1.2 (Surfaces) and 3.1.3 (Lighting), and should be maintained in a sound condition, especially where rails run alongside the quay. Where practicable, the surface should be level with the tops of the rails.

345. Adequate clear space should be allowed between railway tracks and structures, piles of cargo or material traffic routes and walkways. This should allow for the width of railway wagons and should not be less than 2 m.

346. Workers should be protected against stepping onto the rail tracks in front of moving vehicles by suitable barriers and warning signs where buildings have exits opening directly onto port railway tracks, at blind corners and at other places where the field of vision is particularly restricted. Where practicable, this should be achieved by fixed railings across the direct route (figure 26). There should be a safe clearance between the railings and shunters or railway workers riding on rail vehicles.

347. Loading platform edges should be painted in a light coloured paint to highlight the drop in level or gap between it and a wagon, and the danger to both workers on foot and those

Figure 26. Protection of an exit from a building adjacent to a railway



operating vehicles on the platform. The paint should preferably be reflective.

348. Bridge plates spanning gaps between loading platforms and the floors of rail wagons (figure 27) should:

- be clearly marked with the maximum safe load to be carried;
- include positive stops or hooks to prevent slipping or other unintended movement;
- have non-slip surfaces;
- have toe boards at least 150 mm high at the sides; and
- have handholds or other appropriate devices by which they can be moved or lifted.

Figure 27. Bridge plate to rail wagon

349. Where necessary, an appropriate loading gauge should be provided before the exit from a port railway to the national railway system to detect oversize loads. For instance, in some countries 9 ft 6 in (2.8 m) containers can be carried on only a few rail routes.

3.14. Tenders and work boats

350. All tenders, work boats and other craft used for the transport of portworkers should comply with national legal requirements:

- regarding sound construction, stability and maintenance; and
- be equipped with life-saving, navigation and communications systems, first-aid and firefighting equipment.

351. All tenders and work boats should:

- be under the charge of a competent person, suitably qualified by a national authority and standards;

- be manned by an adequate and trained crew;
- display in a conspicuous place the maximum number of persons that may be carried; this should have been certified by a competent person;
- have sufficient seating accommodation for all persons that may be carried; and
- be fitted with fenders along the sides to prevent damage when alongside ships, buoys or elsewhere.

352. Tenders and work boats driven by mechanical power should have:

- bulwarks at least 600 mm high or rigid rails at least 750 mm high to prevent persons falling overboard;
- seating under cover for the maximum number of persons that may be carried;
- protection from the weather for the remainder of the persons wherever practicable;
- an appropriate number of suitable fire extinguishers;
- appropriate life-saving equipment; and
- not be undermanned, overloaded and/or overcrowded.

4. Lifting appliances and loose gear

4.1. Basic requirements

4.1.1. General requirements

1. Every lifting appliance and item of loose gear should be:

- of good design and construction, of adequate strength for its intended use and free from any patent defect;
- made to a recognized international or national standard;
- tested, thoroughly examined, marked and inspected in accordance with section 4.2; and
- maintained in good working order.

2. Occupational safety is affected not only by the design of lifting appliances but also by that of their accessories and other loose gear used with them. The proper design and maintenance of all of them are essential, since breakage of any of them may cause serious accidents. Deterioration may be visible, as when it starts from the surface, or concealed internally; in either case, the mechanical strength of the material is reduced.

3. Documentation (as appropriate) relating to lifting appliances should include:

- a driver's instruction manual;
- an erection manual;
- a maintenance manual;
- a spare parts manual;
- the manufacturer's certification of fitness for use;
- a certificate of test and thorough examination after initial erection;

- the manufacturer's certificates for wire ropes installed on cranes; and
- periodic examination and maintenance records.

4.1.2. Brakes

4. Every power-operated lifting appliance should be provided with an efficient brake or brakes capable of stopping a load while it is being lowered.

5. The brakes should normally be applied automatically when:

- the motion control lever is returned to its neutral position;
- any emergency stop is operated;
- there is any power supply failure;
- when an overspeed is detected; and
- in the case of electrically operated brakes, there is a failure of one phase or a significant drop in voltage or frequency of the power supply.

6. Band brakes generally act in a preferential direction and are sometimes jerky. They should only be used for emergency braking. Brakes with symmetrical jaws and two pairs of pivots have a gradual action.

7. A slewing brake should be capable of holding the jib stationary with the maximum safe working load suspended at its maximum radius when the maximum in-service wind acts in the most adverse direction. Sudden application of the brake should not damage the jib.

8. The brake lining or pads should remain adequately secured during their working life. Unless the brake is self-adjusting, appropriate means should be provided to permit brake adjustment to be readily carried out in safety.

9. The design of electrically operated brakes should ensure that the operating solenoid cannot be accidentally energized by the back electromotive force of any motor driven by the crane, by a stray or rogue current or by breakdown of any insulation.

4.1.3. Electrical supply

10. Self-reeling flexible cables should not allow long lengths of cable to drag on the ground where they can be exposed to damage. Outlets should generally be not more than 50 m apart. The use of motorized reels is preferable to springs or counterweights. Reels on quay cranes should be placed on the waterside, preferably on the outside of the gantry legs.

11. Trolley systems should be fed by overhead conductors or conductors in channels.

12. Overhead conductors should be sufficiently high to prevent contact by a vehicle or its load. Supports should be protected by suitable barriers where necessary.

13. Channels for conductors should be properly drained and designed to prevent entry of any object likely to cause danger.

4.1.4. Safe working load (SWL)

14. The safe working load (SWL) of all lifting appliances and items of loose gear should be based on the factors of safety set out in Appendix E.

15. Every lifting appliance and item of loose gear should be conspicuously marked with its safe working load. The markings should be in kilograms if the safe working load is 1 tonne or less, or in tonnes if it is more than 1 tonne.

16. Lifting appliances where the safe working load varies with the radius of operation should display a chart, showing the radius and the corresponding safe working load, in the cab in a

position where the operator at the controls can clearly see it. The chart should also state the maximum and minimum operating radius for the appliance and from where the radius is measured.

17. Such appliances should also be fitted with a radius indicator that can be clearly seen by the operator at the controls and, where practicable, a safe working load indicator.

18. The maximum load that may be lifted when items of loose gear that have a significant weight (see section 4.2.6, paragraph 92) are attached to lifting appliances should be unambiguous (figure 28). There should be no confusion between the safe working load:

- below the header block/hook of the lifting appliance;
- of the loose gear; and
- below the loose gear.

4.1.5. Controls

19. Controls of lifting appliances should conform to ISO 7752 *Lifting appliances – Controls – Layout and characteristics* and ensure that the operator has ample room for operation when at the controls.

20. Controls (figure 29) should be:

- so positioned that the operator has an unrestricted view of the operation or any person authorized to give the operator signals; and
- marked with their purpose and method of operation.

21. The operating pedals for travel motions of mobile lifting appliances should follow road traffic practice with clutch (when fitted) on the left of the operator's feet, accelerator or other power control on the right and a brake between the other two pedals.

Figure 28. Examples of marking SWL on heavy items of loose gear

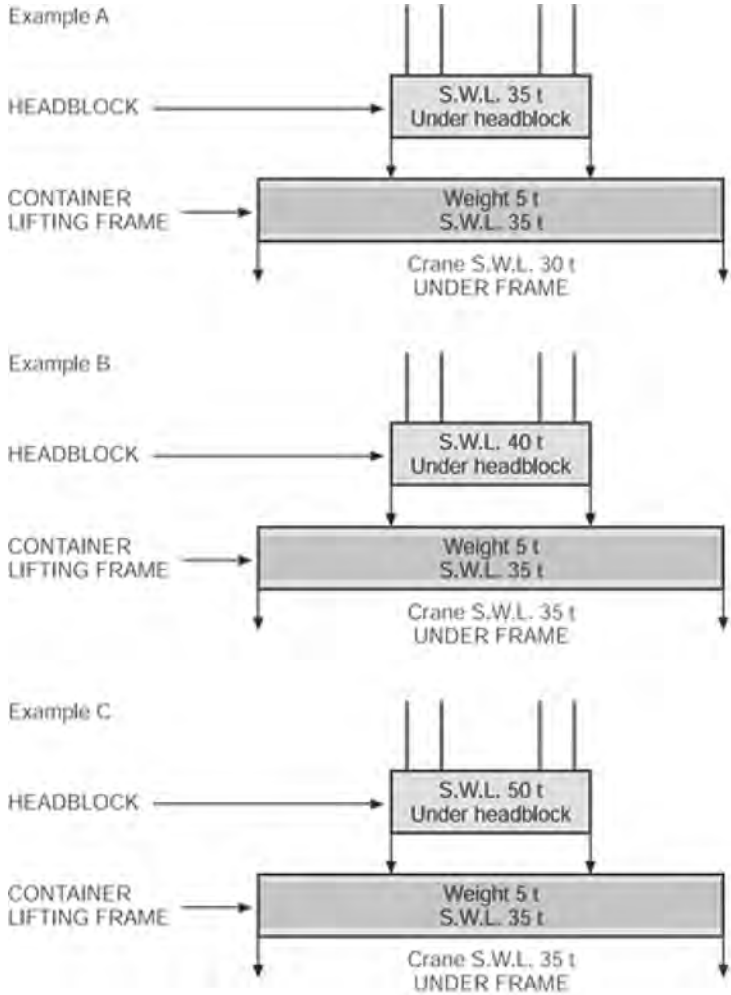
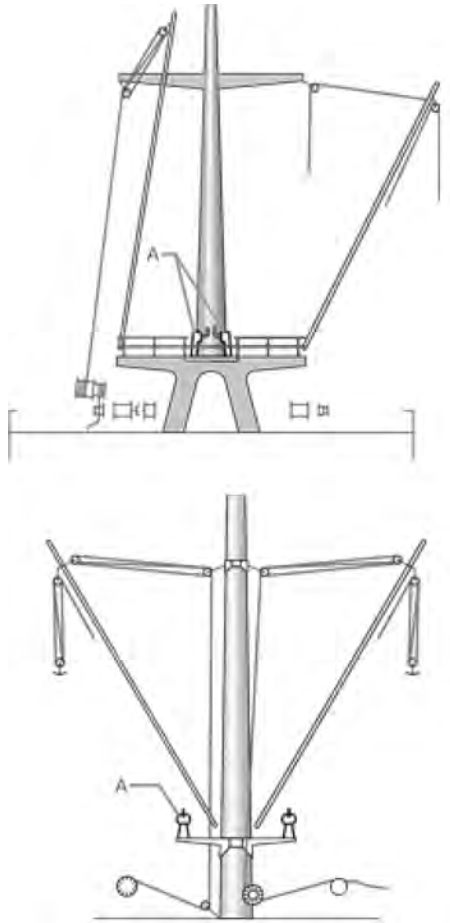


Figure 29. Example of lifting appliance controls – Ships' derricks



A. Controls.

22. Whenever driving considerations permit, controls should return to the neutral position when released.

23. Consideration should be given to fitting "dead man's" controls to prevent inadvertent movement and/or maintain control of movement.

24. The control system should be such that no motion can start when the power supply is connected or the engine started. Movements should only be possible after a positive action.

4.1.6. Limiting devices

25. Limiting and indicating devices should conform to ISO 10245 *Cranes – Limiting and indicating devices*.

26. Wherever possible, every limiter should be positively actuated and designed to fail safe.

27. Where one motion of an appliance can cause a second motion to approach a limiter (e.g. a derricking-out motion that can cause a hoist motion to reach its limit), the limiter should stop both motions.

28. Every power-operated lifting appliance other than a ship's derrick should, where practicable, be fitted with a safe working load limiter. This should operate when the load being raised or lowered exceeds the safe working load by a predetermined amount, generally within the range of 3 per cent to 10 per cent above the safe working load. The limiter should only prevent motions that would increase the overload.

29. Cranes should also be fitted with the following limiters:

- hoisting limiter preventing the load-lifting attachment being raised to the position where it strikes the structure of the crane;
- lowering limiter ensuring that the minimum number of turns is always left on the winch drum;

- derricking-in limiter ensuring that the crane jib cannot be derricked back beyond the minimum radius position;
- derricking-out limiter ensuring that the jib cannot be derricked out beyond the maximum radius position;
- trolley or crab limiter ensuring that the trolley or crab is stopped before it reaches the track end stops;
- slewing limiter on cranes with a limited arc of slew; and
- long travel limiter on rail-mounted cranes preventing them from approaching the track end stops.

4.1.7. Lubrication

30. Every greasing and lubrication point should be located where lubrication can be carried out safely. Remote lubrication points should be provided where necessary.

4.1.8. Operator's cab

31. The operator's cab should be ergonomically designed to provide the operator with a safe and comfortable working environment. The cab and its fittings should be constructed of fire-resistant material and conform to ISO 8566 *Cranes – Cabins*. In particular it should have:

- an unrestricted view of the area of operation;
- adequate protection from the elements;
- windows that can be readily and safely cleaned inside and out;
- a windscreen wiper on any window that normally affords the operator a view of the load;
- a comfortable seat that enables the operator to look in the required direction;
- where practicable a seat for a trainer;

- climate control and filtering;
- a sliding or inward-opening door readily openable from inside and outside if the cabin is elevated;
- means of emergency escape; and
- suitable fire extinguishers.

32. The operator's cab should be designed to limit noise and vibration to within nationally permitted levels.

4.1.9. Overhauling weight

33. An overhauling weight fitted at the end of a hoist rope should be:

- designed to minimize the danger of it catching on any part of a hold, ship's superstructure or similar obstruction; and
- connected to the hoist rope by means of a short length of chain, where practicable.

4.1.10. Swivels

34. A swivel should be fitted between the hoist rope and the lifting attachment.

35. The swivel should be fitted with ball bearings or roller bearings that can be regularly lubricated (figure 30).

4.1.11. Tyres

36. Tyres of lifting appliances that travel on wheels should be selected to be appropriate for the intended duty.

37. Radial and cross-ply pneumatic tyres should never be mixed.

38. The correct pressure of pneumatic tyres should be conspicuously marked near each wheel.

Figure 30. Swivel

4.1.12. Access

39. Safe means of access to all working positions on lifting appliances should be provided.

4.1.13. Winch and rope drums, leads and anchorages

40. Winch drums should conform to ISO 8087 *Mobile cranes – Drum and sheave sizes*.

41. Ropes should be fastened to winch drums in the manner prescribed by their makers.

42. The derricking and hoisting drums of a ship's derrick or derrick crane should be capable of accommodating the maximum working length of rope and the number of complete turns to remain on the winch specified by the manufacturer.

43. The angle of a wire rope lead to a winch drum should be sufficiently small to ensure that the rope is not damaged in service. The angle between the rope and the plane perpendicular

to the axis of the drum should generally not exceed 1 in 16 for hoisting ropes and 1 in 12 for derricking ropes.

44. Where it would otherwise not be possible to avoid an excessive lead angle, a suitable coiling or spooling device should be fitted.

45. Lowering operations should normally be possible only with the winch connected to the power source. Free-fall lowering should be possible only in exceptional circumstances and if the winch is equipped with an automatic speed-limiting device.

4.1.14. Maintenance

46. All lifting appliances and loose gear should be maintained in good working order, and in efficient condition and good repair.

47. Maintenance, including lubrication, should be carried out on a regular scheduled basis, in accordance with the manufacturer's recommendations and operational experience.

48. Replacement components should conform to the manufacturer's manual or be of an equivalent standard.

49. Repairs to the structure of a lifting appliance should follow the correct procedure specified by the manufacturer. Excessive heat can change the properties of steel.

50. Corrective maintenance should also be carried out when necessary.

51. An accurate record of all routine and corrective maintenance should be kept.

52. It is essential that port cranes used on high-duty cycles are not used beyond the design life of safety-critical components until those components are replaced or refurbished and recertified. Increased inspection and maintenance regimes should be

adopted for high-duty cycle equipment in line with the designer's and manufacturer's recommendations.

4.2. Testing, thorough examination, marking and inspection of lifting appliances and loose gear

4.2.1. Introduction

53. Lifting appliances and loose gear should be safe when first provided and should remain safe throughout their operational life. The procedures for achieving this are well established, based on testing, thorough examination, marking and inspection. It is widely accepted that the testing of certain types of loose gear should be subject to a different testing regime. The present requirements and current good practice should be seen as core requirements for safe operations in port work.

4.2.2. Testing of lifting appliances

54. All lifting appliances should be tested in accordance with Appendix A and national requirements before being taken into use and after any substantial repair.

55. Lifting appliances should be retested:

- at least once in every five years, if part of a ship's equipment; and
- as prescribed by the competent authority, if shore based.

56. The testing of cranes should be carried out in accordance with ISO 4310 *Cranes – Test code and procedures*.

57. The tests should cover all parts, and should be supplemented with a detailed examination of the appliance as a whole. The tests are matters for specialists and should be carried out by organizations whose competence has been recognized.

58. All assembled parts of a lifting appliance should be tested under a proof load, in accordance with Appendix D, section D.1.

59. The test conditions for the various parts should be those imposing the severest stresses on each part when in service. Derricks should be tested at the lowest practicable angle to the horizontal, and the slewing motion of an appliance with a derricking jib should be test braked at the lowest practicable angle of the jib.

60. A record of all tests of lifting appliances and related certificates should be kept and should be readily available.

61. The content and layout of the documents should be as established by the competent authority and in accordance with the model documents recommended by the ILO.

62. All loose gear attached to a lifting appliance should be tested in accordance with section 4.2.3.

4.2.3. Testing of loose gear

63. All loose gear should be tested in accordance with Appendix B and national requirements before being taken into use and after any substantial alteration or repair.

64. Wire ropes taken into use should:

- be made to a recognized national or international standard;
- have their minimum breaking load certified by the maker; and
- be of a construction suitable for the purpose for which they are intended.

65. Requirements for the testing of wire ropes are generally set out in national or international standards. Wire rope slings with hand-spliced or mechanically secured eyes (with aluminium or steel ferrules) should be made from wire, manufactured to a recognized national or international standard, and supplied with a manufacturer's certificate showing the

minimum breaking load before the termination or eyes were made. Wire rope slings with ferrule secured eyes should be subjected to a proof test not exceeding twice the rated safe working load in straight pull.

66. Hand-spliced wire, fibre rope and webbing slings should be made from wire or fibres manufactured to a recognized national or international standard and supplied with a manufacturer's certificate showing the minimum breaking load. These slings are not supplied with a manufacturer's test certificate. They should never be subjected to a proof load that exceeds their safe working load. Proof loads in excess of the safe working load are carried out on slings made from synthetic fibres by the manufacturer on a batch basis.

67. Wire rope slings with ferrule-secured eyes should be individually tested.

4.2.4. Thorough examination

68. Thorough examinations of every lifting appliance and item of loose gear should be carried out periodically by a competent person, in accordance with Appendix C.

69. Lifting appliances should be thoroughly examined in line with the designer's and manufacturer's recommendations but at least once every 12 months or after any repair or modification. Appliances used to lift persons should be thoroughly examined at least every six months, or at shorter intervals determined by a competent person. Particular attention should be given to equipment that may be maintained on a less regular basis, including slewing rings in the case of shipboard cranes.

70. Loose gear should be examined at least once every 12 months, or at such shorter intervals as may be prescribed by the competent authority or competent person, and after any repairs or modifications. These examinations should include

hammer tests, removal of paint to expose the metal underneath, ultrasonic examination, radiographic examination and the dismantling of concealed components where appropriate.

71. Wire ropes and chains should be examined more frequently. Some users use ropes rather than chains, since ropes show wear more easily and broken wires project from the rope.

72. If a wire rope contains any grips, wedge sockets or the like, they should be removed during the examination of the rope.

73. The thorough examination of blocks will usually require the block to be stripped and the pin examined.

74. Periodic examinations afford opportunities for deciding whether chains should be discarded or, in the case of wrought iron, sent for heat treatment.

4.2.5. Test and examination reports, registers and certificates

75. The results of tests and examinations should be recorded.

76. After completion of the thorough examination, the competent person should prepare a report which:

- clearly identifies the item examined, the date of the thorough examination, its safe working load(s) and any defects found;
- specifies any parts to be repaired or replaced;
- includes a statement that the item is, or is not, safe for continued use;
- gives the date by which the next test and thorough examination of a ship's lifting appliance should be carried out;
- gives the date by which the next thorough examination of all other lifting appliances and loose gear should be carried out;
- gives the name and qualifications of the competent person;

- includes any additional items required by national legislation.

77. The model form of register for ships' lifting appliances and certificates as required by Article 25(2) of Convention No. 152 replaced earlier versions in 1985. Competent authorities in many countries have issued their own registers, complying with the ILO model form by giving the English text side by side with a translation into their own language.[1]

78. Such records only provide evidence of the safe condition of lifting appliances and loose gear at the time of the examination.

79. Records should be kept on shore or on ship, as appropriate.

80. Registers and certificates for gear currently on board ship or on shore should be kept for at least five years after the date of the last entry.

81. Records may be kept in electronic form, provided that the system includes a means of making them available and of verifying the record.

4.2.6. Marking

82. All lifting appliances should be legibly and durably marked with their safe working load.

83. On derricks, the lifting capacity should be shown near the seating (gudgeon pin) in painted letters and figures within a frame of indentations or welding spots incised on a brass plate or inscribed on other material sufficiently resistant to defacement. On cranes, the capacity should be painted on metal plates that are then enamelled or covered with varnish.

[1] Available at: http://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_214586.pdf.

84. Every item of loose gear should be legibly and durably marked in a conspicuous place with its safe working load, with an alphanumeric identification mark to relate it to records of test examinations and, where appropriate, with a mark to indicate the quality grade of the steel from which it is made. Where appropriate, the inscriptions should be incised, stamped or outline-welded.

85. The marking should be made in a place where it will not give rise to stress.

86. On long chains, the markings should be in a number of places.

87. The quality grade mark on steel items should be in accordance with Appendix F.

88. Where the markings are stamped directly on the gear, the stamps should not exceed the following dimensions:

Safe working load of gear	Maximum size of stamp (mm)
Up to and including 2 tonnes	3
Over 2 tonnes and up to and including 8 tonnes	4.5
Over 8 tonnes	6

89. Where stamps are used on chain links, the stamp size should not exceed the following dimensions:

Link diameter	Maximum size of stamp (mm)
Up to 12.5 mm	3
Over 12.5 mm and up to 26 mm	4.5
Over 26 mm	6

90. The stamp should give a concave indentation without sharp corners, and should not be struck with a blow greater than is necessary for a clear indentation.

91. If the material is too hard or if direct marking would affect or be liable to affect the subsequent safe use of the gear, the marking should be made on some other suitable item of durable material permanently attached to the gear, such as a tablet, disc or ferrule. Marking on such items may be larger than the dimensions indicated in paragraphs 88 and 89 above.

92. Larger items, such as lifting beams, container spreaders or similar gear, that have a significant weight should also be conspicuously marked with their own weight. The markings should be so positioned and of such size as to be immediately legible to those using the gear from the quay or ship's deck.

93. Wire ropes used in long lengths without terminations are not usually marked. The manufacture's certificate for the wire is endorsed with its place of use to enable identification. A wire or wire sling with a thimble or loop splice ferrule should be proof-loaded and the safe working load stamped on the ferrule.

94. Markings on slings should be made in a permanent manner on:

- the terminal ring or link;
- a tablet, disc or ferrule attached to the sling, provided that the attachment will not cause damage to the rope;
- a ferrule of a wire rope having ferrule-secured eyes;
- the sling itself;
- a label; or
- by an approved electronic capture system.

95. Markings on slings should include the number of legs and the safe working load in straight lift and when the angle between the legs and the vertical is 45°.

96. Non-metallic slings should be marked with a label. The label should show, or have electronically captured, the sling's:

- safe working load in straight lift;
- material;
- nominal length;
- individual identification mark and traceability reference; and
- manufacturer's or supplier's name.

97. Single-sheave blocks should be marked in accordance with Appendix H.

4.2.7. Inspection

98. All lifting appliances and loose gear in use should be regularly inspected in line with the designer's and manufacturer's recommendations and in compliance with any applicable national and international standards by competent persons (see also sections 5.1.4.2 and 5.1.4.3). The inspections should comprise visual examinations to check that, so far as can be seen, the equipment is safe for continued use.

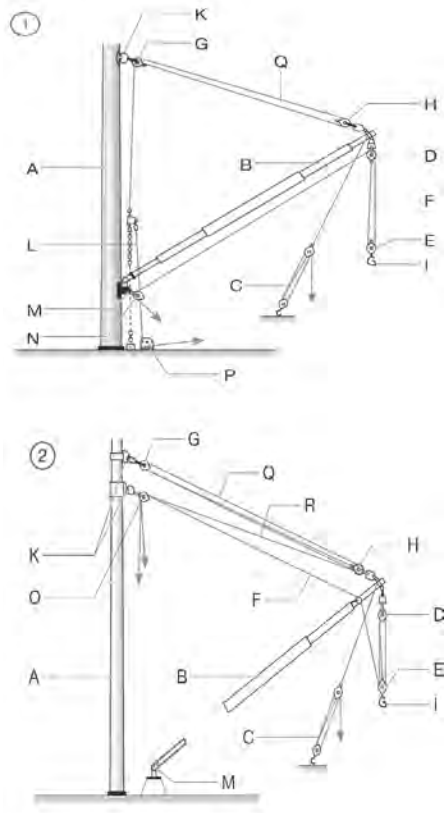
4.3. Lifting appliances

4.3.1. Ships' lifting appliances

99. Every ship should carry adequate rigging plans showing at least:

- correct position of guys;
- resultant force on blocks and guys;
- position of blocks;

Figure 31. Two types of ships' derricks



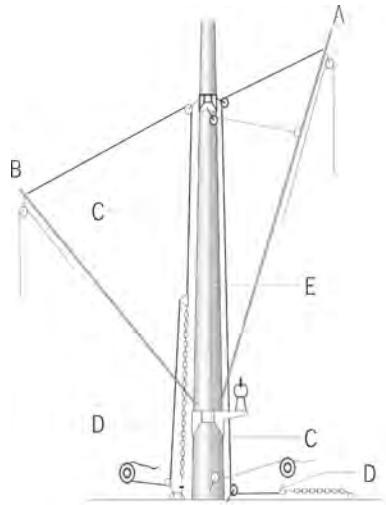
1. Light type. 2. Heavy type.
A. Mast or post. B. Boom. C. Pendant. D. Upper hoisting pulley. E. Lower hoisting pulley. F. Hoisting rope. G. Upper pulley. H. Lower pulley. I. Hoisting hook. K. Swivel for upper pulley. L. Pendant for topping lift. M. Bottom swivel. N. Lead block (guide pulley) on derrick heel. O. Return pulley. P. Heel block. Q. Topping lift. R. Topping lift preventer.

- identification markings of blocks; and
- arrangements for union purchase (where relevant).

100. Safe operation of ships' derricks (figures 31–34) depends largely on the proper maintenance of the running rigging. Wear and tear should be reduced as far as practicable. It is essential to ensure that running ropes do not rub against a fixed or mobile part.

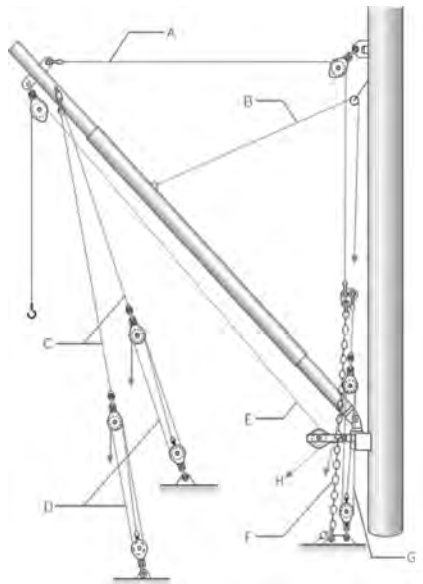
101. Heel blocks should be restrained by a tensioning device to prevent them from swinging down during lowering when there is no load on the rope.

Figure 32. Ships' lifting appliances – A ship's derrick with topping lift and pendant



A. Long boom. B. Short boom. C. Topping lift. D. Pendant. E. Auxiliary lift (to move boom to and from working position).

Figure 33. Rigging of ship's derrick boom



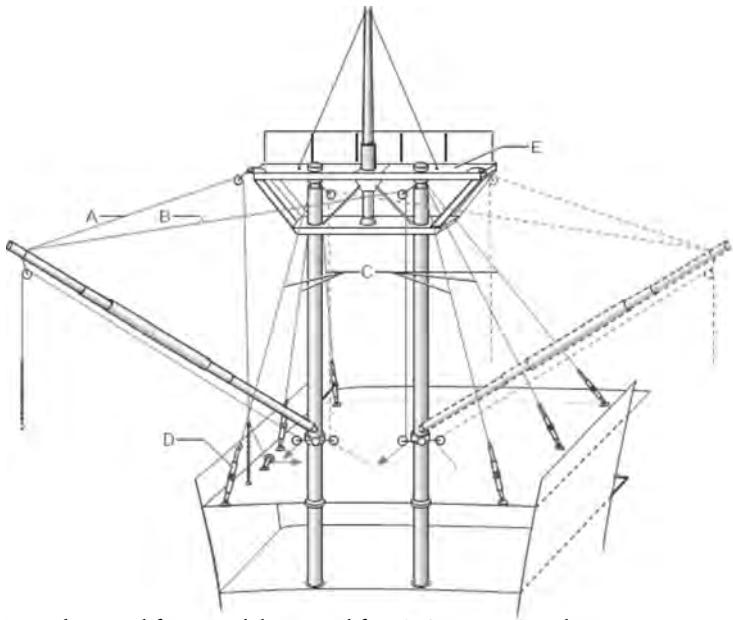
A. Topping lift. B. Auxiliary topping lift (used to move the boom to and from its working and stowed positions). C. Pendants. D. Pendant blocks. E. Cargo runner. F. Span chain. G. Topping lift block. H. To winch.

102. A derrick should neither be rigged nor used at an angle less than the minimum angle marked on it.

103. Derricks should be rigged in such a way that their components cannot whip against the winchman.

104. It should be ensured that light derrick booms do not lift out of their seating.

Figure 34. Samson post



A. Fixed topping lift. B. Mobile topping lift. C. Guys. D. Stretching screws. E. Top.

105. Each derrick should be legibly marked with its safe working load, as follows:

- used only in single purchase SWL xt
- used additionally with a lower cargo block SWL x/xt
- used in union purchase SWL (U) xt

(where x = safe working load).

106. The lowest angle to the horizontal at which the derrick may be used should also be marked on the derrick.

107. The letters and numbers should not be less than 770 mm high and should be painted in a light colour on a dark background, or in a dark colour on a light background.

108. The winch operator's stand should be protected against the weather by a cab with large windows.

109. The derrick luffing winch should have an effective blocking arrangement. This normally consists of the traditional pawl engaging in the wheel. Whatever device is used, it should eliminate all risk of loss of control during the raising or lowering of a load.

110. A ship's cargo lift should have controls:

- of the "dead man's" type that is fail-safe;
- arranged so that only one set of controls can be operated at a time; and
- placed so that the operator is:
  - not in danger from the lift or moving vehicles; and
  - able to see the whole lift platform at all times.

111. An independent emergency stop control should be fitted in a prominent position among or near the other controls.

112. Each opening in a deck for a cargo lift should be protected by barriers that are:

- substantial and at least 1 m high on each side that is not in use for vehicle access;
- hinged or retractable on the sides used for access;
- interlocked so that the platform cannot be moved unless all the barriers are closed;
- arranged so that they cannot be opened unless the platform is at that level;

- as close to and above the edge of the opening as is practicable, so that they cannot be closed if any part of a vehicle or its cargo overlaps the deck opening; and
- painted in alternate yellow and black warning stripes.

113. A flashing warning light, preferably yellow, should be fitted on the deck side of each cargo lift opening, at a place where it can be readily seen from any vehicle on the deck. The light should operate continuously when the platform is away from the opening in that deck.

114. Some ships carry mobile lifting appliances such as lift trucks and mobile cranes that can be used for cargo handling. These should comply fully with the requirements for similar equipment ashore.

4.3.2. Shore cranes

115. Care should be taken to ensure that cranes are designed for the type of application for which they are deployed and have an appropriate fatigue life. The modern method of achieving this is by giving the crane a classification based on the designer's criteria for the use of that crane. Guidance on crane classification can be found in ISO 4301 *Cranes classification*. National and international standards may specify the requirements for new cranes in ports. Some of the guidance provided below in regard to rail-mounted cranes is also applicable to rail-mounted shipboard cranes.

116. Automatic audible and visual alarms that operate whenever the travel motion of the crane is engaged should be fitted to the crane. The audible alarm should be distinct from any other alarm, and loud enough to warn any persons who may be in the vicinity of the wheels of the crane. The visual alarm should be a flashing light, normally of amber colour.

117. The crane should be fitted with a separate horn or similar warning device and a flashing light that can be operated manually to warn or attract the attention of any person nearby.

118. The track of a rail-mounted crane should be:

- of adequate section and bearing capacity;
- firm and level, with an even running surface; and
- electrically bonded and earthed.

119. Shock-absorbing buffers should be provided on rail-mounted cranes and end stops on rails.

120. Rail-mounted cranes should be so designed that in the event of breakage of a wheel, failure of an axle or derailment, the crane will not overturn or collapse.

121. Rail-mounted cranes should be equipped with devices to clear the rails of dunnage and similar material automatically as the crane moves.

Figure 35. Rail-mounted crane wheel protection

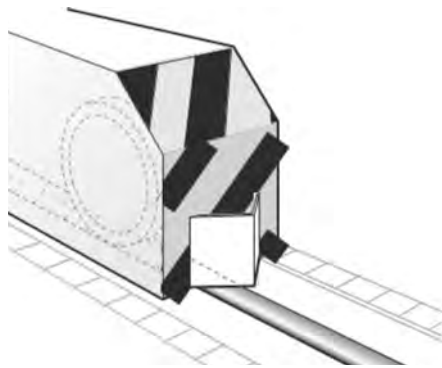
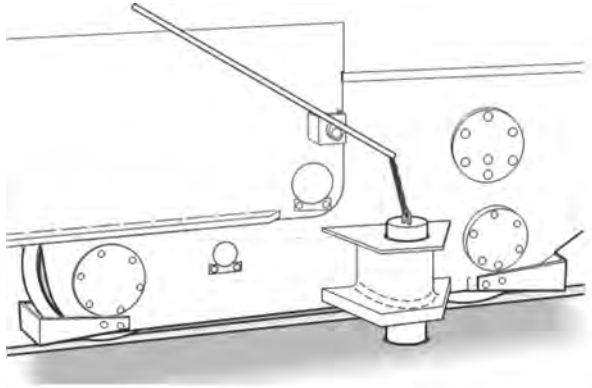


Figure 36. Storm pin on rail-mounted crane



122. The wheels of rail-mounted cranes should be provided with guards to prevent danger to feet (figure 35).

123. Anemometers should be fitted in the most exposed position of large rail-mounted cranes to provide warning of wind conditions requiring them to be taken out of service. The warning should be given to the crane operator and repeated at ground level for the benefit of supervisory personnel.

124. Rail-mounted cranes taken out of service in high winds should be secured when necessary. Securing devices should be designed for the purpose (figure 36). The usual type is a storm pin or bolt that can be inserted into a socket in the quay surface. Other types include rail clamps, wheel scotches and chains.

125. Arrester brakes should be fitted to large rail mounted cranes that are liable to be exposed to high winds during use if the travel motor brakes cannot prevent inadvertent movement along the track in such circumstances.

126. Rail-mounted cranes where the distance between the gantry legs is more than 30 m should be equipped with means of synchronizing the motors to prevent any leg moving out of unison with the others.

127. If a number of rail-mounted gantry cranes working on the same track can be brought close together or come into contact with a ship's superstructure, suitable limit switches and/or proximity sensors should be provided to prevent them striking each other.

128. Any trapping points between a crane's flexible power cable and winding drum should be guarded, unless the drum is so placed as to be as safe as if it were guarded.

129. Old models of scotch derrick cranes may have only one motor driving both the hoisting and the derricking drums. In order to avoid the possibility of interlock failure that may lead to an accident, it is recommended that such drive systems be replaced so that each motion has its own motor and brake.

130. Cranes used for lifting containers should be fitted with devices that indicate when the container spreader is correctly lowered onto the container and when the twistlocks are fully engaged and released. Spreaders in 40-foot (12.2 m) mode should be fitted with twin 20-foot (6.1 m) detectors.

131. Cranes used for lifting containers should be fitted with interlocks that prevent:

- twistlock movement, unless all four twistlocks have entered the corner fittings;
- lifting, unless all four twistlocks are fully locked or unlocked;
- twistlocks unlocking when a load is suspended from them;

- twistlock movement on a telescopic spreader, unless the frame is at the correct length; and
- telescopic spreaders telescoping, unless all four twistlocks are unlocked and clear of the load.

132. Cranes used for lifting containers should be fitted with load-indicating and excessive eccentricity detection devices that show the mass of the load being lifted at each twistlock.

133. Runway slope and the tyre pressure of rubber-tyred gantry cranes should be consistent with the manufacturer's provisions.

134. The limits of stability of straddle carriers should be determined in accordance with ISO 14829 *Freight containers – Straddle carriers for freight container handling – Calculation of stability*.

135. General-purpose mobile cranes are used in many industries. However, it should be appreciated that they are designed to a relatively low classification and should not normally be used intensively for long periods of time without consultation with the manufacturer or other design authority, which may well recommend a reduction of rated capacity for such applications.

136. The chassis of crawler cranes should be clearly marked so that the operator can see the direction of travel at a glance.

137. Mobile harbour cranes should only be used on well-prepared flat ground capable of supporting them and their load. Any slope on which they travel should be within the limits specified by the crane manufacturer.

138. Great care should be taken when adding or removing lattice strut jib sections. This should always be carried out in accordance with the manufacturer's instructions, with the jib adequately supported. Persons should never be underneath the jib.

139. Every lifting appliance fitted with outriggers should be fitted with a device to indicate to the operator whether the appliance is level.

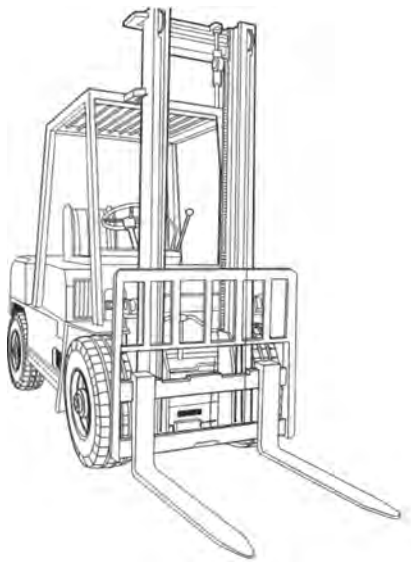
4.3.3. Lift trucks

140. When lift trucks (figure 37) are selected, it should be clearly understood that trucks powered by internal combustion engines carry flammable fuel, produce exhaust emissions with toxic components and can create noise nuisance. Trucks to be used in ships' holds or other confined spaces should preferably be electrically driven.

141. Every truck driven by an internal combustion engine should:

- have an efficient exhaust system fitted with a silencer and a gas cleaner, where appropriate;

Figure 37. One type of lift truck (driver protection on mast and restraint system omitted for clarity)



- have an exhaust system designed in such a manner that engine exhaust is directed away from the operator's position. Materials used in the vicinity of exhaust systems should be non-flammable and not adversely affected by heat from the exhaust system;
- carry an appropriate fire extinguisher; and
- be manufactured or adapted to comply with applicable noise-level regulations.

142. The forks of lift trucks should be designed to prevent their accidental unhooking or unintentional lateral displacement when in use.

143. The forks of a truck are items of loose gear and should be tested and certified before being brought into use. Movement of the attachment and its parts must be mechanically limited at the extreme positions.

144. Trucks should be fitted with devices to automatically limit the upward movement of the forks, and, unless it is non-powered, the downward movement.

145. In the event of the failure of a single lifting/lowering part of the mechanism (such as a gearwheel, chainwheel or spindle), a locking mechanism should prevent the elevated load or operator's platform from dropping.

146. Any trapping, crushing or shearing points within reach of the operator in the normal operating position on the truck should be suitably guarded (figure 38).

147. There should be no sharp edges or angles posing a hazard in the area of the operator in the normal operating position or in the area of access and egress during normal operation and daily checks.

148. All trucks and battery containers on electric trucks that are intended to be hoisted aboard ship should have suitable slinging points.

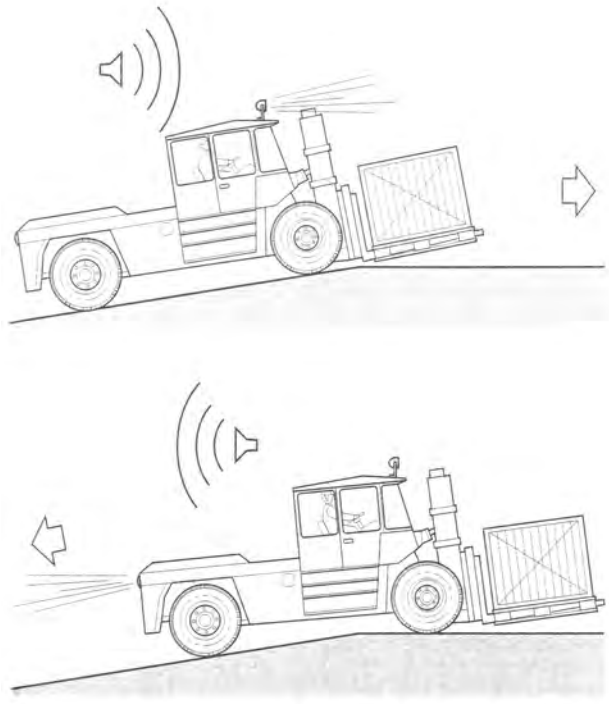
Figure 38. Protection for lift truck operator

149. The steering system of trucks fitted with non-powered steering should be designed, so far as is practicable, to prevent the operator's hands from being injured if one of the truck wheels strikes a kerb, dunnage or other fixed object.

150. Every prototype or modified truck should have been stability-tested by a competent person in accordance with a national or international standard before being taken into use.

151. All trucks should be fitted with a manual audible warning device, an automatic audible warning device that can be easily heard by workers in the vicinity, and warning lights that operate during reversing movements, two headlights, rear lights, parking lights and reflectors, in accordance with national standards, even if they are not expected to leave the port area (figure 39). When reversing, the driver should turn the seat/chair in the direction of travel, if possible. Cameras

Figure 39. Warning devices to be fitted to moving lift trucks



and proximity sensors should strictly be used only to assist the driver, where available.

152. Where possible, the reversing movement warning device should give a distinguishable sound that is standard throughout the port.

153. Headlights should throw forward a yellow or white non-dazzling light. Rear lights (two, as near as possible to the

extremities of the vehicle in the case of wide vehicles) should throw a red beam backwards. All lights should be visible from 150 m away on a clear night.

154. Two reflectors should be fitted as near as possible to the extremities of the vehicle. These should reflect red light visible from 100 m away when illuminated by headlights.

155. As lift trucks generally move both in reverse and forward, the provision of appropriate headlights and work lights is recommended. Larger vehicles should be fitted with additional reflectors at the front and sides.

156. All trucks should be fitted with flashing orange or amber lights.

157. Trucks with an enclosed cab should be fitted with one or two rear-view mirrors.

158. Centre-seated counterbalanced trucks should have an operator restraint system fitted to prevent the operator from being thrown from the vehicle or trapped by the overhead guard if the truck tips over laterally. This may be an enclosed cabin, seat belt or other device. Where a seat belt or restraint is fitted, it should be worn.

159. An upholstered suspension seat should be fitted to minimize the transmission of shock loads to the operator and avoid compression of vertebrae. Good seats should have seat backs giving good support to the operator, but not obscuring the view to the rear of the truck.

160. Forklift trucks should be fitted with a substantial overhead guard sufficiently strong to protect the operator as far as possible against the impact of objects falling from above (see figure 38). In some cases, an additional guard to protect against small falling objects may be necessary. This may be a solid or perforated metal sheet.

161. Side windows should be automatically locked in the closed position on some types of truck, e.g. sideloaders, in order to prevent injury to the head of an operator leaning out of the cab while lowering a load.

162. All moving parts within the operator's reach should be securely guarded.

163. A load backrest extension is recommended if the truck handles small unsecured loads, e.g. small heavy boxes.

164. Sheet metal side and front guards protecting operators of platform trucks should be of a shape that enables them to climb on and off easily and quickly.

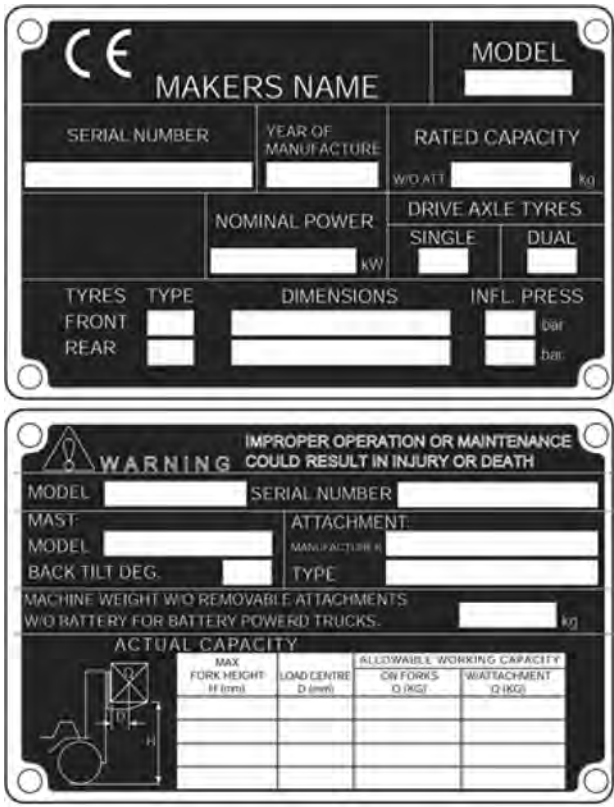
165. Trucks should be designed to permit safe and easy access and egress and to minimize the risk of slipping, falling and tripping. Steps, running boards and handholds (such as grab handles, fixed parts of the truck structure) should be provided above a step height of 350 mm to give three-point contact at all heights (i.e. one hand and two feet or two hands and one foot). Step width, instep clearance and toe clearance should comply with ISO 2867 *Earth-moving machinery – Access systems*.

166. Lift trucks should be fitted with service and parking brakes that comply with national or international standards.

167. All trucks should be marked with their safe working load or loads (where there is more than one load owing to the use of devices such as stabilizers or extension forks) and related load centre (figure 40). The permissible load or rating plate should show the safe working load of the truck at various load centres and lift heights and, where applicable, with attachments fitted that alter the rating.

168. All trucks should be marked with the unladen weight of the truck.

Figure 40. Load or rating plate of a lift truck



169. Electric trucks should be marked with their weights both with and without the battery and battery container. The battery container should be marked with the total weight of the container and battery.

170. All trucks should be provided with:

- a builder's plate giving the authorized gross laden weight, machine type and the maker's name and address; and
- an operating plate giving the owner's name and address and, if possible, maintenance particulars such as servicing dates.

171. No further weight should be added to a counterweight for the purpose of increasing the lifting capacity.

172. The operating platforms of end-controlled powered trucks and tractors should be provided with substantial guards to prevent the operators from being crushed in the event of collision with obstacles or other vehicles.

173. Electrically driven trucks should be fitted with at least one adequate mechanical brake and a mechanically operated current cut-off that comes into operation automatically when the operator leaves the vehicle. When the vehicle is stationary, it should not be possible to close the circuit unless the controller has passed through the neutral position.

174. Measures should be taken to prevent spillage of battery electrolyte, including using the minimum necessary quantity of distilled water, supporting the batteries on shock absorbers and providing drip trays.

175. Wherever possible, wheels should be positioned within the truck body. If they are positioned outside, the wheel guards should be conspicuously marked.

176. In the normal operating position, the operator should be protected against contact with the truck wheels and against objects thrown up by the wheels (such as mud, gravel or debris). The protection device for the steered wheels need only cover them when they are positioned in a straight line.

177. An attachment for lifting freight containers should be equipped with indicator lights in accordance with ISO 15871 *Industrial Trucks – Specifications for indicator lights for container handling and grappler arm operations*. The attachment should have a device(s) to prevent the unintentional disengagement of a container. Means should be provided to prevent lifting of the container for transport unless all interface mechanisms are fully engaged and locked. If multiple containers are lifted horizontally at the same time, the same requirements are valid for all containers. Travel speed should be restricted to a maximum of 10 km/h if the container is not locked to the attachment in a manner that will prevent unintentional drop (such as lifting with grapple arms).

178. All lift trucks should be painted in a bright colour that is highly visible against the backgrounds where they operate. The back ends of rear-wheeled steered trucks should be painted in yellow and black stripes to warn of the dangers of the swinging back when manoeuvring. There should be a pre-use check before commencement of the job.

4.4. Loose gear

4.4.1. General requirements

179. Wrought iron should never be used in the manufacture or repair of any loose gear.

180. Any gear made wholly or in part of wrought iron should be scrapped as soon as is practicable.

181. While any gear made wholly or in part of wrought iron remains in use, it should be periodically heat-treated in accordance with Appendix G.

182. A block should not be subjected to any form of heat treatment.

183. Every steel part of loose gear (other than wire rope) should be made of the same quality grade of steel.

184. Any welding in the manufacture or repair of loose gear should be carried out by qualified workers using appropriate techniques.

4.4.2. Chains and chain slings

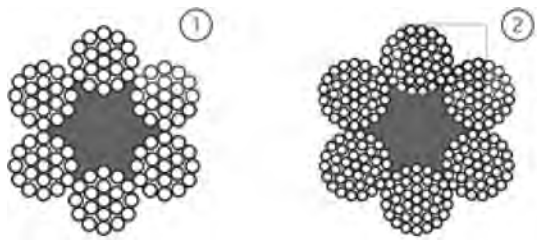
185. Chains and chain slings should generally be constructed from steel bars of at least 10 mm diameter for Grade M chain and 7 mm for Grade T chain.

186. Chains that are to be used at temperatures below about –5°C should be made of special steel. Grade T chains can be used with no reduction of their safe working load at temperatures between –30° and +200°C.

4.4.3. Wire ropes and slings

187. Wire ropes should be of adequate strength for the frequency and type of intended use (figure 41), and selected in accordance with ISO 4308 *Cranes and lifting appliances – Selection of wire ropes*.

Figure 41. Construction of wire ropes



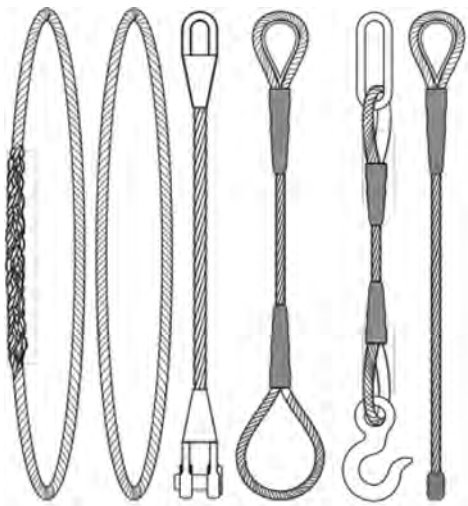
1. Rope with 6 strands of 19 wires (1+6+12) and textile core.
2. Rope with 6 strands of 37 wires (1+6+12+18) and textile core.

188. The guaranteed minimum breaking load should not be less than the product of the safe working load and a factor of safety determined in accordance with Appendix E.

189. Hoisting ropes should be in one length without any joins. If the lengthening of a cable is unavoidable, it should be done by an approved method, such as fitting a thimble and shackle or a Bordeaux connection. In such cases, the safe working load should be reduced by an appropriate amount. It may also be necessary to fit larger sheaves if the connection needs to pass over them.

190. Wire rope slings may be endless, i.e. formed by jointing the two ends of the rope, or have a variety of terminations and splices (figure 42).

Figure 42. Steel wire slings



191. A wire rope should be properly terminated.

192. Capping and splicing are skilled operations that should only be carried out by workers having the necessary expertise.

193. If a particular method of splicing is prescribed by national legal requirements, only that method should be used.

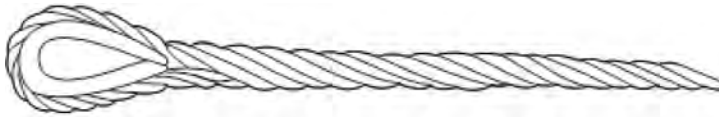
194. All thimble or loop splices should have at least three tucks with a whole strand of rope, followed by two tucks with half the wires cut out of each strand (figure 43). All tucks other than the first should be against the lay of the rope. If another form of splice is used, it should be equally efficient.

195. No splice, however well made, can equal the strength of the original rope. The strength of the splice gradually decreases with diameter. At the largest sizes, it may be only 70 to 75 per cent as strong as the original rope. This loss of strength should be taken into account when the factor of safety is decided.

196. A splice in which all the tucks are with the lay of the rope (see figure 44) should not be used in the construction of a

Figure 43. Loop spliced on thimble

Figure 44. Lang's lay rope



sling or in any part of a lifting appliance where the rope is liable to twist about its axis, even if the splice is protected by a swivel.

197. Any protection on a splice in a wire rope to a lifting appliance should only be provided at its tail. This allows any deterioration of the splice (i.e. broken wires) to be seen.

198. Compressed metal ferrules should be made to a manufacturer's standard:

- the material used should be suitable in particular to withstand deformation without any sign of cracking;
- the correct diameter and length of ferrule should be used for the diameter of the rope;
- the end of the rope looped back should pass completely through the ferrule;
- correct dies should be used for the size of the ferrule;
- correct closing or compression pressure should be applied to the dies; and
- tapered ferrules, where the end of the rope is not visible for inspection after closing, should not be used.

199. Terminal fittings on wire ropes should be capable of withstanding the following minimum loads:

Diameter of rope	Percentage of rope's minimum breaking load
Up to 50 mm	95
More than 50 mm	90

200. A wedge socket used as a terminal fitting of a lifting appliance should be suitable for the size of rope and be properly fitted.

201. The tail of the rope should protrude sufficiently from the socket to enable it to be bent back upon itself to form

a loop, and for the end then to be clamped or lashed to itself after emerging from the socket (not clamped to the main part of the rope).

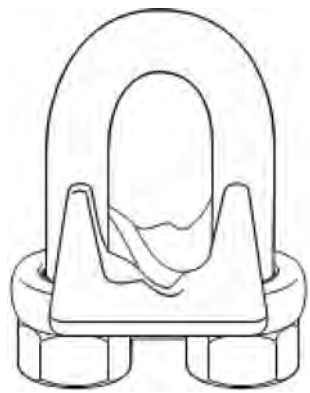
202. The wedge should be inserted and driven home by gentle hammering with a mallet.

203. A heavy load (up to the safe working load of the socket, if this is practicable) should be lifted a short distance and then be allowed to descend and be braked normally in order to bed the wedge.

204. A Lang's lay rope should only be used if it is not free to twist about its axis, i.e. both ends of the rope are secured (figure 44).

205. Bolted clamps (such as Crosby, plate or bulldog grips) should not be used to form a terminal join in any hoist rope, derricking rope, guy of a ship's derrick or derrick crane, or in the construction of a sling (figure 45).

Figure 45. A bolted clamp



206. A rope made of fibre interspersed with wire strand should not be used on a lifting appliance such as a crane, but may be used as a sling in certain circumstances, subject to testing in accordance with Appendix B and certification on the basis of a factor of safety in accordance with Appendix E.

207. Before a wire rope is put into service, it is essential to verify from tables or calculations that it is of the correct diameter for winding on winch ends or sheaves. The winding diameter should generally be at least four times the circumference of the rope (practically 12 times its diameter), but it is advisable to use higher ratios. The following rules are frequently adopted:

- for slow-moving appliances, the diameter of pulleys and sheaves should be 300 times the diameter of the thickest wire in the rope, and for most lifting appliances 500 times that diameter; and
- the diameter of pulleys and sheaves should also be at least 24 times the diameter of a rope with 6 x 37 wires, and at least 20 times the diameter of a rope with 6 x 61 wires.

4.4.4. Fibre ropes and slings

208. Natural fibre rope for use on a lifting appliance or for slings should be of good grade manila (abaca), sisal (aloe) or other fibre of equal quality manufactured to a national or international standard, or in accordance with the requirements of a classification society.

209. Natural fibre slings are usually manufactured from three-strand rope. The splice should be dogged off or a tail allowed. Natural fibre slings are usually made with soft eyes or are endless.

210. As natural fibre ropes are affected by damp, it may be advantageous to use ropes that have been treated with a suitable rot-proofing and/or a water-repellent agent.

211. A thimble or loop spliced in a natural fibre rope should have not less than four full tucks, with all the yarns in the strand tucked against the lay. The splice should then be dogged.

212. A synthetic fibre rope should not be used as a sling or as part of a lifting appliance unless:

- it is made to a recognized national or international standard, or in accordance with the requirements of a classification society;
- the manufacturer has certified its guaranteed minimum breaking load; or
- its diameter is more than 12 mm.

213. A synthetic fibre rope should not be:

- used on a pulley block that does not meet the requirements of section 4.4.5;
- reeved through a pulley block on which:
  - the groove of a sheave is less than the diameter of the rope; or
  - the sheave has any defect likely to cause damage to the rope.

214. A synthetic fibre rope intended to be used for lifting should not be spliced to a natural fibre rope.

215. When a synthetic fibre rope is joined to a wire rope, the two ropes should have the same direction of lay. A thimble should be fitted to the eye of the fibre rope and the ropes shackled together.

216. Synthetic fibre rope slings are usually manufactured from three-strand rope and spliced in the same way as natural fibre slings. The fibre can be indicated by the colour of the identification label as follows:

- green – polyamide (nylon);

- blue – polyester (terylene); and
- brown – polypropylene.

217. A thimble or loop splice:

- in a polyamide and polyester fibre rope should have at least four tucks with all the yarns in the strands, followed by one tuck with approximately half the yarns of each strand, and a final tuck with at least one-quarter of the yarns; and
- in a polypropylene fibre rope should have at least four full tucks, with all the yarns in the strands.

218. All tucks should be against the lay of the rope.

219. Tails protruding from the rope should be at least three rope diameters long or be dogged.

220. Synthetic fibre webbing slings for general use should be at least 35 mm and not more than 300 mm wide. Specially designed slings may be wider. Slings can be manufactured endless or with soft eyes. The eyes of slings over 50 mm wide are reduced by folding at the time of manufacture to allow them to be accommodated in hooks and shackles of the correct safe working load. The eyes may be fitted with reinforcing at point-of-hook contact. Wear sleeves may also be fitted to reduce damage to the main body of the slings.

221. The minimum length of a soft eye measured internally when the webbing is laid flat should be:

- two-and-a-half times the width of webbing, for widths greater than 150 mm; and
- three times the width of webbing up to 150 mm wide.

222. Any substance used to increase the resistance of a webbing sling to abrasion should be compatible with the synthetic fibre.

223. Polypropylene webbing or rope slings likely to be exposed to prolonged bright sunshine should be manufactured of material stabilized against degradation by ultraviolet light, as otherwise severe loss of strength may occur in a relatively short period.

224. The stitching material should be of the same synthetic yarn as the sling, and the join should be such that, so far as is practicable, the load is distributed equally across the width of the belt.

225. Webbing slings should be manufactured to an internationally or nationally recognized standard, supported by an internationally recognized quality management system.

226. Disposable or one-trip slings should:

- be not less than 25 mm wide; and
- have a breaking load at least five times their safe working load if up to 50 mm wide and at least four times their safe working load for wider slings.

227. Disposable or one-trip webbing slings should be clearly and durably marked in a suitable place with the following:

- the safe working load at angles from 0° to 45° from the vertical;
- either the mark "U", indicating a disposable sling, or the word "disposable" or "one way" in English;
- the maker's identification mark;
- the batch number relating to the test certificate or certificate of conformity of the sling; and
- the year of manufacture.

228. Round slings should not be used for regular cargo handling but may be used for special or project cargo under the direct supervision of a competent person.

4.4.5. Blocks

229. Pulley blocks for use with synthetic or natural fibre ropes should have a cast housing or side and partition plates, and straps of steel or of wood suitably reinforced with steel, or aluminium straps.

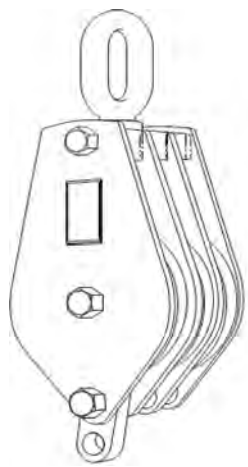
230. Except in the case of a cast housing, the side straps should be adequately and properly secured to the head fitting.

231. The diameter of the sheave(s) measured at the bottom of the groove should not be less than 5.5 times the design rope diameter.

232. The rope groove should have a depth of not less than one-third the diameter of the rope and a radius of not less than 1 mm greater than half the diameter of the rope.

233. A block should generally not be fitted with more than three sheaves and a becket (figure 46), or four sheaves if the block has no becket.

Figure 46. Three-sheave block with becket



234. Provision should be made for the lubrication of all metal bearings and swivel-head fittings and, where necessary, any plastic bearings.

235. The safe working load of the block should be based on use with best grade manila rope.

236. The block should be marked with:

- the size of manila rope for which it has been designed;
- its own safe working load; and
- its identification marks.

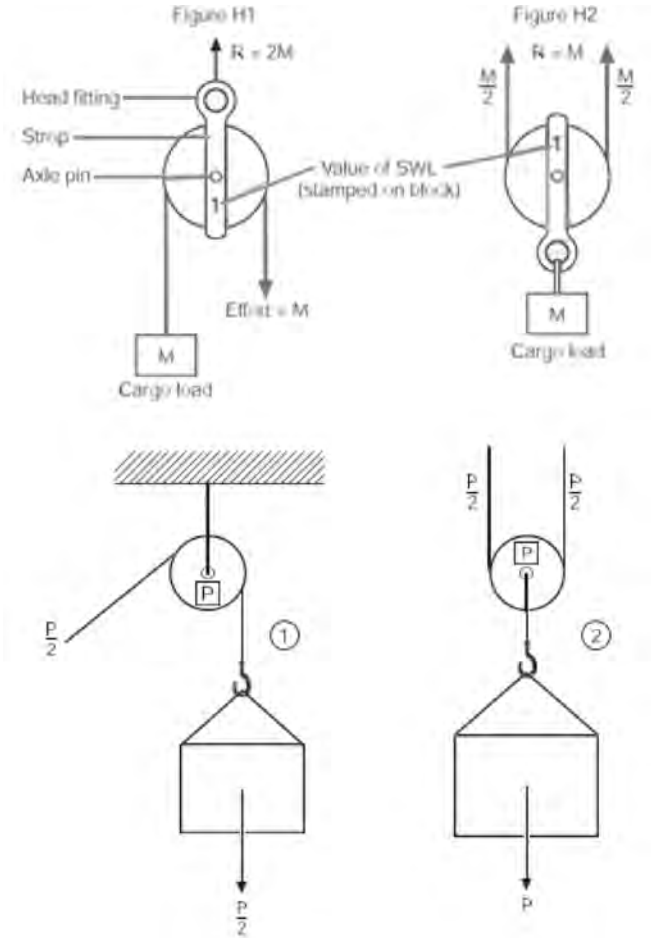
237. The safe working load of a single-sheave block is the maximum load that can be safely lifted by that block when it is suspended by its head fitting and the load is secured to a wire rope passing round its sheave (figure 47 H1).

238. When a single-sheave block is rigged with the load to be lifted secured to its head fitting and the block is suspended by a wire rope passing around its sheave, it should be permissible to lift a load twice the safe working load marked on the block (figure 47 H2).

239. The safe working load of a single-sheave block incorporated elsewhere in a derrick rig, that is secured by its head fitting and subjected to tension arising from a wire rope that forms part of the derrick rig and passes around or partially around the sheave, is half the resultant load upon its head fitting. Allowance should be made for the effects of friction in the block and rope stiffness, i.e. the extra load arising from the effort of bending the wire rope partially around the sheave.

240. The safe working load of a multi-sheave block is the maximum force that may be applied to its head fitting.

Figure 47. Safe working loads of single-sheave blocks



1. Load attached to rope passing around pulley. 2. Load attached directly to the block.
P. Safe working load of the block.

241. The design of blocks to be used with wire ropes should be based on a wire rope having a tensile strength of 180 to 2 00 kg/mm^2 (1,770 to 1,960 N/mm^2).

242. A cargo block fitted to the heel of a derrick for the cargo runner or hoist rope should be provided with a duckbill or similar type of head designed to restrict the downward movement of the block when the runner becomes slack.

243. A cargo block fitted to the head of a derrick used in union purchase, and in other cases where practicable, should be fitted with a swivelling eye.

244. Cargo blocks should be rigged in accordance with the ship's rigging plan.

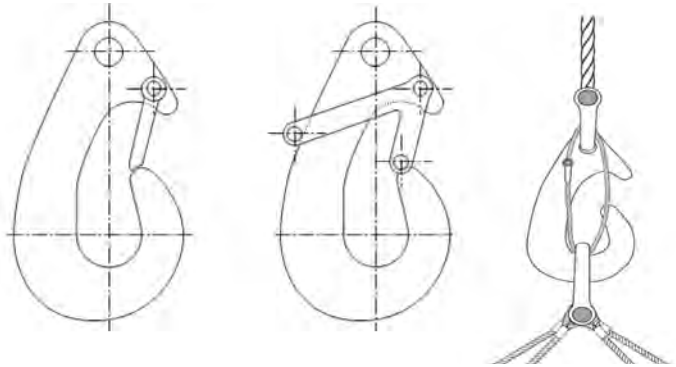
4.4.6. Other loose gear

245. Hooks should be constructed so as to cause as little distortion and damage to the eye of a sling as possible. The larger the hook that can be used, the less distortion is caused to the sling.

246. Every hook should be provided with an efficient device to prevent the displacement of the load from the hook, or be of such construction or shape as to prevent displacement (figure 48). These may be safety latches, "C" hooks, ring assemblies for union purchase or rams horn hooks for use with heavy lifts. As a last resort, when a displacement prevention device is missing or not available and a bridle is used for continuous operation, a short wire sling with eyes at both ends may be passed through the bridle's straps sitting on the hook and shackled together around the shank of the hook.

247. The screwed shank of a hook or other similar thread should be undercut to a depth no greater than that of the thread. Any corner where a plain portion of the shank terminates at a shoulder or flange of greater diameter should be radiused as far as is practicable.

Figure 48. Safety hooks with two types of latches



248. Hooks may be attached to chain slings by mechanical connection or shackled to slings of any material, or may be an integral part of a block.

249. The shape of thimbles should be such that the internal length and width are six and four times the diameter of the rope respectively (figure 49). The thickness of the metal at the bottom of the throat should be 0.4 times the rope diameter.

250. The diameter of the body and pin of a shackle are given (figure 50), (13 mm (1/2") and 16 mm (5/8"). Shackle pins are always larger than the body of the shackle.

251. Shackles are usually manufactured from two types of steel, grade T (800 N/mm^2) and grade M (400 N/mm^2). T shackles are approximately twice the strength of grade M shackles. They are usually known as alloy and high tensile (HT) shackles. Sizes of different types of shackles are as follows:[2]

[2] ISO 2415 – *Forged shackles for general lifting purposes – Dee shackles and bow shackles*.

Figure 49. Thimble

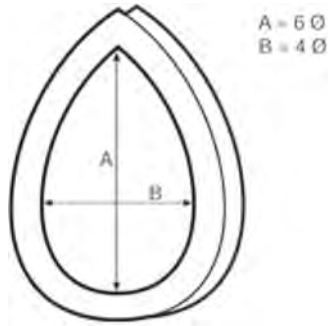
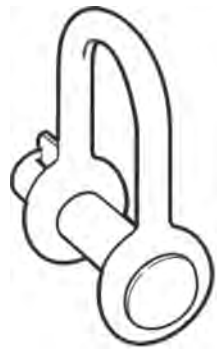


Figure 50. Shackle



Size	High tensile (t)	Alloy (t)
13 mm (1/2”)	1.0	2.0
25 mm (1”)	4.5	8.5
50 mm (2”)	19.0	35.0

252. Where shackles are permanently rigged, the pins should be locked by mousing a screw collar pin or by a split cotter pin on a nut and bolt pin. As a last resort, in the instance where a cotter pin is not available or the shackle is to be used only for a limited operation, a single wire may be wrapped around the inside of the shackle and firmly twisted around the non-threaded end of the pin.

253. A swivel should always be inserted between the sling-hook and the hoisting rope.

254. Every vacuum lifting device should be fitted with the following:

- a suitable vacuum gauge or other device clearly visible to the lifting appliance operator;
- an audible warning to the operator and any person working nearby when the vacuum is 80 per cent or less of the designed working vacuum, or the vacuum pump ceases to operate; and
- means for maintaining a sufficient vacuum to continue supporting the load for sufficient time to allow it to be lowered safely from the maximum height of lift of the lifting appliance to the quayside in the event of vacuum pump failure.

255. The vacuum gauge should be marked in red with the lowest vacuum at which the appliance may be used.

256. The designed working vacuum should be the vacuum necessary to support the test load which the lifting appliance is required to support.

257. Where the vacuum is controlled from the cab of the lifting appliance, the controls should prevent accidental removal of the vacuum.

258. As far as is practicable, the surface of a test load of a vacuum lifting device should be similar to the worst type of surface the device is intended to lift. If the lift is to be wrapped, the test load should be similarly wrapped.

259. The voltage of the electric power supply to any magnetic lifting device should not fluctuate by more than ±10 per cent.

260. A magnetic lifting device should be:

- an electro-permanent magnet;
- provided with an alternative power supply unless the magnet is used only to handle scrap metal or other cargo, and no person will be near the device; and
- constructed to withstand the entry of moisture.

261. A magnetic lifting device should be marked with its safe working load as determined by tests using weights of the same characteristics as the load for which the device is intended to be used. When the load to be lifted is dissimilar to the test load, it should be restricted to approximately 60 per cent of the safe working load.

262. Other loose gear includes lifting beams, spreaders, lifting frames and other attachments for lift trucks, tongs, claws and cradles for handling round bars or logs. All should have adequate strength for their intended purpose with an appropriate factor of safety. The effectiveness of tongs and claws depends on the roughness of their surface or the condition of their teeth.

4.5. Lifting devices forming an integral part of a load

4.5.1. General requirements

263. Lifting devices forming an integral part of a load are not loose gear, but should be:

- of good design and construction;

- of adequate strength for their proposed use; and
- maintained in good repair.

264. Such devices include eye bolts, integral lifting lugs on plant, corner fittings on containers, the lifting straps of flexible intermediate bulk containers (FIBCs), and pallets secured to a load.

265. If part of a load is secured to a lifting device that forms an integral part of a load by further means, it is essential that this also is of adequate strength and maintained in good repair.

4.5.2. Flexible intermediate bulk containers (FIBCs)

266. Some FIBCs (for carrying powdered homogeneous cargo) are reusable, but single-trip FIBCs should never be reused.

267. The lifting straps at the corners of FIBCs should always be lifted vertically (figure 51).

Figure 51. Flexible intermediate bulk container (FIBC)

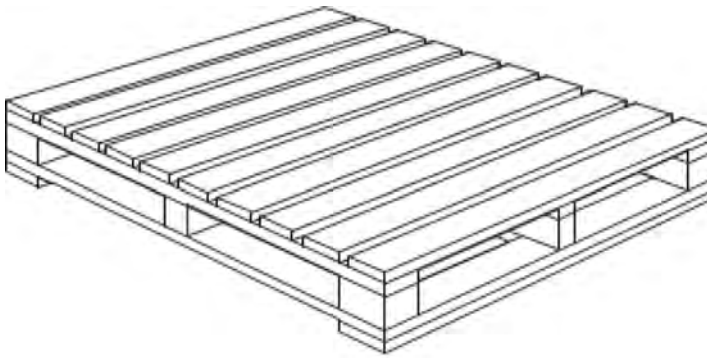
268. Before an FIBC is lifted, the certificate of conformity and a thorough examination certification (issued in the last 12 months) should be checked and the bags should be inspected.

4.5.3. Pallets

269. Pallets should be free from visible defects liable to affect their safe use (figure 52).

270. The decks of wooden shipping pallets should be at least 35 mm thick. The space between the decks should be sufficient to allow easy access by the forks of lift trucks or the arms of other pallet-lifting devices.

Figure 52. Standard pallet




contents

5. Safe use of lifting appliances and loose gear

5.1. Basic requirements

5.1.1. General requirements

1. It is essential that all who work in ports are aware of the basic potential hazards of lifting operations. To control these hazards it is necessary to ensure that:

- all lifting equipment is suitable for the proposed operation and environment;
- initial and continuing integrity of the equipment can be demonstrated;
- all personnel are appropriately trained and supervised;
- lifting operations are properly planned and managed;
- safe systems of work are followed; and
- the equipment is regularly maintained.

5.1.2. Planning and control of lifting operations

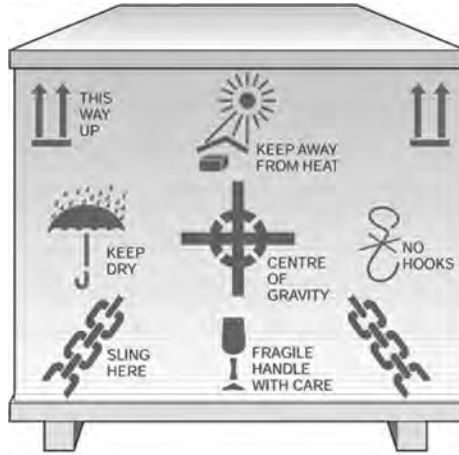
2. All lifting operations should be planned and carried out under the control of a responsible person. Operators of lifting appliances should be competent to control routine operations under the general control of management, but more complex and specialist operations should be carried out under the direct control of a person with the necessary knowledge and experience.

3. Matters to be considered when planning lifting operations should include the following:

- type and size of ship and cargo;

- type of loads to be lifted;
- particular lifting hazards associated with those loads (position of centre of gravity, stability, rigidity, etc.);
- any handling symbols marked on cargo (figure 53);
- attachment of the load to the lifting appliance (availability of appropriate loose gear);
- frequency of the lifting operation;
- where the loads are to be lifted from and to;
- selection of appropriate lifting appliances;
- position of the lifting appliance (sufficient space and level ground);
- proximity hazards (power cables, buildings, roadways, other cranes, etc.);
- requirements for safe erection of the lifting appliance (space, ground loadings, level, etc.);
- ground loadings that will be applied by the lifting appliance and any necessary equipment to spread the load;
- provision of competent staff (lifting appliance operators, slingers, signallers, supervisors, etc.);
- safe systems of work for taking the lifting appliance out of service during maintenance, thorough examination, testing and repairs;
- emergency procedures, including rescue of an operator from an elevated position;
- systems for reporting breakdowns, accidents and dangerous occurrences;
- systems to prevent any unauthorized movement of lifting appliances; and
- provision and maintenance of appropriate safety equipment.

Figure 53. Cargo handling symbols



4. The planning should be constantly reviewed to ensure that any changes are adequately considered.

5. International standard ISO 12480, *Cranes – Safe use – Part I: General* gives guidance on the safe use of cranes.

5.1.3. Training

6. All lifting appliance operators and users of loose gear should be carefully selected, trained and tested to ensure that they are competent. Operators should be trained and certified to operate each make and model of lifting appliance which they operate.

7. International standard ISO 15513 *Cranes – Competency requirements for crane drivers (operators), slingers, signallers and assessors* provides guidance on the competency requirements for crane operators, slingers, signallers and assessors. Further

guidance on the training of crane operators can be found in ISO 9926 *Cranes – Training of drivers*.

5.1.4. Inspection

5.1.4.1. General inspection requirements

8. All lifting appliances and loose gear should be regularly visually inspected before and during use with a view to checking for obvious deterioration and determining whether they are safe for continued use.

9. Inspection is a completely separate process from maintenance. Inspections should be carried out by conscientious, responsible personnel. Lifting machine operators and slingers are often competent to carry out daily and weekly inspections, but checks are needed to ensure that they have the necessary competence.

5.1.4.2. Daily checks

10. All lifting appliances should be inspected at the beginning of each shift or working day during which they are to be used. The use of a checklist is recommended.

11. The checks should include, as appropriate for the type of appliance, all daily checks specified in the manufacturer's handbook, and checks to ensure that:

- all ropes are correctly positioned on their sheaves and drums are not displaced;
- electrical equipment is not exposed to contamination by oil, grease, water or dirt;
- relevant levels and/or components show no loss of fluids (e.g. lubricating oil, coolant);
- all limit switches, cut-outs and dead man's handles or levers operate correctly; caution should be taken during checking in case of malfunction;

- the safe working load limiter is correctly set and the manufacturer's daily test carried out;
- the radius indicator is appropriate to the jib configuration fitted, if separate from the safe working load limiter;
- the load-lifting attachment radius is varied without load to check the correct movement of the radius indicator and safe working load limiter;
- correct air pressure is maintained in any pneumatic control system (e.g. brakes);
- items such as lights, windscreen wipers, washers and other attachments are properly secured and operate efficiently;
- wheels are secure, and the condition and pressure of tyres are appropriate on wheel-mounted lifting appliances;
- all controls function correctly without load;
- audible warning devices operate correctly;
- the appliance is in tidy condition and free from tins of oil, rags, tools, or materials other than those for which storage provision is made;
- safe access is provided;
- appropriate firefighting equipment is available; and
- no obstructions are present in the path of travel of a crane.

12. Appropriate records should be kept. As a minimum, these should record that the inspection has been carried out and any defects found that could not be immediately rectified. Such defects should be reported for rectification.

5.1.4.3. Weekly checks

13. All lifting appliances should be inspected once a week when in use. In addition to the items for daily inspection, the checks should include, as appropriate for the type of appliance:

- weekly checks specified in the manufacturer's handbook;
- visual inspection of all ropes for broken wires, flattening, basket distortion, excessive wear or surface corrosion, or other signs of damage;
- checks of all rope terminations, swivels, pins, retaining devices and sheaves for damage, worn bushes or seizure;
- checks of the structure for damage (including missing and bent bracings on bridges and strut jibs, as well as bulges, indentations and unusual rubbing marks, cracked welds and loose bolts or other fasteners);
- inspection of hooks and other load-lifting attachments, safety catches and swivels for damage, free movement or wear, and checks to ensure that hook shank threads and securing nuts do not show signs of excessive wear or corrosion;
- checks to ensure correct operation and adjustment of controllers;
- inspections to identify any creep of hydraulic rams and hoses, any fitting deterioration on hydraulic machines, and any oil leaks;
- checks to ensure the effectiveness of brakes and clutches;
- inspections of tyres for damage and wear on walls and tread, and checks of wheel nuts for tightness on wheel mounted mobile appliances;
- inspections of slew locks, if fitted; and
- inspections of steering, brakes (foot and parking), lights, indicators, warning devices, windscreen wipers, and washers.

14. The results of all inspections of lifting appliances should be recorded. Details need be recorded only of defects found.

5.1.4.4. Blocks

15. Inspections of blocks should check that:

- sheaves are not cracked at the rim, and no part of the rim is missing;
- grooves are not excessively worn;
- sheaves turn freely and smoothly;
- head-fitting swivels are securely fastened and free from visible defects;
- shanks are not distorted, turn freely by hand and are not slack in their holes;
- clearance between sheaves and partitions of side plates is not excessive;
- side straps are sound and free from any cracks;
- greasing arrangements are satisfactory and grease nipples have not been painted over; and
- data plates are intact and legible.

5.1.4.5. Equipment not in regular use

16. The extent and thoroughness of inspections of lifting appliances not in regular use before each use should be based on the length of the period that the appliance is out of use and its location during this period. An appliance standing out of use under cover or inside a workshop may only require the checks recommended in sections 5.1.4.2 and 5.1.4.3.

17. An appliance left out of use exposed to the weather, atmospheric pollution, etc., may require an extensive appraisal to determine its fitness for use. This should include:

- any checks recommended by the manufacturer;
- examination of all ropes for signs of corrosion and damage;

- examination of all control linkages for evidence of seizure or partial seizure;
- checks to ensure thorough and correct lubrication;
- testing of each crane motion for several minutes without load, first individually, then two or more motions simultaneously, as appropriate, before repeating the tests with a load;
- checking the correct functioning of all crane safety devices; and
- checking hoses, seals and other components for evidence of deterioration.

18. Loose gear that is not in regular use should be returned to the gear store on shore or on board ship (see section 5.3.3.2).

5.1.5. Weather conditions

19. Lifting operations should only be carried out in weather conditions that are permitted in the relevant operating instructions.

20. Adverse weather conditions in which lifting operations may need to stop include:

- high winds;
- lightning;
- dangerous impairment of visibility by rain, snow, fog, etc.;
- adverse sea states; or
- significant vessel movement from wash.

21. Warning of adverse weather should not rely solely on anemometers on cranes. Weather forecasts should be obtained so that appropriate steps can be taken before the arrival of the high winds or other adverse weather conditions.

22. Even at lower wind speeds, it may be dangerous to continue lifting operations, particularly when the load on a crane has a large surface area (e.g. a container). Lifting operations should stop if it is likely to become difficult to control the movement of the load.

23. Operating instructions should include the actions to be taken by specified persons in the event of adverse weather.

24. When high wind speeds are expected, cranes should be secured in their appropriate out-of-service condition. If this requires the raising or lowering of a jib, the planned procedure should ensure that there is adequate time and space to do so. Rail-mounted cranes should be secured. Cranes secured at picket points should be travelled against the wind to the nearest picket position and the storm anchor inserted.

25. Lifting operations should be stopped and all persons withdrawn from the vicinity of the crane if there is a possibility of the crane being struck by lightning.

26. A crane that has been struck by lightning should be thoroughly examined before being returned to service.

27. Ropes attached to the load (tag lines) may be used to help control loads in light winds, but it is essential to ensure that workers holding tag lines are fully aware of the motions to be performed by the crane. Workers holding such lines should never attach them to, or wrap them around, their bodies. The lines should be held so that they can be instantly released if necessary.

5.2. Lifting appliances

5.2.1. General requirements

5.2.1.1. Safe use

28. Lifting appliances should only be used in accordance with the manufacturer's instructions.

29. Operating rules incorporating safe systems of work should be drawn up for all lifting operations.

30. All movements of deck cranes controlled by limit switches should be tested before use.

31. Cranes should only lift loads vertically.

32. A lifting appliance operator should not be permitted:

- to use a limiter as the normal means of stopping a motion; or
- to use a working load limiter as the normal means of determining that a load can be lifted or lowered.

33. Loads should never be dragged or moved in any manner that exerts a side load on a crane or lift truck. If it is necessary to drag a load for a short distance, for example on the 'tween decks area of a ship, a snatch block should be used (see section 5.2.2).

34. There should be a minimum 1 m clearance between any part of a crane and any fixed object. Persons should be prevented from entering any area where the clearance is less than 600 mm.

35. All personnel not directly involved in the lifting operation should be kept clear of the area.

36. No person should stand under a suspended load.

37. No person should be lifted by a lifting appliance other than in a specifically designed personnel carrier.

38. No persons should be permitted to board or leave a lifting appliance without first obtaining the operator's permission. If the access point is out of sight of the operator, means should be provided to ensure that the operator is aware of the whereabouts of the other person. A notice specifying the boarding procedure should be posted at the boarding point, where appropriate.

39. Lifting appliance operators should:

- only perform lifting operations when specifically instructed to do so by the designated signaller; however, every emergency stop signal should be obeyed;
- perform the operations smoothly, avoiding sudden jerks; and
- ensure that the power supply is turned off before leaving the appliance.

40. Lifting appliance operators should never:

- lift loads over persons;
- leave loads suspended longer than is necessary to move them;
- leave appliances unattended with a load suspended; or
- allow workers to travel with loads other than in personnel carriers.

5.2.1.2. Care and maintenance for wire ropes

41. All wire ropes on lifting appliances should be regularly treated with a wire rope dressing free from acid or alkali. Whenever possible, this should be of a type recommended by the manufacturer.

42. Where it is practical and safe to do so, the dressing should be applied where the rope passes over a drum or pulley, as the bending of the rope facilitates the penetration of the dressing.

43. It may be necessary to clean wire ropes used in dusty or abrasive environments thoroughly before applying the dressing.

44. Clear evidence of deterioration will often be presenting the form of barbs or fins formed by broken wires. Such barbs are dangerous when ropes are handled. However, deterioration may

also be due to rotting of the textile (fibre) core. This deprives the steel wire strands of all their support, and the rope then undergoes deformation, which becomes progressively more apparent.

45. If a wire rope has deteriorated, the defective parts should not be joined together.

46. Wire ropes should be replaced when:

- they show significant signs of corrosion, particularly internal corrosion;
- there is any tendency towards "bird caging" (separation of the strands or wires);
- they show signs of excessive wear indicated by flats on individual wires;
- the number of broken wires or needles in any length of six diameters exceeds 5 per cent of the total number of wires in the rope;
- broken wires:
  - appear in one strand only;
  - are concentrated in a shorter length of rope than ten diameters; or
  - appear in the tucks of a splice; and
- there is more than one broken wire immediately adjacent to a compressed metal ferrule or any compressed termination fitted in accordance with section 4.4.3, paragraph 194, concerning thimble or loop splices.

47. Further guidance on the examination of wire ropes and discard criteria is given in the international standard ISO 4309 *Cranes – Wire ropes – Care and maintenance, inspection and discard*.

48. The reason for any defects found should be investigated and remedial action taken.

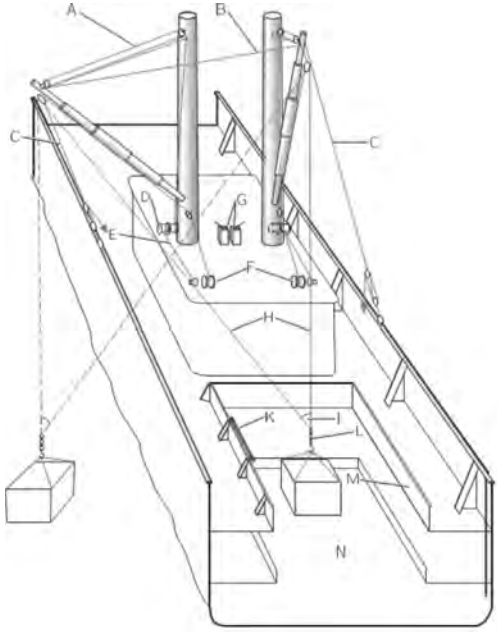
5.2.2. Ships' lifting appliances

5.2.2.1. Ships' derricks

49. When a derrick (figure 54) is rigged:

- a person should be stationed at each span winch and/or cargo winch in use;
- only persons engaged in the rigging work should be allowed in the vicinity. Other persons should only pass along the deck with the permission of the person in charge of the operation;
- wire ropes should be checked to ensure that they are free from corrosion, kinks, needling or other patent defects;
- all shackles and securing blocks should be fitted correctly, with their pins properly tightened and secured by seizing with wire or other effective means;
- block sheaves should be checked to ensure that they are free to turn and properly lubricated;
- guys, including preventer guys where appropriate, should be properly attached to the derrick head and the correct deck eye plates in order to prevent possible jack-knifing;
- it is essential to ensure that the gooseneck is free to swivel. This may be done when the derrick is at a low angle, from 30˚ to 50˚, with one or more persons gently swinging on the guy(s);
- a heavy lift derrick should be checked to ensure that any temporary mast or Samson post stays are properly fitted and that any special slewing guys directly attached to the lower cargo block are properly rigged; and
- rigging items should not be able to whip against the winchman.

Figure 54. Derricks in union purchase rig



A. Topping lift. B. Tie. C. Pendant. D. Topping drum. E. Auxiliary topping rope. F. Hoisting winches. G. Winch couplers. H. Hoisting ropes. I. Triangular piece for joining the two hoisting ropes. K. Roller for protection of hoisting ropes (optional). L. Chain with swivelling hoisting hook. M. Hatch coaming. N. Hatch.

50. When deck cargo stowed on a ship makes the deck eye plates inaccessible, the guys should be secured to wire rope or chain pendants designed especially for the purpose. The pendants should be sufficiently long to enable the guys to be coupled to the pendants at the top level of the deck cargo.

Extreme care should be taken to ensure that the relative positions of the guys remain as shown on the rigging plans.

51. No derrick should be rigged and adjusted for angle other than by its own power-operated topping winch or by a span winch.

52. When a topping winch is used, a person should standby the pawl-operating gear ready to engage the pawls when signalled by the person hauling in or paying out the rope whip.

53. It is advisable to use separate drums for the luffing rope and the topping lift.

54. No attempt should be made to engage the pawls while the winch drum is rotating in the direction for lowering the derrick.

55. A whip rope used for driving a topping winch should:

- not be used on a drum that is liable to damage the rope;
- not have more turns on the drum than is necessary for safety, provided that extra turns should be made on a drum that is whelped;
- not be surged or rendered on the drum, particularly in the case of synthetic rope; frictional heat is liable to damage the rope;
- not contain any splice; and
- be of a suitable size to ensure adequate strength and handling.

56. The power of winches should be limited to a value corresponding to the safe working load of the derricks. This is likely to range from 18.6 to 37 kW (25 to 50 hp) for hoisting speeds of 0.4 m/s for 8 t loads, 0.6 m/s for 3 t loads.

57. The winch operators should:

- be protected against the weather, preferably by a sheet metal cab with large windows;
- have a clear view of the hatch, unobstructed by steam or otherwise;
- wear suitable gloves to protect hands from possible burns;
- coil rope on the deck when appropriate; and
- never stand in any bight of the rope.

58. A chain stopper should not be used on derrick spans.

5.2.2.2. Use of coupled derricks (union purchase)

59. The arrangement known as "union purchase", or "married falls", allows the load to be moved sideways over the deck without slewing the boom. This may be done by using two booms or by using one boom and a fixed point, possibly on a building, at right angles to the hold.

60. When two booms on the same mast are used, union purchase is generally used for light loads of not more than 3 tonnes.

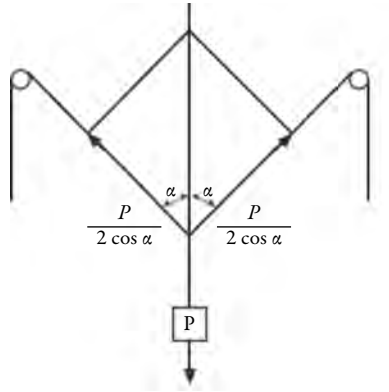
61. Calculation of the stresses on the various parts of the system should be carried out by a competent person.

62. The angle between the two cargo falls should not exceed 90° at any time. As the angle increases above 90°, the stresses on the ropes and booms increase rapidly. The tension in each of the ropes is –

$$\frac{P}{2 \cos \alpha}$$

where P is the weight of the load lifted in tonnes and α is the angle between the cargo runner and the vertical (figure 55).

Figure 55. Tension in union purchase cargo falls



The table shows the values of the stress –

$$\frac{1}{2\cos\alpha}$$

- with variations in the angle of lift α P weight of load:

α	$\frac{1}{2\cos\alpha}$
10°	0.508
20°	0.532
30°	0.577
40°	0.653
50°	0.778
60°	1.000
70°	1.461
80°	2.800

63. The load in union purchase should generally be limited to half the safe working load of the weaker of the two booms used.

64. Before any union purchase operation is undertaken, reference should be made to the union purchase certificate and rigging plan for the operation. Particular attention should be paid to the position of the deck lugs for the guys and preventer guys; these should be specially marked.

65. The guys holding the booms should be so placed that their horizontal projection is approximately in the plane of the load's travel.

66. The derricks should not be coupled until preventers have been put in place, unless the guys and other permanent rigging have been specifically planned for union purchase.

67. When a derrick is to be used in union purchase:

- a preventer guy should be fitted in addition to the main guy, care being taken not to confuse a guy intended only for trimming a boom with a working guy;
- the preventer and the main guy should be attached to deck eye plates that are separate but placed as close together as practicable;
- the preventer and the main guy should be adjusted when the derrick boom is under a slight dynamic loading, such as a suspended heavy hatch beam; and
- the main (working) guy should be under slightly more tension than the preventer guy.

68. Where the length of a guy is adjusted by a claw device in conjunction with a series of metal ferrules compressed to a wire rope secured to a deck eye plate, the claw should be of suitable design and of adequate strength, and arranged so that it will not be accidentally released in the event of temporary partial

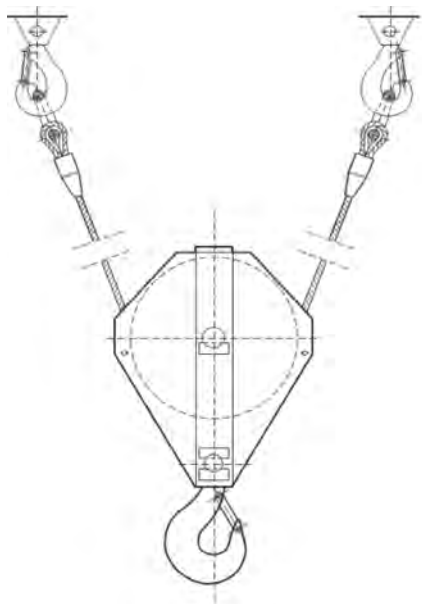
slackness in the guy. If a fibre rope block and tackle is used, the rope should be of synthetic fibre, as this has better elasticity and does not need adjustment when it becomes wet or dry.

69. The hoist ropes of the two derricks should be secured by the use of an equalizing pulley or by suitable swivels to a common ring carrying the cargo hook (figure 56). The hook should be fitted as close to the junction of the falls as possible.

70. When derricks are in use in union purchase:

- the load should be raised just enough to clear the coaming, bulwark or railings, whichever is the highest; and

Figure 56. Equalizing pulley for two coupled cranes



- slings on loads should be of minimum length to enable the height of lift to be kept as low as possible.

5.2.2.3. Ships' cargo lifts

71. A scissor lift should be provided with temporary fencing on any side of the lift from which it is not being loaded or unloaded at that time (figure 57).

72. No person, other than the operator, the operator of a vehicle or persons loading or unloading the platform, should be allowed near the lift when it is in use.

Figure 57. Ship's cargo lift (other safety features omitted for clarity)

73. No person, other than the operator of a vehicle who remains at the controls of the vehicle, should travel on a cargo lift platform.

5.2.2.4. Ships' mobile lifting appliances

74. The layout of the controls of mobile lifting appliances, such as lift trucks and mobile cranes that belong to a ship (see section 4.3.1, paragraph 114), should be checked before the appliances are used. If the layout is different from those on similar equipment on shore, operators should receive familiarization training before using them and take particular care to prevent unexpected motion.

5.2.2.5. Cranes temporarily installed on ships

75. The effects of possible list and movement of a ship, barge or pontoon should be considered when a shore crane is placed on board. These may adversely affect the strength and stability of the crane or the operation of its motions, and make it necessary to restrict the load which the crane may lift. Where there is any doubt, advice should be sought from an appropriate crane design authority.

76. A complete design assessment of the installation should be carried out if the crane is to remain on board for an extended period. This should take into account the means of securing the crane. After such an assessment, the crane should be tested to ensure adequate stability, adequate freeboard and the correct ratings.

5.2.3. Shore cranes

77. There should be a minimum clearance of 1 m between a rail-mounted crane and any obstacle it passes, including stacked goods or a vehicle being loaded or unloaded. If goods are permanently stacked near a crane track, the boundary of the stacking

area should be conspicuously and permanently marked on the ground.

78. If it is not practicable to provide and maintain a clearance of 1 m, effective steps should be taken to prevent access by persons.

79. The track of a rail-mounted crane should be kept clear of loose material and rubbish as far as is practicable.

80. Travel routes to be used by mobile cranes should be checked for level, and to ensure that they are able to take the wheel loads and that there is sufficient overhead clearance from pipes, cables and other hazards. Inclines and cross-falls on the route should be checked if cranes are to travel with the jib extended or elevated.

81. If the ground is not capable of withstanding the weight of a rubber-tyred crane and its load, packing should be placed beneath the jack pads to spread the loads over an area sufficient to provide adequate support and prevent the crane from overturning or becoming unstable. Packings should be suitable for the purpose. A bed of sand may ensure more even distribution of the loads and prevent damage to the packing material.

82. It is essential to ensure that the chassis of a "free-on-wheels" mobile crane is level before use.

83. Outriggers should always be used in accordance with the manufacturer's instructions. Cranes should never be used with outriggers extended only on one side.

84. Cranes that are out of service overnight or longer should be left in the condition specified in the manufacturer's instructions.

85. A number of accidents have occurred when the bow or stern of a ship approaching a quay has overshot the edge of the

quay and struck a crane, causing it to collapse. During berthing operations, rail-mounted cranes should be positioned where they cannot be struck by the ship.

86. Container cranes are designed primarily to lift containers and not people. Advice should be sought from the crane manufacturer if there is any doubt about precautions that should be taken when such cranes are used to lift portworkers, for example in a lashing cage. The precautions may include:

- reducing the operational lifting, lowering and trolleying speeds;
- prohibiting gantrying along the quay;
- use of "dead man's" controls in the operator's cab;
- double wire purchases;
- safety cut-outs;
- use of safety belts;
- limiting the number of persons to be carried at one time;
- fitting an emergency stop button accessible to those being carried;
- fitting a control monitoring system to detect serious errors; or
- more frequent safety inspections.

5.2.4. Lift trucks

5.2.4.1. General requirements

87. An adjustable seat should be adjusted to provide a comfortable driving position. The seat should be designed and located to provide easy access to the controls, and provide a position for the truck operator in accordance with ergonomic principles. If a suspension seat is fitted, the weight adjustment

should be set to correspond to the operator's weight to minimize transmission of shocks to the spine.

88. Appropriate fork attachments, such as rotating heads and drum or bale clamps, should be used whenever they are available to handle particular types of cargo.

89. A special attachment consisting of a frame fitted to the fork-anchoring frame and fitted with a conventional hook should be used only if:

- the safe working load, including that for traversing on a slope (if required), is marked on it;
- the maximum height of lift of the hook is conspicuously marked on the mast of the truck; and
- care is taken to ensure that swing of the suspended load is controlled when the truck is travelling.

90. Trucks and battery containers of electric trucks that are hoisted aboard ship should be lifted by suitable slinging points.

91. Any oils spilled should be cleaned up as soon as possible.

5.2.4.2. Safe use

92. When lift trucks are used:

- flashing orange/amber lights should be operated whenever the truck is in motion;
- trucks should be driven at an appropriate safe speed; this should not exceed 25 km/h;
- seat belts should be worn when appropriate;
- the clearance of the loads should be borne in mind, especially when the truck enters places that are narrow or restricted in height;
- stacking on and travelling across inclines should be avoided;

- if the load obscures forward vision, the truck should be driven in reverse, or a banksman/signaller should be used; forward vision cameras may also assist as an aid but should be used with caution;
- the audible warning device (horn or klaxon) should be sounded when necessary to alert pedestrians and when the lift truck is about to pass through rubber swing doors or pass any concealed entrance, parked vehicle or large obstacle, such as temporary cargo;
- truck forks or other load attachments should be fully lowered when the truck is parked; and
- the parking brake should be applied whenever the truck is at rest.

93. Lift trucks should not be:

- driven:
  - without permission;
  - on routes other than those which have been specifically approved in advance; or
  - with unsafe loads;
- braked unnecessarily sharply, made to take bends at high speed, or otherwise driven dangerously;
- used to:
  - lift a load exceeding the truck's capacity;
  - lift a poorly balanced load;
  - lift a load on only one fork arm;
  - travel with the forks raised above a nominal 150 mm, either loaded or unloaded;
  - carry persons on trucks not specially equipped for the purpose, on trailers with or without brakes, on couplings, or on the forks;

  - pull or push a wagon or other vehicle with a truck not specially designed for the purpose, unless a special safe system of work has been drawn up by a competent person; or
  - deposit metal goods where they might fall onto the batteries of electric trucks;
- used with any additional weight on the counterweight;
- left in a traffic lane; and
- left with the ignition key in an unattended truck.

94. Special care should be taken when a truck is driven:

- on slippery ground;
- in areas where there is loose dunnage or waste material;
- by or through doorways used by personnel;
- around corners where vision is restricted;
- in any place where the overhead clearance is limited;
- near any open hatch or lift opening on a ship when the lift platform is away from that deck; and
- on bridges over trenches or other gaps.

95. During stacking and unstacking operations with a counterbalanced lift truck (figure 58 (1 and 2)):

- forks should penetrate under the load as far as the heel of the forks;
- forks should be at least three-quarters the length of the load in the direction of the forks;
- where loads are stacked behind one another, the fork length should be such that it does not disturb the stack behind the load being lifted;

- when travelling, with or without a load, the forks should be at least 150 mm above the ground, so that there will be no risk of the forks or load hitting the ground; and
- no load should be carried or raised with the mast tilting forward, unless the truck complies with national or international standards relating to operations.

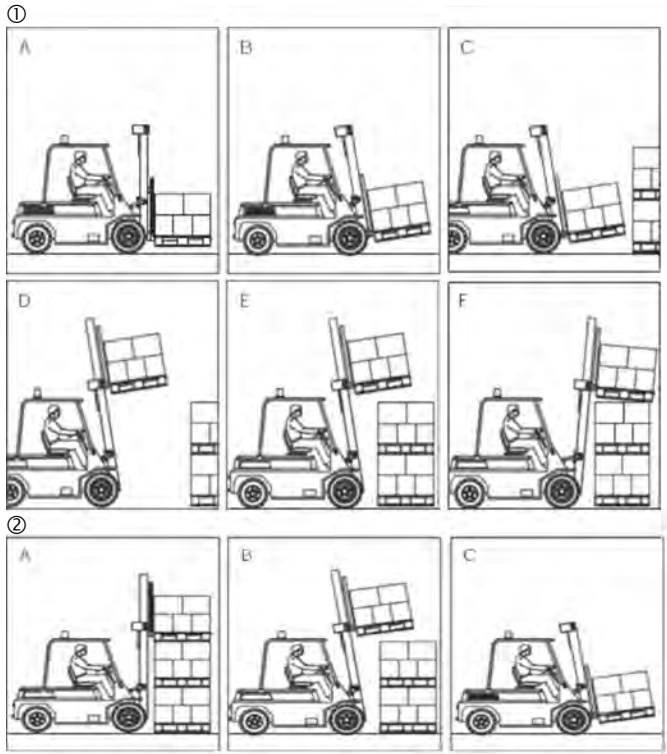
96. During stacking (figure 58.1):

- the stack should be approached slowly, with the mast tilted backwards;
- when the truck is sufficiently close to and facing the stack, the brakes of the truck should be applied and the forks then raised until they are slightly above the stacking level;
- when the load is over the stack, the brakes should be reapplied, the mast should be brought to its vertical position and the load deposited;
- once the load is properly stacked, the forks should be withdrawn from beneath the load (with the mast tilting forward if necessary) by backing the truck away from the stack; and
- the forks should then be lowered to the travelling position.

97. During unstacking (figure 58.2):

- the truck should approach the stack and stop with the fork tips approximately 300 mm from the stack face;
- the operator should check that the forks are at the correct width spacing and the load is within the capacity of the truck;
- with the forks raised to the correct height and the mast vertical or tilted slightly forward, the truck should be

Figure 58. Stacking and unstacking by lift truck



1. Stacking.
A. Take the load at ground level and raise about 150 mm. B. Give lifting assembly and load maximum tilt to rear. C. Align the truck in front of the stacking point and set the brakes. D. Lift the load to the required height. E. Move the truck forwards slowly until the load is aligned over its final position and reset the brakes. F. Lower the load slowly, if necessary allowing the platform to tilt forwards slightly.
2. Unstacking.
A. Pick up the load with the uprights vertical. B. Move backwards with load and tilt to rear. C. Lower the load.

moved forward until the heels of the forks are in contact with the load, and the brakes of the truck should then be applied;

- the forks should be raised until the load is just clear of the stack and the mast should be tilted slightly backwards. Great care should be taken to ensure that any other load on the stack is not disturbed during this operation;
- the operator should ensure that the way is clear, and should reverse the truck sufficiently far from the stack to clear the road; and
- the load should then be lowered to the travelling position, the mast should be tilted fully backwards and the truck should then move off steadily.

98. When a counterbalanced truck is driven on an incline:

- without any load, the forks should face down the slope;
- the load should always face up the slope; and
- travelling across the incline and turning on the incline should be avoided.

99. A counterbalanced truck should not pick up, put down or carry a load on a slope that runs across the fore-and-aft centre line of the truck.

100. When a truck is travelling on the platform of a ship's lift, it is essential to ensure that:

- no part of the truck or its load projects beyond the edge of the platform;
- the truck brakes are firmly applied; and
- the operator stays at the controls of the truck.

101. Pallet loads should be secure and safely banded. They should not overhang the pallet.

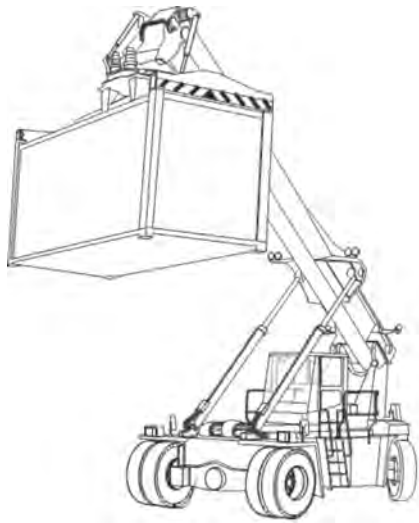
5.2.4.3. Batteries

102. The batteries of a truck or automated guided vehicle (AGV) should be handled, whether for charging, removal or other purposes, only in a proper place especially set aside for that purpose and under the supervision of an experienced person. Only authorized and competent persons should handle batteries owing to the possibility of injuries from electric shock or burns from battery acid.

5.2.4.4. Reach trucks/reach stackers

103. A reach truck/stacker (figure 59) should not be driven with its reach mechanism extended.

Figure 59. Reach truck / reach stacker



104. Before the reach mechanism is operated, the brakes of the truck should be properly applied.

105. No person should be allowed to step over the reach legs/outriggers/stabilizer legs while the truck is in use.

106. When reversing, the driver could use a camera-monitoring system and/or proximity sensors as an aid, if available.

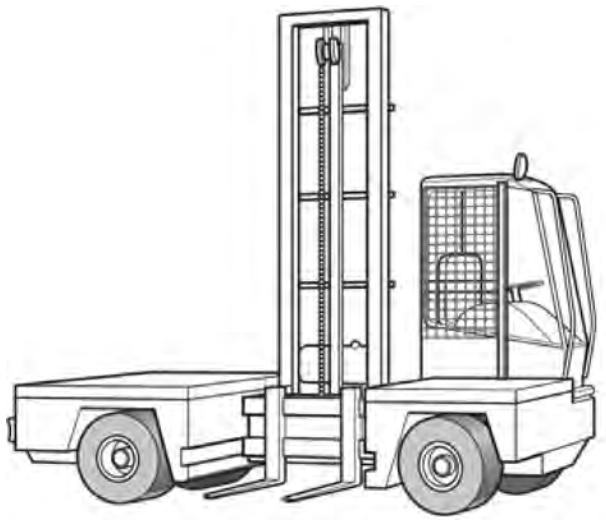
5.2.4.5. Side-loading forklift trucks

107. When using a side-loading forklift truck (figure 60), the load should be raised clear of the deck before traversing in.

108. If stabilizing jacks:

- are fitted, they should be fully lowered before the load is lifted;

Figure 60. Side-loading forklift truck



- are fitted but not used, and the truck has a reduced safe working load when used without stabilizing jacks, this load should not be exceeded; or
- are not fitted, the load should not exceed the load appropriate to operating without stabilizing jacks.

109. Unless backward tilt of the forks is used to stabilize a loose load, the load should be firmly on the deck and the forks just clear of the ground before travel takes place.

110. If the truck has a jackless capacity, it should not move while the mast is in the traversed-out position other than to manoeuvre the load into position, for example, on a vehicle platform.

111. When a side-loading forklift truck is used for stacking:

- the stack should be approached with the load placed on the deck of the truck, making use of backward deck tilt (if fitted);
- the truck should stop when the load is in line with the depositing position and the truck is parallel to the stack;
- the stabilizing jacks, if any, should be firmly applied;
- any deck tilt should be removed;
- the load should be raised to the required height;
- the load should be traversed out until it is over the stacking position;
- the load should be lowered onto the stack, any tilt being corrected as necessary;
- when the load is properly stacked, the forks should be lowered until free of the pallet or dunnage strips;
- the mast should be traversed fully in and the forks lowered to just below deck level; and

- the stabilizing jacks, if any, should then be retracted or raised.

112. The procedure for unstacking should be the reverse of the procedure for stacking.

5.2.4.6. Pedestrian-controlled pallet trucks

113. The operator of a pedestrian-controlled pallet truck should always walk with it and not attempt to ride upon it.

114. The operator should walk to one side of the control handle and clear of the truck, if it is necessary to precede the truck.

115. When approaching an obstacle, the operator should be behind the truck whenever possible.

116. When a truck is to be driven onto a vehicle being loaded or unloaded, it is essential to verify that:

- the vehicle's brakes are firmly applied;
- the bridge spanning the gap between the loading platform or bay and the vehicle is sound, of adequate strength and firmly positioned; and
- the vehicle's loading surface is sufficiently strong and in good and level condition.

117. When a truck is required to use a goods lift, the operator should:

- approach the lift load first;
- stop at a safe distance from the gate;
- check that the combined weight of the truck and its load is within the safe working load of the lift;
- check that the floor of the lift is level with the ground or loading floor;
- check that the load will clear the lift entrance;

- drive on slowly and cautiously; and
- firmly apply the brakes and shut off the power.

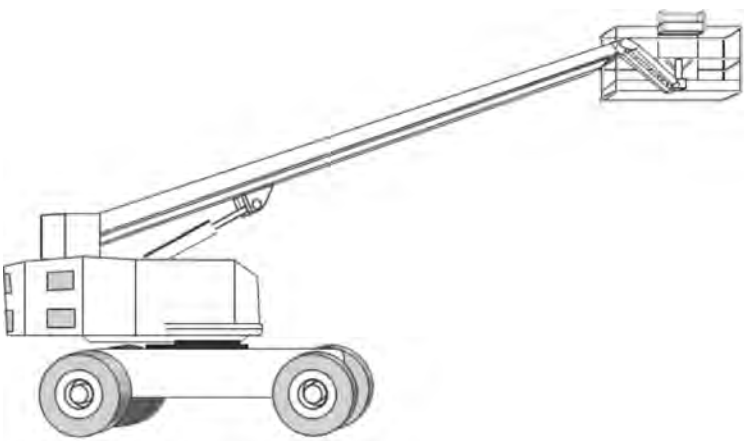
5.2.5. Other lifting appliances

118. Mobile elevating work platforms (MEWPs) should be used only with fully guarded operational platforms which should be fitted with over-elevation protection (figure 61), in accordance with national laws and regulations. If they are to be used as a means of access, the manufacturer should be consulted about necessary precautions.

119. Particular attention should be paid to the stability of MEWPs. Before the platform is raised it is important to ensure that:

- it is not operated in adverse weather conditions;

Figure 61. Mobile elevating work platform (MEWP) (illustrative of the type of equipment, may not include all types of safety equipment)



- the appliance is suitable for the intended operation;
- the ground below its wheels and outriggers can support the load;
- the outriggers are fully extended and, if necessary, supported by suitable packings;
- wheel locks are applied, if fitted;
- fall-arrest equipment should be used;
- the equipment should be pre-checked before use; and
- the carriage is level.

120. MEWPs should only travel with the platform raised if they have been designed to do so. Travel should be at slow speed, special attention being paid to avoid potholes or slopes that could reduce stability.

121. Winches operated by steam power should be operated in such a way that:

- portworkers are not scalded by hot water or steam;
- exhaust steam does not obscure the operator's field of vision;
- the cylinders and steam pipes are cleared of water by opening appropriate drain cocks; and
- a constant steam pressure is maintained at the winches to ensure safety and smooth working while the winches are in operation.

5.2.6. Use of more than one lifting appliance to lift a load

122. The use of two lifting appliances in tandem is a hazardous operation that should be performed only in exceptional circumstances. It calls for detailed planning and great caution. In particular:

- it should be directly supervised by a competent person;

- lifting appliances should be compatible and operate in the same manner;
- the load should not exceed the safe working load of either appliance by more than 25 per cent;
- neither appliance should lift more than 75 per cent of its safe working load;
- movements should be slow and strictly controlled;
- only one motion should be used at a time;
- as far as possible, cranes should not slew with the load;
- side loading of cranes should be avoided.

5.3. Loose gear

5.3.1. Safe working load

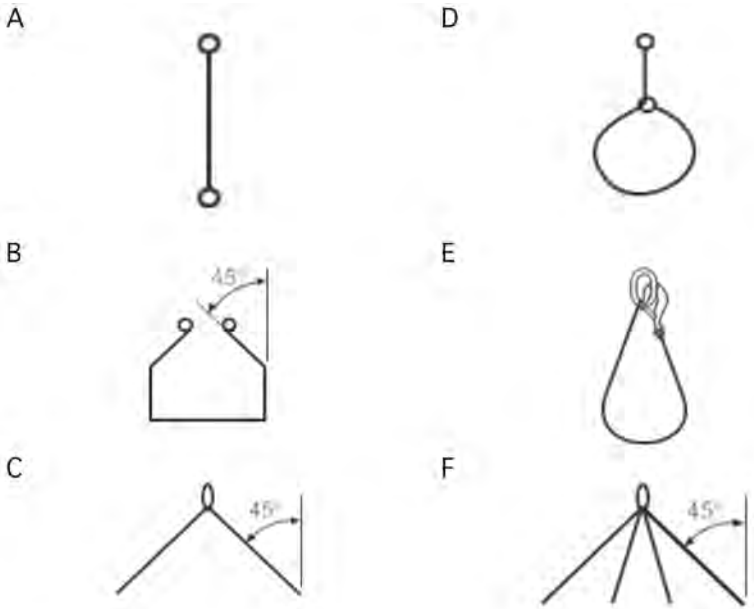
123. The safe working load (SWL) of items of loose gear should be determined by a competent person. Usually this is done by applying a factor of safety to the breaking load of the item, but the safe working load of specially designed lifting beams, lifting frames and special clamps should be determined by design calculations.

124. The safe working load of a sling (figure 62) depends on the configuration in which it is used (mode factor).

125. Using the uniform load method that is normally employed, the mode factors which should be applied to the safe working load of a single sling are:

Configuration	Mode factor
Straight vertical lift	1.0
Choke hitch	0.8
Vertical basket hitch	2.0
45º basket hitch	1.4

Figure 62. Hitches/mode factors



A. Straight vertical lift M = 1.0 B. Basket hitch 0°–45° M = 1.4 C. Two equal single legs used 0°–45° M = 1.4 D. Choke hitch M = 0.8 E. Single leg hooked back M = 1.0 F. Three or four equal single legs used 0°–45° M = 2.1.

126. Using the trigonometric load method, the SWL of an inclined single sling can be calculated from the following formula:

$$SWL = 1 \times SWL \text{ of single leg} \times \cos \alpha$$

(where α is the angle of the sling from the vertical).

127. Using the uniform load method, the mode factors for multi-leg slings of wire, chain or fibre with a maximum angle of 45° from the vertical are:

Sling	Mode factor
Two leg	1.4
Three leg	2.1
Four leg	2.1

128. Using the trigonometric load method (figure 63), the SWL of a multi-leg sling can be calculated from the following formulae:

$$\text{Two-leg sling} - \text{SWL} = 2 \times \text{SWL of single leg} \times \cos\alpha$$

$$\text{Three- and four-leg slings} - \text{SWL} = 3 \times \text{SWL of single leg} \times \cos\alpha$$

(where α is the angle of the sling leg from the vertical).

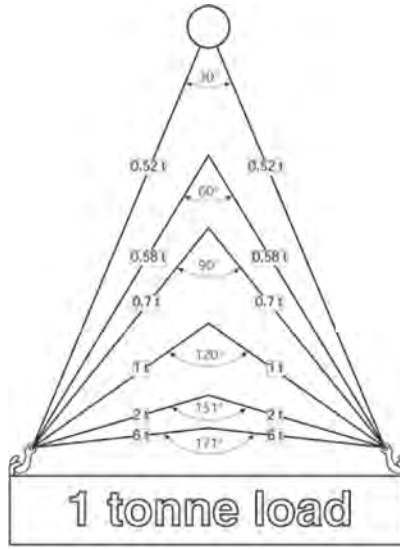
The SWL of a four-leg sling should be the same as that of a three-leg sling as most loads are not uniform.

129. In normal use, the angle of 45° from the vertical should not be exceeded. If this becomes necessary, the angle should never exceed 60°, since at this angle the stress in each leg of a two-leg sling is equal to the weight lifted.

5.3.2. Safe use

130. The first and most basic tenet of safe slinging is to ensure that the load is as secure suspended as it is on the ground. To achieve this, the correct selection of loose gear combined with the correct method of use should be employed.

Figure 63. Examples of stress on a two-leg sling using the trigonometric method of calculation



131. Slingers and other persons responsible for attaching loose gear to the load and lifting appliances should be:

- trained and competent in slinging and directing the movements of lifting appliances;
- capable of selecting the correct loose gear;
- able to recognize defects that should result in the rejection of gear;
- able to assess and balance loads and minimize the sling angle;
- familiar with the signalling system in use in the port; and
- able to initiate the movement of the lifting appliance.

132. If more than one slinger is required for a particular load, one slinger should be in charge of the operation and should be the only person to direct the lifting appliance operator.

133. Every item of loose gear should be visually inspected by a responsible person before use and continuously during operations by the slingers.

134. Any item of loose gear seen to be defective on inspection or during use should be taken out of service and referred to a competent person.

135. Loose gear should not be:

- dropped from a height; or
- subjected to snatch or shock loads.

136. A sling should not be:

- used if crossed, twisted, kinked or knotted;
- used to roll a load over;
- dragged from beneath a load by a lifting appliance, unless the load is resting upon dunnage of adequate thickness. This rule does not apply in the operation of unhooking logs. In such a case, the slings should be inspected on an ongoing basis for any shafting; or
- subjected to excessive heat or allowed to come into contact with any acid, alkali, abrasive or other substance liable to damage the sling.

137. Before the hoisting signal is given to the operator of a lifting appliance after a load has been released, it is essential to confirm that:

- the sling is completely free of the load; and
- any hook or other lifting device at the end of the sling is hooked or attached to the upper ring of the sling; if that is not practicable, steps should be taken to ensure that

the hook or other lifting device will not catch or foul any object.

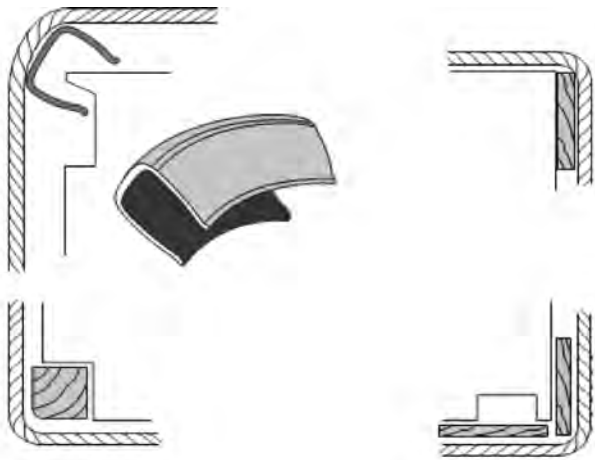
138. A shackle should not be used on a sling unless it is fitted with a proper shackle pin; an ordinary bolt or piece of steel bar should not be used.

139. The links of a chain should not be joined together by a nut and bolt, by wiring, or by passing one link through another and inserting a bolt or nail to hold it in place.

140. A chain, fibre rope, wire rope or webbing sling should not be allowed to come into contact with any sharp or jagged edges of the load, but should be protected by means of wood, webbing, rubber or other suitable packing.

141. If a load has sharp angles, wedges of rag, paper, wood, plastic or rubber tyre should be placed over the edges so as not to damage the sling (figure 64).

Figure 64. Methods of protection of slings, etc. against sharp edges



142. No hook or other lifting device should be attached to any wire, strap, band or other fastening of a load unless it is so attached for the purpose of breaking out a load and only lifted a short distance to make up a set. Unitized loads or packages banded by twisted wire or flat metal should only be lifted by such bands if they are accompanied by relevant certificates in the same way as disposable or one-trip slings.

143. In the case of unitized loads (figure 65), hooks or lifting devices may be so used, provided that:

- they are specifically designed for the purpose;

Figure 65. Lifting banded unitized loads

- the wire, strap, band or other fastening has been properly secured to the load;
- the wire, strap, band or other fastening is compatible with the hook or lifting device used; and
- at least two hooks or lifting devices are used, and each is secured to a band or group of wires.

144. No hook should be attached to the rim or chine of a drum or barrel unless the hook is of suitable shape, and the rim or chine is of adequate strength and depth for the purpose and is not distorted or otherwise damaged.

145. No hook should be inserted into the attachment of a load unless the attachment is of sufficient size for the load to be freely supported on the seat of the hook. The load should never be applied to the point of the hook nor should the hook be hammered in.

146. When lifting a heavy or bulky load, care should be taken not to crowd the hook of the lifting appliance with slings.

147. If a large number of slings cannot be avoided, one or more bow shackles should be used to connect the slings to the hook.

148. When it is necessary to handle irregularly shaped loads, such as a machine tool or very long loads where the centre of gravity may be some distance from the vertical geometric centre line, a number of trial lifts should be made by partially lifting the load and adjusting the sling position until the suspended load is as level as practicable.

149. Where it is necessary to shorten one or two legs of a sling in order to achieve equal balance, a proper device such as a chain claw should be used (figure 66). A sling should never be shortened by knotting.

Figure 66. Chain shortening claw

150. When tubes, girders, long metal sheets or similar long loads are lifted, double-wrapping the sling is the safest and most appropriate method to employ.

151. Where two shoes, dogs or hooks used to grip a load are connected by a running chain, this should be fitted with a shortening clutch so that an angle of 60° can be maintained by the chain.

152. Where necessary, the load should be fitted with lanyards or guys (tag lines) so that twist or swing of the load can be controlled by persons stationed on the guys.

153. Unless a load is of sufficient length to warrant the use of a spreader beam or lifting frame, its weight should not exceed:

- the safe working load of either of the slings when slings of equal safe working loads are used; or
- the rating of the sling having the lesser safe working load when slings of unequal safe working load are used.

154. The weight of a load to be lifted by a sling used in choke hitch (with the standing part of the sling being reeved through the hook or eye at the end holding the load) should be limited to 80 per cent of the safe working load marked on the sling (see section 5.3.1, paragraph 125).

155. When two slings are used, the slings should be passed around the load at least twice before being attached to the standing part of the sling (a wrapped choke hitch) in order to reduce to a minimum the tendency of the slings to slide inwards towards one another when they are under tension.

156. When a choke hitch is used, the angle between the hook or eye and the standing part should be allowed to take a natural position and not be knocked down to tighten it. A practical rule is to keep the height of the choke above the load to at least two-thirds the length of the sloping part of the sling. This rule is easy to apply to the slinging of sacks, but the load should always be well balanced.

157. When a chain sling is used in choke hitch, the hook or eye of the sling should be hooked or reeved into the standing part so that the subtended angle between the standing part and the end of the sling is not more than 90°. Slings other than chain slings tend to take up an angle of 90°, but on chain slings this is prevented by the hook or eye locking itself between two chain links.

158. In the case of a sling having an eye at each end and reeved with both eyes on the hook of the lifting appliance and the two standing parts of the sling reeved through the

eye of another sling placed around the load, the weight of the load to be lifted should not be greater than the safe working load marked on either of the slings.

159. Pre-slung slings are subject to all the normal requirements of manufacture and certification.

160. During the discharge, pre-slung slings should be inspected prior to each lift as damage can occur while the ship is at sea as a result of movement between the packages. Ideally, small dunnage sticks should be placed between the packages on loading to prevent chafing.

161. Ships carrying pre-slung cargo should hold a copy of the test certificate or certificate of conformity showing the safe working load of the slings and, if they are reusable, a copy of a current (i.e. issued within the last 12 months) thorough examination certificate.

162. Plate clamps should be of an adequate size and strength for the loads handled, and all the teeth on a clamp face and/or locking cam should be sound.

163. A self-locking plate clamp should not be used unless it is fitted with a safety catch to prevent the load from being accidentally released in the event of the tension upon the clamp becoming momentarily slack.

164. When a load is lifted by barrel hooks, crate clamps or similar appliances, the sling should be reeved from the crane hook through the barrel hook, crate clamp or similar appliance and then back to the crane hook. In order that the resultant force will make the hook or clamp engage more firmly, an angle of 60° should be maintained between the legs of the sling.

165. Except when making up a set in circumstances in which portworkers could not be injured, the lifting of such loads as bales by the insertion of hooks should be prohibited.

166. Small loose goods such as small drums, canisters, boxes and carboys should be loaded onto suitable pallets or trays hoisted by four-legged slings. When necessary, special precautions, such as fitting a net around the slings, should be taken.

167. Buckets, tubs and similar appliances should:

- be loaded in such a way that there is no risk of any of the goods falling out;
- be secured to the hook by a shackle, unless fitted with a handle specially designed to fit the hook of a lifting appliance;
- have a handle with a special bend at its centre or be shaped in such a way that the hook or shackle will lift the bucket or tub only at the centre of the handle; and
- have, if the handle can hinge about its attachments to the bucket or tub:
  - hinge points above the centre of gravity of the bucket or tub when it is loaded; and
  - a locking device fitted to prevent a bucket or tub from accidentally turning over when it is suspended.

168. When a cargo, such as loaded bags, sacks or reels of paper, is to be hoisted by a sling:

- an endless fibre rope or flat endless webbing sling should be used, and should be reeved in choke hitch in such a way that the two parts of the rope encircling the bags or sacks are spaced approximately one-third the length of bag away from each end;
- in the case of paper reels of large diameter, when three reels are hoisted at the same time by means of a sling, the reels should be placed in triangular fashion with one reel resting upon the other two; and

- the bags or reels should be arranged so that their ends are all approximately in the same vertical plane.

169. When the hook of a multi-legged sling is attached to an eye fitting on a pallet, tray or load, it should be inserted into the eye from the inside of the load, so that in the event of a leg of the sling becoming momentarily slack, the hook will remain engaged in the eye (figure 67).

170. When ingots are hoisted, they should be supported by special bearers having eyes through which the slings are reeved in accordance with the guidance for lifting with barrel hooks, each layer of ingots being laid at right angles to the layer beneath, or by another suitable and safe method.

Figure 67. Correct positioning of lifting hooks

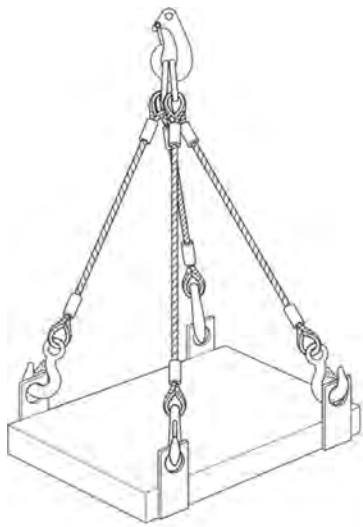
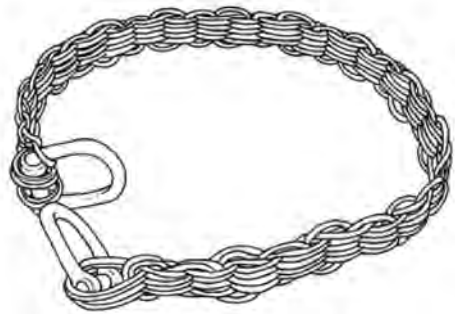


Figure 68. Woven steel sling for lifting wire coils



171. When a reel of cable or coils of metal wire are to be lifted, the slings should be attached to a steel bar of adequate strength and length passing through the hole in the centre of the reel, or through the coils of wire (figure 68). Such bars should be tested and certified in the same way as any other item of loose gear. Alternatively, a sling that has been specially designed for use with reels or coils may be used on its own.

172. Animals hoisted should be in boxes, cages or slings that immobilize them sufficiently to prevent dangerous disturbances of loading or unloading operations, or injury to portworkers or to the animals themselves.

5.3.3. Ropes and slings

5.3.3.1. Use

173. Grade "T" slings should never be exposed to acid or sulphur in the atmosphere, as hydrogen embrittlement may cause a critical loss of strength.

174. Chains intended for use for significant periods at temperatures below about –5°C should be made of special steels (see also section 4.4.2, paragraph 185).

175. Wire slings should not be used at temperatures above 100°C, as they may have fibre cores and/or alloy ferrules.

176. Natural fibre slings are often used for handling light cargo. The use of ropes treated with rot-proofing and/or water-repellent agents can reduce damage by damp.

177. Natural and synthetic fibre ropes and slings that become wet should be dried naturally.

178. A natural or synthetic fibre rope intended for use with a boatswain's chair should be suitably tested before a person is hoisted in the chair.

179. Ropes composed of synthetic fibre should not be surged, paid out or rendered by slacking away the rope, as this may subject it to frictional heat. They should also be protected from heat generated by other external sources. Any melting on the surface will render the rope or sling useless.

180. Polypropylene fibre ropes and slings should not be continuously exposed to ultraviolet light such as bright sunshine.

181. Nylon (polyamide) ropes and slings should not be immersed in water or wetted appreciably, as this can result in approximately 15 per cent loss of strength.

182. When not in actual use, synthetic fibre ropes and slings should be kept covered by tarpaulins, stowed below deck or in the store.

183. Disposable or one-trip slings should be scrapped by cutting up or other suitable means after being taken from their loads at the final destination.

184. The normal mode factors for slings do not apply to disposable or one-trip slings, as the safe working load at an angle has already been calculated. However, if the safe working load is only given for a single angle (such as 0°), the normal mode factors should be applied.

5.3.3.2. Storage and maintenance

185. Loose gear (such as chains, wire rope and fibre ropes) when not in use should be stored under cover in clean, dry, well-ventilated places, free from excessive heat and protected against corrosion.

186. Loose gear should be raised from the ground and not be in contact with damaging agents such as ashes, clinker, coke breeze or chemicals.

187. As far as is practicable, loose gear in storage should be so arranged that items with the same safe working load are grouped together and fibre ropes separated from metal gear.

188. Ropes should be carefully wound on reels of wood, metal or plastic, or laid out in straight lines so as to avoid kinks and partial unravelling.

189. Synthetic fibre slings should be hung on wooden pegs or galvanized hooks away from any source of heat.

190. Ropes and slings that are wet should be dried naturally.

191. Ropes or slings that have been, or are suspected of having been, in contact with any acid, alkali, gypsum or other substance harmful to them should be destroyed.

192. If it is suspected that a synthetic fibre rope or sling has come into contact with organic solvents such as paint, paint stripper or coal tar, it should be thoroughly washed as soon as possible with fresh water, allowed to dry in air and be inspected for damage.

193. A synthetic fibre rope should not be replaced if worn. Flat woven webbing should not be repaired or altered.

194. Loose gear in stores should not expose workers to risks of overreaching, or of falling objects.

195. Loose gear awaiting repair should be clearly identified, recorded and stored separately in a quarantine area.

196. Loose gear beyond repair should be scrapped, or held in a clearly marked area and identified for scrapping by marking with an agreed colour, or by some other means.

5.3.3.3. Removal from service

197. When loose gear is inspected or examined, particular attention, as appropriate, should be paid to:

- illegible markings;
- broken, missing, distorted, worn, corroded or otherwise damaged components;
- chemical attack;
- heat damage; and
- solar degradation.

198. Particular attention should be paid to the effects of cuts, chafing and damage to stitching of synthetic fibre slings.

199. Loose gear should be removed from service for scrapping if:

- wear in eyes of chain links or the saddle of hooks exceeds 8 per cent;
- permanent elongation in sling chains exceeds 5 per cent;
- the cross-section of a chain link is reduced by more than 12 per cent;
- jaw openings of hooks have increased by more than 10 per cent;

- the diameter of wire ropes is reduced to below 90 per cent;
- the number of broken wires or needles in any length of six diameters exceeds 5 per cent of the total number of wires in a rope;
- broken wires:
  - appear in one strand only;
  - are concentrated in a shorter length of rope than ten diameters;
  - appear in the tucks of a splice; and
- there is more than one broken wire immediately adjacent to a compressed metal ferrule or fitting.

5.3.4. Other loose gear

200. When pairs of shackles are selected for a job, both should have the same safe working load. Size may be misleading, as grade "T" shackles are approximately twice the strength of grade "M" shackles.

201. "Dee" shackles should be used for straight pull applications and "Bow" shackles where a number of slings pull at different angles. Where shackles are permanently rigged, the pins should be locked by mousing a screw collar pin or by a split cotter pin on a nut and bolt pin.

202. The safe working load of a shackle in a sling should always be equal to the sling, the increased stress due to an angle in the arrangement being duly taken into account.

203. When used in normal slinging applications, the screw pins of shackles should only be done up hand tight and monitored on a continuous basis. However, the pins should be secured with seizing wire to keep them from coming undone.

204. Pulley blocks selected for use should always have sheaves matched to the fibre or wire rope to be used. The diameter of the sheaves at the bottom of the groove should not be less than:

- 14 times the diameter of a wire rope; or
- 5.5 times the diameter of a fibre rope.

205. Unless the alignment of the sheaves of a pulley block is to remain in line with a fixed fitting, a swivel head block should always be used.

206. A pulley block should:

- be regularly lubricated;
- not have its data plate or any grease nipple painted over;
- be kept in the ship's cargo store or lifting gear store when not in use.

207. Hooks should be selected to cause as little distortion and damage to the eye of a sling as possible. The larger the hook that is used, the less distortion to the sling.

208. Hooks should always have a means of preventing a sling from becoming accidentally detached.

209. Hooks are designed to take loads vertically through the saddle. Bow shackles should be used when there are too many slings in a hook or the spread is too wide. Shackles should always be used with their pin in the hook.

210. Specialized cargo-handling hooks should be used where appropriate. These include hooks designed to lift by specially designed bands around cargo or to stick into goods such as logs and bales.

211. Where hooks are hooked into the eyes of lugs or container corner fittings, they should always be hooked from the inside out to prevent them from becoming unhooked accidentally.

212. The correct type of loose gear should be used to lift ISO containers without spreaders, when this is permitted by international standard ISO 3874, *Series 1 freight containers – Handling and securing*. Those for lifting from bottom corner fittings fit in from the side and can be used vertically or at an angle. As they are right- and left-handed, it is important to check carefully that they are at the correct corner.

213. When grabs are used to handle bulk cargo:

- there should be ample room at loading and unloading points for workers to avoid the swinging grab;
- grabs should be secured against accidental opening and be so constructed that they can be locked in the open position to prevent persons from being trapped by accidental closing;
- if heavy goods such as ore are being handled, special supervision should be provided for trimmers; and
- the attachment and changing of grabs on the lifting appliance should be left to the engineers in charge of the appliance.

214. Automatic container spreaders should be used whenever practicable. If manually operated spreaders are used, portworkers usually have to go on top of containers to hook on and off (see section 7.8.3).

215. Manual spreaders should always be fitted or removed on the ship's deck or quayside where the hook of the appliance can be lowered. "Tag" or restraining lines should be used to control the container when necessary.

216. Vacuum and magnetic lifting gear should:

- only be used in holds if portworkers are able to take shelter from any falling objects; and

- never be used to transport persons.

217. Vacuum lifting gear should only be used on cargo specially wrapped for the purpose, or that has an otherwise suitable surface for vacuum lifting pads.

218. When vacuum lifting gear is used:

- each pad should support an equal part of the load, so far as is practicable;
- the load should be suspended horizontally, as far as possible;
- the surface of the cargo to be handled should be clear of any loose material that would prevent any vacuum pad from making effective contact with the surface; and
- warning devices should be tested at the beginning of each week.

219. When magnetic lifting gear is used:

- the power to the magnet should not be switched on until the magnet has been lowered onto the load to be lifted;
- after the power has been switched on, the lifting motion should be delayed for a few seconds (up to ten seconds in the case of scrap metal);
- it should be carefully lowered on the load, not dropped;
- it should not be allowed to strike a solid obstacle;
- it should not be used to lift a steel sheet from a pile of sheets unless checks are made to ensure that sheets beneath the sheet to be lifted are detached; and
- it should not be used on hot metal.

220. When magnetic gear is not in use:

- the power should be switched off to prevent the magnets becoming too hot; and

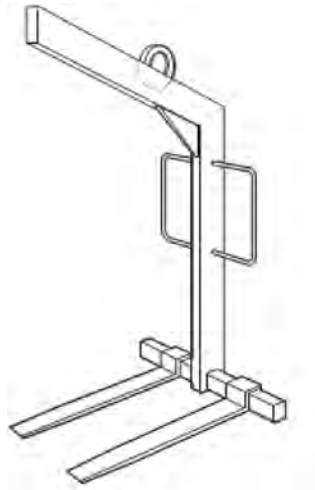
- the magnet should be supported by suitable means; it should not remain on the ground.

221. Vehicles carried on non-purpose car carriers are slung either by means of special gear equipped with metal frames on which the chassis rests, or by fixing a net, usually a metal one, under the wheels, and attaching the net to ropes slung from a lifting beam (figure 69). It is essential to calculate the loads carried by each sling. The slings used should each be able to withstand the heaviest stresses that can be set up by a load.

222. The safest way of lifting pallets is with pallet forks having a sliding centre of gravity (figure 70). The tines of the forks should extend at least 75 per cent of the way under the pallet. These forks can be fitted with nets to prevent items falling from the pallet while in the air.

Figure 69. Lifting vehicles by means of a sling

Figure 70. Pallet lifting forks



223. Other equipment for lifting pallets includes the following:

- *Spring-loaded pallet hoists*. These resemble a set of fork-lift tines hung from the crane hook. The spring-loading enables the centre of gravity of the appliance to adjust itself and keep the forks horizontal, whether loaded or light. They can also be adjusted for varying sizes of pallet.
- *Pairs of metal stirrups*, each with a clamp or claw at each end. One end is fixed and the other can be extended by a spring. The stirrups engage under the edges of the pallet and grip the ends of the ties. A four-legged wire rope sling is attached to a pair of stirrups.

- *Wing pallets*. These should be at least 100 mm deep. A pallet bar should be placed under each wing and attached to a four-leg wire rope sling. When the pallet is lifted, two workers should stand by the set to ensure that the bars stay under the wings.
- Other appliances for lifting a factory pallet onto a shipping pallet to prevent the former from sliding on the latter. In their absence, special fastenings should be used to prevent sliding.

224. Pallets should never be lifted by slings passed between the boards, as it is likely that one will slip to the centre and allow the set to fall over. If the centre of gravity is too high in the set, a slight displacement of goods will allow the set to capsize.

225. Inspections of wooden pallets should include checks to ensure that:

- all deck boards are of equal thickness;
- deck boards, bearers or blocks are not split or otherwise damaged or distorted;
- nails are not pulled through and do not project from deck boards;
- deck boards are not loose, permitting the pallet to distort or rack;
- all members are securely fastened by at least two nails that are adequately spaced; and
- members do not have extensive bark or knot inclusions;
- members are not contaminated by corrosive or flammable substances.

226. Pallets that are found to be defective should be destroyed or repaired before being returned to service.

5.4. Signallers

227. Signallers may be slingers or other persons responsible for giving directions to lifting appliance operators. They should be trained and certified in the art of signalling and directing crane movements by means of the signalling system in use in the port.

228. Only one person should act as the signaller for each lifting appliance. The signaller should be clearly identifiable to the operator and, unless responding to an emergency stop signal, the operator should only act on the signaller's instruction. Identification can be ensured by a distinctively coloured hat or clothing, or by radio call sign. Wearing light-coloured sleeves and gloves will enable signals to be more easily seen.

229. More than one signaller may be required for a lifting operation if:

- one signaller will not have a clear view of the load throughout its path of travel; or
- hand signals are used and the first signaller has to move out of view of the appliance operator.

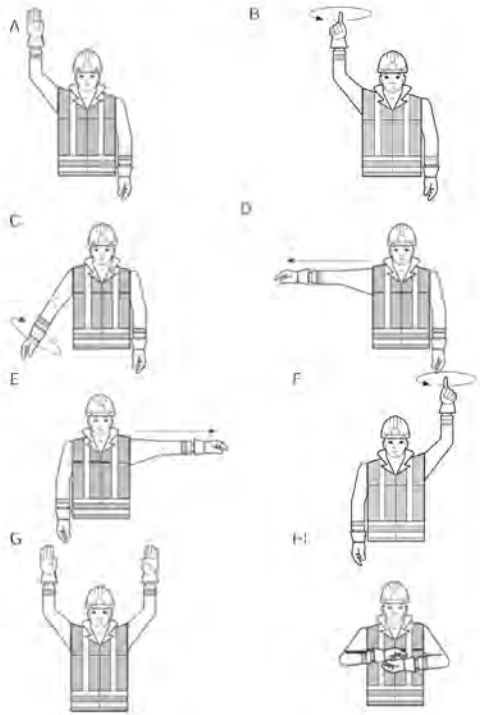
230. If signalling requires verbal communication, the signaller should be able to give clear and precise instructions in the language understood by the appliance operator.

231. Hand signals should be clear and precise, and given by wide movements that are unambiguous.

232. The system of hand signals should be agreed and clearly understood by all parties (figure 71). This is particularly important if the signaller and the operator of a lifting appliance are of different nationalities.

233. The signalling system should be fail safe. If radios are used, each crane should have its own separate call sign and frequency, which should be kept free from communications for

Figure 71. System of hand signals



A. Stop (end of movement).
B. Raise.
C. Lower.
D. Move in direction indicated.
E. Move in direction indicated.
F. Twistlocks on/off; rotate wrist of left hand.
G. Emergency stop.
H. End operations.

other purposes in order to prevent operators reacting to signals intended for another crane. The signaller should constantly repeat the required motion throughout the intended movement, such as "hoist, hoist ... hoist", and the motion should be stopped if the operator ceases to hear the instruction.

234. The signalling system should include a means for a signaller to inform the crane driver that he/she will no longer be giving the directions. A further signal should indicate to the crane operator that a second signaller is taking over responsibility for directing the crane movements.

235. Signallers should not give an order before satisfying themselves that all measures have been taken to ensure that the operation can be carried out safely. The essential characteristics of signallers should be ceaseless vigilance and awareness that appliance operators are totally dependent on them during operations outside the operator's line of sight.

236. Before work is started for the day, a signaller should ensure that the workplace on the ship's deck or on the deck cargo is clear.

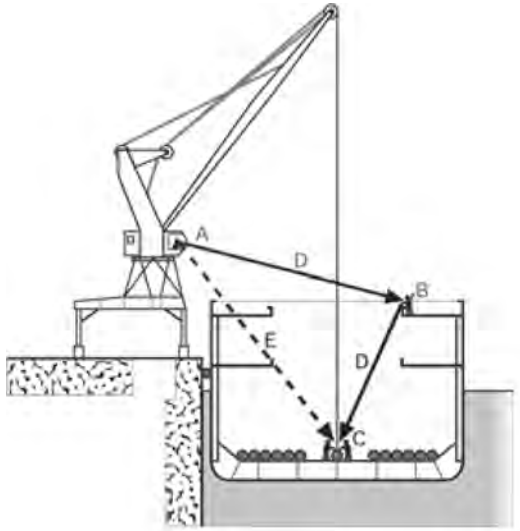
237. Signallers on ships should place themselves where they can be seen both by the workers in the hold and by the operator of the appliance (figure 72).

238. Signallers should do their utmost to protect persons against accidents. When necessary, they should warn persons in cargo holds, on lighters and ashore.

239. When cargo is being loaded or unloaded:

- by a fall at a hatchway, it should be possible for the signaller to pass safely between the hatchway and the ship's side; or

Figure 72. Correct positioning of signaller



A. Crane driver. B. Signaller. C. Portworkers in hold. D. Direct line of sight.
E. Direct line of sight impossible.

- when more than one fall is being worked, a separate signaller should be used for each fall, except in the case of union purchase.

240. Before giving a signal to hoist, a signaller should ensure that the load is properly slung and that hoisting can be started without risk to persons working in the hold or elsewhere.

241. No signal to lower a load should be given by a signaller unless all persons are clear in the hold and elsewhere.

242. Before giving the signal to land, signallers should satisfy themselves that the load can be safely landed.

243. Signallers should never:

- give an order to move a load if any person is under its path; the person should be asked to move;
- agree to order operations that would violate safety rules, such as operations with defective slinging, dragging loads horizontally other than by bull roping, or with persons travelling on the load; or
- give an instruction for operations if the light is insufficient or if there is thick fog, unless special precautions are taken.

244. Signallers should ensure that no persons are carried by lifting appliances except in properly constructed personnel carriers.

245. If it is necessary to stop a load while it is being raised or lowered, the signal should be precise but not abrupt, so that the operator of the lifting appliance does not jolt the load.

246. Equipment used for giving sound, colour or light signals for hoisting, lowering or transporting loads should be efficient, properly maintained and protected from accidental interference.

6. Operations on shore

6.1. General provisions

6.1.1. General requirements

1. Many cargo-handling operations that are carried out on shore are also carried out on ships. The guidance in this part of the code applies to all such operations. Guidance that is relevant only to operations carried out on ships is given in Chapter 7.

2. All port operations should be carried out in accordance with a safe system of work by portworkers who are appropriately trained and supervised. The safe system of work should enable a worker to stop an operation immediately when there is a risk to safety or health.

3. All plant and equipment used in port operations should be:

- of good design and construction;
- of adequate strength for the purpose for which it will be used;
- of sound material and free from obvious defects;
- inspected visually by the user before use;
- periodically inspected at appropriate intervals by a competent person and a written record kept, as required by national legislation or recommended by the designers and manufacturers; and
- properly maintained in a safe and efficient condition.

4. Routine fire inspections should be carried out. These should include inspections during periods when work is not in progress, as many fires result from smouldering and can break out several hours after their initial cause.

5. All means of escape in case of fire should be kept free from obstruction at all times. Flammable materials should never be kept under stairways.

6. There should be a clear policy on smoking. Smoking should be prohibited throughout the port area and on ships, except in designated areas. Smoking and no-smoking areas should be clearly identified.

6.1.2. Access arrangements

7. Safe means of access should be provided to all places where persons have to work.

8. Persons on foot should be separated from vehicles, whenever this is practicable.

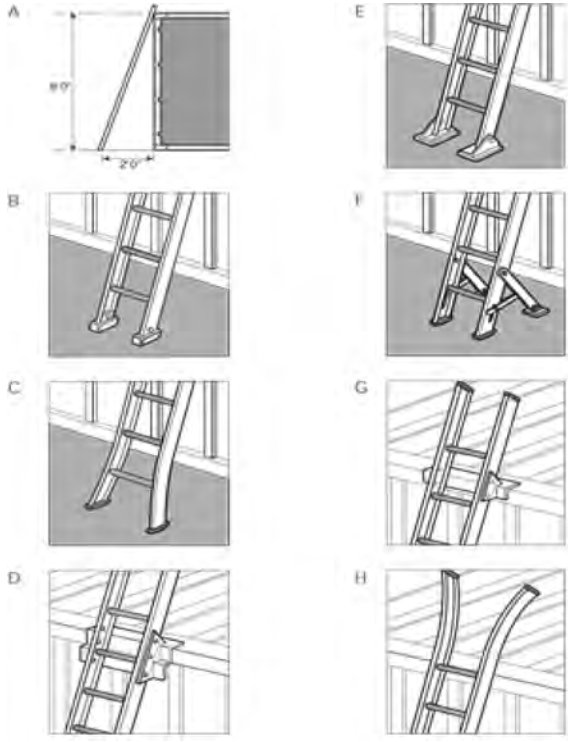
9. Pedestrian walkways should not be used for other purposes.

10. Where access is needed through areas from which pedestrians are excluded, arrangements should be made for them to travel in a suitable vehicle. Access by crew, pilots and other visitors to ships at a container terminal could be one example. Persons on ships should be informed, by means of a gangway notice or otherwise, how to summon the transport.

11. Mobile access equipment, such as mobile elevating work platforms (MEWPs or "cherry pickers") should generally be used in preference to portable ladders. However, such equipment should always be used in accordance with the manufacturer's instructions, particularly those relating to the locking or scotching wheels and the use of outriggers.

12. Portable ladders should be used for their intended purpose only and in accordance with the manufacturer's specifications. They should be used to move from one surface level to another and not as a platform. When it is necessary to use a portable ladder (figure 73):

Figure 73. Use of portable ladders



A. Correct angle of use. B. Rubber feet. C. Splayed stiles at foot of ladder. D. Double step angle piece. E. Safety feet. F. Stabilizing legs at foot of ladder. G. Angle locating piece at top of ladder. H. Splayed stiles that can be worked through at top of ladder

- the top of the ladder should rise at least 1 m above the landing place or the highest point to be reached by a person using the ladder, unless other adequate hand-holds are provided;

- the stiles of the ladder should stand on a firm and level footing. Loose packing should not be placed under a stile;
- the ladder should be secured to prevent it from slipping. This should preferably be done by securing it at its upper resting place. If this is not practicable, it should be secured at its base. If even this is not practicable, the ladder should be footed by another worker;
- a ladder more than 6 m in length should be secured at a point about one-third of its length from the ground; and
- the ratio of the height of the ladder and the distance of its foot from the vertical surface against which it rests should be 4:1, i.e. 4 m height, 1 m out.

13. Workers using a ladder should:

- inspect it before use for defects;
- have both hands free for climbing up and down;
- face the ladder when climbing up and down;
- wear suitable footwear that is not likely to slip; and
- use a belt or other suitable means to carry any object that is necessary.

14. A portable metal ladder or other mobile access equipment should not be used in any place where any part of it or a person on it is liable to come into contact with an overhead electric cable, trolley wires or any other electrical equipment with bare conductors, unless the power has been switched off and the system isolated. This should generally be in accordance with a "permit to work" that ensures that power cannot be switched on during the work.

6.1.3. Housekeeping and cleanliness

15. All parts of port areas should be kept in a clean and orderly condition.

16. All access routes and working areas should be kept free from objects and materials that are liable to cause a person to trip or slip.

17. Loose gear, tools and similar equipment should be kept safely or removed from working areas when not in use.

18. All dunnage and other rubbish should be collected as soon as possible and disposed of in an appropriate manner.

19. Spillages of oil or other materials likely to be a hazard should be cleaned up by trained personnel as soon as possible and reported to a supervisor.

20. Appropriate arrangements for clearance and gritting should be made to deal with snow and ice when necessary. Particular attention should be paid to means of access to workplaces, including access to ships.

21. All plant and equipment should be parked in appropriate designated areas when not in use.

6.1.4. Manual handling

22. Manual handling includes all forms of lifting, lowering, pulling and pushing of loads by portworkers.

23. Portworkers should not be required or permitted to manually handle loads that are likely to prejudice their health or safety owing to their weight, size or shape.

24. The need to handle significant loads manually should be avoided by the use of mechanical handling equipment, whenever this is practicable.

25. Manual handling should only be carried out by portworkers who have been trained or instructed in manual handling techniques in accordance with good kinetic handling principles (figure 74). Supervisors should ensure that the correct lifting techniques are used in practice.

Figure 74. Manual lifting

26. It is neither practicable nor desirable to prescribe the maximum weight that may be handled manually by a portworker. Factors that should be considered include the weight of the load, the age, physique, posture, fitness and sex of the worker, the size and shape of the load, the working environment, and the frequency and duration of operations.

27. Particular consideration should be given to the loads that may be handled safely by workers under the age of 18 years and pregnant women. The employment of such persons may be restricted by national legal requirements.

28. Where appropriate, portworkers should be medically examined for fitness before being regularly assigned to carry out manual handling of significant loads.

29. Loads to be handled manually should whenever possible be compact. They should be clearly marked with their

weight and provided with handles or other devices, as necessary. Handling aids should be used when appropriate.

30. The packaging of loads to be handled manually should not be liable to cause injury to persons handling them.

31. Appropriate personal protective equipment, including safety footwear and gloves, should be worn by portworkers engaged in manual handling.

6.1.5. Cargo in transit

32. Most cargo is only "kept" at ports for a short time while being trans-shipped or in transit along the transport chain.

33. Other cargo may be "stored" at ports for longer periods until it is needed.

34. All cargo in transit in a port should be kept or stored safely and securely.

35. Particular attention should be paid to the segregation of dangerous goods (see Chapter 8) and the need to maintain clear access for the emergency services in the event of a fire or other incident.

36. It should be possible to identify the nature, quantity and location of all cargo present in a port at all times. This may be done by electronic or other means. Areas containing dangerous cargo should be clearly identified.

37. Portworkers should be made aware of the general nature of the hazards of any cargo that they handle and of the precautions to be taken when handling specific cargoes.

6.1.6. Operational maintenance

38. All plant and equipment in ports should be regularly maintained in a safe and efficient condition, in accordance with the manufacturer's or supplier's recommendations, relevant

national legal requirements and operational experience. This should be done on a planned, preventive basis, and should include periodic inspections and examinations, as well as physical maintenance.

39. Inspection and maintenance should be carried out on emergency equipment and personal protective equipment, as well as operational plant and equipment.

40. Maintenance and inspections should be carried out by engineering personnel, operators or users, as appropriate.

41. All persons carrying out maintenance and inspection duties should be trained in the relevant procedures and the identification of potential defects that may be found.

42. Safe means of access should be provided to all places to which maintenance personnel have to go. This should normally be permanent access.

43. All plant should be isolated before maintenance work is started. The isolation system should include lock-off facilities if the plant can be started remotely. Where necessary, maintenance work should be carried out in accordance with a "permit to work" system. Batteries should be handled, whether for charging, removal or other purposes, only in a proper place especially set aside for that purpose and under the supervision of a trained person. People handling batteries should also have received appropriate training.

6.1.7. Hot work

44. Hot work should be carried out in accordance with national legal requirements and any port by-laws. These often require the permission of the port authority to be obtained before hot work is carried out. Obtaining a hot work permit from a port authority does not absolve those carrying out hot

work from their duty to ensure that appropriate precautions are taken.

45. A hot work permit should generally specify:

- the location and nature of the work;
- the proposed time and duration of the work;
- the period for which the permit is valid;
- any precautions to be taken before, during and after the work;
- the person in direct control of the work; and
- the identity of the person authorizing the work.

46. The precautions should generally include ensuring that:

- the work area is free from any flammable materials or flammable material residues. This should include the far side and adjacent areas of any plates or other metal involved in the hot work, and any area where hot particles may fall;
- no flammable or otherwise dangerous substances will enter the area during the work;
- the atmosphere in the work area is safe to breathe and remains so throughout the work;
- appropriate personal protective equipment, including overalls, gloves and eye protection, is used;
- appropriate firefighting equipment is available at the site of the work, together with a person trained in its use; this may be a person carrying out the work;
- any cylinders of flammable gas and oxygen, and hoses and torches attached to them, are removed from any enclosed space when the work stops; and

- periodic checks for smouldering are made after the work has finished. These should include adjacent spaces that may have been subjected to heat or falling residues, as fires due to smouldering often break out several hours after completion of work.

47. If hot work is carried out on sprinkler systems in warehouses or elsewhere, particular care should be taken to ensure that other adequate firefighting facilities are available during the period that the sprinkler system is inoperative. If it is not practicable to remove goods from the area below the work, they should be covered by non-flammable sheets to protect them from falling hot particles.

48. The permit should include a facility for "signing off" when the work is completed.

6.1.8. Use of personal protective equipment (PPE)

49. All persons in cargo-handling areas should wear high-visibility overalls or other high-visibility outer clothing.

50. Loose clothing should never be worn by workers when working near open conveyors or other moving machinery. One-piece overalls are suitable.

6.2. Cargo packaging

51. Factors that should be considered when choosing packaging for cargo include:

- properties, including the weight, of the cargo;
- properties of the packaging;
- proposed method of stowage in a hold or cargo transport unit;
- climatic conditions to which the cargo will be exposed along the transport chain; and

- legal requirements in countries along the transport chain.

52. Packaging and packages should be marked with relevant information as necessary. As per Article 1, paragraph 1, of the Marking of Weight (Packages Transported by Vessels) Convention, 1929 (No. 27), if the package is 1 metric tonne or more, the weight should be plainly and durably marked upon it on the outside. Other information may include:

- identification of the centre of gravity;
- identification of slinging points;
- nature of the cargo, such as "Fragile";
- correct orientation; or
- dangerous goods labels, placards, marks and signs.

53. Traditional wooden casks, boxes and crates should not have projecting fastenings or sharp edges on metal reinforcements.

54. Wooden packaging and dunnage should comply with legal requirements relating to the importation of forest products that are aimed at the prevention of infestation.

55. Cardboard boxes or other cardboard packaging should generally not be used in very humid countries, as moisture can lead to crushing of the packages and cause stacks to collapse. Any signs of dampness on a cardboard package should be investigated and appropriate action taken. Dampness on packages may be caused by leakage from one or more receptacles inside them.

56. Paper bags or sacks should not be used in circumstances in which they are likely to be affected by atmospheric humidity or be exposed to strong sunlight for prolonged periods, as these can lead to deterioration.

57. As the properties of plastics vary widely, any plastic packaging selected should be appropriate for the intended cargo, journey and destination. Plastics are waterproof, and considerably stronger and lighter than many traditional packaging materials. They are generally suitable for use at temperatures between –15˚C and +50˚C, although some soften with heat and may degrade in ultraviolet light and prolonged strong sunlight. Plastic packages should be secured when necessary, as plastics have a low coefficient of friction and may be easily displaced.

58. Single-trip flexible intermediate bulk containers should never be reused.

59. All containers used in international transport, except offshore containers and those specifically designed for transport by air, should comply with the IMO International Convention for Safe Containers (CSC), 1972. There is no exemption for single one-way journeys.

60. The main requirements of the Convention are that all containers should:

- be of a design that has been approved by the administration of a contracting State following satisfactory testing;
- have a valid safety approval plate permanently affixed in a readily visible place on each container, normally on a door; and
- be maintained in accordance with a periodic or continuous examination programme that has been approved by the administration of the relevant contracting State.

61. A periodic examination programme requires the container to be thoroughly examined in accordance with the programme within five years of the date of its manufacture, and thereafter within 30 months of the date of the last examination.

The date of each examination should be clearly marked on the safety approval plate.

62. An approved continuous examination programme (ACEP) requires the container to be thoroughly examined in connection with all major repairs or refurbishments and each on-hire/off-hire interchange. The interval between such examinations may not exceed 30 months. The dates of examinations are not marked on the safety approval plates of containers subject to an ACEP programme. Instead, they should carry a decal marked with the letters ACEP and the reference of the approved examination programme. The colour of the decal indicates the year of the last thorough examination of the container.

63. The presence of a valid safety approval plate on a container should not be taken to indicate that the container is in a safe condition. The plate can only reflect the condition at the time of the last examination. Damage or deterioration of the container may have occurred since that date.

64. Before goods are packed into a container, it is important to verify that the container has no obvious defects and carries a valid safety approval plate.

65. Offshore containers, defined as "portable units specially designed for repeated use in the transport of goods or equipment to, from or between fixed and/or floating offshore installations and ships", should conform to the guidance contained in IMO MSC/Circ. 860, *Guidelines for the approval of offshore containers handled in open seas*. The approval plate on an offshore container should be clearly marked "Offshore container".

66. The ISO standards for Series 1 freight containers are complementary to the CSC: ISO 830 *Freight containers – Vocabulary* defines the different types of container; ISO 668 *Series 1 freight containers – Classification, dimensions and*

ratings specifies their designations, dimensions and ratings; and ISO 1496 *Series 1 freight containers – Specification and testing* details their specification and testing.[1]

6.3. Container operations

6.3.1. Control of container operations

6.3.1.1. General requirements

67. For definitions of terms that relate to the handling of containers, see section 3.8.1.

68. The access of vehicles and pedestrians into container-handling areas should be strictly controlled.

69. No passengers in visiting container vehicles should be permitted to enter a container-handling area. Passengers should await the return of the vehicle from the container-handling area in a suitable waiting room.

70. All persons permitted to enter a container-handling area should be informed of the procedures they should follow while they are in that area. This may be done by signs, or by providing leaflets or copies of the relevant terminal procedures which they should follow. Different instructions will be relevant to different groups of people, such as terminal workers, drivers of visiting container vehicles, drivers of taxis and private vehicles, pedestrians and the crews of ships at berths in the terminal.

71. Instructions to drivers of container vehicles should specify where and when twistlocks securing containers to vehicles should be released or locked.

[1] Reference to *CTU Code*: IMO/ILO/UNECE *Code of Practice for Packing of Cargo Transport Units*.

72. All containers arriving at a terminal by road, rail, barge or ship should be inspected for external damage, including the presence of mud and botanical or animal alien invasive species or tampering that could affect their safe handling. A container with reduced stacking or racking capability should be identified, flagged and assurances obtained that it will not be placed at the bottom of a stow, either on the terminal or on the ship. If a container is found to be unsafe, appropriate action should be taken. As part of its safe work system for receiving containers, the terminal should adopt the measures set out in section 4.2.7 of the *IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units* (*CTU Code*) and Annex 2 thereto.

73. All containers declared or marked empty arriving at a terminal should be verified empty before handling.

74. Containers should be marked with the maximum cargo weight that they are designed to carry. The gross weight of all loaded containers should be known before they are lifted. Containers exceeding the maximum allowable weight of the container or the capacity of the relevant container-handling equipment should not be lifted. Under Regulation VI/2 of the SOLAS Convention, the ship's master or his representative and the terminal operator are required to obtain the verified gross mass of a container before it is loaded onto a ship.

75. A container that is leaking should not be transferred to another mode of transportation until the leak has been dealt with. If the leaking container is on the dock, it may be moved to an area designated for that purpose only if it is safe to do so.

76. Lashings of cargo in open containers should be inspected to ensure they are adequate and undamaged.

77. The number of road vehicles permitted to enter straddle carrier and rail-mounted gantry crane (RMG) or rubber-tyred

gantry crane (RTG) exchange areas at one time should be limited in order to reduce congestion.

78. Access to container-handling areas by pedestrians should be prohibited so far as is practicable. Any access that is permitted should be restricted to clearly designated walkways or under specific supervision.

79. No taxis or private cars should be permitted to enter container-stacking areas. Any taxis or private cars that are permitted to enter quayside areas should be required to keep to specified vehicle routes. They should not be permitted to enter a quayside area while containers are being loaded or unloaded from a ship. Where appropriate, a minibus or other suitable terminal vehicle should be provided to carry ships' visitors, ships' crews and other persons engaged in operations to or from such areas.

80. Vehicles from outside the terminal that need to leave the specified vehicle route should be escorted by a terminal vehicle.

81. All container terminal vehicles should be fitted with a flashing yellow warning light.

82. Containers should only be moved within the container terminal on vehicles that are suitable for the purpose.

83. All vehicles that have to be driven in a container-handling area while they are carrying containers that are not secured to them should be driven at an appropriate slow speed. Care should be taken to avoid heavy braking and sharp cornering.

6.3.1.2. Automated container terminal (ACT)

84. Automated container terminals vary significantly in the degree of automation involved but basically consist of three main areas of operation:

- loading and unloading of ships using automated (or typically semi-automated or remote control) ship-to-shore (STS) quayside cranes;
- transferring containers to and from the STS by the use of automated guided vehicles (AGVs); and
- stacking and destacking of import and export containers in the stacking yard normally abbreviated to "transferring" by automated stacking cranes (ASCs).

Such operations are controlled and managed by sophisticated computer systems, the so-called Terminal Operating System (TOS). Some automated terminals run an Equipment Control System (ECS) rather than a traditional TOS. Many automated terminals also now have automated processes at the in-gates and out-gates where visiting truck drivers check containers in and out, sometimes under supervision of portworkers. In any operation, such as those described above, where automated machinery interacts with portworkers and others, sophisticated and fail-safe protection systems should be in place and fully utilized.

85. Semi-automated container terminals vary in that some operations are still carried out by plant and machinery operated by portworkers, for example straddle carriers or tractors/tugmasters and trailers to transfer containers to the stacking yard. It is therefore essential to ensure that there are robust systems in place to ensure portworkers cannot enter the controlled zones.

86. The AGV operation area in an automated terminal should be entirely fenced off so a safe-zone is created. Fencing should be totally enclosed physical barriers, but where access gates are necessary for maintenance, staff entry for example, these should be electronically controlled and only opened by the main terminal control station, whereupon AGV motion would

automatically cease and be prevented from starting up again until portworkers are clear of the area. No access to this fenced area should occur without the approval of the automated container terminal (ACT) main control station. To avoid accidents, AGV movement should cease and be prevented from reoccurring whenever personnel requires access to the area. The area requiring human access should be isolated by physical means from automated equipment movement.

87. AGVs should be fitted with safety systems including hardware and software that prevent the movement of the AGV when: it detects the presence of an object blocking its path; it loses its guidance or tracking signal; or its speed varies beyond its normal parameters. This safety system should include an audible alarm and a warning light.

88. Where ASCs are used to operate in the stacking yard, there should similarly be a "safe-zone". The area requiring human access should be isolated by physical means, including laser curtains and/or sensor interlocks, from automated equipment movement.

89. In the process of loading or unloading a vessel, especially where STS are remotely controlled, there should be radio communication between the crane operator and a portworker on the deck of the vessel that monitors the crane's operation, and checks for faulty twistlocks, etc. To ensure the safety of the operation, any portworker on deck should be suitably trained and qualified to provide all necessary information and instructions to the crane operator. The radio communication facilities should be well maintained and kept in good working order; should it fail for any reason, then operations should cease until communications are restored.

90. During loading and discharge in ACTs, it will still be necessary for portworkers to remove and replace semi-automatic

twistlocks (SATLs) and fully automatic twistlocks (FATLs). It is essential that such workers are separated from the AGV zone. One example of this separation can be achieved by undertaking twistlock removal and replacement on the sill beam of the STS (also protected by fencing or electronic sensors to prevent unexpected contact with moving machinery) or in a fenced-off area under the back-reach of the STS preventing access to the AGV area.

91. In accordance with national laws and regulations, cranes should also be accessible for emergency personnel (paramedics) so that a crane driver can be safely removed if he or she is incapacitated. This would also apply to RMGs, RTGs, straddle carriers, etc. that are manually driven. Unless there is an accessible ladder, the cab should be equipped with a self-lowering rescue device in the event that the operator has to evacuate the cab immediately. Operators should be trained in the use of this equipment.

92. In accordance with national laws and regulations, workstations designed for remote crane operation should be ergonomically designed, fully adjustable to suit all operators and secure from unauthorized entry. Port employers should ensure that the demands of the workload on remote crane operators allow them to take regular and frequent breaks from their operating position. Ideally these breaks should allow the operator a chance to move or change their posture. Where the nature of work prevents the operators' discretion about when to take a break, employers should ensure that the task is designed to incorporate regular breaks: this could be a change of work activity where the use of a visual display unit is not required. In emergency situations the operational need should take priority over the need for strict adherence to taking breaks. Preferably a break of five to ten minutes' duration should be taken every hour; breaks should not be accumulated into larger breaks.

6.3.1.3. Straddle carrier exchange operations

93. A straddle carrier exchange grid should only be used for loading and unloading freight containers from road vehicles. Grids should not be used as general waiting areas for road vehicles. Vehicles that need to wait for significant periods should be redirected to appropriate parking facilities.

94. Wherever possible, the grids should be operated with a one-way flow of traffic for road vehicles.

95. Where it is necessary for a road vehicle to reverse into a slot on a grid, there should be ample space for the manoeuvre to be carried out safely. Straddle carriers should only approach the slot from the opposite direction.

96. Reversing movements by road vehicles should not be permitted for any other purpose.

97. The entry of road vehicles to grid slots for loading or unloading should be controlled so that only one vehicle is in a slot at any one time.

98. Twistlocks and other container-securing devices should be released and locked in a designated safe place that should be clear of straddle carrier exchange grids.

99. The road vehicle driver should leave the cab of the vehicle and stand in a clearly marked area before the approach of a straddle carrier (see section 3.8.6, paragraph 291). This area should be forward of the cab of the vehicle, a safe distance from the vehicle and visible to the straddle carrier operator. The road vehicle driver should remain in the marked area throughout the loading or unloading operation. The driver should not return to the cab until the straddle carrier has left the grid.

100. A straddle carrier should only approach a road vehicle in order to load or unload it from the rear of the vehicle and should also leave the vehicle to its rear.

101. Any oversize container or problem container that cannot be handled safely at the grid should be moved to a suitable designated area where it can be dealt with safely.

6.3.1.4. RMG and RTG exchange operations

102. Twistlocks securing a container to a road vehicle should only be released or locked in a designated safe place. Where practicable, this should be separate from the place where the vehicle is loaded or unloaded. Particular care should be taken to ensure that all twistlocks securing a container that is to be lifted are fully disengaged.

103. Drivers of road vehicles should not stop on the marked runways of RMGs or RTGs.

104. Drivers of road vehicles should remain in the cabs of their vehicles at all times when in an RMG- or RTG-operated container-stacking area, unless specifically instructed otherwise.

105. When drivers of road vehicles have to be instructed to leave the cabs of their vehicles while in an RMG- or RTG-operated container-stacking area, they should only do so in accordance with a safe system of work. It is essential that where there is an overhead hazard the driver always wears a safety helmet and high-visibility clothing, and is visible to the RMG or RTG operator at all such times.

106. The driver of a road vehicle who needs to enter the ground cab of an RMG or RTG should only do so while the gantry is stationary. No more than one driver should be in the cab at any one time.

107. RMG and RTG operators should ensure that a road vehicle at which they are to work is stationary and that the cab of the vehicle is not under the intended lift.

108. Whenever practicable, containers should be transferred to or from a road vehicle to the side of the vehicle and not from the rear.

109. Visual and audible warnings of the movement of RMGs and RTGs should be given. Particular care should be taken if it is necessary to carry out "blind side" container exchange operations at the opposite end of the gantry to the operator's cab. Consideration should be given to the use of closed-circuit television (CCTV) systems or proximity alarms.

6.3.1.5. Entry to stacking areas

110. Entry into container-stacking areas should be restricted to authorized terminal vehicles that are fitted with flashing yellow lights and to authorized road container vehicles in RMG and RTG stacking areas.

111. No person should be allowed to enter a container stacking area on foot other than by a clearly delineated walkway that does not cross a container traffic route. If a crossing of such a traffic route is found to be necessary, the crossing should be clearly marked and signed.

112. Work on foot in a container-stacking area should be done only with the express permission of Control. Permission should be given only after the relevant area has been isolated and Control has issued a permit to enter, and only for work that takes into account the characteristics of the terminal and the work to be carried out. A visual signal, such as a token or light on the control desk, should be used to remind the controller that an area has been temporarily isolated.

113. The permit to enter and to work in a specified area should be issued only by an authorized control officer who is satisfied that:

- all drivers of vehicles and plant operators in the container-handling area have been notified of the closure of the relevant area and have acknowledged the instruction. Each vehicle should have a board in the cab upon which the driver should enter a clear indication of the block that has been isolated;
- the relevant area has been clearly signed to prevent entry by other vehicles;
- the person or persons to enter the area are wearing high-visibility clothing in accordance with terminal rules;
- the person to enter, or the person in charge of the group if there is more than one person, has been issued with a two-way radio and is familiar with its use; and
- the person or persons to enter the area have been fully instructed on the operations to be carried out, the procedures to be followed and the precautions to be taken.

114. The area to be isolated should include a suitable buffer zone between the location of the work and any active area. In a container-stacking area that is operated by straddle carriers, there should be at least one clear lane between the lane in which work is to be carried out and any active lane.

115. The particulars to be included in the "permit to work" should include:

- the name(s) of the person(s) wishing to enter;
- the work to be performed;
- time of entry and exit;
- any specific instructions; and
- an instruction not to leave the area until Control has been notified by radio and permission to do so has been received.

116. Control should ensure that any additional operators who enter the container-handling area, or relieve operators already in it at change of shift, are informed of the position of the isolated block.

117. The permit to work should be returned to Control once the work has been completed and permission to return has been received.

118. The permit should not be transferred if the work is not completed at the end of a shift or for other reasons, and needs to be continued by others. A new permit should be issued in such cases.

119. Control should check the return of the permit for cancellation. If it has not been returned after a reasonable time, steps should be taken to find out why and, if necessary, the whereabouts of the missing person(s).

6.3.1.6. Emergency procedures

120. In an emergency, such as an accident or fire, Control should send a clear signal or instruction by radio or some other immediately recognized means. On hearing the emergency signal or instruction, all vehicles should immediately stop in a safe manner and remain stationary until instructed to do otherwise. When stopping, drivers and operators should bear in mind the need to leave clear access for emergency services and other rescue personnel and equipment.

121. Whenever possible, unserviceable vehicles, plant and equipment should not be repaired in an operational container-handling area. If it is necessary to do so, for example to enable them to be removed, the area should be isolated. This is particularly important in automated container terminals where unmanned equipment operates.

122. Unserviceable vehicles, plant and equipment should be clearly and appropriately marked to ensure that they are not used.

6.3.2. Container-stacking areas

123. The ground of all container-stacking areas, including empty containers, should be maintained in a sound and level condition.

124. Every slot in a container-stacking area should be able to be readily identified. This may be done by the identification of blocks and rows on the ground or by other markings.

125. The tracks of RMGs and RTGs that service blocks of containers should be clearly marked and kept clear at all times.

126. Dangerous goods should only be kept in the stacking area in accordance with national legal requirements and terminal rules (see Chapter 8).

127. Containers in stacks should all be of the same length to ensure that the lower corner fittings of a container above the bottom tier rest directly on the top corner fittings of the container below. Non-standard-length containers may be stacked on standard containers, provided that their corner fittings are located in the same positions.

128. Containers should never be stacked beneath or close to overhead power lines.

129. Containers should not be stacked more than one high within 6 m of a building where there is a risk to persons in the building if a container is mishandled or subjected to high winds.

130. Consideration should be given to the possible effects of high winds on container stacks. This may include the orientation of containers in line with prevailing winds. Where necessary, containers should be secured by twistlocks or otherwise.

131. The ends of rows in stacks serviced by straddle carriers should be stepped down, where this is practicable, in order to improve the visibility of straddle carriers emerging from the stack.

132. Whenever practicable, tank containers should only be stacked one high. When it is necessary to stack tank containers more than one high, it is recommended that stacking cones be used, in view of the differences of tank container frame designs. Tank containers carrying highly volatile substances should not be stacked above the pressure relief valves of highly volatile flammable substances.

133. Any person seen on foot in a container-stacking area, other than in an area that has been isolated, should be reported to Control immediately. Control should isolate the area until the pedestrian has been removed.

134. A conspicuous metal plate with a long handle may be inserted into a top corner fitting of a refrigerated container connected to the electrical supply in order to prevent it from being lifted while still connected (figure 75).

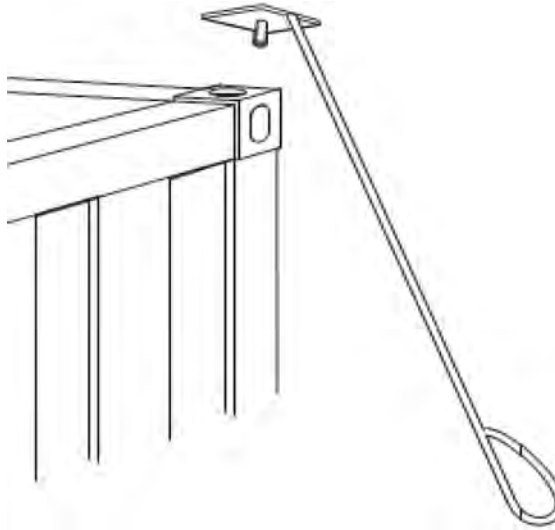
6.3.3. Container handling and lifting

135. The supervisor should prohibit anyone from being beneath a suspended container. Access to the lifting zone should be restricted.

136. Containers exceeding the maximum gross weight on their safety approval plate or the capacity of the handling equipment should not be handled.

137. Containers should be handled and lifted in accordance with relevant international standards. Table 1 of ISO 3874 *Series 1 freight containers – Handling and securing* illustrates the nine specified methods of lifting (figure 76). It should be

Figure 75. Plate to prevent lifting of a refrigerated container while it is connected to the electrical supply on the terminal

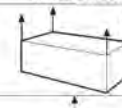
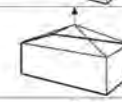
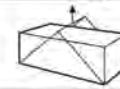
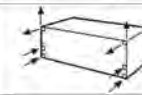
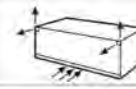
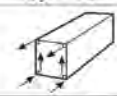
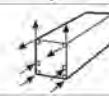


noted that all methods have their limitations and many are not allowed for specified loaded containers.

138. Loaded containers should generally be lifted by container cranes vertically from their four top corner fittings with the aid of a purpose-designed spreader.

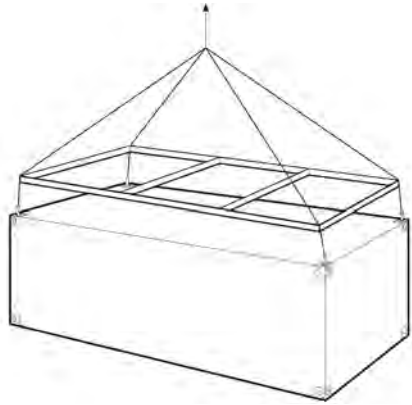
139. Empty containers may be lifted with the aid of a four-legged sling assembly (figure 77). The assembly may incorporate a chandelier spreader. The sling legs should be long enough to give a safe angle of not more than 90° between them at the crane hook. This angle should never be exceeded. Sling hooks inserted into corner castings should face outwards.

Figure 76. Summary of specified lifting methods: ISO 3874, table 1

Subclause	Description	Illustration
6.2	Top lift spreader	
6.3	Top lift sling	
6.4	Bottom lift sling	
6.5	Side lift: method 1	
6.6	Side lift: method 2	
6.7	Side lift: method 3	
6.8	End lift: method 1	
6.9	End lift: method 2	
6.10	Fork-lift	

Source: The terms and definitions taken from ISO 3874:1997 *Series 1 Freight containers – Handling and securing*, table 1 (English version) are reproduced with the permission of the International Organization for Standardization (ISO). This standard can be obtained from any ISO member and from the website of the ISO Central Secretariat at the following address: www.iso.org (copyright remains with ISO).

Figure 77. Top lifting of empty containers with a four-legged sling assembly



140. Containers carrying over-height loads may be lifted from the bottom corner fittings (figure 78) or with the aid of special purpose-designed over-height frames (figure 79).

Figura 78. Bottom lifting of containers

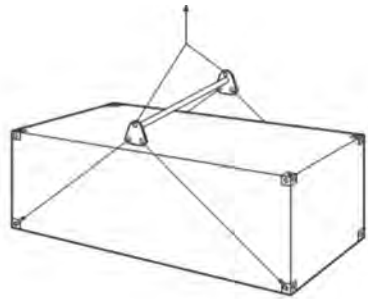


Figure 79. Over-height frame

141. The design of spreaders for twin lift operations should take into account the potential total gross weight of the two containers and possible asymmetrical loading of cargo inside them.

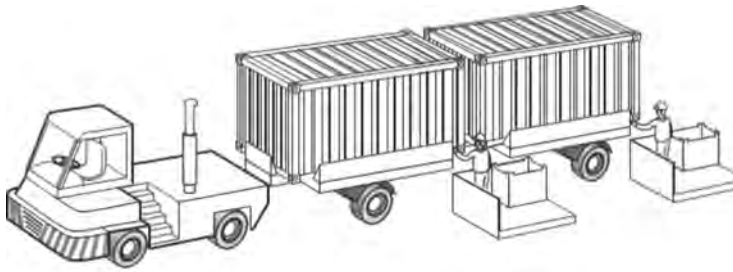
142. Containers should only be handled by other methods after careful evaluation of the equipment to be used and the methods of operation proposed.

143. Containers should only be handled by forklifts or goosenecks if they are fitted with forklift pockets or gooseneck tunnels, in accordance with ISO 1496, and provided that these are maintained in good condition. Tank containers should never be handled by forklifts.

144. Container-handling equipment should be driven at an appropriate safe speed. Speed should be reduced for cornering.

145. In order to maximize its stability, container-handling plant travelling with a container should carry it as low as is practicable to ensure adequate clearance of obstacles.

Figure 80. Protected twistlock insertion/removal workstation (example for illustration; other examples exist)



146. RMGs or RTGs lifting a container from a road vehicle whose operator is required to stay in the cab should lift the container slowly until it is seen to be clear of the vehicle.

147. Special precautions should be taken when it is necessary to handle damaged containers. Damaged containers should be withdrawn from service unless they are safe to continue to their destination for unloading or to a repair depot.

148. Hatch covers that are landed during loading or unloading operations should be clearly visible and not obstruct traffic routes. All relevant traffic vehicles and personnel should be alerted when hatch covers are landed.

149. The insertion or removal of any SATL/FATLs exposes portworkers performing this work to significant hazards. Safety protocols and devices should be installed to ensure that portworkers inserting or removing SATL/FATLs do not come into unexpected contact with the container-handling equipment (figure 80). This particularly applies to automated terminal operations. See section 6.3.1.2 on automated container terminals (ACT).

150. Twistlock bins should not obstruct traffic routes on the quayside. However, they may be used to protect workers from traffic while twistlocks are inserted on the quay.

6.3.4. Changing spreader frames

151. When a spreader frame is changed:

- the work should be carried out by trained personnel;
- all electrical power circuits to the frame should be isolated before the plug is removed;
- the hoist wires on the crane should be fully slackened off before the frame is disconnected;
- the electrical plug should be stored in the dummy stowage after removal, and should not be allowed to become damp;
- frames should be securely stowed on trailers to enable them to be removed from operational areas; and
- when a frame is attached, it is essential to ensure that the control switches in the cab correspond to the position on the frame.

152. If it is necessary to change a spreader frame on a crane or other container-handling appliance in a container-handling area, the area around the operation should be isolated.

153. Suitable arrangements should be made for storage of spreader frames that are not in use in a safe place that does not obstruct traffic routes. This may be on ready-use trailers.

154. Where necessary, spreader frames that are not in use should be protected by barriers and warning signs.

155. Painting spreader frames in bright colours helps to ensure that they are highly visible when kept on a quay.

6.3.5. Access to tops of containers

156. Safe means of access, such as steps, a portable ladder, a mobile elevating work platform or an access cage, should be provided if access to the top of a container is necessary. Workers should never climb up the door fittings of a container.

157. Portable ladders should not be used for access to containers stacked more than two containers high unless no safer means of access is reasonably practicable (see section 6.1.2., paragraphs 12–14).

158. The surrounding area should be isolated if access is necessary to the top of a container in a container-stacking area.

159. Portworkers who have to work on top of containers should be prevented from falling off them. Whenever possible, the work should be carried out from a mobile elevating work platform or an access cage. If this equipment is not available, fall-arrest equipment should be worn.

6.3.6. Operations inside containers

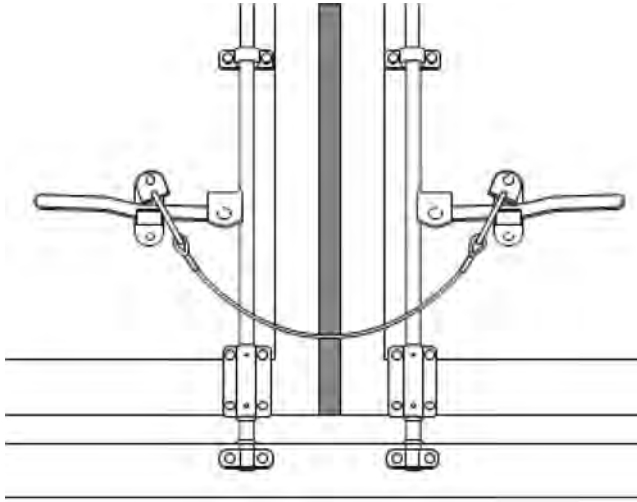
6.3.6.1. Opening containers

160. Sealed containers should not be opened without appropriate customs or other appropriate authority attending.

161. The doors of containers should only be opened under control (figure 81). A simple way is to first restrain them by a short sling with a spring-gate karabiner. If the door is under pressure, it will then only be able to open a short distance. It can then be opened under control by a lift truck or other restraint after the sling has been removed. If the doors are not under pressure, the sling can be removed immediately.

162. The doors of a container should be secured in the fully open position once they have been opened. This ensures the

Figure 81. Sling to restrain container doors



maximum natural ventilation of the container and prevents a door from being moved by wind.

163. No person should enter a container until it has been confirmed that it is safe. Hazards in addition to those of the cargo include:

- toxic gases or emissions, including decomposition products, evolved and emitted by the cargo;
- fumigant gases or fumigant residues that are still active;
- lack of oxygen.

164. No reliance should be placed on the absence of dangerous goods placards or fumigation warning signs.

165. If there is any reason to suspect the presence of a hazardous atmosphere in a container, no entry should be made until the container has been effectively ventilated and the atmosphere confirmed to be safe after allowing for any difficulty of ventilating the far end of the container. It has been found that up to 4 per cent of all loaded containers may contain dangerous levels of fumigant gases. It is therefore recommended that no container should be entered unless the atmosphere inside is confirmed to be safe, as specified in Chapter 12 of the *CTU Code* and Annex 5 thereto.

166. Sealed containers which have been opened with appropriate customs or other authority, should be resealed with an approved seal of equivalent or higher security than the original seal.

6.3.6.2. Customs inspections

167. Containers should not normally be opened for customs examinations in stacks in container parks. If it is necessary to open a container in a stack, the area should be isolated.

168. Containers to be opened for customs examination should be taken to a separate secure area with safe means of access into the container.

6.3.6.3. Packing and stripping of containers and other cargo transport units

169. Every container should be inspected before it is packed to ensure that:

- it has a valid CSC safety approval plate;
- the maximum gross weight markings on the container are consistent with those on the safety approval plate;
- it is in good structural condition, free from obvious defects and has securely closing doors;

- it is suitable for the load;
- it is clean, dry, free of any invasive botanical or animal alien species and without any residues from previous cargoes or fumigation;
- no irrelevant hazard warning placards, marks or signs have been left on the container; and
- cargo inside a container should be packed and secured in accordance with the *CTU Code*.

170. The load in a container should be uniformly distributed so far as this is practicable. No more than 60 per cent of the weight of the cargo should be in one-half of the length of the container.

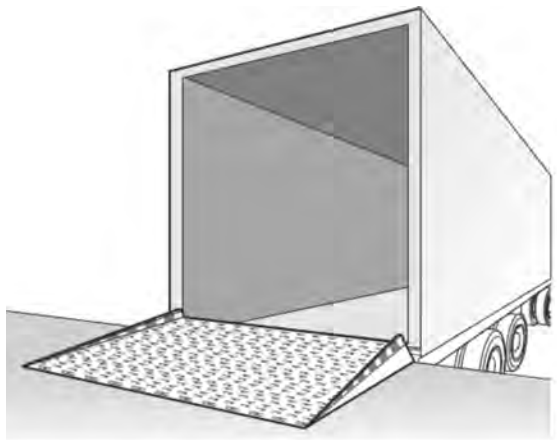
171. A container, when packed and secured, should be sealed in accordance with relevant customs requirements.

172. Packaged dangerous goods should be segregated, packed and labelled, placarded, signed and marked in accordance with the IMO's *IMDG Code* (see Chapter 8).

173. Lift trucks used for packing or stripping a container or other cargo transport unit should be suitable for the purpose, with a short mast and low overhead guard for the operator. To prevent build-up of dangerous exhaust gases, only liquefied petroleum gas (LPG)-fuelled or electric trucks should be used. Lift trucks should not impose excessive point loads on the floors of containers. Container floors are generally designed to withstand the wheel pressure of a lift truck with a lifting capacity of 2.5 tonnes. Lift trucks with small metal wheels on the outer end of forks should not be used, as they can subject floors to high-point loadings.

174. If containers or other cargo transport units are packed or stripped while on a trailer, care should be taken to ensure that

Figure 82. Ramp to road vehicle



the trailer cannot move or tip up during the operation. Brakes should be securely applied, wheels should be chocked and the front end of the unit adequately supported. Where necessary, a ramp or bridge piece should be provided (figure 82).

6.3.6.4. Cleaning of containers

175. All containers should be cleaned after use. In addition to basic cleaning to remove cargo residues, more thorough cleaning may be necessary for:

- quarantine control to prevent the export of pests and diseases;
- the maintenance of food quality in containers; or
- the avoidance of cross-taint between successive loads.

176. All portworkers cleaning containers should be specifically trained in the potential hazards of the operations.

177. Before any container-cleaning operation is carried out, the identity of any cargo residues that are likely to be present in the container should be positively identified.

178. It should be appreciated that under some circumstances the hazards inside the container may include a lack of oxygen, in addition to the other hazards from cargo residues. Both doors of the container should be opened to maximize natural ventilation during cleaning operations, and any other necessary precautions should be taken before entry.

179. It should not be assumed that there are no hazardous residues in containers not carrying hazard warning placards.

180. Any residues found in a container should be treated as hazardous until they have been proved to be non-hazardous.

181. Appropriate personal protective equipment should be worn by all persons carrying out container-cleaning operations. The type of equipment required will be determined by the nature of the possible residues in the container.

182. If the container to be cleaned is on a trailer or chassis, safe access should be provided to and from the container. This may be by steps, ladders or other appropriate means.

183. Hazardous residues should not be swept out of containers. If they are, the relevant area will then require cleaning.

6.3.7. In-transit repairs to containers

184. Any container that is found to require detailed examination or repair should be removed from the container-handling area to a suitable area where it can be safely examined.

185. A container found on examination to have a defect that could place a person in danger should be stopped. However, if the container can be safely moved to its destination or some other place where it can be repaired, this may be permitted,

subject to any necessary conditions to ensure safety, and on condition that it is repaired as soon as is practicable.

186. Damaged or defective containers should not be reloaded until any necessary repairs have been carried out.

187. Damaged or defective containers that are not to be repaired immediately should be clearly marked to ensure that they are not used.

188. Provided that it is safe to do so, a container or tank that is found to be leaking should be moved to an area where the leakage can be contained to prevent it entering a water course and until remedial action can be taken. This may involve transferring the contents to another container or tank. Some ports keep a special frame that is essentially an open tray into which a leaking container can be put and which can hold 110 per cent of the contents of the container.

6.4. Conveyors

189. A clear space of at least 1 m should be provided at each working position at a conveyor.

190. Conveyor operators should check that no persons are working on a conveyor or immediately adjacent to it before it is started. A suitable warning signal of starting should be given if the operator does not have a clear view of the whole conveyor or conveyor system. The signal may be audible, visual or both.

191. Portworkers should be prohibited from riding on all types of conveyors and from using chutes or dray ladders as means of access.

192. Rolling goods should only be moved on gravity rollers, chutes or dray ladders under the control of two ropes or other safety appliances.

193. When necessary for the safety of workers, chutes should be equipped with sideboards to afford protection from falling objects.

194. Reception hoppers and discharge points of conveyors and transfer points between conveyors used for the movement of dusty material should be enclosed as far as is practicable.

195. The emission of dust should be prevented as far as is practicable. It can be reduced by minimizing the distance of free fall of material, by discharging through a properly adjusted spout or stocking and by the application of local exhaust ventilation.

196. Powered conveyors should be equipped with readily accessible stop controls for use in an emergency.

6.5. Electrical equipment

197. Only duly authorized competent persons should be permitted to install, adjust, examine, repair or remove electrical equipment or circuits.

198. When work needs to be carried out near uninsulated electrical conductors, such as crane trolley wires, the relevant circuits should be isolated and locked off. A "permit to work" on a system will often be necessary to ensure that the system cannot be accidentally re-energized while the work is in progress.

199. All portable electrical equipment should be examined and tested periodically by a competent person.

200. All portable electrical equipment should be inspected at least daily by a competent person. Operators may be competent for this purpose if they have been appropriately trained.

201. Portable electric lights should only be used when adequate permanent fixed lighting cannot be provided.

202. Portable or flexible electrical conductors should be kept clear of loads, running gear and moving plant or equipment.

203. Only appropriately constructed and explosion protected electrical equipment should be used in areas where flammable atmospheres are likely to be present.

6.6. Forest products

6.6.1. General requirements

204. In developing their safe system of work, terminals handling forest products should refer to ICHCA Briefing Pamphlet 23: *Safe Handling of Forest Products*.

205. All forest product cargoes should be protected from extremes of weather, as this can cause their condition and their handling and stability characteristics to deteriorate.

206. Packaged timber absorbs moisture. Weights printed on the side of packs of timber may indicate only the maximum weight of the dry timber and should be marked as approximate, as per Article 1, paragraph 2, of Convention No. 27 and should only be regarded as an indication.

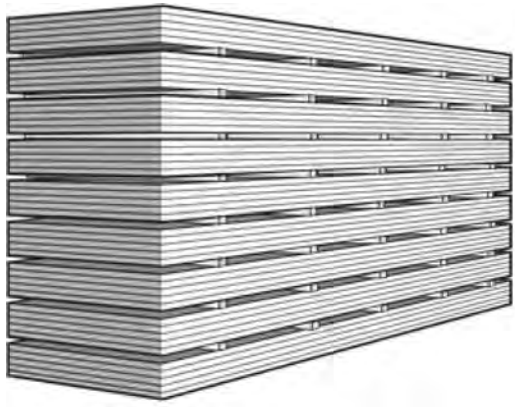
6.6.2. Storage

207. Storage areas for forest products should be clean, dry and level. The direction of the prevailing wind should be considered when setting the line of open-air timber stacks.

208. Stacks should be stable, uniform, profiled and well-spaced to enable lift trucks to handle the widest packs safely. Isolated "tower" or "chimney" stacks should be avoided wherever possible (figure 83).

209. Timber should be stacked carefully on suitable bearers. Bearers should be thick enough to enable insertion of truck blades without catching the packs. The bearers of all tiers should be in a vertical line and not protrude beyond the stack (figure 83).

Figure 83. Stacking of timber



210. Packs that are rounded or have insufficient banding should not be stacked.

211. Stacks should be made up of timber with similar lengths whenever possible. Particular care should be taken when stacking packs of mixed length with protruding boards. Portworkers should never climb up protruding boards.

212. Stack heights should be limited to three times the width of the packs for outside storage and four times the width of the packs for inside storage. Larger block or bulk stows may be possible after careful assessment.

213. Large packs should always be below smaller packs when packs of different sizes are stacked.

214. Each tier of stacks of relatively short timber should be stacked at right angles to the tier below. The height of such stacks should be restricted.

215. Racks in which timber is stored should be marked with their maximum loads and regularly inspected for damage.

216. As cargo is de-stacked, towers should be stepped down.

217. Cargo stacks should be regularly inspected, particularly if they are old. Cargo shrinkage as moisture dries out may loosen bands and make packs and stacks unstable. Air-dried packages of timber with boards separated by small battens are particularly prone to severe shrinkage and should be inspected more frequently. Affected packs should be re-banded and re-stowed.

218. Portworkers should never climb up the sides of stacks.

219. Side-loader fork trucks may be used to obviate the need to move large amounts of cargo when picking individual packs for customer requirements. Care should be taken when such packs are handled not to knock over the adjacent row. Pedestrians should not traverse side-loader bays when forklifts are operating.

220. The bottom tier of stacks of logs or poles should be wedged or retained by special frames to prevent slippage. The slope of the stack should not exceed an angle of 30°, smaller diameter logs or poles being placed on top.

221. Reels of paper stacked vertically on end by clamp trucks should be of the same diameter and in line vertically to ensure stability. The height of the stack should generally be not more than eight times the diameter of the reels.

222. Paper reels stowed on their side should be wedged to prevent slippage.

223. Bales of pulp can be stacked five or six bales high or greater. Each tier should be interlocked for stability. Greater stability can be achieved by "locking" second or third tiers with boards. Dunnage should be placed on the corner bales of the first tier to promote a pyramid effect of the stow.

224. Pulp should never be exposed to moisture, as it may swell, burst the banding and cause the stack to become unstable.

225. Bales of waste paper are particularly susceptible to moisture absorption and may spontaneously combust when drying out.

6.6.3. Handling

226. When lifting equipment to handle forest products is selected, allowance should be made for timber that has been stowed unprotected or left outside for long periods, as this can increase the nominal weight of the pack significantly.

227. Particular care should be taken when handling forest products such as tongue and groove boarding or paper products, which are especially susceptible to damage.

228. Packs of timber should not be lifted above the load guard of a lift truck.

229. Lift trucks with packs elevated should only be driven short distances and at low speed for specific purposes (such as stacking/unstacking a pile or loading/unloading a trailer unit or to set up a load at the dock to be lifted by the crane).

230. Heavy braking of lift trucks should be avoided, as it may displace the load.

231. Timber stacks should be stepped as they are broken down.

232. Loose gear and dunnage should not be lifted on top of sets or packs of timber.

233. Packs should be landed on suitable dunnage bearers.

234. Loose banding wire should be collected up as work progresses.

235. When unpacked bundles of timber are lifted by a single sling, a wrapped choke hitch should be used to prevent pieces from falling out (figure 84).

Figure 84. Single sling lift by wrapped choke hitch

236. Paper reels are normally handled by simple mechanical scissor-head clamps, hydraulic or vacuum clamps or frames, core probes or Jensen slings. The manufacturer's instructions should be followed.

237. Bundles of pulp should be lifted by large frames with quick-release hooks or flat pulp hooks, which spread the load on the wire seizings or strappings. Normal hooks may break the wires. A stretcher bar should be used to prevent hooks from sliding together under load and causing the bundle to become unstable.

238. Normally, when one lifting wire is broken, the safe working load of the utilized cargo is not met. The banding certificate should be consulted. If bundles are broken and individual bales have to be handled, suitable hooks should be used, hooks being inserted under different packing wires.

239. Pulp is normally handled by "squeeze" or bale clamps fitted to the carriage of a lift truck.

240. Bales of waste paper are handled and stowed in a similar manner to pulp.

241. Eye protection and suitable gloves should be worn when removing or replacing banding on bales of pulp or waste paper.

6.7. Gatehouses and reception buildings

242. Work near gatehouses or reception buildings should be organized so as to minimize the exposure of workers to vehicle exhaust emissions while undertaking traffic control, examination of vehicles and security duties (see sections 3.12.1 and 9.1.7).

243. The time during which workers are exposed to vehicle exhaust emissions should be limited if it is not practicable to reduce such emissions to an acceptable level. This may be done by rotating duties during the working period.

6.8. General cargo operations

244. General cargo operations should be planned so as to minimize the necessity for portworkers and vehicles to work in the same area.

245. Where practicable, walkways that have to pass through cargo-handling areas should be located at the edges of the areas, rather than passing through the middle of them.

246. When objects are lifted with jacks, the jacks should be:

- constructed so that they will remain supported in any position and cannot be lowered accidentally;
- set on solid footings;
- centred properly for the lifts; and
- placed so that they can be operated without obstruction.

247. If cargo platforms are used, they should be:

- constructed of robust material;
- sufficiently large to receive the cargo and ensure the safety of persons working on them; and
- not overloaded.

248. Hatch covers should not be used in the construction of cargo platforms.

249. Where heavy objects, such as loaded drums or tanks, are handled up or down an incline, their movement should be controlled by ropes or other tackle as well as chocks or wedges. Portworkers should not stand on the downhill side of the load.

250. Drums, casks and similar cylindrical cargo that can be rolled should be kept under control at all times. They should be pushed with the hands flat on the circumference of the drum and well in from the ends in order to prevent possible trapping. Wooden casks or barrels should be pushed on their hoops.

251. The method of stacking or storage of cargo should be determined in the light of the:

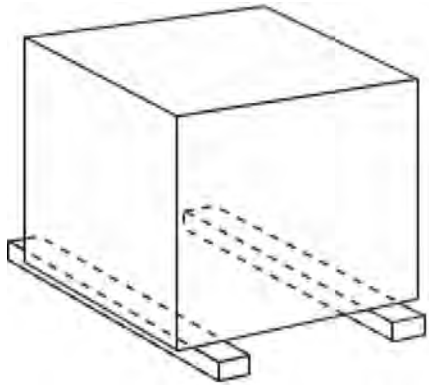
- cargo-handling equipment that is available;
- location and size of space that are available;
- length of time the cargo will be kept in that location; and
- next operation.

252. Dunnage should be free of bark and used as appropriate under goods that are to be loaded or unloaded by lift trucks or other lifting devices (figure 85).

253. Dunnage should be of sufficient size to allow for forks, other lifting devices or slings to be inserted or removed easily.

254. Stacks of goods should be broken down systematically from the top tier in order to ensure that the stability of the stack is maintained.

Figure 85. Use of dunnage



255. Where appropriate, cargo should be kept on pallets.

256. Long thin cargo, other than timber, should be kept in racks.

257. Due consideration should be given to the need to maintain the stability of racking when goods are loaded and unloaded from it. Goods should never be balanced on the edge of racking. This may lead to the overturning of racking, particularly if the lower levels of racking are empty or lightly loaded and the centre of gravity of the loaded rack is above that level.

258. Cargo placed at a quay edge should be positioned so that there is a clear space of not less than 1.5 m between any part of the stack and the quay edge. If this is not practicable, the cargo should be placed in such a way that there is not enough room for a person to squeeze between the stack and the quay edge.

6.9. Machinery (general)

259. All machinery should be regularly maintained and cleaned, to ensure that it remains in a safe and efficient

condition. Particular attention should be paid to the risk of corrosion that may result from the marine environment and the materials handled.

260. Any machinery that is found to be unserviceable should be isolated or immobilized, as appropriate. It should also be clearly signed or marked to show that it is unserviceable and to ensure that it is not returned to use before it has been repaired.

261. Machinery should be secured to prevent shifting.

262. Guards of dangerous parts of machinery should not be removed.

263. Dangerous parts of machinery should be guarded and/or protected by interlocking systems whenever possible which should be inspected periodically.

264. Dangerous parts of machinery should only be cleaned, examined, lubricated, adjusted or repaired when the machine is stopped.

265. Only duly authorized persons should be permitted to remove guarding from dangerous machinery. Any guarding that is removed by an authorized person should be replaced as soon as possible and before the machinery is restarted.

266. All machinery that is stopped for servicing or repairs should be isolated. Effective measures should be taken to ensure that it could not be accidentally restarted. This may be achieved by the use of lock-off devices or "permit to work" systems (lockout/tagout).

267. If it is found to be absolutely necessary to examine or adjust machinery in motion and with a guard removed, the work should only be carried out by specially authorized and trained personnel, in accordance with a safe system of work. Such persons should wear one-piece overalls with no loose ends.

268. An audible or other suitable warning should be given to workers nearby before large or complex machinery is started, unless the operator can clearly see all parts of the machine or system.

269. Pipes containing steam or other hot fluids at temperatures of more than 50°C should be suitably insulated or otherwise protected. Where necessary, pipes should be colour coded in accordance with national standards.

6.10. Mobile equipment (general)

6.10.1. General requirements

270. All safety-critical items of mobile equipment should be maintained in a safe and efficient condition. This should include an appropriate daily inspection by the driver, operator or other competent person, including checking tyre pressures in order to maintain stability. Mobile phones and personal electronic devices should not be used at any time while working.

6.10.2. Internal movement vehicles

271. Internal movement vehicles should only be driven by portworkers who are competent and authorized to do so. To be authorized, they should be over 18 years of age, medically fit and appropriately trained, both on the type of vehicle used and the operations to be performed. Many port and terminal operators operate a licence or permit system that clearly identifies driver and operator competencies.

272. Seat belts or other appropriate restraints should be provided and worn where necessary. These should preferably be of the inertia reel type and designed to take into account the working position of the driver or operator, which may differ from that of a normal road vehicle.

273. Passengers should only be permitted to be carried in vehicles that are constructed to carry passengers.

274. All port vehicles should be driven within port speed limits at a speed that is appropriate for the vehicle and its load.

275. The braking capacity of a tractor unit should always be sufficient to control and stop its trailer safely when carrying the maximum payload on a loading ramp, whether or not the trailer is braked.

276. The braking system of a tractor unit should always be compatible with that of any trailer that it is to tow. Particular attention should be paid to this matter in ports where trailers from different countries with different braking systems are liable to be handled.

277. The driver of a tractor unit towing one or more trailers should:

- drive at an appropriate speed;
- not cut corners;
- allow plenty of clearance when passing other vehicles, stationary objects or people, particularly when towing a wide load;
- avoid reversing whenever possible and seek assistance when necessary;
- not reverse with more than one trailer;
- drive slowly down gradients when trailers are loaded, particularly if not fitted with overrun brakes; and
- avoid braking fiercely, since this may cause trailers to jackknife.

278. Dusty material conveyed in port areas in open trucks should be covered to prevent it from being blown from the vehicle by wind.

279. When vehicles are stationary for any period of time, the engine should be switched off.

6.10.3. Trailer operations

280. The braking system on a trailer should be compatible with that on the tractor unit that is to move it.

281. All brake lines and brake reservoirs should be fully charged before a trailer is moved.

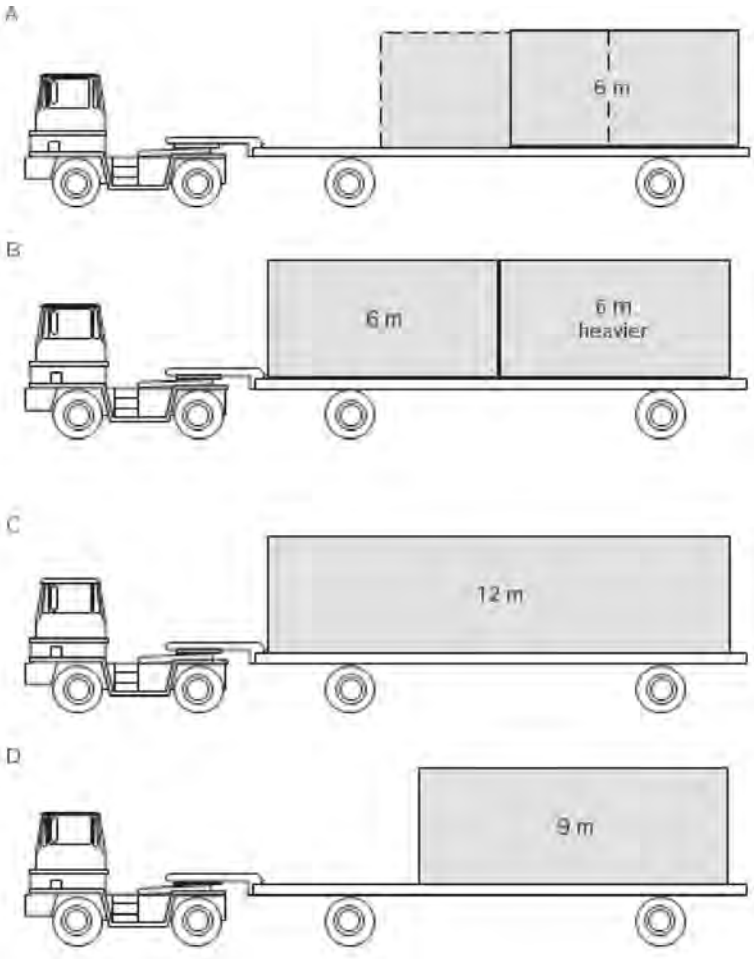
282. The correct weight distribution of the load relating to each type of tractor unit used should be determined for each design of trailer used. Incorrect loading and speed are the two major causes of skeletal trailers rolling over in ports. In general:

- single 6 m (20 ft) containers should be at the rear position on a trailer. However, where there is a central stowage position on the trailer, it should be used (figure 86A). Where two 6 m containers are loaded, the heavier container (+/–2 tonnes) should be at the rear (figure 86B); and
- any 12 m (40 ft) containers should be placed as near to the front of the trailer as possible (figure 86C), but 9 m (30 ft) containers should be at the rear (figure 86D). Ideally, when single 6 or 9 m containers are placed on a trailer, stop pins or ridges should prevent container movement.

283. Trailers carrying containers that are to be loaded or unloaded from a loading bay by lift trucks should be adequately supported, by trestles or otherwise, to prevent the trailer from tipping when the truck is inside the container.

284. No one should be standing on the trailer when loading long sections of cargo such as steel pipes or timber.

Figure 86. Distribution of load on a trailer



6.10.4. Trestles

285. Trestles should be moved with care, as they can cause injury if not handled correctly.

286. Trestles moved lengthways should be pushed at their mid-height, where possible, and care should be taken not to pitch into gradients or ground the base of the trestle.

287. When necessary, assistance should be sought if a trestle has to be pushed up a gradient.

288. No attempt should be made to right a trestle that has fallen over without help.

289. Trestles should be stored away from traffic routes on level ground. If it is necessary to leave a trestle on a slope, it should be chocked or tethered.

290. Special care should be taken when a trestle is placed beneath the last vehicle in a row, and when the trestle cannot be located from either side (a tunnel stow). A good system of work and signals is required, since the operation entails workers manoeuvring a trestle alongside or under a moving vehicle. Alternatively, modified trestles that can clip onto the trailer chassis, or are held or pushed by skids or bars, on the rear of the tractor unit can be used.

6.10.5. Goosenecks

291. When it is necessary to travel with an unladen goose-neck, it should be:

- preferably to the rear;
- kept approximately 1 m from the ground, to avoid damage; and
- in line with the haulage vehicle and not slewed across the carriage.

292. Great care should be taken when cornering. Sharp turns can cause a gooseneck to swing violently.

293. When tractor units with goosenecks are parked, the gooseneck should be lowered to the ground in line with the vehicle.

294. Storage frames for goosenecks should be located in such a way that it is not necessary for tractor units to reverse directly into traffic routes.

6.10.6. Roll trailers

295. The loading of containers on roll trailers differs from that on skeletal trailers, in that:

- a single 6 m (20 ft) or 9 m (30 ft) container should be loaded at the front, nearest to the gooseneck end (figure 87A); and
- if two 6 m containers are loaded, the heavier should be at the front (figure 87B).

296. Whenever practicable, roll trailers that are being moved on or over ramps and inclines (figure 88) should be:

- pushed (reversed) up the slope; and
- pulled (forward) down the slope.

297. If containers are double stacked on a roll trailer:

- the containers should be connected by twistlocks, cones or other inter-box connectors;
- two 6 m (20 ft) containers should never be stacked on top of a 12 m (40 ft) container;
- four-wheel drive tractor units should be used;
- travel routes should be as direct as is practicable;
- turns should be kept to a minimum. Where turns are necessary, the turning circle should be as large as is practicable;

Figure 87. Distribution of load on a roll trailer

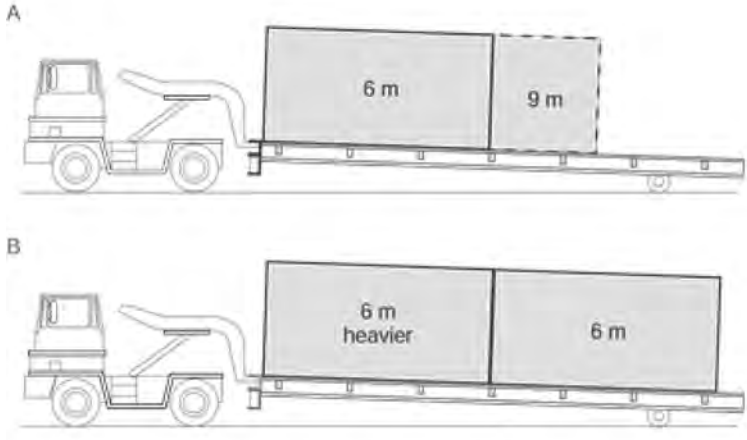


Figure 88. Roll trailer on a ramp

- speed should be limited to approximately 8 km/h (brisk walking pace); and
- the total load should not exceed the safe working load of the trailer.

298. Double-stacked containers should only be carried by roll trailers if:

- the heavier of two 12 m (40 ft) containers is on the bottom;
- the heaviest of three 6 m (20 ft) containers is at the front of the two bottom containers and the lightest container is on the top at the rear; or
- with four 6 m (20 ft) containers, the weight of either container on top does not exceed the weight of the lighter container on the bottom.

All weights referred to are gross.

299. Arrestor chains should only be necessary when towing empty or lightly loaded roll trailers with a gross weight no greater than the combined safe working load of the chains.

300. Arrestor chains should never be used when towing heavily loaded roll trailers. Should the roll trailer become detached, particularly on gradients, chains may fail and strike the tractor unit operator (see section 6.17, paragraph 430).

301. Roll trailer parks and traffic routes should be laid out to permit parking trailers with forward-facing goosenecks.

6.10.7. Cassettes

302. Cassettes should generally be operated in a similar manner to double-stack roll trailers.

303. Cassettes should always be kept as nearly in line as possible when approaching ramps or bridges. Speed should be

appropriate to the prevailing conditions. Factors to be considered include the gradient of ramps, the nature of the surface and weather conditions.

304. Cargo loaded onto cassettes should be kept within the dimensions of the cassette. If it is necessary to load over width cargoes, care should be taken not to obscure the driver's view.

305. Cargo on cassettes should be secured with appropriate strapping, angles and ratchet tensioners.

306. The lenses or protective shields of cassettes fitted with cameras at their rear should be kept clean.

307. Where cameras are fitted, cassettes may be manoeuvred without the use of a traffic controller or banks man.

308. Cassettes are designed to take advantage of the maximum height of deck heads on ro–ro ships. Factors affecting the height and stability of the load that should be considered include:

- ratio of load height and width;
- load uniformity for lashing purposes;
- maximum headroom on board ship and elsewhere;
- gradient of bridges, ramps and 'tween ramps;
- centre of gravity of the load; and
- driving speeds.

309. When cassettes are lifted, they should be kept horizontal either by lifting both ends at the same time or by lifting the ends a little alternately.

310. The tractor unit and cassette should always be stationary during loading.

311. Cassettes should never be grounded while moving. This may cause the load to shift and break lashings.

6.10.8. Parking

312. Mobile plant and equipment should only be parked on firm level ground.

313. The handbrake or other parking brake should be properly applied on all mobile plant and equipment when they are parked. Additional appropriate precautions, such as the use of chocks, should be taken to prevent unintended movement if it is found to be necessary to park on a slope.

314. Parking areas for mobile plant and equipment, including trucks and mobile cranes, should be marked out in suitable locations.

315. Mobile equipment should not be parked in a place where it is liable to cause an obstruction to traffic, or restrict the field of vision of drivers of other vehicles on roads or elsewhere.

6.10.9. Refuelling

316. Wherever possible, motor vehicles should be refuelled at fixed installations. If this is not practicable, the refuelling should be carried out in a well-ventilated space, preferably in the open air.

317. When refuelling is carried out, it is essential to ensure that:

- the engine is stopped and handbrake applied;
- the operator is off the truck;
- sources of ignition are excluded from the area;
- hot engine surfaces are protected from spillage;
- spillage and overfilling are prevented;
- any spillage that does occur is cleared up before the engine is restarted; and
- filler caps are securely replaced.

318. Refuelling should be carried out in a well-ventilated place, preferably in the open air. Vehicles should not be refuelled in holds or other confined spaces.

319. LPG and *low flashpoint fuel* containers should only be changed in the open air by trained workers. The replacement container should be free of damage and all fittings should be in good order. The container should be fitted with its pressure relief valve at the top. Care should be taken to ensure that threads are not damaged and connections are gas-tight.

320. All LPG and *low flashpoint fuel* containers not in use should be kept with their relief valves uppermost in a secure, well-ventilated store.

6.11. Liquid bulk cargoes

321. Operations involving the handling of liquid bulk cargoes should be carried out in accordance with international and national industry standards and codes of practice. These include the IAPH/ICS/OCIMF *International Safety Guide for Oil Tankers and Terminals (ISGOTT)* and the ICS/OCIMF *Safety guide for terminals handling ships carrying liquefied gases in bulk*.

322. The limits on the size of ships that may be handled at each berth should be clearly established.

323. If severe weather conditions can be experienced at the terminal, the maximum wind speed at which operations can be carried out safely should be determined. Arrangements should be made for the terminal to receive appropriate warning when wind speeds in excess of the limit can be expected.

324. Before cargo-handling operations start, the master of a tanker and the berth operator should:

- agree in writing the handling procedures, including the maximum cargo-handling rate;

- complete and sign, as appropriate, the ship/shore safety checklist;
- agree in writing the action to be taken should an emergency arise during the operations; ands
- agree clear unambiguous communications between ship and shore.

325. The ship/shore safety checklist should show the main safety precautions that should be taken before and during the cargo-handling operations. All items on the checklist that lie within the responsibility of the tanker should be personally checked by the tanker's representative, and all items that are the responsibility of the terminal should be personally checked by the terminal's representative. In carrying out their full responsibilities, both representatives should assure themselves that the standards of safety on both sides of the operation are fully acceptable by questioning the other, by reviewing records and, where it is felt to be appropriate, by joint visual inspections.

326. Appropriate means of escape in case of fire should be provided from all points on the berth. This should preferably be done by the provision of alternative means of escape. If only one means of escape is available on the berth, the alternative may be by additional walkways, boat, the provision of water sprays to protect the means of escape or suitable shelters for people awaiting rescue to protect them against radiant heat or exposure to toxic gas.

327. The use of self-sealing emergency release couplings with metal cargo arms minimizes the spillage of hazardous liquids in the event of an emergency. Emergency release couplings should be used for all operations with liquefied gases.

328. Cargo-transfer hoses should be examined on each occasion before use.

329. Cargo-transfer hoses should be handled with care. Hoses should not be dragged along the ground or bent to a radius less than that recommended by the manufacturer. Where necessary, lifting bridles or saddles should be used. Hose strings should not be allowed to impose undue strain on the ship's manifolds.

330. An insulating flange or section of cargo-transfer hose should be inserted in hose strings to be used for the transfer of flammable liquids, to prevent arcing during connection or disconnection of hoses (figure 89). Care should be taken to ensure that the insulating flange or section of hose is not short-circuited. This may be by the use of uninsulated lifting cradles or otherwise. The use of a ship/shore bonding cable has been found to be ineffective and potentially dangerous, and is not recommended.

331. All loading arms and pipeline manifold connections should be clearly identified to prevent accidental misconnection and resultant contamination of cargo.

Figure 89. Position of insulating flange in cargo-transfer hose

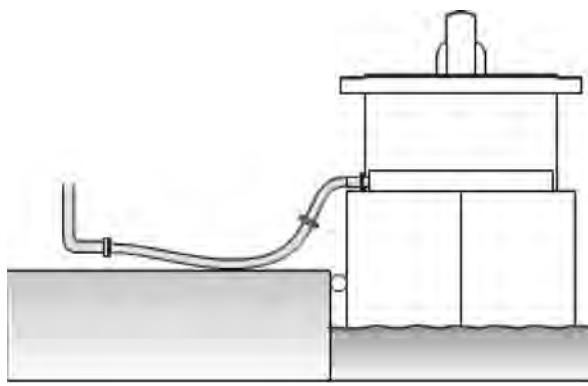
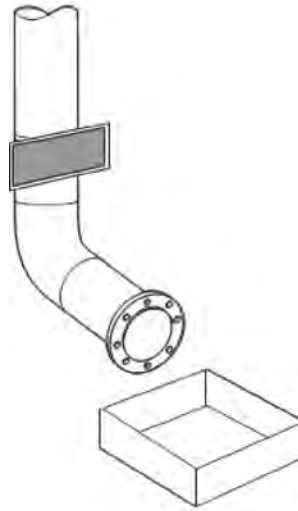


Figure 90. Drip tray below shore pipeline connecting flange



332. Drip trays should be provided beneath the flanges at the end of shore pipelines (figure 90).

333. All cargo-loading arms and hoses should be drained down before couplings are opened.

334. All portworkers connecting or disconnecting cargo arms or hoses should wear personal protective equipment that is appropriate for the cargo being handled.

335. Cargo-handling operations should be kept under surveillance throughout the operation.

336. Cargo-handling operations should be stopped in the event of range or drift alarms operating and appropriate remedial action taken.

337. Cargo-handling operations should be stopped and cargo arms drained and disconnected when wind speeds approach the permitted limit.

338. No naked lights, other sources of ignition or hot work operations should be permitted at berths where operations involving flammable liquids or gases are carried out unless specifically authorized under a "permit to work" that ensures that all necessary precautions are taken in connection with the work.

6.12. Logs

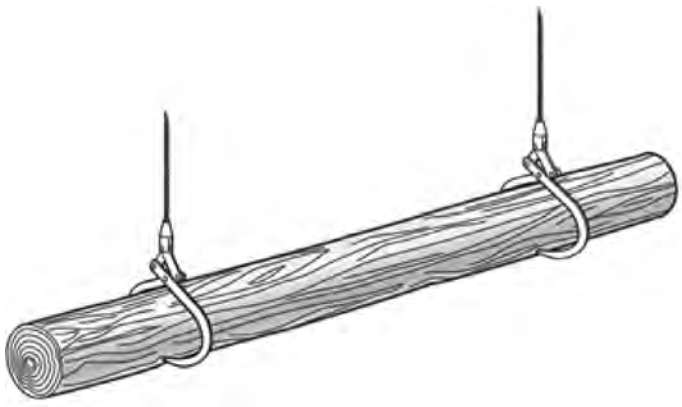
339. When logs are handled, it should be assumed that they are in a saturated condition. Loose gear used to handle logs should accordingly have a safe working load that is greater than the log's dry weight by a generous margin.

340. When tongs or scissor clamps are used:

- logs should be at least 1 m shorter than the length of the hatch;
- tongs should be placed as near as is practicable to a point immediately above the log's centre of gravity; trial lifts should be carried out, where necessary, for this purpose;
- tongs should bite into the wood beneath the bark; bark should be removed at the lifting points if there is any doubt as to whether or not it has been pierced; and
- persons applying tongs should stand well clear when the lift or trial lift is made.

341. Big logs should be handled with tongs slung from a lifting beam (figure 91). Tongs with claws should grip the log in the lower half of the circumference. Compression will increase with the load.

Figure 91. Log tongs



342. Wooden billets can also be slung with wire ropes. At least two slings should be used to avoid any risk of slipping. To prevent choked slings from slipping along logs, wrapped choke hitches should be used. Chains should be avoided, as it is difficult to prevent them from slipping.

343. Special care should be taken during discharge operations in the hold if logs are stacked one above the other, as removal of one may bring others down onto portworkers.

344. Where necessary, logs should be moved under a lifting appliance by a lift truck or bull-roping so that they may be lifted vertically.

345. Any person working on a log boom should be protected by a PFD.

6.13. Mooring operations

346. The area around all mooring bollards should be kept clear of obstructions.

347. All portworkers carrying out mooring operations should be specifically trained. The training should preferably be coordinated with that of ships' crews. This is likely to be practicable in ports with frequent calls by regular services, such as ferry terminals.

348. The training should include the properties and hazards associated with the different types of mooring lines and the hazards of working in the "snap back" danger zone. The "snap back" zone is the area in which a person is liable to be struck by a line that parts under tension. As a rule, the free end of a taut line suddenly released from tension will snap back towards the source of tension. The most common reason for a line to part is excessive wear or damage. Portworkers should notify the employer and the ship's master or officers in charge of the mooring operations if they notice such defects.

349. Portworkers carrying out mooring duties should wear appropriate personal protective equipment. This should normally include safety helmets, protective footwear, high-visibility overalls, PFDs and gloves. If foul-weather clothing is necessary, it should also be of high visibility.

350. Mooring operations should only be carried out in response to clear instructions or signals. These are made easier by the use of portable radios to communicate directly with the mooring party on the ship.

351. Members of mooring parties should stand clear of lines being thrown, but should be ready to pick them up as soon as they have landed.

352. When a winch or capstan is used to haul in a mooring line, not more than three turns should be put on the winch. The first turn should be put at the bottom of the winch. One member of the mooring party should be stationed by the winch,

with a second member backing up and coiling down the slack line.

353. Members of the mooring party should only enter the "snap back" zone around a winch when it is necessary to carry out a specific task, such as releasing or dipping a mooring line. Their presence in the zone should be limited to the minimum period that is necessary.

354. No persons should put their feet in bights or eyes of mooring lines or step over a mooring line under tension.

355. The dropping of mooring lines into the water when casting off should be avoided as far as possible. Lines in the water are liable to foul bow and stern thrusters.

356. Heaving lines and other lines should be coiled down after use.

357. A "monkey's fist" at the end of a heaving line should only be made of rope. Additional weights should never be added to it.

358. When quick-release hooks are reset after use, a check should be made to ensure that they have been properly reset.

359. All mooring lines and bollards should be suitable and in good condition. Any defects in mooring lines or other mooring equipment should be reported to the appropriate person as soon as possible.

360. Small boats should not be moored to quayside ladders. Where this is unavoidable, the boats should not obstruct access to the ladders from the water and consideration should be given to the need to provide additional ladders.

361. Exercises should be regularly carried out on retrieving persons who may have fallen into the water.

362. When automated mooring systems are used, for example with high-speed ferries, the portworkers concerned should be

trained in the operation of the linkspan and mooring clamps, and emergency procedures in the event of equipment failure.

6.14. Pallet handling

363. All pallets should be inspected before being used. Any pallets found to be defective should be removed from the area and withdrawn from service. Discarded pallets should not obstruct working areas or traffic routes.

364. Pallets should be suitable for the intended load and method of handling. Many accidents have occurred when pallets have been taken from a random selection of used pallets of unknown specification. Most pallets are designed to lift a uniformly distributed load. Unless the pallet has been specifically designed for point loading, the load should be distributed as uniformly as possible.

365. Loads should be built up on pallets in an appropriate pattern so as to be compact and stable. The overlapping of individual packages, the insertion of sheets of paper or cardboard between layers, and strapping the load to the pallet by metal or plastic tapes or shrink wrapping, are some methods of increasing stability.

366. Strapping securing loads to pallets should not be over tensioned. Deck boards can pull away from the bearers if the straps are tensioned excessively or the load is too small. Top boards should be used with small loads.

367. If pallets are to be stowed in the hold of a ship, it may be desirable for the load on a pallet to extend a short distance beyond the edges of the pallet, as this will allow them to be stowed compactly together, with little or no need for dunnage or inflatable cushions to block the stow.

368. The height of the load on a pallet should generally not exceed the longest base dimension of the pallet.

369. Pallets should not be loaded above their rated load.

370. Dangerous goods should be stacked on a pallet with their hazard warning labels clearly visible. Shrink wrapping should not be allowed to obscure such warning labels.

371. Palletized loads that are to be transported in the same condition throughout the transport chain should be conspicuously marked with the gross combined weight of the load and pallet.

372. The forks of pallet-handling devices should extend into the pallet for a distance of at least 75 per cent of the dimension of the pallet parallel to the forks. The forks should be so spaced as to ensure that maximum support is given to the pallet when it is lifted.

373. The small finger wheels of pallet trucks should not be allowed to damage base boards of pallets.

374. Pallets handled by crane should only be lifted by suitable fork attachments or, in the case of wing pallets, by bar slings with spreaders.

375. Loaded pallets which on visual examination do not meet the requirements set out above should be secured onto pallets in good condition before being further handled. Alternatively, the load can be removed and placed on a satisfactory pallet.

376. Empty pallets should be handled with care and should not be dragged or thrown down. They should not be handled by methods liable to damage or loosen them, such as the insertion of the platform of a sack truck between the bearers.

377. Pallets should never be used with a forklift truck as an improvised access platform.

378. Pallets that are not in use should be kept in appropriate designated places that are protected from the weather.

6.15. Passenger terminals

379. Access by passengers should be limited to appropriate areas physically segregated from all other operations, whenever this is practicable. Areas to which access by passengers is prohibited should be marked.

380. Passenger movements should be monitored and controlled to ensure that they remain in permitted areas.

381. Vehicle access routes and passenger drop off/pick up areas should be monitored and supervised, to ensure an effective and efficient flow of traffic.

382. Additional signs and other traffic control measures should be provided as necessary during visits by cruise ships, when unusually large numbers of vehicles may be present for short periods. Whenever possible, passenger traffic should be segregated from other traffic, including that provisioning the ship.

6.16. Rail operations

6.16.1. General requirements

383. So far as is appropriate, port railways should be operated in accordance with the principles of the rules for similar lines in the national railway system.

384. Written procedures, which may involve specialized training for the operation of transfer yards and other rail operations that may be carried out in conjunction with workers of the national rail system or other organization, should be drawn up and agreed between the relevant organizations.

385. Written safe systems of work should be developed for port railway operations. These are likely to include:

- shunting (switching) by any means;

- coupling and uncoupling;
- braking and brake testing;
- operation of level crossings;
- liaison with other rail organizations for the dispatch and receipt of trains;
- derailment procedures; and
- track maintenance.

386. No person should pass under, over, through or between railway vehicles, unless required as part of a controlled operation.

387. No person should cross railway lines within 15 m of a stationary railway vehicle, unless it has been positively established that it will not move. Particular care should be taken when crossing behind a train that has just stopped. Braking may have taken up slack between vehicles and compressed couplings and buffers. Wagons may then roll back several metres after the train stops.

388. All persons working on or near railway lines should wear high-visibility clothing.

389. All persons driving locomotives should be duly authorized to do so, medically fit and appropriately trained.

390. Locomotive drivers should only act on clear signals given by an authorized person. However, an emergency signal to stop should always be obeyed, irrespective of the source.

391. Locomotive whistles should be sounded or other appropriate warning devices actuated before locomotives or trains move off, and on approaches to level crossings and other hazardous places.

392. Unauthorized persons should never ride on locomotives or railway wagons.

393. Locomotives passing through a port area where people are working should move at dead slow. When wagons are pushed through such areas, the front wagon should be accompanied or preceded by a person on foot who is clearly visible to the driver at all times.

394. If a radio is used to communicate with a locomotive driver to direct a shunting or other rail movement, continuous radio contact should be maintained, so that the integrity of the communication is constantly monitored and confirmed. This may be done by continuous repetition of the word "proceed".

395. Care should be taken during shunting operations to ensure that both facing and trailing points are correctly set before the start of the movement. Level crossings and unprotected openings near the track should be supervised as appropriate.

396. No worker should climb above a footplate or floor level on any locomotive or wagon while under overhead electrified lines.

397. No goods or other obstruction should be placed within 2 m of the nearest rail of a track.

398. No wagons should be parked beyond the fouling point at the end of a siding.

399. Wagons and other vehicles should not be parked close to road or pedestrian crossings or other places where they are liable to cause an obstruction or obscure the view of road or rail drivers.

400. Brakes should be applied to parked rail vehicles to prevent unintended movement. Where necessary, the wheels of a vehicle may be scotched. Scotches should only be applied to the wheels of stationary vehicles.

401. Work on railway tracks should only be carried out if appropriate steps have been taken to protect those carrying out

the work from the approach of trains. This may be by a "permit to work" giving total possession of the section of track, by the provision of appropriate warnings and the use of lookouts, or by other appropriate means.

402. No worker should be permitted to work between or beneath railway vehicles unless positive steps have been taken to prevent the movement of the vehicle or vehicles and the approach of other vehicles.

6.16.2. Loading and unloading of rail wagons

403. When opening wagon doors, portworkers should check that the door fastenings are in good order and stay clear of the door and any goods that may fall as the door is opened.

404. Workers should not be inside open wagons (gondola cars) when bulk material is handled by grabs or magnetic lifting devices.

405. Danger signs should be placed at either end of sections of passageways or walkways near which open wagons with swinging side doors are being emptied.

406. Precautions to prevent workers' fingers from being crushed should be taken when drop doors on hopper wagons or open wagons with hopper bottoms are opened.

407. Before wagons are moved, all hinged doors should be properly fastened, and insecure and overhanging stanchions or metal straps should be removed and placed at least 2 m clear of the rails.

408. Bridge plates between loading platforms and the beds of wagons should be properly secured. When not in use, they should be kept in a suitable location at least 2 m from the edge of the platform.

409. Suitable tools should be provided and used for unfastening metal straps.

410. Lift trucks should not be used inside railway wagons unless the floors of the wagons are in a safe condition.

411. Double-deck wagons that are to be loaded or unloaded should have handrails at the sides of the top deck. Walkways adjacent to the handrails should have a non-slip surface.

6.16.3. Moving rail wagons

412. Train crews should ensure that all portworkers are out of the wagons and all persons clear of the area before moving railway wagons.

413. Railway wagons should only be moved under proper control. Fly shunting (flying switches) should be prohibited in port areas.

414. Wagons moved by a locomotive should normally be coupled to it.

415. The number of wagons moved by a locomotive should not exceed the number that can be controlled by the brake power of that locomotive.

416. Wagons should be stopped only by applying the brakes. If it is necessary to move a wagon that is not coupled to a locomotive, the wagon should be under the control of a brakeman.

417. All trains should be brought to a full stop before any wagons are uncoupled.

418. Cranes, ships' winches and derricks should not be used to move railway wagons.

419. The use of locomotives or wagons as a ram to adjust a load on a wagon should be prohibited.

420. Where it is necessary to move railway wagons more than a short distance without a locomotive, the wagons should be moved by means of power-driven wagon movers, winches or capstans.

421. Power-driven wagon movers should be driven to the side of the track when pushing wagons so that the driver has the best possible view. When pulling a wagon, the driver should be able to disconnect the traction rope from the driver's seat in case of danger.

422. When a railway wagon or a group of wagons that is not coupled to a locomotive is being moved, a worker should control each wagon or group of wagons. Unless the person in control of the wagon has a clear field of vision, the operation should be directed by a signaller in a safe position.

423. If wagons are moved by capstans:

- treadle-operated capstans should be tested each day before use;
- areas immediately around capstans should be kept free of obstructions;
- capstan controls should be on the side away from the live rope and located so that the operator is clear of the intake of the rope;
- wagons should only move under control;
- synthetic fibre rope should not be allowed to heat by friction on the capstan; and
- workers should not stand between the rope and the wagons, and should keep clear of the hauling rope.

424. Ropes or hawsers used with capstans should be regularly examined.

425. Wagons should not be moved by means of push poles and locomotives or wagons on an adjacent track or crossover.

426. When it is necessary to move wagons without mechanical power, workers should never:

- push wagons when standing between the buffers of two coupled wagons;
- press on buffers with shoulders or hands to push vehicles;
- push a vehicle by putting hands on slideways of doors, frames of open doors or open doors;
- stand in front of a moving vehicle; or
- slow down a vehicle by pulling on the buffers.

427. Wagons should not be left standing on quays with short distances between them unless this is necessary for operational reasons.

428. Damaged wagons should only be moved when necessary and with extreme caution, especially if a coupling or buffer is damaged or missing.

6.17. Roll-on–roll-off (ro–ro) operations

429. Any necessary checks on ro–ro vehicles and their cargo should be carried out at the access gate or other suitable place.

430. Particular attention should be paid to any couplings between vehicles to ensure that they will not become uncoupled on a ship's ramp. Particular attention should be paid to vehicles towing caravans, which should always use proper ball hitches and trailers. Goosenecks on tractors are liable to become disconnected from a trailer at the ends of a ramp if the slope is too great. Additional side safety chains or other fastenings should be used where necessary except when heavily loaded roll trailers are being stowed (see section 6.10.6, paragraph 300).

431. Checks on the declaration and placarding, marking and signing of dangerous goods should be carried out in accordance with national legal requirements.

432. Abnormal loads may need to be escorted directly to or from the ship or a suitable waiting area.

433. Ro–ro traffic should be appropriately controlled at all times. All traffic marshals should wear high-visibility clothing. Speed limits should be enforced.

434. Parking on ro–ro traffic access routes should be prohibited except in suitable designated areas. Vehicles carrying dangerous goods in such areas should be segregated as necessary.

435. Adjustments of loads on vehicles and the sheeting and unsheeting of loads on vehicles should only be permitted in clearly indicated designated areas.

436. Trailer legs should be lowered to the ground before trailers are uncoupled. It is important to ensure that the trailer parking brakes have been properly applied and the front of the trailer left high enough to permit another vehicle to couple to it.

437. The shore approaches to ramps of ro–ro ships should be kept clear at all times.

438. Each ramp should be plainly marked with its load capacity. The marked capacity should not be exceeded.

6.18. Scrap metal

439. The effects of possible noise and dust on neighbouring premises and activities should be considered when a quay is selected for scrap metal operations.

440. The maximum permissible size of piles of scrap metal at quays where it is handled should be determined.

441. A clear access way should be left between the edge of scrap metal piles and quay edges.

442. Portworkers should be alert to the possible hazards of scrap metal received. These hazards include the following:

- flammable residues inside closed vessels;
- lack of oxygen in closed receptacles or containers due to rusting or other atmospheric oxidation;
- the presence of radioactive sources or radioactive contamination in scrap from demolition or dismantling of plant at factories and mines; and
- heating of consignments of aluminium smelting by-products or turnings that have become damp.

443. Magnetic lifting gear should be used in accordance with section 5.3.4, paragraphs 219 and 220.

444. Where ships are loaded with scrap metal directly from vehicles, a substantial barrier should be provided to prevent the vehicles from accidentally going over the edge of the quay.

6.19. Solid bulk cargoes

445. Solid bulk cargo-handling operations should be carried out in accordance with the IMO's *Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code)*. Compliance with the *BLU Code* is being made a legal requirement in a number of countries. Grain should be loaded in accordance with the IMO's *International Code for the Safe Carriage of Grain in Bulk (International Grain Code)*.

446. A port or terminal where a bulk carrier is to load or unload should appoint a terminal representative to have responsibility for the operations that are to be carried out by the terminal in connection with that ship.

447. Copies of relevant terminal and port information books should be given to the master of a bulk carrier, if possible before arrival. This may be done by electronic means. The recommended contents of port and terminal information books are set out in Appendix 1 of the *BLU Code*.

448. The terminal representative should ensure that appropriate information about the bulk cargo to be loaded is given to the ship. This should include specification of the cargo, its stowage factor and angle of repose, its moisture content and chemical properties if relevant, and trimming procedures. A recommended form for cargo information is set out in Appendix 5 of the *BLU Code*.

449. The terminal representative should agree the ship's loading or unloading plan with the ship's master. An example of such a plan is given in Appendix 2 of the *BLU Code*.

450. The terminal representative and the ship's master should jointly complete and agree a ship/shore safety checklist before loading or unloading is started. The checklist is set out in Appendix 3 of the *BLU Code* and guidelines on its completion are given in Appendix 4.

451. Loading and unloading operations should only be carried out in accordance with the plan. Any change that is found to be necessary should be agreed upon by both the terminal representative and the ship's master.

452. Planning of storage areas for solid bulk materials should take into account the angle of repose and other relevant properties of the material. Allowance should be made for any alteration that may be caused by events, such as vibration, impact or alteration of the moisture content, that could lead to a collapse.

453. Appropriate measures should be taken to suppress dust that could result from cargo-handling operations. The measures will depend on the properties of the material and individual factors. Measures could include water sprays, local exhaust ventilation at loading and unloading points, and covering the material and keeping it inside buildings, silos or hoppers.

454. Bulk material should not be kept against walls of buildings or elsewhere unless it has been confirmed that the walls have sufficient strength to withstand the maximum horizontal pressure to which the material may subject them.

455. Silos, hoppers and storage bins should be designed with smooth sides to allow discharge without hang-up of material on the sides. Where appropriate, vibrators should be fitted to ensure that any residual material is dislodged. Any necessary cleaning operations should be able to be carried out from outside the silo or hopper, whenever this is practicable.

456. Conveyor systems carrying material that is likely to produce dust should be enclosed to protect the material from wind.

457. The loads of open vehicles carrying solid bulk material should also be covered to prevent stripping of the cargo by wind. A sheeting system should preferably be built into the vehicle and be able to be operated from the ground.

458. A clear signal should be given to all persons in the area before conveyor systems are started.

459. Regular cleaning should be carried out to prevent the build-up or accumulation of dust.

460. The interior of all buildings containing silos of grain, animal feed products and similar flammable material should be regularly cleaned in order to prevent any secondary explosion in the event of failure of a conveyor system or other incident. Much serious damage that occurs in the event of a dust explosion is caused by secondary explosions of dust blown up by the primary explosions.

461. Portworkers should only be permitted to enter silos, hoppers or storage bins for cleaning, clearing a blockage or other purposes under controlled conditions. Many workers have been asphyxiated after sinking into free flowing solid bulk

materials. Entry should normally be controlled by a "permit to work" system. The permit should ensure that:

- no further material will enter the silo or hopper;
- no discharge valve will open or conveyor start up;
- the atmosphere in the hopper or silo is safe to breathe;
- the worker is wearing a suitable harness connected to a lifeline or other suitable means for rescue in an emergency; and
- one or more workers immediately outside the silo or hopper are aware of the action to be taken in an emergency and are capable of carrying it out.

462. When material is present in the silo or hopper, lifelines should be kept as taut as is practicable without impeding movement. Where possible, lifelines should be belayed at suitable positions so that if a worker loses his foothold or material collapses his weight will be immediately supported.

463. It should be appreciated that some solid bulk materials that can be kept safely in small quantities may become hazardous if kept in large stacks.

464. Portworkers engaged in the handling of hazardous solid bulk cargoes such as, but not limited to, lead, zinc, copper or nickel, should be tested for accumulative contamination at least once a year.

6.20. Stacking and stowing of goods

465. Goods and materials that are not in containers or vehicles should be kept in stable and orderly stacks or piles on ground or floors that are firm and level.

466. Matters to be considered when determining the method by which the goods are stacked or otherwise kept should include:

- maximum permissible loadings of quays or floors;
- possible presence of underground sewers and culverts;
- types of mechanical handling equipment available and the space in which it will be used;
- whether the goods are classified as dangerous goods;
- the shape and mechanical strength of the goods and their packaging;
- length of time the goods or material will be kept; and
- the natural angle of repose of bulk material.

467. Stacks of goods should remain stable at all times. With the increased reach of modern cargo-handling equipment, the maximum height of a stack is likely to be determined by the need to ensure that the stack remains stable. The height of stacks should generally be limited to 6 m.

468. Loaded pallets should not normally be stacked more than four high. The use of pallets with uniform or generally similar loads makes it possible to form stable stacks of a simple shape that can easily reach a height of 4 or 5 m.

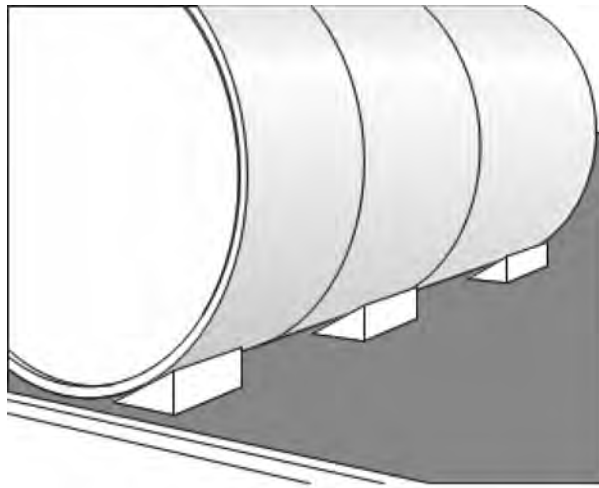
469. Stacks should not be of such a height or shape as to be unstable in high winds.

470. The area of an individual stack should be limited to 450 m^2 if the fire risk is small, or 150 m^2 if the goods in it would burn fairly easily. Passageways at least 3 m wide should be left between stacks to enable the use of appropriate cargo-handling equipment and to form firebreaks.

471. Stacks of goods should be broken down systematically from the top tier in order to ensure that the stability of the stack is maintained at all times.

472. Dunnage should be placed under goods that are to be loaded or unloaded by lift trucks or other lifting devices as

Figure 92. Use of wedges to restrain cargo



necessary (figure 92). The dunnage should be of sufficient size to allow forks or slings to be inserted or removed easily.

6.21. Steel and other metal products

6.21.1. General requirements

473. The differences in the properties of metals commonly shipped through ports should be taken into account when determining appropriate methods and equipment for their storage and handling. For example, lead is more than five times as heavy as aluminium, both are far softer than steel, and all metals have a low coefficient of friction.

6.21.2. Storage

474. Special consideration should be given to permissible floor loadings of warehouses and quaysides. If necessary,

additional bearers should be used to spread the load, particularly on lower tiers.

475. Hardwood chocks or bearers are preferable to softwood. Wooden railway sleepers are ideal for bottom bearers.

476. Tiers of long sections or plates should be separated by suitable dunnage, bearers or chocks. These should be placed in a vertical line above one another.

477. Push sticks should be used when necessary to adjust the position of the bearers. Workers should never insert their hands between tiers of stacked material.

478. Round bars or billets and pipes should be wedged to prevent lateral displacement.

479. Bars or billets of small cross section are best stored and handled in bundles.

480. Flanged pipes should be turned "end for end" in alternate tiers to protect the flanges and prevent damage. Spacers are necessary on the bottom tier to separate the flanges.

481. Wedges and spacers in stows of round bars or pipes should be of suitable dimensions and preferably nailed to bottom bearers to prevent displacement. Where loose pipes are stacked, steel clamps or joiners may also be used to "marry" two pipes together thus preventing them from rolling. Where round bars or pipes are bundled together by metal strapping in sufficient numbers (three together is preferable), they should be secured at both ends and in the middle of the bundle. If any straps are missing, they should be replaced immediately before stacking.

482. Climbing on stows should be avoided wherever possible.

483. Plates or heavy sheets stacked on edge should rest on a solid foundation and lean against vertical supports of adequate strength.

484. The bottom tier of coiled sheet steel stacked in nested tiers, i.e. with the coils in the tier above resting in the hollows formed by the coils below, should be firmly chocked.

485. Coils of varying diameter should be stacked in descending size of coil, with the largest diameter at floor level. The height of the stack should be limited to not more than five tiers.

6.21.3. Handling

486. Lifting equipment to handle steel or other metal sections or fabrications should be selected carefully, as it is often large and awkward to handle. Consideration should be given to such factors as:

- size, shape and weight of the load;
- weight of loose gear to be used;
- control of the load; and
- size of handling areas and any travel routes.

487. Long steel sections should be handled by cranes or side-loading lift trucks. Forklift trucks are not suitable as the load is liable to be unstable and difficult to control, particularly if sudden braking is necessary. Forklift trucks may be used only if they are large and capable of a wide span between forks. They should be used only to load/unload trailers. Tractor trailers should only be used for transport. Forklift trucks may be used in tandem but only if it is safe to do so.

488. Long sections should be slung in two places, preferably from a lifting beam, to make it easier to balance the load and prevent accidental sliding or unhooking (figure 93). Sliding of slings can also be prevented by using wrapped choke hitches or wedging slings with wooden chocks (never metal on metal). If necessary, for flexible sections or plate, a “strongback” which is held to the steel by the lifting slings can be used.

Figure 93. Use of lifting beam with double wrapped slings

489. Great care should be taken when lifting metal with forklift trucks. In particular, the operator should ensure that:

- truck forks are as far apart as possible to provide maximum stability;
- travel speed is reduced as necessary; and
- heavy braking is avoided.

490. If metal products are wrapped in oiled cloth or other materials to prevent corrosion, it may be necessary to provide a non-slip surface to the blades of the truck, such as rubber or dunnage flats secured to them.

491. Protection to prevent chafing and damage may be necessary between metal products and lifting equipment. Rubber

strips, padding or coir mats may be suitable, depending on the load.

492. Stretchers and beams should be used where necessary. These should be at least one-third of the length of the load.

493. Long sections, particularly thin plate, are prone to bending or sagging and should be supported at more than two points. Pieces of long thin plate should be stabilized for lifting by a strong-back on top of the plate tightened by chain slings.

494. Tag lines should be used where necessary to control loads handled in gusting winds, tight stowage areas or loads that spin when lifted.

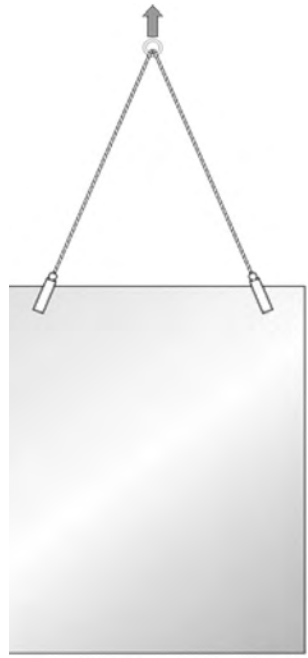
495. Special equipment, such as pipe hooks, clamps, vertical or horizontal plate clamps, coil probes, etc., should be used when appropriate. When such attachments are used, care should be taken to ensure that the load is well within the safe working load of the attachment and other loose gear, and that the combined weight of the load and loose gear does not exceed the safe working load of the lifting appliance.

496. Plates hanging vertically on edge should only be handled by self-locking plate clamps. The clamp should not be directly attached to the hook of the lifting appliance but should be connected to it by a short length of chain. Only one plate at a time should be handled in this way.

497. When two vertical plate clamps secured to a two-legged sling or two separate slings are used to raise or lower a plate by gripping one edge of a vertically hanging plate, the clamps should be applied so that their centre lines are in line with their respective sling legs (figure 94).

498. More than one plate may be clamped when horizontal plate clamps are used, provided that the clamps are kept at 90° to the edge of the plate, if necessary with a lifting beam.

Figure 94. Use of vertical plate clamps



499. Special camlock lifting clamps should be used to handle railway lines. Long sections should be supported at more than two points.

500. As road and rail transport often carry steel sections or bundles on their flat side for stability, it may be necessary to

turn them under careful control to prevent dunnage breaking in stows. This may be done by turning in rotating cradles or slinging with offset slings and carefully lifting, slewing and lowering once the weight has passed its centre of gravity.

501. A trial lift, to check that slings are adjusted to balance the load, should be carried out when awkward or irregular-shaped loads are handled.

6.22. Trade vehicles

502. Trade vehicle traffic should be strictly controlled to ensure the safety of all persons in the area. Although many trade vehicles are cars (automobiles), they can also include a wide variety of other vehicles and plant that may be large, cumbersome, difficult to manoeuvre and complex. Port calls by car carriers are likely to require the movement of large numbers of vehicles over a short period.

503. Trade vehicles should normally be loaded or discharged separately from other ro–ro traffic. Car carriers are generally dedicated ships, but heavy vehicles and specialized plant are often carried on other ships. In such cases, the trade vehicles should normally be loaded before the general ro–ro traffic and unloaded after it.

504. Holding areas for trade vehicles should be as close to the berth as is practicable, and laid out to avoid or minimize the need to reverse into parking spaces. Traffic routes within the holding area should be one-way.

505. Traffic routes between the holding area and the ship should preferably be separate from those for other traffic. Separation may be physical, by the provision of separate routes, or by timing, by restricting access by other vehicles during the loading and discharge of the trade vehicles.

506. Only authorized portworkers should drive trade vehicles. Before such workers are authorized, it should be confirmed that they are medically fit to drive the relevant type of vehicle and competent to do so. In many cases, the holding of a national licence for a given class of vehicles should be a minimum requirement. It should be noted that some licences may be limited to vehicles with automatic gearboxes, to certain vehicle sizes or in other ways. Additional training and instruction may be necessary before authorization is granted to drive certain types of vehicle. This may be available from the vehicle manufacturer or local representative. In all cases, trade vehicle drivers should be fully instructed about the type and relevant characteristics of vehicles to be driven.

507. Portworkers loading or unloading vehicles as cargo, under their own power, should check that the vehicles are safe to drive before loading or unloading them.

508. Seat belts fitted to trade vehicles should be worn by drivers.

509. Trade vehicle drivers should observe all speed limits and keep a safe distance from the vehicle in front at all times. Trade vehicles may need to be subject to lower speed limits than the normal speed limit applied in ports.

510. Drivers of trade vehicles should be taken back to the holding area or ship after delivering a vehicle by a suitable van or other vehicle. This both separates pedestrians from vehicles and speeds up operations. The van should normally accompany the convoy of vehicles to or from the ship. The number of vehicles in the convoy, or section of the convoy, should be limited to the capacity of the van.

511. Additional precautions to protect drivers from the hazards of vehicle emissions in the holds of ships and other enclosed

places may be necessary when vehicles are shipped as an incomplete chassis or are poorly maintained (see section 9.1.7).

6.23. Traffic control

512. Road and rail traffic in port areas should be controlled to ensure the safety of all persons on the premises.

513. Where appropriate, entry to all or specified parts of port areas should be restricted to authorized traffic.

514. National legal requirements relating to road and rail traffic should generally be taken as the basis of standards at ports.

515. Consideration should be given to the enactment of appropriate by-laws where national traffic laws do not apply on port premises. The by-laws should include powers of enforcement. These should be used whenever necessary.

516. Vehicles used in ports should generally comply with national standards for such vehicles. This will already be required if they are also used in the national traffic system.

517. All drivers of vehicles in ports should be authorized to do so, medically fit and appropriately trained. In general, drivers should be required to hold the appropriate licence to drive similar vehicles in the national traffic system and to receive appropriate job-specific training to carry out specified operations.

518. Appropriate speed limits should be set on all port premises. Different limits may be established in different areas according to an assessment of the risks posed. In many cases, the limits will need to be lower than national limits. The speed limits should be clearly indicated, particularly at any point where the limit changes.

519. Suitable parking areas should be provided to ensure that waiting vehicles are not a hazard to other traffic. Such hazards

are most likely to arise from vehicles obstructing or restricting the vision of other drivers. Parking should be prohibited near road junctions, road or rail pedestrian crossings, sharp bends or other hazardous areas.

520. Traffic signs should conform to national standards.

521. At ferry terminals with ro–ro services to countries that drive on different sides of the road, signs should remind drivers of the correct side of the road to drive on. These signs should be multilingual where necessary.

6.24. Warehouses and transit sheds

522. Floors of warehouses and transit sheds should not be overloaded. Any restrictions on the amount or types of goods that may be kept should be clearly indicated by notices.

523. All goods in warehouses and transit sheds should be kept in an orderly fashion. Obstructions should never be left in aisles. Rubbish and dunnage should be removed and safely disposed of as soon as is practicable.

524. Stacks of goods should be separated by aisles of sufficient width to permit the safe use of lift trucks and other cargo-handling plant that is likely to be used in the building. The edges of the aisles should be clearly marked.

525. Where practicable, a one-way traffic route should be operated in the building. The traffic direction should be clearly indicated.

526. All goods should be stacked in such a way as to be stable. Where necessary, safe means of access should be provided. Only properly constructed access equipment should be used for this purpose. The forks of a lift truck or the hook of a crane should never be used. Access should never be permitted near bare conductor wires for overhead cranes.

527. When work is being carried out on a high stack, warning notices should be displayed and adequate measures taken to ensure the safety of persons passing below.

528. Suitable handholds should be provided if railings or other fencing for openings in walls or floors are likely to have to be opened or removed to permit the passage of goods. The railings or fencing should be closed or replaced as soon as is practicable.

529. Where there is danger from overhead bare crane conductor wires or from other electrical equipment, or a risk of trapping by equipment such as overhead travelling cranes, the height of stacks should be limited.

530. Any potentially dangerous conditions found in warehouses or transit sheds should be reported immediately and appropriate action taken.

531. Portworkers working in climate-controlled warehouses should be provided with suitable personal protective clothing. Those working in such areas for long periods should be permitted to take breaks in normal areas at appropriate intervals.

6.25. Confined spaces

6.25.1. General requirements

532. Serious risks to the health of portworkers can arise from entering or working in confined spaces. The term "confined space" means an area that is totally enclosed. It does not mean airtight, nor does it refer just to a small space. While small spaces can be confined and potentially dangerous to enter, the risks also apply to much larger spaces. A ship's hold may be a large void but, with the hatch covers on, it is a confined space and the atmosphere in it, including the access ways to the hold, may well be hazardous. Portworkers should be given adequate

training to instil awareness and enable them to identify a potential confined space. Such training should take into account that many portworkers have interchangeable duties within the port's jurisdiction.

533. For guidance, refer to the IMO's *Revised Recommendations for Entering Enclosed Spaces Aboard Ships* originally intended as guidance for ships' crew.

6.25.2. Hazards and precautions

534. The normal atmosphere that we breathe is composed of 79 per cent nitrogen and 21 per cent oxygen, and it is the latter that sustains life. Variations in that amount, either up or down, can have serious effects.

535. If extra oxygen is fed into the atmosphere in a confined space, it will increase the flammability of materials and widen explosive limits, making ignition leading to serious fires or explosions more likely. If such a situation develops, the oxygen or enriched air supply should be cut off and the confined space thoroughly ventilated before any further work is undertaken.

536. If the oxygen content of air is reduced, its ability to sustain life is also reduced, and at 16 per cent or below it will fail to sustain life at all. A portworker entering such an atmosphere without adequate respiratory protection will rapidly become unconscious and may die.

537. Lack of oxygen in a hold or other confined space may result from:

- absorption of oxygen from the atmosphere by the cargo. This can happen relatively quickly. A closed hold full of copra, for example, needs only a few hours to reduce the oxygen content to a dangerously low level. A range of bulk cargoes can behave similarly;

- rusting or other oxidation of the space or the cargo, such as scrap metal, held within it;
- forest products such as logs, lumber, woodchips or pellets;
- decomposition or rotting of cargo; or
- gas cutting or welding operations.

538. Toxic or flammable gases can also build up to dangerous levels in confined spaces. This can result from the decomposition of coal, fishmeal, bark or other cargoes, the leakage of packages due to faulty filling, packing or transit damage, vehicle exhaust emissions and leaking pipes, hoses, etc.

539. Although there are potential confined spaces in warehouses and elsewhere in port areas, accidents during port work are most likely to occur on board ship, particularly when workers enter holds.

540. As part of their risk assessment programme, terminals and/or port employers should identify, with the participation of their workforce, all confined spaces in their workplace that individuals may enter. New, easy-to-use modern electronic devices are available at reasonable cost that allow oxygen and toxicity levels to be tested and read rapidly. The proper use of such devices requires minimal training.

541. Entry into a confined space should not be permitted unless:

- the space has been adequately ventilated. The degree of ventilation required will depend on the size of the space, the likelihood of the air being contaminated and the possibility of the contamination continuing (compressed air should never be used for this purpose); and
- a competent person has declared it safe to enter.

542. If there is any doubt, the oxygen content and toxic or flammable gas concentrations should be measured before unrestricted entry is allowed.

543. If unrestricted entry cannot be allowed, a responsible person should take control, permiting entry to only specifically trained and instructed workers:

- under close and adequate supervision;
- subject to a "permit to work" system;
- wearing appropriate respiratory and other personal protective equipment; and
- if suitable rescue arrangements have been made.

7. Operations afloat

7.1. General provisions

1. This part of the code applies to operations that are carried out solely on board ships. Chapter 6 applies to operations that take place both on ships and on shore.

2. All portworkers, including supervisors, on board ships should be fully trained and competent. This is essential, given that more accidents involve portworkers working on board ships than at any other location in ports.

3. All port operations on board ships should be carried out in accordance with safe systems of work. These should be drawn up following identification of the hazards, assessment of the risks and development of measures to control them.

4. Experience has also shown that regular inspections and reports on the condition of ships will help to reduce the number of shipboard accidents involving portworkers. If deficiencies affecting the safety of portworkers persist on a particular ship and are not corrected after more than one voyage, a report may be made to the national competent authority inspector or port state control officer.

5. It is the responsibility of the ship to provide conditions on board in which port work can be carried out without risk to health and safety. However, before starting to load or unload a ship, the company responsible for port work should itself take steps to ensure that:

- there are safe means of access onto and about the ship (see sections 7.2 and 7.3);

- a ship's lifting appliances and lifting gear (if they are to be used for cargo operations) are correctly certificated, and appear to be in good order and safe to use (see sections 4.2 and 5.1);
- suitable deck and under-deck lighting, with a minimum level of 10 lux on access routes and 50 lux in working areas, taking into account any specific need that may require additional lighting, is provided;
- slings around pre-slung cargo on a ship have been certificated and are in all respects safe to discharge the cargo;
- any lashing gear to be used is suitable, in a safe condition and compatible with the cargo to be lashed. Cargoes should only be lashed/unlashed by portworkers when the ship is alongside the pier.

6. If it is found that the provisions made by the ship are not safe or do not comply with international legal requirements, the deficiencies should be reported to the ship's master or his/her representative, the ship owners and the shoreside management. The portworker should not allow work to start until the deficiency has been corrected. Alternatively, a shoreside provision may be made which remedies the situation, for example:

- a shoreside gangway is provided;
- quay cranes or other shore-based lifting appliances are used where possible;
- portable lighting is provided by the port employer; or
- stevedore slings are placed around the cargo.

7. A port employer who proposes to handle cargo with ship's lifting gear should verify that the gear is safe by checking

certificates and carrying out visual inspections before it is used. If the lifting gear is shown to be deficient before or during use, port employer's lifting gear only should be used.

8. Furthermore, if crew members are to utilize the stores crane, that use should not interfere with port work. The stores crane should be safe to operate.

9. Any shoreside appliances and gear used on board a ship should fully comply with Chapters 4 and 5 of this code of practice.

10. The same standards of housekeeping that apply onshore should be applied to those parts of the ship used by portworkers.

11. Any damage to the ship or its equipment that occurs during cargo handling or other activities should be immediately reported to a responsible ship's officer.

7.2. Access to ships

7.2.1. General requirements

12. Sufficient, safe and suitable means of access to the ship should be available for the use of portworkers passing to and from the ship. The means of access should be of sound material and construction and adequate strength, be securely installed and maintained in a good state of repair. Means of access should, wherever possible, be constructed in accordance with international standards.

13. The means of access from the quay to the ship's deck should be the ship's accommodation ladder, whenever this is reasonably practicable.

14. If the use of an accommodation ladder is not reasonably practicable:

- a gangway may be used;

- when normal access equipment cannot be used owing to the ship's high freeboard,[1] purpose-built shoreside access equipment should be provided and used;
- where the freeboard is too low for the normal means of access to be used, the ship or barge should be moored alongside a quayside ladder (see section 3.3.5);
- portable ladders should only be used where no safer access is reasonably practicable; and
- where the access is to/from a ship and a barge or other vessel of low freeboard moored alongside it, a rope ladder may be used when it is impracticable to comply with any of the above requirements.

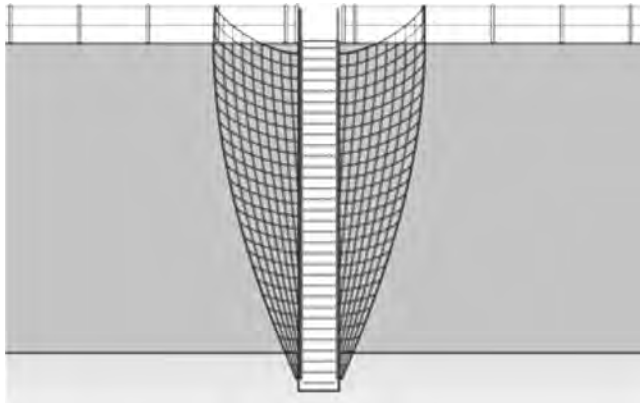
15. The means of access should:

- be so placed as to ensure that no loads pass over it; if this is not practicable, it should be supervised at all times during cargo handling;
- be placed where access to it will not be obstructed; and
- not be placed on or near a crane track, railway track or other route in the port where it could be struck by moving traffic on that track or route.

16. A safety net should be rigged wherever a person may fall between the ship and the quay from a means of access to a ship (figure 95). So far as is reasonably practicable, the net should protect the entire length of the means of access. Where practicable, safety nets should be fastened top rail to top rail.

[1] For the purposes of this code, "freeboard" means the height above water level of the deck used for access via the ladder when the access is used for the first time.

Figure 95. One means of access: A gangway and a safety net



17. The relationship between the quay and the ship is not always static. When necessary, the means of access should be regularly checked to ensure that it is correctly adjusted. The master of the ship should appoint a person for this purpose.

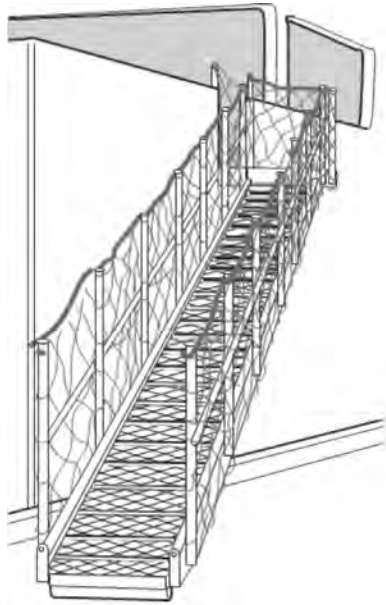
7.2.2. Accommodation ladders

18. Ship's accommodation ladders should be set in a safe position and safety nets deployed (figure 96). Nets should be fastened top rail to top rail.

19. The construction of the ladder should be sufficiently robust to reduce any sway or bounce to a minimum. It should be fenced on both sides along its entire length with both upper and intermediate guard rails.

20. The ladder should be properly rigged and be kept adjusted in such a way that:

Figure 96. Accommodation ladder with a safety net



- whatever the state of the tide or the draught of the ship, the ladder's angle to the horizontal does not exceed approximately 40° as far as this is practicable; and
- it is safe to pass from the lowest tread or platform of the ladder onto the dock and also up to and onto the deck.

21. As far as is practicable, the ladder should be kept free of any snow, ice, grease or other substance likely to make a handhold or foothold insecure.

22. Precautions should be taken to prevent the suspension ropes of accommodation ladders from becoming slack; this can result in the ladder falling violently along the ship's side if the ship lurches away from the quay as a result of wind or the wash of a passing ship.

7.2.3. Gangways

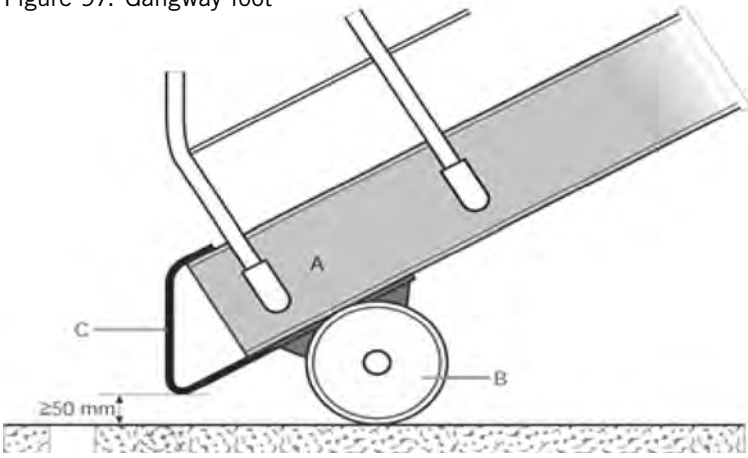
23. Gangways should be placed at right angles to the ship's side and connect the quay with one of the ship's decks or with the bottom platform of the accommodation ladder.

24. A gangway should:

- have a closely boarded walkway at least 550 mm in width;
- be fitted with transverse treads at suitable stepping intervals;
- be fitted with upper and intermediate guard rails;
- be fitted with devices enabling it to be properly secured to the ship;
- be fitted with proper slinging attachments so placed that it will balance about the attachments when it is suspended, if a lifting appliance has to be used to place it in position;
- not normally be used at an angle of more than 30° to the horizontal, or 45° if it is fitted with transverse treads every 500 mm or so;
- never be used at an angle of more than 45° to the horizontal; and
- land on a clear and unobstructed area of the quay.

25. Where a gangway rests on a ship's bulwark, safe means of access should be provided between the ship's deck and the gangway.

Figure 97. Gangway foot



A. Bottom frame of gangway. B. Wheel or roller. C. Protective metal sheet.

26. A gangway that rests on a quay on rollers or wheels should be positioned in such a way that the rollers or wheels are on a reasonably level surface and not in the vicinity of any obstruction or hole that could restrict their free movement. The rollers or wheels should be fitted or guarded in such a way as to prevent a person's foot from being caught between them and the quay surface, leaving a minimum gap of 50 mm (figure 97).

27. A gangway should be securely fastened to the ship. One arrangement consists of placing the gangway above the deck or the platform and providing a fastening at the bottom, for example a U-section whose web, perpendicular to the gangway floor, is placed at the end of the gangway. The fastening should be supplemented by safety ropes or chains. Small chains should also be used to ensure the continuity of the handhold between the gangway railing and the ship's bulwarks.

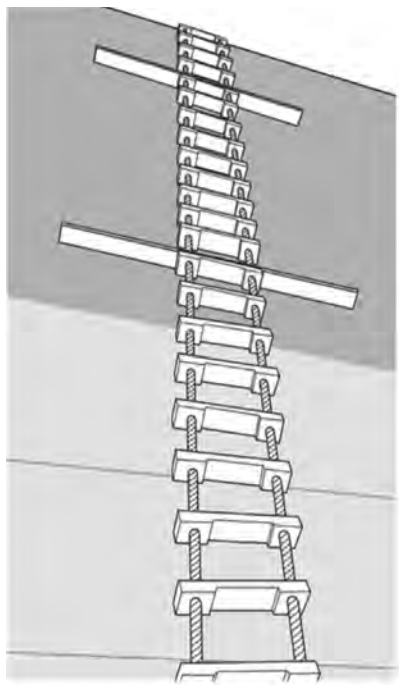
7.2.4. Portable ladders

28. A portable ladder (see section 3.5.4) should only be used as means of access to ships in exceptional circumstances, such as in the event of damage to an accommodation ladder or a gangway.

7.2.5. Rope ladders (pilot's ladder)

29. A rope ladder should not be used. Pilot's ladders only should be used to provide access from a ship to a barge or similar vessel of lower freeboard (figure 98 shows a pilot's ladder).

Figure 98. Rope ladder (pilot's ladder)



30. When a rope ladder is rigged:

- its two suspension ropes on either side should be under equal tension, as far as possible, and properly secured to the ship;
- the treads should be horizontal, flat and constructed to prevent twisting;
- safe access should be provided between the top of the ladder and the deck of the ship and the lower part of the ladder and the other ship; and
- the ladder should, when practicable, hang fully extended when in use and not be positioned over or in close proximity to a discharge opening in the ship's side.

7.2.6. Bulwark steps

31. Bulwark steps are a type of stepladder placed on the ship's deck behind the bulwarks between the deck and a gangway ending at the level of the bulwark rails.

32. Handrails, or other firm handholds for users of bulwark steps, should be provided, if possible on both sides.

7.2.7. Access to the decks of bulk carriers and other large ships

33. Where the freeboard of the ship is too high for normal access equipment to be used and there is no lower access point in the ship's hull, specially designed equipment should be provided on the shore.

7.2.8. Access to barges and other small ships

34. Where the freeboard of the ship is too low to allow normal access equipment to be used, the ship should be moored in a position where the fixed ladders in the quay walls can be safely used for access.

7.2.9. Access to ro–ro ships

35. Whenever possible, safe pedestrian access, separate from vehicle access ramps, should be provided to ro–ro ships (figure 99A). Pedestrian access via the main loading ramp can present hazards from moving vehicles.

36. When pedestrian access via a vehicle ramp is necessary, a separate walkway or walkways should be provided on the outer edge or edges of the ramp (figure 99B). Walkways should be fenced on both sides to prevent falls into water and provide protection from moving vehicles.

37. If the provision of a fenced walkway is not practicable, a clearly marked and signed walkway should be provided on one side of the ramp (figure 99C).

38. If none of these options is practicable, access via the ramp should be controlled at all times while vehicles are using it (figure 99D). The degree of control that will be necessary may vary with the size of the ramp and the number of vehicle movements. The control arrangements adopted should ensure that all pedestrians, including seafarers and other persons visiting the ship, are subject to the same control system.

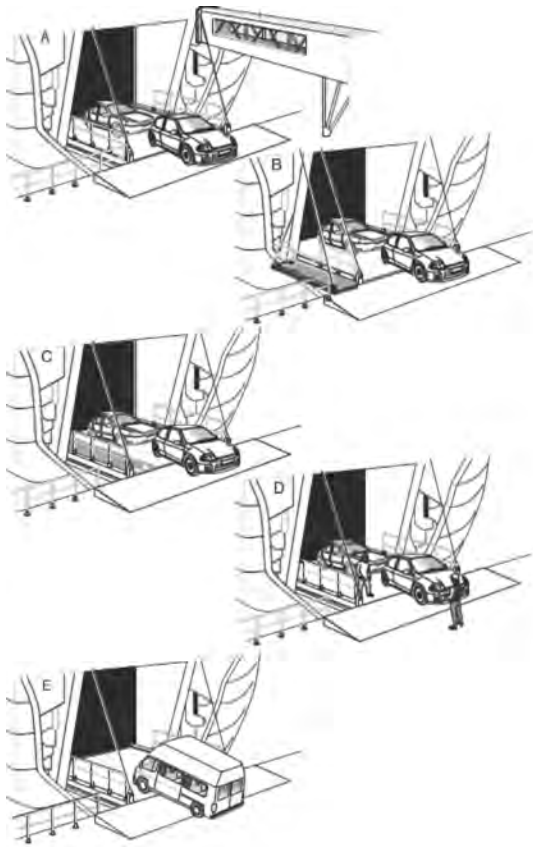
39. The ramp controller should ensure that when vehicles are using the ramp, pedestrians are prevented from doing so. The traffic movements should be stopped to enable them to transit the ramp. Control may be effected by hand signals, whistles or by traffic lights.

40. If the ramp or ramp and link span combination is long, it may be necessary to have a controller at both ends in direct radio communication with one another.

41. Controllers should wear high-visibility outer clothing and safety helmets at all times.

42. Portworkers driving trade vehicles to or from a ship and a terminal storage area should return by minibus or other suitable vehicle (figure 99E).

Figure 99. Control of pedestrians on ramps



43. If loading or unloading of the ship takes place in tidal waters, a suitable link span or floating bridge should be installed, where necessary, to ensure that the slope of the ramp does not exceed 1 in 10. The ramp should be fenced to prevent a vehicle or a person from falling from its sides.

44. If a ramp is capable of dealing with simultaneous two-way traffic, or two separate ramps are in use, the directions of traffic should be clearly marked by arrows (figure 100). These should be clearly visible when vehicle movements take place at night or in poor light.

45. If a ramp is capable of carrying only one vehicle at a time, precedence on the ramp should be given to a loaded vehicle.

46. The edge of the quay adjacent to a ship's ramp should be protected to prevent people from falling into the water.

7.2.10. Ship-to-ship access

47. Where there is a need to gain direct access from one ship to another, gangways or other suitable access equipment should be used as appropriate.

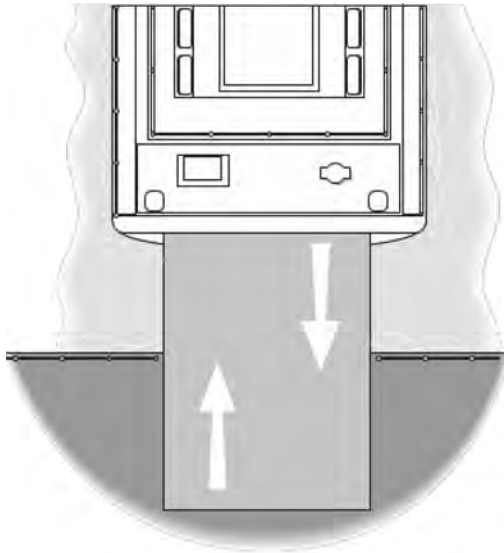
7.2.11. Access by water

48. Access to ships by water can be hazardous and should be kept to the minimum. However, portworkers have to be transported by water when ships are worked away from a berth. Portworkers should be wearing a PFD when being transported and when accessing the ship to be worked.

49. Tenders (see section 3.14) used to transport portworkers to or from ships should be fitted out for carrying passengers in compliance with national legal requirements.

50. At either end of the journey, portworkers should not board or leave the tender unless it is properly moored or secured. Particular care should be taken when passing between

Figure 100. Traffic direction signs on a ship's ramp



the tender and the ship. Wherever possible, access to the ship should be by its accommodation ladder.

7.3. Access on board ships

7.3.1. General requirements

51. Safe means of access about the ship should be provided for portworkers between the gangway or other main access and the holds, deck cargoes, winches and cranes that are to be worked.

52. Access routes should not pass under cargo being worked.

53. All such access routes should be kept tidy and clear of obstructions. If specially constructed, they may consist of

wooden grating or steel plates at least 600 mm wide. They should be raised some 100 mm above the deck.

54. Access routes should as far as possible avoid lashings, ropes and other obstructions that might otherwise impede access. If deck cargo is stowed up to the bulwarks, access should be provided on the other side of the ship or, if that is not possible, a safe route should be constructed through or over the cargo.

55. If access is required during the hours of darkness, the routes should be lit in accordance with section 7.1, paragraph 5.

56. Portworkers should always be alert to moving vehicles when moving around cargo holds and decks of ro–ro ships. Safety helmets and high-visibility garments should always be worn.

7.3.2. Access to holds

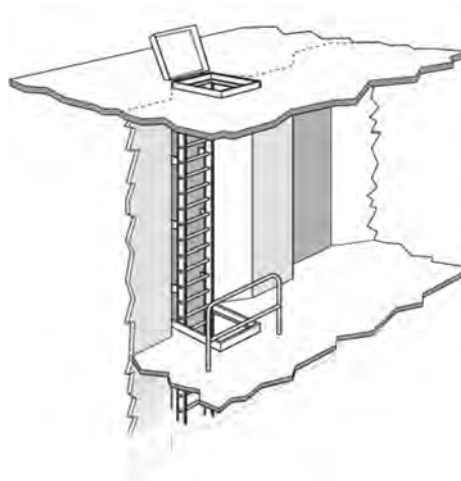
57. Access to cargo holds should be effected by the ship's permanent access (figure 101). Access should be effected by portable ladders only if all permanent access ways are obstructed or otherwise unable to be used.

58. Access hatches ("man-hatches") and other openings giving access to holds should be protected by coamings. There should be a clear space of at least 400 mm around the coamings to allow easy access. If openings are too small, coating the lower edges with foam rubber or other elastic material should ensure that heads and shoulders are not injured if they strike against them.

59. The approaches to a hold and an access hatch should be kept unobstructed to reduce the risk of falls and to enable holds to be evacuated quickly in an emergency.

60. Portworkers should be alert to the possibility that openings into holds have been left open or unfenced, or are hidden or obstructed by cargo.

Figure 101. Hold ladder



61. Where such openings have lids, these should be secured to prevent them from accidentally closing during access.

7.3.3. Access to deck cargo

62. When it is necessary for portworkers to gain access to the tops of general break-bulk deck cargoes and safe means of access are not provided, suitable safe access should be constructed. This should include suitable handholds.

63. Access routes onto and about stows of timber on deck should be constructed, where necessary, in accordance with Chapter 2 and Annex A of the IMO's *Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011*. When access involves walking across the cargo itself, care should be taken not to step into gaps in the timber stows and to avoid tripping hazards such as banding or pre-slung cargo slings lying on the

surface of the timber. When uneven-length timber units have been wrapped, the wrapping on top should be removed.

64. Particular care should be taken when timber deck cargo is discharged, as rough weather may have dislodged stacks or made them unstable.

65. When possible, container top working and the need for access should be avoided. However, when container top work is necessary on board ships, safe means of access should be provided (see section 7.8.3).

66. When there are no safer means available, portable ladders (see section 3.5.4) may be used to access containers up to two high. A co-worker should always be holding the ladder unless it is otherwise adequately secured. Portworkers should never be permitted to climb up the ends of containers.

7.4. Hatches

7.4.1. Hatch coverings

67. All hatch covers, hatch beams and pontoons should be:

- of sound construction and maintained in good condition;
- plainly marked to indicate the hatch, deck and section to which they belong, unless all such items are interchangeable; and
- fitted with effective locking devices that prevent them from being displaced when locked.

68. Missing, broken, or poorly fitting hatch covers that do not afford adequate protection to portworkers should be reported at once to the officer in charge of the vessel. Pending the replacement or repair of the unsafe covers, work should not be performed in the section containing them or in adjacent sections unless the flooring is made safe.

69. Hatch covers that have to be lifted by hand should be fitted with suitable hand grips. They should be inspected before use on each occasion.

70. Wooden covers should be bound with steel bands or straps. The bands or straps should be kept firmly secured in place, particularly at their ends.

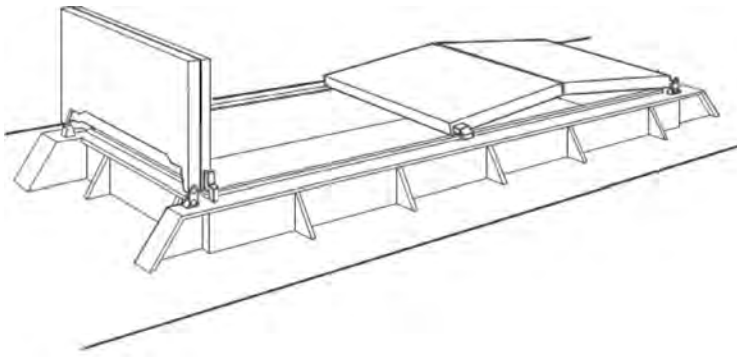
71. Broken, split, poorly fitting or otherwise defective covers and beams should not be used and should be immediately repaired or replaced.

72. The bearing surface of covers, pontoons and beams should be sufficient to support any loads which they have to carry and also be wide enough to practically eliminate any risk of a beam slipping out and falling into the hold. Seatings should be at least 65 mm wide for covers and 75 mm for beams.

73. If the hatch is fitted with rolling or sliding beams (figure 102):

- the top guide should project over the roller or end of the beam in such a way that when a beam is moved horizontally in the directions of its length as far as it will go in one direction, the other end is still retained by its top guide;
- lateral movement of a rolling or sliding beam in the horizontal direction of its length should be restricted in such a way that in the event of its crabbing it will seize before an end can slip off its guide;
- it should not be used if components are missing, especially parts of the locking mechanism; deficiencies should be reported to a ship's officer; and
- no attempt should be made to release a rolling or sliding beam that seizes in position while being moved by

Figure 102. General arrangement for a rolling/sliding hatch cover



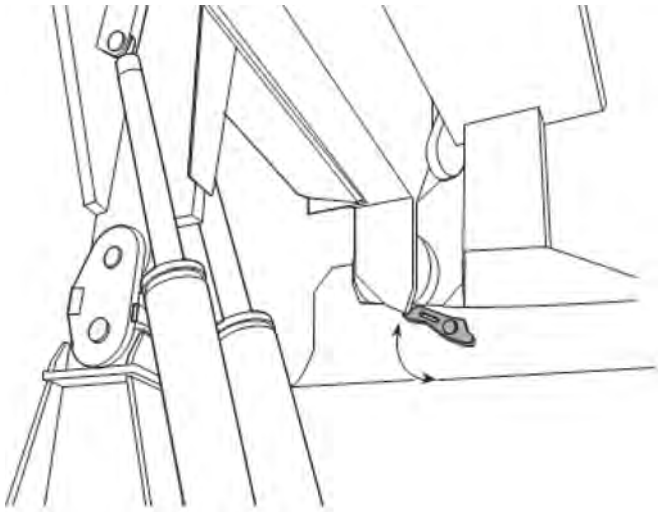
bumping it with a suspended load or by hauling on it by means of a wire rope reeved on the warping drum of a winch; the matter should be reported to a ship's officer.

74. Locking devices should be strong enough to withstand a reasonable blow from any swinging cargo without damage. The devices may be self-locking, so that the locked component can be released only by a manual operation.

75. Folding hatch covers should be fitted with locking devices, wheel chocks or other suitable means to prevent the covers from spontaneously folding back when they are released from their coaming seats (figure 103).

76. Every hatch beam and cover that has to be removed by the use of a lifting appliance should be fitted with suitable attachments for securing the lifting slings or spreader. The attachments on beams should be so positioned that it is not necessary for a person to go on a beam to secure the sling or slings.

Figure 103. Hatch cover locking device



77. When pontoons are lifted by four-legged slings, the slings should be long enough to reach easily the holes at the ends of the beam when forming an angle not exceeding 90° to each other.

78. Each leg of all beam and pontoon slings should be equipped with a substantial lanyard at least 3 m long.

79. When cargo is to be stowed on deck or 'tween deck hatch covers, it is essential to ensure that the covers and their supports are of adequate strength to withstand the static and dynamic loads that they will have to bear.

80. Hatch covers, beams and pontoons should not be used in the construction of cargo stages or for any other purpose that might expose them to damage.

7.4.2. Handling hatch coverings

81. Hatch covers, beams and pontoons should not be removed or replaced while work is going on in the hold under the hatchway.

82. Portworkers removing hatch covers by hand should work from the centre towards the sides and from the sides towards the centre when the covers are being replaced. Workers should use suitable long-handled hooks to avoid stooping when grasping the covers or sling halyards. Hatch covers that cannot be easily handled by two workers should not be handled manually.

83. Portworkers pulling tarpaulins should walk forwards, where possible, not backwards, when working on hatch covers.

84. Power-operated hatch covers should only be operated by designated members of the ship's crew or other authorized persons.

85. It is essential to ensure that there are no loose objects on folding or lift-away hatch covers before they are operated.

86. No person should be permitted to be on any hatch cover, whether closed or retracted, when it is about to be opened or closed.

87. Persons should be warned, by warning devices or otherwise, when hatch covers are about to be opened or closed.

88. Portworkers should keep well clear of hatch covers and their machinery while they are being operated. They should never stand on covers during such operations.

89. No person should be allowed onto the top of a retracted back-folding hatch cover unless the preventer chains or other securing devices are in position.

90. Loading or unloading should not take place at a hatch unless:

- all parts of a hatch covering that may be displaced by a load have been removed or secured; and
- powered hatch covers are secured in the open position, or are of such a design as to make inadvertent abrupt closing impossible.

7.4.3. Stacking and securing of hatch coverings

91. Hatch covers, beams, tarpaulins and pontoons that have been removed should be placed, stacked or secured in such a way that they cannot fall into the hold, present a tripping hazard or otherwise cause danger.

92. Hatch covers and pontoons should either be arranged in neat stacks not higher than the coaming and away from it, or be spread one high between coaming and rail with no space between them. It is recommended that on the working side of the hatch the top level of the stacks should be at least 150 mm below the top of the coaming.

93. Hatch beams should be laid on their sides or stood on edge close together. They should be lashed, to prevent the outside one being overturned, and, if necessary, should be wedged to prevent tilting. Beams that are convex underneath should be wedged at each end.

94. The height of stacks should be limited so that workers below or overside will not be endangered if the stack is accidentally struck by a load.

95. A space of at least 1 m should be left between hatch covers, beams and pontoons that have been removed and the hatchway, if the construction of the ship so allows. If this is not possible, the covers should be stacked on only one side of the hatch and the other sides left free. Safe walkways should also be left between the hatch coaming and the rail and from fore to aft.

96. The handling of pontoon hatch covers requires extreme care. The stacking guidelines in operation manuals and markings on hatch covers should be followed. All turnbuckles and lashing rods lying on the pontoon should be secured and any that hang over the edge removed.

7.4.4. Protection of hatches

97. Hatches at deck level should be protected by coamings of sufficient height to prevent accidental falls into the hold. Coamings should preferably be 1 m high.

98. Portworkers should not work on cargoes on deck or between decks that are over an opened hatch. No one should stand on a coaming for any reason.

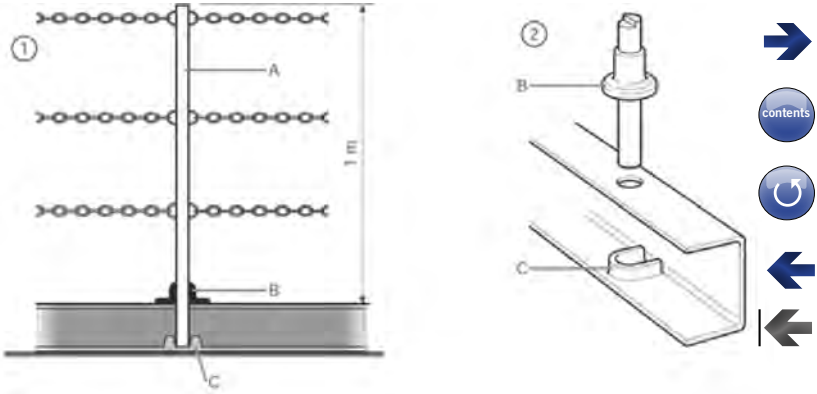
99. Work in the 'tween decks area should not normally take place if the hatch is open to the lower hold. If this cannot be avoided, the hatch should be fenced to prevent portworkers from falling.

100. The fencing should be 1 m high and may be of suitable wire rope or chain (figure 104(1)), provided that:

- there are means to keep the ropes or chains as taut as possible;
- wire ropes have sufficient wires per strand to be flexible, are free from broken wires, and any loose ends are fitted with ferrules or other means of protection to prevent injury; and
- sufficient stanchions are provided.

101. Deck sockets into which stanchions fit should be equipped with locking devices and should be sufficiently deep and designed in such a way as to prevent the stanchions from moving unduly out of the vertical or being accidentally displaced (figure 104(2)).

Figure 104. Moveable fencing for 'tween decks (locking device omitted for clarity)



1. General view. 2. Detail.
A. Stanchion (steel tubing). B. Steel collar welded to the stanchion. C. Welded round iron.

102. The fencing should form a permanent part of the ship's equipment and be kept in place at all times, except:

- when the hatch is being opened or closed;
- when goods are being loaded onto that particular deck and the work in the hold prevents the hatch from being closed; or
- during meal breaks or similar short interruptions of work.

103. Where necessary, barriers should be installed to prevent:

- lift trucks working in the 'tween decks area from falling into the hatch; and
- lift trucks operating to and from side doors from falling onto the quay.

7.5. Work in holds

7.5.1. General requirements

104. The possibility that the atmosphere in a hold or access way to a hold may be hazardous (see sections 9.1.7 and 9.2) should always be considered before entry is made.

105. The main hazards that portworkers handling cargo in holds should be aware of include:

- falling through openings in holds or from cargo;
- falls of unstable cargo;
- congested working areas;
- uneven working surfaces on cargo;
- tripping hazards;
- manual handling hazards;
- unclear or inadequate communication with lifting appliance operators;
- swinging loads;
- falling objects; and
- mechanized plant and vehicles, and their emissions.

7.5.2. Working practices

106. The number of portworkers in each gang working in a hold with the same lifting appliance should depend on the nature of the cargo, the hours of work, the equipment used, the target output, and the fatigue that would result if not enough workers were employed. Numbers should be limited to what is necessary, since too many workers may be a hazard in the often constricted working spaces in a hold.

107. Goods should be stowed, handled, stacked or unstacked under competent supervision.

108. As far as is practicable, only one gang at a time should work in a hold. Where two or more gangs work in the same hatch:

- there should be a separate signaller for each fall worked, except in the case of union purchase;
- where gangs are working at different levels, a net should be rigged and securely fastened to prevent cargo from falling onto portworkers below; and
- only one crane at any time should be over the hatch except in the event that cranes are rigged in union purchase or are being used for tandem lifting that has been approved following a risk assessment.

109. When it is impossible for lifting appliance operators to have a clear view of the area where loads are being slung in the hold, a signaller should be employed to direct the operator of the lifting appliance. The signaller should be able to see and be seen both by the portworkers in the hold and by the lifting appliance operator. The signaller should use an agreed set of hand signals (see section 5.4, paragraph 232). Alternatively, the signaller should be in direct radio communication with the lifting appliance operator.

110. Safe access to a safe position on the deck or the deck cargo should be provided for the signaller.

111. As far as is practicable, sets in holds should be made up in such a way that they can be lifted vertically. Lifting appliance operators should ensure that there is a smooth take up of the load and when it is lifted out of a hold. Where practicable, tag lines may be used to control any swing or twist motion.

112. Portworkers should stand away from the set once it has been made up and while it is lifted out of a hold. The lift should never pass above portworkers. Portworkers should also be alert

to possible swinging of the load once the appliance has taken the strain and is being lifted.

113. When cargo is built up in sections in the hold, each section should allow for a safe landing place for the cargo.

114. Suitable protection should be provided where portworkers have to work close to edges from which they can fall from a height that may cause injury, in accordance with a risk assessment. This may take the form of netting or other suitable means.

115. No loose gear or other objects should be thrown into or out of the holds.

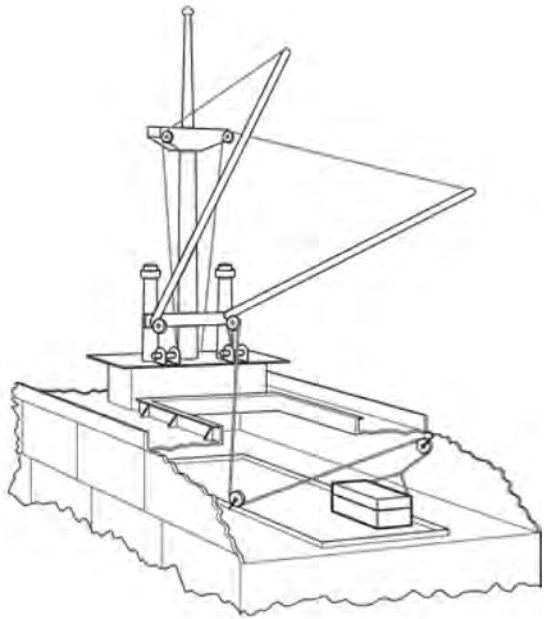
116. Dunnage should be used when necessary to make cargo stowage safe and stable. When dunnage is used for this or any other reason, consideration should be given to how it can be removed at the port of discharge and at any intermediate ports where access may be required.

117. Consideration should be given to the order of discharge when cargo is stowed between decks to ensure that when 'tween deck hatch covers and beams have to be removed, there will be a working space 1 m wide between the stowed cargo and the coaming. No such space needs to be left free on the covered portion of a partly opened hatch, but measures should be taken to prevent stowed cargo from falling into the open section.

118. Where cargo for discharge is situated under the 'tween decks area, it needs to be brought out to the square of the hatch where it can be plumbed by the lifting appliance in order to be discharged safely. Light goods can be moved on rollers into the square. With heavier goods, a suitable lift truck or other mechanical device should be used whenever possible. Where there is no alternative and the weight of the cargo is within the safe working load of the lifting appliance, a bull wire may be

attached to the goods and reeved through a sheave on the opposite end of the hatch (figure 105). The bull wire should preferably be attached to a ship's winch. If a crane has to be used, the cargo hook should be attached to a bull wire to prevent wear on the hoist rope. The crane jib head should be positioned vertically above the sheave. One signaller should be on deck and another signaller in the hold to ensure that the goods do not snag. With careful movements, the crane should be able to bring the goods to the square.

Figure 105. Use of bull wire



119. Mechanical plant used in a ship's hold should:

- be fitted with an overhead guard;
- have its wheels situated within its main body;
- be painted in a highly visible colour; if it is a rear-wheeled steered truck, the back portion should be painted with stripes or some other highly visible marking;
- preferably be electric or diesel powered; and
- preferably all have the same or similar methods of control.

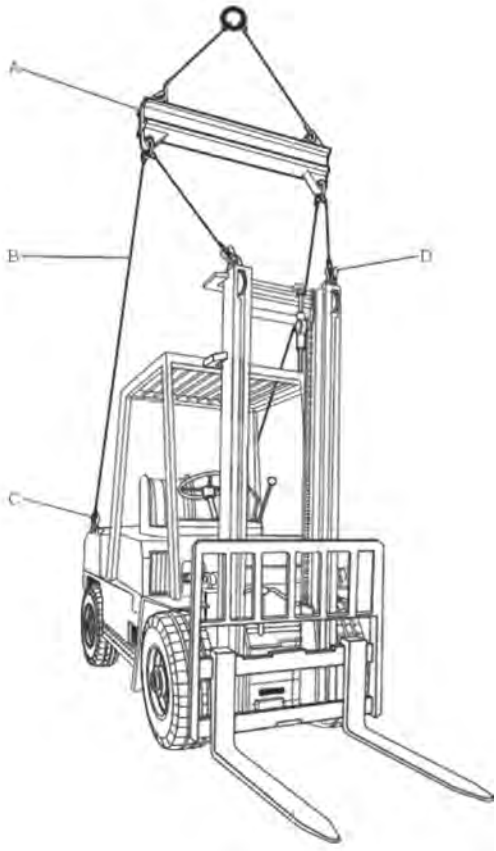
120. Mechanical plant that needs to be lifted in and out of holds should have:

- four lifting lugs built onto the body of the plant as near to the four corners as possible;
- each of the pair of lugs at the front and rear of the plant at the same height, but not necessarily at the same height front and rear; and
- the lugs positioned so that when a sling is attached, its legs will not come into contact with the overhead guard or any other part of the plant.

121. A dedicated four-legged lifting sling assembly should be made up and used to lift each item of plant or similar items having the same layout, weight and configuration of lifting points (figure 106). The assembly should:

- have legs constructed from an appropriate size of steel wire rope;
- have legs of sufficient length to ensure that the plant remains level when lifted;
- preferably include a small chandelier spreader;
- be attached to the plant by shackles that form part of the assembly;

Figure 106. Lifting frame and attachment points for lift truck (all the proper guards have been omitted for clarity)



A. Spreader beam. B. Wire rope slings. C. Shackles attached to lifting lug of truck body. D. Shackles attached to lugs at top of mast.

- be clearly marked with the identity of the item of plant or model of plant for which it is intended to be used;
- only be used for its intended purpose; and
- be kept in the gear store away from all general-purpose slings when not required for use.

122. When mechanical plant is used in a hold, adequate ventilation should be maintained at all times.

123. The tank top or the 'tween decks surface on which the plant operates should be of sufficient strength to support the weight of the plant and fully level. If the plant cannot operate safely on the floor of the hold, it may be necessary to put down steel plates or other temporary flooring to provide a suitable level and safe working surface.

124. When work is carried out in the 'tween decks area, the height of the mast at full lift should be restricted. Trucks with low masts should preferably be used.

125. The operator should pay careful attention to the stability of the plant at all times.

126. Working space in holds is often congested. Rear-wheeled steered plant has a tight turning circle. Great care should be taken by plant operators and other workers in the hold to avoid collisions with people, cargo stacks, which could be dislodged, or damage to the ship's structure.

7.6. Work on deck

7.6.1. General requirements

127. All upper decks to which portworkers may have access to carry out port work should be provided on the outer edge with a bulwark or guard rails that are so designed, constructed and placed, and of such a height above the deck, as to prevent any worker from accidentally falling overboard.

128. The bulwark or guard rails should be securely fastened in position. Removable sections should be securely fastened when in position.

129. Work surfaces should be safe, with ropes, beams and covers, hatch lids and other gear and equipment stowed safely and tidily. Any spillages of oil, cargo or other substances likely to affect the safety of portworkers should be cleaned up. Portworkers should be alert to possible obstructions built into the deck, such as eye bolts, and those on the deck, such as lashings.

130. Deck cargoes should be stowed in such a way that:

- safe access is provided to the deck cargo, winches/deck cranes, hold ladders and signaller's stand; where necessary, properly secured ladders or other means should be used; and
- winches and deck cranes to be used during loading or unloading can be safely operated.

131. When a signaller has to move from the square of the hatch to the ship's side, a space at least 1 m wide should be kept clear.

132. If the surface of the deck cargo is uneven, safe walkways running both fore and aft and athwartships should be provided, where this is practicable.

133. When deck cargo that is not being worked is stowed against the ship's rails or hatch coamings, and at such a height that the rails or coamings would not prevent portworkers from falling overboard or into the open hold, temporary fencing should be provided.

134. When cargo is stowed on deck or in the 'tween decks, and the hatches have to be opened at intermediate ports before that cargo is unloaded, it should be stowed in such a way as to provide

a clear space of at least 1 m around the coamings or around the part of the hatch that is to be opened at subsequent ports.

135. If this is impracticable, suitable fencing should be rigged to enable portworkers to remove and replace in safety all fore and aft beams and thwartship beams used for hatch covering, and all hatch coverings.

136. The coaming clearance of 1 m should be marked with a painted line.

137. If goods have to be stowed on hatch covers, due regard should be paid to the bearing capacity of the covers. The responsible persons should satisfy themselves that:

- the hatch beams are properly placed; and
- the hatch covers sit well and fit tight together, and are in an undamaged condition.

138. When deck cargo is carried, adequate arrangements should be made to ensure that the signaller can be seen by the crane or winch operator. The signaller should have an unobstructed view of the hold and the winch operator.

139. When forest products, usually timber, have been carried on deck:

- allowance should be made for any weight gain due to water absorption; and
- great care should be taken before the deck cargo lashings are let go. All personnel should be kept clear, in case there has been movement of the cargo that has put the lashings under tension and the cargo has become unstable.

7.6.2. Lashing and securing of cargo

140. All ships of 500 gross tonnes or more that are designed to carry cargo that requires lashing and securing for sea voyages

are required to carry a cargo securing manual. This should detail how the cargo should be secured, what lashings or other equipment may be used and how tight the lashings should be.

141. The port employer should ensure that the requirements of the manual are followed, unless otherwise instructed by the master of the ship. General guidance on the securing of cargo is contained in the IMO's *Code of Safe Practice for Cargo Stowage and Securing (CSS Code)* and the Nautical Institute's book *Lashing and securing of deck cargoes*. In the case of timber deck cargoes, the port employer should also refer to the IMO's *Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011*.

142. Safe places of work should be provided to enable portworkers to carry out such securing work.

7.7. Shot cargo

143. Ships at sea can often encounter bad weather and rough seas. This can cause cargo to move, despite all the securing arrangements made beforehand. Deck cargoes can be moved out of stowage and even lost overside. Hold stowages can move and, in severe cases, be completely mixed up and out of place. In such circumstances, damage may be done to cargo and spillage may occur, including spillage that continues after the adverse conditions have passed.

144. Ships that have encountered bad weather and rough seas may come into port experiencing difficulties with their cargo. If the ship itself has a problem, that should be dealt with first. When the ship is safe and is at its berth, portworkers should stabilize the cargo before discharging it or securing it for a further voyage.

145. Great care needs to be taken to ensure the safety of portworkers during such operations, which should normally be carried out under the direct control of experienced supervisors.

A high level of alertness is required, particular attention being paid to the stability of the cargo, safe access, footholds and handholds, the application of lifting gear and the need to stand well clear.

7.8. Container ships

7.8.1. General requirements

146. Containers stowed in open hatches that are secured by the cell guides do not need further securing arrangements.

147. Containers carried by ships that do not have cell guides should be secured by lashings, bars, etc., both in the hold and on deck.

148. The terminal operator or port employer should refer to the IMO's *Code of Safe Practice for Cargo Stowage and Securing (CSS Code)* and Annex 14 specifically for purpose-built container ships.

149. All lashing gear is provided by the ship and is ship's equipment. Fully manually operated twistlocks are now tending to be replaced by semi-automatic twistlocks (SATLs). On loading, SATLs may be placed in position on the underside of the container on the quay. When the crane lowers the container into position, the SATLs automatically lock into position. On discharge, the SATLs have to be unlocked with the aid of a long pole. Such poles can only be used from deck level to unlock up to four containers high because of their length and weight.

150. The operators of container quay cranes should be positioned in such a way that they can see directly down onto the cargo and the crane, and thus lock on to individual containers and lift them without other persons being involved.

151. The need for working on top of containers should be eliminated or reduced by the use of:

- hatchless ships that eliminate it;
- SATLs that reduce the need but do not eliminate it completely;
- a combination of lashing platforms and SATLs restricting it further; or
- fully automatic twistlocks.

152. When a jib crane or derrick is used for discharging/loading, there may be a need to steady the load when a container is being lifted or lowered, or a spreader is lowered onto a container.

153. When it is necessary to use over-height frames to lift open-topped containers:

- all lifting brackets, shackles and other loose gear on both the main frame and the subframe used in the lift should be subject to the provisions of section 4.3 and marked accordingly;
- the over-height frame should be marked with its weight and safe working load;
- a physical check that twistlocks have turned and are engaged should be made before lifting ;
- where necessary, care should be taken to ensure that the twistlock operating ropes do not catch on fixed objects while the frame is in use; and
- frames should be securely stowed on trailers when not in use.

154. When container cranes are used to lift loads other than freight containers, it should be ensured that:

- the equipment and methods are adequate and safe;
- the manufacturer's recommendations are followed if the crane's heavy lift hook is used;

- lifting frames are not asymmetrically loaded beyond the manufacturer's recommendations; and
- only tested and marked lifting points on the main frame or other frames are used.

155. Further guidance on the safe operation of container cranes and work with them is included in Chapters 5 and 6.

156. Further general guidance on safe work on container ships is contained in the ICHCA International Ltd. *Safe working on container ships,* International Safety Panel Briefing Pamphlet No. 8.

7.8.2. Deck working

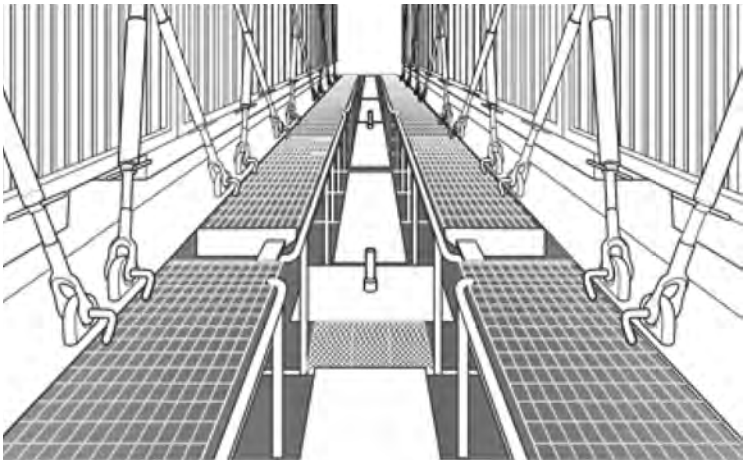
157. Further guidance on the safe lashing of deck containers can be found in the most recent editions of the IMO's MSC 1/Circ.1352 *Amendments to the Code of Safe Practice for Cargo Stowage and Securing (CSS Code)* and ICHCA Safety Briefing Pamphlet 35: *Safe Lashing of Deck Containers*. The IMO amendments constitute a complete new annex to the *CSS Code* (Annex 14).

158. Shoreside management should ensure that safe access is provided by the ship to any place on the ship where portworkers have to work, and that the place of work is safe. This includes adequate fencing with toe-boards provided where there is potential for a fall. Grating surfaces should be free of severe corrosion and holes.

159. Safe access should be provided to lashing positions:

- in-between container stows on hatch covers;
- at the end of hatches;
- on outboard lashing stanchions/pedestals;
- outboard lashing positions on hatch covers;

Figure 107. Working space for placing and removing lashing equipment



- on lashing bridges; and
- any other position where people work with container securing.

160. All lashing positions (figure 107) should have a firm and level working surface.

161. Sufficient space should be provided to permit the lashing gear and other equipment to be stowed without causing a tripping hazard.

162. The width of lashing positions, other than on lashing bridges, should preferably be 1,000 mm but not less than 750 mm, excluding lashings in place.

163. The width of permanent lashing bridges should be 750 mm between top rails of fencing and a clear minimum of

600 mm between storage racks, lashing cleats and any other obstruction.

164. Lashing bridges and platforms should, where appropriate, be fenced with the top rail 1 m high from the base and two intermediate rails.

165. Lashing systems should be compatible with the physical ability of persons to safely hold, deploy and use such equipment.

166. Bins or stowage places for lashing materials should be provided.

167. A lighting plan should be developed for access and working areas.

168. Shoreside management should ensure that during plugging/unplugging of reefer containers, portworkers are fully protected from any exposure to electrical arcs or explosions during the operation.

169. Portworkers engaged in lashing/unlashing of containers should always work in pairs with one handling the turnbuckle and the other firmly holding the lashing bar.

170. Container lashing exposes portworkers performing this work to significant hazards. Safety protocols and devices should be installed to ensure that portworkers performing lashing duties do not come into unexpected contact with the container-handling equipment. This particularly applies to automated terminal operations.

7.8.3. Container top working

171. When work on container tops cannot be avoided, safe means of access to them should be provided.

172. Access to the tops of containers should be from part of the ship's permanent superstructure whenever possible. This may be from lashing platforms.

173. When such access is not possible,[2] safe access should be provided by the use of a quayside crane and a:

- purpose-built access cage (see section 3.6.2.9);
- purpose-built gondola;
- platform built on the container spreader; or
- platform built on the headblock.

174. When a cage or platform is used for access:

- at least two persons should travel in the cage or platform, one of whom should have a radio in direct contact with the crane operator;
- the crane operator should only take directions from that person;
- the secondary means of attachment to the spreader should be connected; and
- all parts of the body, particularly the hands and head, should be kept inside the cage or platform at all times.

175. Portworkers should never climb up the ends of containers.

176. Non-purpose-built container-carrying ships may also carry containers on deck or in the hold in circumstances where portworkers may be required to access container tops. When this involves loading or discharging by jib crane, an additional reason for being on the top layer of the containers may be to steady the load as it is positioned or removed. In these circumstances, a safe system of work should be developed to ensure that portworkers have safe access.

[2] Some countries do not allow riding on platforms.

177. When work has to be undertaken on container tops, precautions should be taken to ensure the safety of portworkers. Suitable fall prevention or fall-arrest systems of work should be devised and used in order to eliminate or control the risk of falling from the container stow. Fall prevention systems include working from inside a cage used for access, or secured to a short lanyard that prevents falls from open sides of containers.

178. The choice of system actually used will be influenced by the equipment used to secure the containers. If this equipment consists of manually placed twistlocks and bridging pieces, it may be possible to carry out the work from inside an access cage, or it may need to be undertaken actually on the tops of containers. If the securing equipment consists of SATLs, there should be no need to go onto container tops during loading operations. On discharge, SATLs above four containers high have to be unlocked by pole either from the topmost tier or from a gondola at the side of the stow.

179. When a purpose-built access cage is used, it can be moved slowly across the top of each tier of containers while workers inside it place or remove twistlocks. Great care should be taken to ensure that portworkers' hands are not trapped. A second person in the cage should be in direct radio contact with the crane operator and should control the operation at all times.

180. When it is necessary for portworkers to leave an access cage or platform to go to the corners of the containers, carrying the twistlocks, bridging pieces or locking poles, etc., with them, they should wear a full body harness and be connected to a secure anchorage point by lanyards, safety lines or inertia reel fall-arrest equipment. The harness should have "D" rings at the front and back for attachment to the reel and to aid recovery.

181. Other systems or methods may be used in connection with container top working, provided that they ensure the safety of portworkers at all times.

182. Work on top of containers should cease in high wind conditions (see section 12.1.9).

183. Similar precautions should be taken to ensure the safety of portworkers who have to go onto the tops of containers on the deck or in the hold of combination carriers, where freight containers are stowed and lashed.

184. Port employers should, following a risk assessment, provide and ensure that portworkers use fall-prevention equipment whenever working along an unguarded edge where a fall hazard exists.

185. Further guidance on safe working on tops of containers is provided in ICHCA Briefing Pamphlet 34: *Container top safety*.

7.9. Ro–ro ships

7.9.1. General requirements

186. Ro–ro ships are equipped with a variety of cargo access equipment, e.g. ship/shore ramps, bow/stern/side doors, internal ramps and cargo lifts. This equipment is normally operated by the ship's crew.

187. The main operations in a ro–ro hold are the marshalling of vehicles and lashing them to the deck for the voyage. In a sto–ro ship, cargo such as paper reels is brought into the hold on roll trailers. It is then taken off the trailer by lift truck and placed into a stow in the hold.

188. In each of these operations, mechanical appliances are widely used and, apart from driver-accompanied freight

vehicles and passenger cars, are usually driven and operated by portworkers, who may also marshal vehicles and lash/unlash vehicles to the deck.

189. The principal hazards for portworkers working in ro–ro holds are associated with vehicle movements. Vehicles moving in a confined space represent a risk of person/machine contact and exhaust emissions can affect health. Air quality should be monitored on an ongoing basis (see section 9.1.7). Dust or other nuisances should be eliminated or minimized as appropriate following a risk assessment. Lashing operations can also present a risk. Portworkers should also be aware of any cargo-access equipment in the area where they are working and know how it operates.

190. Audible and visual warnings should be given before any cargo-access equipment is operated. Portworkers should be alert for such indications.

191. The slope of an internal ramp should not exceed 1 in 10.

192. Every stanchion or other fixed structure on an enclosed deck that is liable to be a danger to vehicles, or to give rise to a risk of trapping between itself and a vehicle, should be clearly marked with alternating black and yellow stripes.

193. All portworkers on ro–ro ships should wear high-visibility clothing.

194. For access to ro–ro holds, see section 7.2.9 and for precautions against vehicle emissions, see section 9.1.7.

7.9.2. Vehicle movements

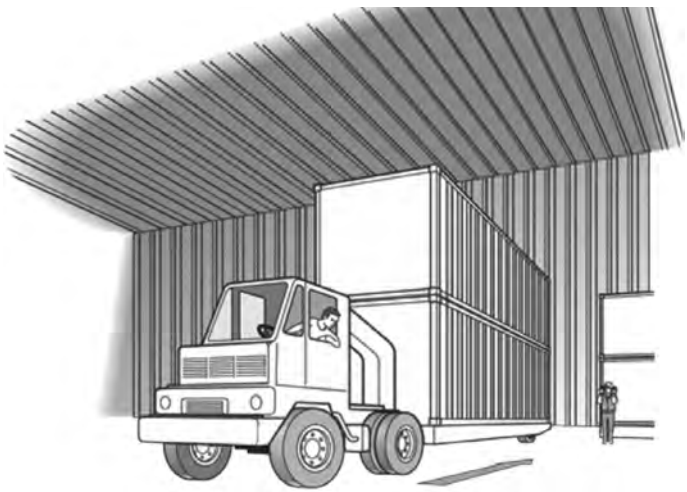
195. All movement of vehicles on board ro–ro ships should be effectively and continuously controlled.

196. Only authorized persons should be allowed on any vehicle deck while vehicle movements are taking place.

197. Drivers should comply with the relevant speed limits on ramps and vehicle decks at all times. These may be lower than those on the quay. Signs indicating the speed limit should be clearly displayed in prominent positions both on the quay and on the ship.

198. All large vehicles and trailers being reversed or manoeuvred into stowage positions on deck should do so under the direction of a signaller (figure 108). Signallers should satisfy themselves that no person is in a position of danger, particularly in any trapping area behind a reversing vehicle. Drivers should not move their load/vehicle unless a signaller so directs. Drivers should immediately stop their vehicles at any time the signaller is not within their field of vision.

Figure 108. Guiding a reversing trailer on a ship's deck



199. While loading and unloading is taking place, the area should be kept clear, so far as is practicable, of dunnage, loose wires, unused vehicles, securing gear and other extraneous equipment or material.

7.9.3. Passenger movements

200. The movement of passengers on foot on the vehicle decks of ro–ro ships should be strictly controlled and minimized.

201. Passengers arriving on ships in vehicles should:

- be given clear instructions for parking their vehicles;
- apply the handbrake before leaving their vehicles; and
- be prohibited from walking around vehicle decks while loading is taking place except on clearly marked safe walkways.

202. Passengers returning to vehicle decks prior to discharge should:

- only enter the vehicle deck when permitted and by an authorized route;
- not be permitted to start engines until ramp doors open;
- not be permitted to move until the vehicle deck is clear of passengers; and
- not be allowed onto the vehicle decks after vehicles have started to move except on clearly marked safe walkways.

7.9.4. Vehicle lashing operations

203. The wearing of bump caps by portworkers lashing vehicles may be more appropriate than safety helmets owing to the restricted working positions.

204. Portworkers carrying out lashing operations should work in pairs, each worker always remaining in sight of the other.

205. Great care should be taken when vehicles are moving, especially when the system requires vehicles to reverse into place. In particular, it is essential to ensure that:

- large vehicles are always controlled by a signaller when reversing (see section 7.9.2); and
- portworkers do not position themselves at the back of a vehicle when vehicle loading operations are taking place in that row.

206. Portworkers should release lashings warily, as vessel and vehicle movement during the voyage may have made them excessively taut.

7.9.5. Cargo lifts

207. Portworkers working on or near cargo lifts should:

- not ride on a cargo lift when it is in operation, except the driver of a vehicle who is in the cab; and
- exercise caution when working with or close to a cargo lift.

7.10. Bulk carriers

208. Loading and unloading should be undertaken in accordance with the plan required by the IMO *BLU Code* (see section 6.19) and agreed between the terminal representative and ship's master.

209. When portworkers are required to use mechanical plant in a hold to trim loaded dry bulk cargo and to move or break down cargo residues for discharge, care should be taken not to cause damage to the structure of the ship.

210. During loading, the regular distribution of the cargo in holds should be achieved by careful use of the loading machinery. This may be supplemented by belt conveyors or

rotary machines, which throw the material some metres from the loading spout.

211. During unloading, cargo may have to be moved into an area of the hold from where it can be picked up by grabs or by other handling equipment such as suction pipes and pneumatic equipment. This may be carried out with mechanical plant, such as vehicles fitted with a bucket or, in some instances, by hand.

212. When work has to be carried out in the holds of bulk carriers:

- a signaller may be necessary to control grabs or other equipment;
- in holds loaded by grabs, one worker should act as lookout if there is a danger of workers being buried under a load from a grab;
- all portworkers should be checked in and out of the hold;
- portworkers should be secured by a full safety harness and lifeline when necessary during trimming or discharge;
- appropriate precautions should be taken to prevent dust inhalation;
- the equipment and methods used to bring down bulk cargo residues adhering to the sides and ends of holds should ensure the safety of workers; and
- equipment such as grabs should only be used for the purpose for which they are designed.

213. When equipment is being used in a bulk cargo hatch, no person should work unobserved.

7.11. Hot work

214. In the case of hot work in or near tanks containing combustible substances, a safe-for-work permit issued by a competent person specifically qualified in the field and appointed in accordance with national laws and regulations should be obtained. The permit should be renewed if circumstances change, and in any case at least every 24 hours.

215. In special cases, such as hot work in or near the holds of tankers or combination carriers, a thorough inspection of the area should be conducted by specialists who can determine whether specific safety measures are required. Pipe work and pumps on board ships that have carried flammable liquids or gases should also be certified as safe for work.

216. Welding and cutting of any manner that may cause sparks should not be conducted in the vicinity of cargo-handling operations unless such hot work constitutes part of cargo operations is carried out in a safe manner.

8. Dangerous goods

8.1. Packaged dangerous goods

8.1.1. General requirements

1. Many cargoes transported in packages have hazardous properties that could cause fire and explosion, injuries or environmental damage. Emergencies could occur anywhere in the transportation chain. However, as a result of internationally recognized rules for carriage by sea, which have applied since 1965, millions of tonnes of dangerous goods are safely handled at ports every year.

8.1.2. International arrangements

2. The transport by sea of dangerous goods in packaged form is required to be carried out in accordance with the *International Maritime Dangerous Goods Code (IMDG Code)*. The Code became mandatory from 1 January 2004 under the provisions of Chapter VII of the IMO's SOLAS Convention. Produced by the IMO, it is based upon recommendations published by the United Nations Committee of Experts on the Transport of Dangerous Goods. The *IMDG Code* is revised and republished every two years. Amendment 34 to the *Code* requires all shore-based workers involved in the handling of packaged dangerous goods to be trained in a manner commensurate with their duties (see section 8.4.2).

8.1.3. United Nations classification

3. The United Nations (UN) system of classification of packaged dangerous goods is an integral part of the international provisions. Goods to be transported are classified according to

their primary hazard by the shipper or consignor. The nine UN classes are:

- class 1 – explosives;
  - subdivided into six divisions 1.1–1.6;
- class 2 – gases;
  - subdivided into flammable, non-flammable, non-toxic and toxic gases;
- class 3 – flammable liquids;
- class 4 – solids;
  - subdivided into flammable, spontaneously combustible and dangerous when wet;
- class 5 – substances containing oxygen;
  - subdivided into oxidizing agents and organic peroxides;
- class 6 – toxic and infectious substances;
- subdivided into toxic and infectious substances;
- class 7 – radioactive material;
  - subdivided into three separate levels of radioactivity plus fissile material;
- class 8 – corrosive substances; and
- class 9 – miscellaneous dangerous substances and articles, including environmentally hazardous substances.

4. The *IMDG Code* also recognizes that many substances, as well as being potentially dangerous to humans, can be environmentally hazardous to the marine environment. Accordingly, for the marine mode only, it uses the term "marine pollutants" for those dangerous goods to which this applies. There are also two UN Numbers in class 9 for solid and liquid substances that are not hazardous to humans but are hazardous in the marine environment, e.g. creosote.

8.1.4. IMDG Code

5. The *IMDG Code* contains the international requirements for the safe transport of dangerous goods by sea. This Code is mandatory for all IMO Member States. This means that their national legal requirements as flag States require dangerous packaged goods transported by sea in ships flying their national flag to be carried in accordance with the Code. As the ILO Occupational Safety and Health (Dock Work) Convention, 1979 (No. 152) refers to dangerous goods on the shoreside, the combined legal requirements should cover the whole journey from the entry to the export port to the destination in the import port.

6. Additional legal requirements may apply to movements by road, rail or air.

7. The basic requirements of the *IMDG Code* are that all packaged dangerous goods are:

- classified in accordance with the UN system of classification;
- packaged in appropriate UN approved packaging;
- labelled;
- packed onto a cargo transport unit, if required; and
- declared.

8. The shipper is required to classify the goods and arrange for them to be packaged in appropriate UN approved packaging. The resultant packages are then labelled with the relevant hazard warning signs, as required.

9. Individual packages are often further packed inside a cargo transport unit (CTU), such as a container or road or rail vehicle, in which it will be transported along the transportation chain. The dangerous goods in the CTU should be segregated, packed and secured in accordance with the *CTU Code* and the

IMO circular entitled "*Informative material related to the IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code)*" with the relevant hazard warning signs affixed to the outside of the CTU and a container or vehicle packing certificate, certifying the correct packing of the goods and other matters, completed and signed.

10. The hazard warning signs may be labels, placards, marks or signs. These are essential to alert personnel throughout transportation to the presence and hazards of the dangerous goods. Labels are affixed to packages and placards to CTUs. The *IMDG Code* specifies how many labels/placards are to be attached (figure 109).

11. Diamond-shaped labels and placards identify hazards by colour and symbol. The design for each class is different and, for classes 2, 4, 6 and 7, there are also different designs for the subdivisions. The class number, and for classes 1 (divisions 1.1, 1.2 and 1.3 only) and 5, the subdivision is shown at the bottom of the label and placard. For class 1 the compatibility group is also shown. Appropriate diamonds are required to be affixed for the primary hazard and up to two other subsidiary hazards.

12. The marine pollutant mark, elevated temperature mark and fumigation warning sign are also required to be affixed when relevant. In addition, packages and certain CTUs are required to be marked with the Proper Shipping Name and the UN Number.

13. All packaged dangerous goods for transport by sea are required to be declared in a dangerous goods transport document signed on behalf of the shipper. When relevant, this should be included or be accompanied by a container/vehicle packing certificate.

14. The information to be included in the declaration always includes:

Figure 109. IMDG Code hazard warning labels, placards, marks

Class 1 – Explosive substances or articles

	(No. 1) **Divisions 1.1, 1.2 and 1.3**	Symbol (exploding bomb): black. Background: orange. Figure "**1**" in bottom corner.
	(No. 1.4) **Division 1.4**	Background: orange. Figures: black. Numerals should be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm x 100 mm). Figure "**1**" in bottom corner.
	(No. 1.5) **Division 1.5**	
	(No. 1.6) **Division 1.6**	

** Place for division – to be left blank if explosive is the subsidiary risk.
* Place for compatibility group – to be left blank if explosive is the subsidiary risk.

Class 2 – Gases

	(No. 2.1) **Class 2.1** ***Flammable gases***	Symbol (flame): black or white (except as provided for in 5.2.2.2.1.6.4). Background: red. Figure "**2**" in bottom corner.
		
	(No. 2.2) **Class 2.2** ***Non-flammable, non-toxic gases***	Symbol (gas cylinder): black or white. Background: green. Figure "**2**" in bottom corner.
		
	(No. 2.3) **Class 2.3** ***Toxic gases***	Symbol (skull and crossbones): black. Background: white. Figure "**2**" in bottom corner.

Class 3 – Flammable liquids

 	(No. 3)	Symbol (flame): black or white. Background: red. Figure "**3**" in bottom corner.

Class 4

	(No. 4.1) **Class 4.1** ***Flammable solids***	Symbol (flame): black. Background: white with seven vertical red stripes. Figure "**4**" in bottom corner.
	(No. 4.2) **Class 4.2** ***Substances liable to spontaneous combustion***	Symbol (flame): black. Background: upper half white, lower half red. Figure "**4**" in bottom corner. .

Class 4

 	(No. 4.3) **Class 4.3** ***Substances which, in contact with water, emit flammable gases***	Symbol (flame): black or white. Background: blue. Figure "4" in bottom corner.

Class 5

	(No. 5.1) **Class 5.1** ***Oxidizing substances***	Symbol (flame over circle): black. Background: yellow. Figure "**5.1**" in bottom corner.
 	(No. 5.2) **Class 5.2** ***Organic peroxides***	Symbol (flame): black or white. Background: upper half red; lower half yellow. Figure "**5.2**" in bottom corner.

Class 6

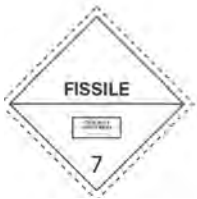
	(No. 6.1) **Class 6.1** ***Toxic substances***	Symbol (skull and crossbones): black. Background: white. Figure "**6**" in bottom corner.
	(No. 6.2) **Class 6.2** ***Infectious substances***	The lower half of the label may bear the inscriptions "INFECTIOUS SUBSTANCE" and "In case of damage or leakage immediately notify Public Health Authority". Symbol (three crescents superimposed on a circle) and inscriptions: black. Background: white. Figure "**6**" in bottom corner.

Class 7 – Radioactive material

	((No. 7A) **Category I – White**	Symbol (trefoil): black. Background: white. Text (mandatory): black in lower half of label: **"RADIOACTIVE"** **"CONTENTS..."** **"ACTIVITY..."** One red bar should follow the word "RADIOACTIVE". Figure "**7**" in bottom corner.

Class 7 – Radioactive material

<table>
<tr><td> 
</td><td>(No. 7B)
Category II – Yellow</td><td rowspan="2">Symbol (trefoil): black.
Background: upper half yellow with white border, lower half white.
Text (mandatory): black in lower half of label:
“RADIOACTIVE”
“CONTENTS....”
“ACTIVITY...”

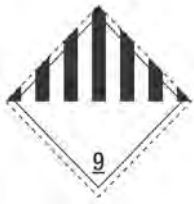
In a black outlined box: TRANSPORT INDEX ...</td><td>Two red vertical bars should follow the word “RADIOACTIVE”. Figure “7” in bottom corner.</td></tr>
<tr><td> 
</td><td>No. 7C)
Category III – Yellow</td><td>Three red vertical bars should follow the word “RADIOACTIVE”. Figure “7” in bottom corner.</td></tr>
<tr><td> 
</td><td>No. 7E)
Category IV
Fissile material</td><td colspan="2">Background: white.
Text (mandatory): black in upper half of label: “FISSILE”.
In a black outlined box in the lower half of the label: “CRITICALITY SAFETY INDEX”...
Figure “7” in bottom corner.</td></tr>
</table>

Class 8 – Corrosive substances

	(No. 8)	Symbol (liquids, spilling from two glass vessels and attacking a hand and a metal): black. Background: upper half white; lower half black with white border. Figure "**8**" in bottom corner.*

* A class 8 label with a shaded hand may also be used.

Class 9 – Miscellaneous dangerous substances and articles

	(No. 9)	Symbol (seven vertical stripes in upper half): black. Background: white. Figure "**9**" underlined in bottom corner.

Others

MARINE POLLUTANT Mark

ELEVATED TEMPERATURE Mark

FUMIGATION WARNING Sign

For further information on the use of labels, marks and signs, see Part 5 of the *IMDG Code*.
Source: Reproduced with the permission of the International Maritime Organization.

- Proper Shipping Name;
- class and, where necessary, division;
- UN Number;
- packing group;
- number and kind of packages; and
- total quantity of dangerous goods.

15. Information that may also be required includes:

- the words "marine pollutant" where applicable;
- the words "limited quantity" where applicable;
- special information for goods in classes 1, 6.2 and 7, for certain substances in classes 4.1 and 5.2, and for CTUs under fumigation;
- minimum flashpoint, if 61° C or less;
- specific reference to empty, uncleaned packages; portable tanks and bulk packaging; and waste; or dangerous goods;
- subsidiary hazards not conveyed by the Proper Shipping Name;
- other information required by national authorities; and
- weathering certificates, exemption certificates and classification certificates for certain substances in classes 4.1 and 5.2.

16. The information is required in order that the port and shipping company can arrange for safe handling, stowage and segregation on the terminal and on board the ship. Shipments should not be allowed to proceed into the maritime transportation chain without such information being properly provided.

17. Some substances, if allowed to come into contact with one another, will react and may cause a serious incident.

Consequently, they need to be segregated both within CTUs and on board ships. The segregation requirements in the *IMDG Code* require segregation on ships both on deck and under deck. There are four segregation distances: 3, 6, 12 and 24 m. In some instances vertical separation is also required. The same provisions can be used for segregation on the terminal.

18. Other requirements relate to the carriage of small amounts of dangerous goods, known as limited quantities. Certain of the requirements are relaxed for small amounts contained inside receptacles and packages. These relaxations only apply to the less dangerous goods.

19. While the *IMDG Code* is intended mainly for precautions to be taken for the sea voyage, its provisions can also be applied in shoreside terminals and the Code recommends that it be so used.

8.1.5. Checking of packaged dangerous goods

20. On receipt of the documentation, checks should be made on the accuracy of the contents. This should include the information in section 8.1.4, paragraph 14 and that the Proper Shipping Name and UN Number are consistent. The container or vehicle packing certificate should be completed, where relevant, and both the certificate and the declaration should have been signed.

21. The procedures should ensure that those concerned know what action should be taken in the event that the information is not fully correct.

22. When the vehicle arrives at the port or terminal, a check should be made that the placards, signs and marks are affixed to the outside of the vehicle or container in the required numbers and positions.

8.2. Solid bulk cargoes

23. Some solid bulk cargoes can be hazardous when shipped in bulk. The most common bulk cargoes are coal, metal ores, agricultural cargoes including grain, fertilizers and fertilizer raw material, and scrap metal.

24. Hazards associated with the transportation of solid bulk cargoes include:

- their inherent dangerous properties, covered by the nine UN classes (see section 8.1.3);
- other relevant properties; and
- operational hazards.

25. Relevant considerations may include:

- oxidation resulting in lack of oxygen in a hold, access way or other confined space;
- decomposition resulting in evolution of toxic or flammable gases and possibly also lack of oxygen;
- the angle of repose at which the cargo is likely to be unstable;
- their potential to liquefy;
- physical properties allowing cargo to collapse or persons to sink into it; or
- some cargoes, for example sulphur, iron finings, biomass and fertilizer, may combust or ignite in certain circumstances.

26. Operational hazards include:

- incorrect procedures;
- misdeclaration of cargo. Bulk shipping names should be used in accordance with the IMO's *International Maritime Solid Bulk Cargoes Code* (*IMSBC Code*);

- lack of communication; and
- unexpected presence of fumigants.

27. The *IMSBC Code* lists the solid bulk cargoes carried by sea. Appendices A and B of the Code list those cargoes that may liquefy and those that have hazardous properties. Other cargoes that are typically carried by sea are listed in Appendix C of the Code.

28. Solid bulk cargo-handling operations should be carried out in accordance with the IMO's *Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code)* (see section 6.19).

8.3. Bulk liquids and gases

29. Many bulk liquids and gases have hazards associated with their inherent chemical properties. In particular, many have low flashpoints and represent serious potential fire and explosion hazards. In view of the inherent risks and the volumes of cargoes stored and handled, such bulk liquids and gases should generally be handled at purpose-built terminals situated away from the main port facilities.

30. Bulk liquids and gases should be handled in accordance with the procedures set out in internationally recognized guidelines, including:

- IAPH/ICS/OCIMF: *International Safety Guide for Oil Tankers and Terminals* (ISGOTT);
- IAPH/ICS/OCIMF: *International safety guide for chemical tankers and terminals*;
- ICS/OCIMF: *Safety guide for terminals handling ships carrying liquefied gases in bulk*; and
- SIGTTO: *Liquefied gas handling principles on ships and in terminals*.

8.4. Operational precautions

8.4.1. General requirements

31. Adequate controls over the entry, presence and consequential handling of all types of dangerous goods should be in place for the safety of portworkers.

32. The authority responsible for the port area should be legally able to devise, apply and enforce appropriate rules and standards. International guidance can be found in the IMO's *Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas*.

33. The regulatory authorities, port management, berth operators, shipping companies and portworkers all have various responsibilities. In addition, the many organizations that may be involved with dangerous cargoes even before they reach the port area and ship have a crucial role to play in the ultimate safe handling and transportation. This group includes shippers, packers, those concerned with documentation, consolidators and forwarding agents, collectively called "cargo interests", and all relevant provisions concerning the safety of dangerous goods in the port area should apply to them.

8.4.2. Training

34. All persons should receive training appropriate to their duties. Different training will be appropriate for different groups of persons, including portworkers.

35. Not everybody should attend the same course. Training should be tailored according to the responsibilities and involvement of the persons concerned. For example, very few persons in the port will need to know the entire *IMDG Code*, although everyone needs to know the part or parts that apply specifically to his or her work, and the relevant port and company rules or instructions and safe systems of work.

36. Specific training on the action to be taken in an emergency involving dangerous goods should be given in addition to the appropriate general awareness and familiarization, and function-specific training.

37. The general training should be designed to provide familiarity with the general hazards of the dangerous cargoes handled and the relevant legal requirements. This should include a description of the classes of dangerous goods and their marking, labelling, placarding, packing and segregation, documentation and emergency response procedures.

38. All portworkers should receive training and instructions on the action they should take in the event of a spillage or other release of dangerous goods.

39. The training should be ongoing and periodically supplemented with retraining, as necessary.

40. All training should be recorded.

41. Relevant training materials include:

- Training unit P.3.1 (Handling dangerous cargoes in port) of the ILO's Portworker Development Programme;
- IMO model course 1.10, Dangerous, hazardous and harmful cargoes; and
- *IMDG Code*, Chapter 1.3, recommendations on "Training of shoreside personnel".

8.4.3. Control of entry and presence

42. The entry of dangerous goods into port areas by any mode of transport should be controlled.

43. The port authority should determine any restrictions that may be necessary on:

- classes or quantities of dangerous goods that may be brought into or be present in the port area; and
- conditions under which dangerous goods may be present or handled.

44. The port authority should be empowered to prohibit the entry of dangerous cargoes for keeping[1] or storage within, or transit[2] through, the port area if it is considered that their presence would endanger life or property because of their condition, the condition of their containment, the condition of their mode of transport or the conditions in the port area.

45. The port authority should also be able to remove or require the removal of any dangerous goods or any ship, package, freight container, tank container, portable tank, vehicle or other cargo transport unit containing such goods within the port area that constitute an unacceptable hazard by reason of their condition or that of their containment.

8.4.4. Notification of dangerous goods

46. The port authority should be provided with Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS) before dangerous goods are brought into the port area.

47. Unstable substances should not be accepted unless all necessary conditions to ensure safety have been specified and met.

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[1] "Keeping" refers to cargoes that are present in a port area after being taken off one means of transport and awaiting the next means of transport to take them on their consigned journey. "Storage" refers to cargoes that are held in the port area awaiting further instructions concerning their sale and/or onward delivery.

[2] "Transit" refers to goods that are destined for another port and are due to remain on board the ship while in the port area.

48. The notice required should generally be not less than 24 hours. Special arrangements may need to be made for short voyages and for certain modes of transport, categories and/or quantities of dangerous goods.

49. The notification should include the information specified in Annex 1 of the IMO's *Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas*.

50. Notification of dangerous goods carried by inward bound ships should be made by the ship's master, owner or his or her agent. Notification of such goods carried by land-based means of transport should be made in accordance with national legal requirements.

51. The method of notification and the authority to which it should be sent should be determined by the port authority.

52. The port authority should make arrangements for the receipt, checking and assessment of notifications.

53. The port authority should be notified of the dangerous goods on board a ship before its departure. Generally not less than three hours' notice should be given.

8.4.5. Checking the information

54. When notifications of incoming dangerous goods are received, it is important to check that:

- the goods can be handled safely while they are in the port area;
- they are correctly identified and declared;
- they will be kept at an appropriate location; and
- any special arrangements, including emergency arrangements, are made.

55. The terminal operator should ensure that:

- packaged dangerous goods entering the terminal have been declared in accordance with national legal requirements as properly identified, packaged, marked, labelled or placarded in accordance with the *IMDG Code*; and
- the information supplied by the ship and by cargo interests is verified and, as far as can be ascertained, correct.

56. Packaged dangerous goods entering from the shoreside should be physically checked at the port or terminal entrance or some other area designated for the purpose to ensure that the correct labels, placards and other external attachments required by the *IMDG Code* are all present and correct.

57. The checks should be carried out continuously throughout the operational hours of the port. The procedures should include the action to be taken if the documentation or labels/placards, etc., are found to be incorrect. Dangerous goods should not be allowed to go further along the transportation chain until any problems have been corrected or clarified.

8.4.6. Handling and stowage

58. The terminal operator should ensure that dangerous goods are stowed safely, taking into account any segregation required by incompatible cargoes. The general segregation rules contained in the *IMDG Code* should be used for this purpose. However, any other suitable standard may be used, provided that it is effective and that all those concerned with its operation are aware of its provisions.

59. Portworkers should be made aware of the location of any radioactive cargo. Testing by a competent person should be conducted to ascertain that the cargo is not emitting any radiation. If the cargo is to be discharged from the ship, it should be done as promptly as possible and the cargo removed from

the facility right away. The same should be carried out if the cargo is to be exported.

60. Dangerous goods may be kept in specified areas in sheds, warehouses or on the terminal, or with other cargo. Any of these options may be acceptable, but in each case proper segregation rules should be applied

61. In remote areas, less stringent requirements may be acceptable, but in areas sited near housing, chemical plants or tank farms, more stringent stowage and segregation requirements may be necessary.

62. Irrespective of any other requirements, special care should be taken when handling dangerous goods, whether manually, by lifting appliance or by internal movement vehicle.

63. Class 1 explosives, other than those in Division 1.4S, and Class 6.2 (Infectious Substances) dangerous goods (in the United Nations system of classification), should normally only be permitted to enter the port area for direct shipment or delivery.

64. Special procedures should be drawn up for the transport and handling of explosives. These should take into account the hazards involved, the number of people in the vicinity and the precautions set out in the *IMDG Code*.

65. The terminal operator should ensure that areas where packages of dangerous goods are kept are properly supervised and that such goods are regularly inspected for signs of leakage or damage. Leaking packages should only be handled under the supervision of a responsible person.

66. Nobody should be permitted to open or otherwise interfere with any freight container, tank container, portable tank or vehicle containing dangerous goods without due authorization.

8.4.7. Emergency arrangements in the port area

67. Appropriate arrangements should be made to deal with any emergency that may take place in the port area. At all times these should include:

- provision of appropriate means to raise the alarm both on shore and on board a ship;
- procedures for notifying the emergency services;
- procedures for the action to be taken by all persons;
- provision and availability of appropriate emergency equipment and emergency response information; and
- means to determine the identity, quantity and location of all dangerous goods in the port area; this should include their correct technical names, UN Numbers and classifications; these should be made available to the emergency services when required.

68. The relevant emergency arrangements should be drawn to the attention of all persons in the port area.

69. For further guidance, see Chapter 12 and the IMO's *Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas*.

8.4.8. Special provisions

70. The port authority should appoint at least one responsible person who has adequate knowledge of the current national and international legal requirements concerning the safe transport and handling of dangerous goods. That person should have all relevant national and international legal requirements, guidelines, recommendations and other documents concerning the transport of dangerous goods, ships carrying such goods and installations handling, transporting, producing or otherwise using such goods. These documents should be readily

available in the port area for reference, and should be kept up to date.

71. Areas where dangerous goods may be present should be designated as areas where smoking and other sources of ignition are prohibited. Electrical equipment in such areas should be explosion-protected, where necessary. The carrying out of hot work or any other activity that may lead to a fire or explosion hazard in such areas should be strictly controlled.

72. Records should be maintained of the dangerous goods that are present in the port area for use in an emergency.

73. Special areas for the holding and repacking of damaged dangerous goods, or wastes contaminated with dangerous goods, should be provided wherever necessary. All such packages, unit loads or cargo transport units should be immediately moved safely to a special area, and not removed from that area until they have been made safe.

74. The ship's master should ensure that any cargo-handling operations will not hazard any bunkering operation and that these conditions are fulfilled during the entire time the bunkering takes place. The IMO's *Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas* includes a checklist which should be followed before the bunkering operation commences.

8.4.9. Repair and maintenance work

75. The port authority should require notification before any repair or maintenance work is carried out, either on board a ship or on the shore, which could constitute a hazard because of the presence of dangerous goods. Such work should only be authorized after it has been established that the work can be carried out without creating such a hazard. A "permit to work" system should be used where appropriate.


contents

9. Health

9.1. Health hazards

9.1.1. General requirements

1. Portworkers should be fit for the work which they are employed to carry out. They should be protected from health hazards that may arise from the activity itself, the means to carry out that activity, the work environment or the organization of the work. This part of the code gives examples to assist in identifying the risks and detailing the action that should be taken to avoid them.

2. The health and fitness for work of portworkers who regularly work in areas or on operations known to include health hazards should be regularly monitored by persons competent to do so, keeping in mind applicable privacy laws (see section 9.2). Those carrying out the monitoring process should regularly liaise with those responsible for areas or operations to ensure that the precautions and arrangements for eradicating, reducing or controlling the hazards are effective.

3. Health hazards should be identified, the risks known and evaluated, the dangers to health understood and effective preventive measures put in place to ensure the health of the portworkers concerned. There should be a management system for identifying such risks and a strategy for responding to them. Arrangements for the participation of workers should include health matters.

4. The principal health hazards that can arise from port operations may include physical hazards (extreme temperatures, noise, vibrations, radiation, lighting, etc.); ergonomic hazards

(repetition of movements, extreme postures, etc.); chemical hazards (inflammables, irritatives, toxics, exhaust emissions, explosive substances, etc.); biological hazards (animals, micro-organisms, bacteria, viruses, fungi, etc.); and psychosocial hazards (work-related stress, violence and harassment at the workplace, fatigue, night work, shift work, etc.). These hazards should be effectively controlled in accordance with national legal requirements.

5. Exposure of portworkers to particular hazardous substances should be kept below the relevant maximum 15-minute and eight-hour time-weighted occupational exposure levels for the substances concerned, in accordance with national laws and practices.

6. Portworkers exposed to hazardous substances should be trained, provided with MSDS/SDS and undergo periodic medical monitoring. The substances should be adequately labelled with the contents, with reference to the globally harmonized system (GHS) of classification and labelling of chemicals or according to existing MSDS/SDS. Workers should be advised about the precautions to be taken to prevent exposure to these substances.

9.1.2. Dangerous goods and fumigation

7. Health hazards may arise from specialized activities associated with dangerous goods.

8. Great care should be exercised when it is necessary to inspect or sample such goods. Particular attention should be paid to the hazards of the cargo as indicated by the labels or placards and documentation.

9. Cargo transport units that have been transported under fumigation should be declared and should bear the fumigation sign. They should be ventilated before entry into them is

permitted. In order to ensure that the atmosphere is safe for entry, it will normally be necessary to test it first.

10. If the cargo, packaging or dunnage in a cargo transport unit is of a category that might need to be fumigated, fumigant residues may still be present in the unit. Precautions before entry should be taken, even though the cargo may not be "dangerous goods" and may not have been declared as being transported under fumigation.

11. When cargo is required to be fumigated within the port area before onward transportation, the operation should be carried out by competent specialists in an area away from normal operations. Precautions should be taken to ensure that the fumigant is confined to the immediate area where it is being applied.

12. Bulk cargoes may also be fumigated:

- in the case of exports:
  - before reaching the port area;
  - when in storage in the port area before loading; and
  - when in the ship's hold before the ship sails.
- in the case of imports:
  - before or during the voyage and while still under fumigation; and
  - in the port area before onward transportation.

13. Bulk cargoes such as grain which have been fumigated before entry into the port area from shore or from sea should be declared and the port authority should require such a declaration to be made before entry. In addition:

- adequate and suitable measures should be adopted to safeguard the health of portworkers engaged in handling such cargoes; and

- such measures should take account of the possibility that fumigant is still present in the cargo.

9.1.3. Dusty cargoes

14. Exposure of portworkers to dust should be prevented as far as is practicable. This should include nuisance dusts for which no specific occupational exposure level has been assigned. National legal requirements should specify maximum occupational exposure levels of individual dusts and nuisance dusts.

15. Ideally, loading or unloading of dusty cargoes should be totally contained unless the dust concerned may be explosive at sufficient density. Where this is not practicable, dust emissions should be prevented as far as possible and controlled.

16. Measures to control dust emissions include:

- appropriate design of grabs, hoppers, conveyors and other material-handling equipment;
- enclosure of transfer and discharge points;
- enclosure of operators' cabs;
- local exhaust ventilation; and
- suppression by covering or damping.

17. Other measures to limit exposure to dusts should include:

- avoiding the need for portworkers to enter or work in dusty areas;
- restricting the time spent in such areas;
- provision of appropriate respiratory protective equipment, such as helmets providing a continuous supply of clean filtered air; and
- ensuring that respiratory protective equipment is worn when necessary.

18. The air supply to an enclosed cab or control room should be from a clean source and filtered as necessary.

19. Accumulations and residues of dust should be regularly cleaned up by an appropriate method.

20. Some dusts, such as from grain, can have a sensitizing effect that can induce changes in the respiratory system such as asthma or other medical conditions. Portworkers who are medically assessed as being sensitive to such conditions should not work in areas where they may be exposed to such dusts.

21. Other cargoes can also give off dust that may be harmful in enclosed spaces. These can include some forest products and scrap metal.

22. Exposure to asbestos fibres can give rise to cancer and mesothelioma, and should be prevented and prohibited. All asbestos cargoes should be properly packaged.

9.1.4. Other cargoes

23. Some cargoes, including mouldy cargoes, may present risks of infection of portworkers. Portworkers handling such cargoes should be under appropriate medical supervision and be provided with, and use, relevant personal protective equipment.

24. Exposure to hides, skins, fleeces, wool, hair, bones or other parts of animals can give rise to anthrax or other animal-related diseases which may be transmitted to and be harmful to humans. Such cargoes should be disinfected and certificated by a competent authority before shipping in accordance with national legal requirements. When the risk of anthrax may be suspected, special precautions, including the use of personal protection equipment and medical supervision, should be taken.

25. Some cargoes may bring with them insects, snakes and other creatures, and portworkers should be alert to the dangers

of being bitten. In the event of such a bite, they should receive medical treatment immediately.

26. Radioactive materials should be contained by packaging appropriate to the risk. Correctly packaged cargoes of this type are safe for transport workers, provided that total quantities do not exceed international transport index limits.

9.1.5. Noise

27. Noise can be emitted from engines and transmission equipment fitted to lifting appliances and vehicles, and can be heightened when the equipment is being used in a shed, warehouse or ship's hold. Noise levels may affect the equipment operator and/or portworkers that work with or in the vicinity of such equipment when it is being used.

28. In coordination with the workplace safety and health committee, noise levels should be periodically monitored and sources of excessive noise identified.

29. Noise levels should be controlled at source whenever it is practicable to do so.

30. Noise levels, as defined by national legal requirements, should be specified when new equipment is ordered. The noise specification should be as low as possible.

31. The need to work in noisy areas should be avoided or minimized as far as possible. Appropriate hearing protection should be supplied and worn when necessary.

32. When appropriate, consideration should be given to the periodic monitoring of hearing loss of portworkers.

9.1.6. Fatigue

33. Fatigue can affect health, safety and work performance. Regular breaks should be incorporated into work periods. Excessively long shifts or work periods should be avoided.

34. If it is necessary to work an abnormally long shift, it is essential that an adequate period of rest be provided before the start of the next period of work, particularly overnight.

35. Shift work is particularly demanding on the human system and is known to be a source of fatigue. Port employers should endeavour to arrange shifts so as to cause the least possible disruption to portworkers. Port employers should refrain from imposing and/or enabling irregular shifts, and double shifting should be avoided.

9.1.7. Emissions

36. Exhaust emissions from ships, terminal machinery, trade cars, passenger vehicles, ro–ro vehicles and trade wheeled cargo vehicle exhausts can present health risks to portworkers from:

- carbon monoxide (the main component of emissions from petrol engines);
- carbon dioxide (the main component of emissions from diesel engines);
- polycyclic aromatic hydrocarbons (PAH);
- oxides of nitrogen;
- sulphur oxides;
- aldehydes; and
- particulate matter, e.g. soot.

37. The composition of exhaust emissions and the risks from them vary with the type of engine, the fuel being used, and the age and level of maintenance of the engine. The volume of exhaust emissions in the atmosphere will depend on the number of engines running at any one time and the level and efficiency of ventilation. In respect of ships' emissions while

alongside the quay, the new IMO sulphur emission control area (SECA) content limit is 0.5 per cent.

38. Hazardous levels of emissions can affect those in the immediate vicinity, especially if the area is enclosed or if the emissions are concentrated at one particular point.

39. Preventive measures include:

- regular scheduled maintenance of all terminal vehicles, including engine tuning and exhaust systems;
- ventilating places where vehicles operate by natural or mechanical ventilation to ensure safe levels;
- switching engines off when vehicles are standing for long periods;
- making initial fume assessments of individual terminal vehicles and shoreside premises where vehicle emissions may present a problem;
- preparing fume profiles of each hold of a ship in which vehicles may be operated on a regular basis;
- preparing a plan to ensure that emissions from such vehicles on premises and in holds do not exceed safe levels, and specifying the maximum number of engines allowed to run at any one time;
- using electric, LPG- or LNG-driven vehicles where available; and
- ports or facilities should endeavour to establish a shore-based electrical feed for berthed ships, where practicable.

40. Profiling of holds in line with the requirements for confined space entry in section 6.25 can typically consist of taking readings of fume levels in each hold at hourly intervals throughout the loading/unloading process. It is not normally necessary to take readings for each component of the vehicle

exhaust emissions; only carbon monoxide and carbon dioxide readings need be taken. If it can be shown that the levels of those components are safe, it can normally be assumed that the other components are equally safe. If there is any doubt, an industrial hygienist or other expert should be consulted.

41. Profiling of holds should be carried out with all available ship's ventilation in operation and with the maximum number of vehicle engines consistent with operational procedures running at any one time.

42. Each set of readings should consist of at least six measurements, two at each end and two in the middle of the hold taken at about 1 m above the deck. Alternatively, individual monitors may be used.

43. The levels measured should not at any time exceed the eight-hour time-weighted occupational exposure limits for carbon monoxide and carbon dioxide. If the measured levels are reduced to acceptable levels, the levels of the other components, which are present in very small amounts, should also be at safe levels. In such circumstances, most portworkers may enter and leave the hold without being required to record their exposure times or wear respiratory protective equipment.

44. If unsafe levels, as indicated in section 9.1.7, are measured in a hold, the shoreside employer and the ship's officers should collaborate to ensure that they are reduced to an acceptable level. This may be achieved by increasing ventilation, adding portable ventilators or reducing the number of engines running at any one time.

45. Once a ship has been profiled, and it can be shown that all holds or areas where portworkers may work are within safe limits at all times while the ship is loaded or unloaded in the normal way, further profiling should not be necessary unless the purpose or configuration of the ship changes.

46. This procedure should be satisfactory for most portworkers working on ships as they move in and out of the hold during cargo operations. However, certain portworkers, such as those engaged in lashing or unlashing vehicles on ro–ro ships or forklift truck operators in sto–ro operations, may be present and vehicle exhausts emitted for the entire work period. There may also be others who work for extended work periods of over eight hours. As occupational exposure levels are based on time exposure, more detailed calculations will need to be made in these circumstances to safeguard the health of such workers, and personal protection may be necessary.

47. During operations in holds, it is essential to ensure that:

- all available ship's ventilation is in operation;
- the ventilation functions correctly with exhaust fans not reversed, and air ducts are not covered or obstructed at either end;
- doors, ramps and other openings in the hull are open to permit natural ventilation; and
- only the stipulated number of engines are being run at any one time.

48. Appropriate precautions should be taken to protect the operators of quayside cranes from emissions from ships' funnels.

9.1.8. Vibration

49. Hand/arm and whole-body vibration generated by powered hand tools and machinery can affect human health. Vibration levels should be measured and kept below nationally recognized maximum and eight-hour exposure levels. Operators of terminal plant are most likely to be adversely affected by whole-body vibration levels.

50. An assessment of the risks from vibration should be based on readings of each piece of terminal operating equipment and should lead to the preparation of a plan that will ensure that such equipment remains safe for its operators.

51. All new equipment should be designed to minimize vibration to below nationally recognized safe levels.

9.1.9. Abnormal environments

52. Some ports regularly operate in temperatures below −40°C and/or over +40°C. Exposure to extremely high or low temperature is likely to affect the ability of portworkers to continue to work safely and may represent health risks. Appropriate precautions should be taken, particularly if such conditions are only experienced occasionally. Precautions may include limiting the time workers are exposed in any one period, and arranging a readily available supply of clean drinking water and suitable clothing. Portworkers should be adequately trained to deal with these circumstances.

9.1.10. Other health aspects

53. Where portworkers are accidentally exposed to health hazards, their health should be checked by persons competent to do so.

54. Where portworkers handle harmful substances, they should change their outer clothes and thoroughly wash their hands and face with soap or some other suitable cleaning agent before taking any food or drink or using toilet facilities. Special care is required when washing contaminated clothes, which should not be removed from the workplace by the portworker.

55. Health protection monitoring should be considered for all portworkers.

56. Special attention should be paid to risks from manual handling, especially heavy loads. Portworkers should not be engaged on such activities without suitable medical assessment and training in the skills necessary to carry out manual handling safely.

9.1.11. Ergonomics

57. Workplaces, work systems and work equipment should be designed, constructed and maintained in accordance with good ergonomic principles. When necessary, specialist advice should be obtained.

58. Bad design of the operator's cab and poor posture can affect the health of portworkers, especially if they are spending most of their working time in the same position. This includes:

- the layout and positioning of the cab;
- the climate inside the cab;
- daylight and illumination;
- possible obstruction of view from within the cab;
- noise;
- speech intelligibility;
- positioning of displays and other communication means; and
- positioning of the hand and foot controls, and the design and positioning of the operator's seat.

These should all be taken into account when designing and arranging operators' cabs.

59. When appropriate, the continuous time spent on a task should be limited, possibly by job rotation or other suitable relief.

9.2. Communicable diseases

9.2.1. General provisions

60. Due to the nature of their work, portworkers may be exposed to contact with persons, animals and materials originating from communicable disease endemic zones. Accordingly, advice should be provided by the port employer and/or competent authority to portworkers regarding appropriate actions required, to be taken or being taken where risks of communicable diseases have been identified.

61. The competent authority should ensure that port employers consider the relevant advice promulgated by the WHO, the IMO, the ILO and other appropriate bodies in this regard and act appropriately by providing the necessary information to portworkers and other persons and taking precautionary measures.

62. Port authorities are reminded of the need for free pratique[1] and to ensure immediate medical support and advice.

63. The competent authority should ensure that port employers consider communicable diseases that may pose a risk to portworkers, and ensure appropriate precautions are taken. Portworkers seeking medical attention should advise the medical practitioner or attendant if they suspect they have been exposed to or are carrying a communicable disease.

[1] "Free pratique" means permission for a ship to enter a port, embark or disembark, discharge or load cargo or stores (source: WHO International Health Regulations 2005, Article 1, Definitions, and Article 28, Ships and aircraft at points of entry).

9.2.2. HIV and AIDS

64. The Human Immunodeficiency Virus (HIV) continues to be a major global public health issue. It weakens the body's natural defences against illness, leaving an affected individual susceptible to infections and some forms of cancer. The most advanced stage of HIV infection is Acquired Immunodeficiency Syndrome (AIDS).

65. The competent authority should ensure that port employers:

(a) provide and support health promotion and behavioural change programmes on HIV and AIDS;

(b) eliminate prejudice and discrimination against portworkers living with HIV;

(c) provide support in confidence for any portworkers known to be living with HIV;

(d) provide up to date information, materials and advice on HIV and AIDS to all workers, both through induction programmes and ongoing training programmes;

(e) provide a kit for protection against blood-transmitted diseases;

(f) make condoms available to portworkers on all ships;

(g) maintain confidentiality concerning the status of any portworker who may be living with HIV; and

(h) treat temporary absences of portworkers living with HIV as absences for other reasons (reference to Convention No. 158 on termination of employment).

66. For further guidance, refer to ILO Recommendation No. 200 and the *ILO Code of Practice on HIV/AIDS and the world of work*. Consult Appendix J for further information relating to HIV and AIDS in the port sector.

9.2.3. Other diseases

67. Port work may lead to portworkers being exposed to biological agents. For the purpose of this code of practice, "biological agents" means microorganisms which may provoke an infection, allergy or toxicity. For example, portworkers may be exposed to biological agents resulting from poor food hygiene, contaminated food or drinking water, inappropriate personal hygiene, unhygienic medical treatment and the spread of bacteria and viruses such as influenza. It is imperative that effective steps are taken to eliminate these hazards.

68. The competent authority should ensure that the port employer takes biological hazards into account when planning work and implementing measures to minimize exposure to such hazards. Additional precautions should include, but are not limited to:

- detection, where possible – for example, by testing drinking water;
- collection, storage and disposal of waste;
- special treatment of waste prior to disposal;
- prohibition of eating and drinking in work areas;
- offering relevant vaccinations; and
- documented inspections.

9.3. Occupational health services

9.3.1. General principles

69. Good prevention practices include the ability to detect and monitor work-related injuries or occupational diseases in consultation with the safety and health committee, if it exists, or portworkers and their representatives. This may be by means of instituting a medical monitoring programme, which is

highly recommended. The benefits of such a programme will be to provide appropriate protection to workers in the workplace.

70. In accordance with national law and practice, medical monitoring should be carried out by competent persons, respect confidentiality of workers and could include elements pertaining to:

- pre-employment screening;
- occupational health hazards;
- respect for patient/doctor confidentiality; and
- adequate follow-up.

71. The cost for such a medical monitoring programme should be covered by the port employers.

72. The development and implementation of a medical monitoring programme should be carried out in consultation between the port employers and portworkers and their representatives.

73. Occupational health services should establish and maintain a safe and healthy environment to facilitate optimal physical and mental health in relation to work, and should also provide advice on adapting work to the capabilities of workers in the light of their state of physical and mental health. These services, which may be supplemented by others listed in Article 5 of the Occupational Health Services Convention, 1985 (No. 161), are the following:

- provision of first-aid and emergency treatment;
- treatment and care of urgent cases;
- monitoring of workplaces and conditions from the standpoint of the health and fatigue of the workers;
- periodic training of first-aid personnel;
- promotion of health education among portworkers; and

- cooperation with the competent authority in the detection, measurement and evaluation of chemical, physical or biological factors suspected of being harmful.

9.3.2. First-aid personnel

74. First-aid stations should be provided where less serious injuries can be treated and from which injured portworkers can, if necessary, be conveyed rapidly to a centre where they can receive more comprehensive medical attention.

75. First-aid stations should be clearly marked and should contain first-aid equipment in accordance with national legal requirements.

76. Automated external defibrillators approved and recommended by a medical professional for use by a first-aid attendant should be available at all port facilities. These devices should be regularly tested and maintained by a competent person to ensure their reliability. First-aid personnel should be properly trained on the correct use of the device.

77. In general:

- except in emergencies, first aid in case of accidents or sudden illness should be given only by a medical doctor, a nurse, or a person trained in first aid and possessing a first-aid certificate acceptable to the competent authority;
- adequate means and personnel for giving first-aid treatment should be readily available during working hours at places where port work is carried out. If first-aid attendants are engaged in any other duties, they should be able to respond readily to any emergency situation;
- employers should pay first-aid personnel and maintain their proficiency by providing periodic refresher courses and testing by an approved first-aid training institute;

- severely injured portworkers should not be moved before the arrival of a doctor or other qualified person, except for the purpose of removing them from a dangerous situation; and
- all injuries, however slight, should be reported as soon as possible to the nearest first-aid person or station.

78. Where portworkers may be exposed to the risk of injury from corrosive substances:

- suitable first-aid facilities such as eyewash bottles and means of drenching with water should be provided and kept readily available; and
- notices giving suitable first-aid advice should be displayed.

79. Port employers may organize first-aid facilities in collaboration with each other and/or the port authority. This should not result in undue delays in first-aid response. For first aid to be effective, close coordination between all organizations concerned is essential.

9.3.3. Personnel providing occupational health services

80. Personnel providing occupational health services, including counselling, should enjoy full professional independence from employers, workers and their representatives, where they exist, in relation to the functions listed in section 9.2.1, paragraph 72.

81. The competent authority should determine the qualifications required for the personnel providing occupational health services, in the light of the nature of the duties to be performed and in accordance with national law and practice. All facilities should be clean, dry and smoke free.

10. Personal protective equipment

10.1. General requirements

1. Personal protective equipment (PPE) provides supplementary protection against exposure to hazardous conditions where the safety cannot be ensured by other means, such as eliminating the hazard, controlling the risk at the source or minimizing the risk.

2. PPE should never be used as a substitute for eliminating or otherwise controlling a risk. However, when this is not possible, suitable PPE should always be used.

3. The need for PPE should be determined in accordance with national legal requirements and an assessment of the risks to which portworkers may be exposed during their work.

4. All PPE should be made available, inspected and maintained in order to provide the required level of protection.

5. Portworkers should generally be supplied with a basic PPE package that consists of:

- protective footwear;
- head protection;
- appropriate foul/hot/cold-weather clothing;
- high-visibility clothing; and
- gloves.

Portworkers should wear them when appropriate. Other types of PPE should be provided and worn as necessary.

6. Additional PPE that should be supplied to portworkers may include, but not be limited to:

- ear/hearing protection;
- fall-prevention and fall-arrest equipment;
- PFDs;
- foot and ankle protection;
- hand and arm protection, e.g. insulating gloves;
- knee and leg protection;
- eye and face protection, e.g. face shields;
- overalls;
- respiratory protection;
- restraints;
- shoulder protection; and
- impermeable personal protective clothing.

7. Portworkers who wear prescription spectacles should have lenses made of plastic instead of glass. Plastic lenses are less likely to shatter in the event of an accident. Purpose-designed safety spectacles to protect against dust particles are preferable to goggles. Goggles should not be worn over spectacles; prescription safety spectacles should be provided instead.

8. All PPE should comply with relevant international and national legal requirements and standards.

9. PPE should be provided by the employer at no cost to the portworker.[1]

10. PPE should be personal to the wearer unless it is properly cleaned after each use.

[1] Articles 16(3), 17 and 21 of the Occupational Safety and Health Convention, 1981 (No. 155).

11. It is essential that appropriate training and instruction in the use, care, storage and maintenance of PPE is given to all portworkers.

12. PPE should only be used for the purpose for which it is intended.

10.2. Selection of PPE

13. When selecting the most appropriate type of PPE for an operation, information available from equipment manufacturers and suppliers and those who will have to wear it should be considered before a final selection is made.

14. PPE should be selected to ensure that it is as comfortable as is practicable for those who have to wear it, as this can be onerous, particularly if more than one type of protection needs to be worn at the same time.

15. PPE should generally be available in a range of sizes and types, as one size or type seldom fits all. Comfort and acceptability to the wearer are important, as the equipment may need to be worn for long periods. Particular attention should be given to the gender-specific design and measurements of PPE.

16. PPE should not create additional hazards for wearers, whose size, weight, health and gender should be taken into consideration, as well as the fit of the equipment. Users involved in selecting their PPE are more likely to wear it.

10.3. Usage of PPE

17. All PPE against falls from a height should be made available, inspected and maintained in order to provide the required level of protection. When fall-arrest equipment is used, adequate means should be available in the immediate vicinity to ensure prompt release from such equipment. This includes a rescue plan.

18. Management and supervisors should ensure that appropriate PPE is used by all portworkers in accordance with instructions. Management should give a clear lead by using the equipment when it is required.

19. Appropriate PPE should be used at all times by all persons when exposed to danger. Time considerations should never be a factor in deciding whether to wear PPE.

20. All persons in cargo-handling areas should wear high-visibility overalls or other high-visibility outer clothing.

21. Loose clothing should never be worn by workers when working near open conveyors or other moving machinery. One-piece overalls are suitable.

22. Portworkers handling substances that are corrosive or can be absorbed through the skin should wear appropriate impermeable personal protective clothing.

23. Different-coloured overalls or other outer clothing and head protection may be useful to identify persons such as trainees and visitors. This helps to identify and draw attention to unauthorized persons in working areas or to persons who may be less familiar with hazards in the area.

10.4. Storage and maintenance of PPE

24. Suitable facilities should be provided for the storage of PPE when it is not in use. This should generally be separate from accommodation for workers' personal clothing in order to prevent cross-contamination, especially if the equipment or clothing may be contaminated by toxic or otherwise dangerous substances. The facilities should include means of drying, where necessary and should be kept in a clean and orderly condition.

25. All PPE should be maintained in a clean, hygienic and effective condition, in accordance with the manufacturer's

recommendations and replaced when necessary. This may be done centrally, or by the users if they have been appropriately trained. Specialist equipment, such as some types of PFDs, may need to be returned to the manufacturer for periodic servicing.

26. Filters in respiratory protective equipment and other components with a limited capacity or shelf life should be regularly replaced in accordance with the manufacturer's recommendations. Filters should be of a type appropriate to the exposures they are to protect against.

27. Port employers should provide for the cleaning, disinfecting and examination of PPE which has been used and may be contaminated by materials that are hazardous to health before reissuing the PPE. This should be provided at no cost to the portworker.

28. Some PPE has a limited useful life. Limitations may be based on time or the use of the equipment. In such cases, the equipment, or the relevant part of it such as the filter in a respirator, should be changed in accordance with the manufacturer's recommendations.


contents

11. Personnel welfare facilities

11.1. General provisions

1. Adequate personnel welfare facilities should be provided and be available at all times to portworkers at or near the area in which they work. All facilities should be clean, dry and smoke free.

2. Toilet facilities, washing facilities, cloakrooms, messrooms, canteens, hiring halls, waiting rooms and any other personnel welfare facilities should be:

- suitably located and of an appropriate size and construction;
- fully enclosed, if on shore;
- provided with floors, walls and ceilings that are easy to clean;
- well ventilated and lighted, and, if necessary, heated or air-conditioned;
- equipped appropriately for their purpose;
- in the charge of a responsible person;
- maintained in a clean, sanitary and orderly condition;
- protected against rats and other vermin; and
- away from noisy operations, dust pollution and other sources of contamination, where practicable.

11.2. Toilet facilities

3. Suitable and sufficient toilet facilities should be provided and made accessible for the use of all portworkers and appropriate arrangements should be made for transport drivers,

visitors and other persons, and should be available at any time during working hours.

4. All toilet facilities should comply with national health and hygiene requirements and be fitted out in accordance with local custom.

5. Toilet facilities should be located at regular intervals, as far as is practicable, throughout the port area. The facilities may be located near to sheds or other buildings so as not to cause obstructions on quay areas.

6. At least one toilet should be available for portworkers near the ship, where practicable. Ships' facilities may be used by prior arrangement with the ship's master and if they are in compliance with paragraph 1 above; if not, a portable facility should be provided.

7. Toilets and urinals should be of the water-flush type, wherever possible.

8. Floating cranes, grain elevators, bunker machines and similar installations on which or by means of which port work is carried out should be provided with at least one toilet.

9. The number of toilets provided should be based on the maximum number of persons expected to work in an area. As a general rule, a set of toilet facilities should be provided for each berth or at least every two berths. Each set should comprise a toilet for every 25 or 30 workers. This may mean two toilets per berth, or four if the set is shared by two berths. Each toilet should be supplemented by an adequate number of urinals.

10. Separate toilet facilities for each sex should be provided unless the toilet facilities can only be occupied by one person at a time.

11. All toilet facilities should be properly enclosed and easy to clean. A floor drain with a water seal should be provided in each toilet to facilitate flushing the floor.

12. Each toilet on shore should be under cover and occupy a separate compartment installed in a special toilet facility. Each compartment should be provided with a separate door fitted with a latch on the inside.

13. Urinals should be of suitable width and preferably consist of a row of stalls. If the urinals are of a smaller type (cuvettes) they should be adequately separated by side partitions.

14. For personal cleansing, an adequate supply of toilet paper or, where local custom requires, water should be provided.

15. Adequate washing facilities, including soap and means of drying hands, should be provided in or adjacent to each toilet area.

16. Consideration should be given to the need to provide toilets equipped for use by disabled persons.

11.3. Washing/Showering facilities

17. Suitable and sufficient washing facilities should be provided for all portworkers.

18. There should be at least one washing facility for every ten portworkers who are likely to use them at the same time.

19. If portworkers of both sexes are employed, separate washing facilities should be provided for each sex.

20. Each wash place should have:

- a sufficient flow of clean, adjustable hot and cold water;
- an adequate means for removing waste water;
- a sufficient supply of suitable non-irritating soap or other cleanser; and

- suitable means for drying; the common use of towels should be prohibited.

21. Where portworkers are exposed to skin contamination by toxic, infectious or irritating substances, oil, grease or dust, at least one shower should be provided for every six regularly employed workers who are exposed to such contamination and cease work at the same time. Each shower should have a supply of clean, adjustable hot and cold water.

22. Showers should be enclosed in individual compartments, with the entrance suitably screened.

23. Hooks or other facilities for clothing and towels should be provided for persons taking showers.

24. Shower equipment should be thoroughly cleaned at least once a day. An effective disinfectant should be used to destroy fungi. Regular monitoring for conditions such as legionnaires' disease should be undertaken whenever hot water is supplied.

25. Washing facilities should not be used for any other purpose.

11.4. Clothing accommodation

26. Suitable and sufficient cloakrooms should be provided for all portworkers.

27. Cloakrooms should be provided with:

- individual lockers, preferably of metal, with means of fastening and adequate ventilation for the storage of clothes;
- separate storage facilities for workers' and street working clothes;
- suitable facilities for changing;
- suitable facilities for drying wet clothes; and

- benches or other suitable seating arrangements.

28. If portworkers of both sexes are employed, separate cloakrooms should be provided for each sex.

29. When women are employed and no separate room is available, some suitable space in the men's cloakroom should be provided. This space should be properly screened and suitably furnished.

30. Cloakrooms should not be used for any other purpose.

31. Suitable arrangements should be made for disinfecting cloakrooms and lockers in accordance with the requirements of the competent health authority.

11.5. Drinking water

32. An adequate supply of cool and potable water should be provided and be readily accessible to all portworkers. All water supplied for drinking purposes should be from a source approved by the competent health authority and controlled in the manner prescribed by that authority. If a supply of potable drinking water is not available, the competent health authority should give the necessary instructions for making available water safe for human consumption.

33. An adequate number of drinking water outlets should be provided. These should be protected from damage and dirt.

34. Drinking water outlets should be clearly identified as such by a suitable notice stating "Drinking water". The notice should conform to national legal requirements.

35. No confusion with outlets of water that is not suitable for drinking should be possible. If there is any scope for such confusion, outlets of water that are not fit for drinking should be clearly identified by a notice stating that the water is not fit to drink. Where appropriate, pictorial signs should be used.

36. Where practical, hygienic drinking fountains should be provided.

37. The use of common drinking cups should be prohibited.

38. In places where it is not possible to provide a piped supply of drinking water, such as in a cargo hold or on tugs, lighters or other harbour craft, drinking water should be provided in sealed bottles or in suitable closed containers clearly marked "Drinking water". The containers should be properly maintained and replenished as necessary. Drinking water should not be contained in barrels, pails, tanks or other containers from which the water has to be dipped, whether they are fitted with covers or not.

11.6. Mess rooms and canteens

39. If portworkers regularly take part in port work onshore or on a ship moored to the shore, suitable mess rooms or canteens on the shore for the consumption of food and beverages should be provided for portworkers to take their breaks and eat.

40. Mess rooms and canteens should be located away from workplaces with occupational hazards. The mess rooms and canteens should be fully protected from these occupational hazards. They should also be smoke free.

41. Floors of mess rooms and canteens should be constructed of, or covered with, material that is impervious to water and easily washable.

42. Mess rooms and canteens should be provided with:

- tables with impervious surfaces that are easy to clean;
- suitable chairs or other seating facilities with back rests;
- separation of smokers from non-smokers;
- facilities for heating food and boiling water;
- a supply of clean drinking water;

- covered receptacles for the disposal of waste food and litter. Receptacles should be emptied after each meal and thoroughly cleaned and disinfected;
- adequate facilities for cleaning utensils, tables, chairs, etc.; and
- facilities for hanging wet-weather clothing or other outer clothing during breaks.

43. Adequate toilet and washing facilities, including soap and means of drying hands, should be provided in or adjacent to each mess room and canteen.

44. Mess rooms and canteens should be kept in a clean and orderly condition.

45. Mess rooms should not be used as workrooms or storage rooms.

46. The sale or consumption of alcoholic beverages should not be permitted in canteens or mess rooms.

47. The consumption of food or beverages in areas where hazardous materials are being handled or kept should be prohibited.

11.7. Hiring halls and waiting rooms

48. In ports in which the hiring of portworkers takes place on a daily basis or at other frequent time intervals, appropriate hiring places should be provided where employers and workers can meet to agree terms and make up gangs.

49. In such ports, suitable hiring halls or call stands should be provided for the accommodation of portworkers while they are waiting to be allocated port work. The equipment for these hiring halls or stands is often prescribed in national or local legal requirements relating to the hiring of workers.

50. The hiring place should usually consist of a large hall in which workers gather and employers make offers of employment. The hall should include desks where workers can register. The labour inspectorate should also have an office in the hiring place so that it can more easily keep watch for irregularities.

51. Hiring halls should include suitable areas or rooms in which workers can wait between calls, or between the end of a call and the start of work. These areas or rooms should include adequate seating accommodation, and toilet and washing facilities.

12. Emergency arrangements

12.1. Emergency arrangements on shore and ship

12.1.1. General requirements

1. Many types of emergencies are possible in port areas, and in many countries the development, publication, exercise and regular review of emergency plans in ports is a legal requirement. General advice is given by the IMO's *Recommendations on the Safe Transport of Dangerous Goods and Related Activities in Port Areas*, the OECD's *Guidance concerning chemical safety in port areas* and the UNEP/IMO programme *Awareness and Preparedness for Emergencies at Local Level (APELL) for Port Areas*.

2. Appropriate training or instruction of portworkers on the action they should take in an emergency is essential.

3. Emergency rescue workers and emergency rescue teams should be hired or designated and trained.

4. Emergency arrangements and emergency plans (see section 12.2.5) should cover all foreseeable emergencies, from minor mishaps to major incidents. They should be capable of increasing response capacity appropriately as an incident develops.

5. Suitable alarm systems, emergency and rescue equipment and first-aid facilities should be provided. Both these facilities and a certified first-aid attendant should be readily accessible and available.

6. Emergency vehicles that are responding to an emergency are normally exempt from speed limits and from route, direction and signal constraints. They should be given priority

over all other traffic in order to ensure that emergency services reach the emergency scene without delay.

7. A port facility should ensure that emergency vehicle access to the facility is not hindered by rail movement or traffic congestion at the gate.

12.1.2. Injuries and ill health

8. Arrangements for emergencies should include a suitable number of first-aid boxes and first-aid personnel (see section 9.3.2) and readily available means to transport more serious cases to hospital. Some ports have ambulances staffed by paramedics (persons trained to assist medical professionals and give emergency medical treatment) based within the port area, while others rely on the local community ambulance service. In each case, it should be very clear how the service is contacted. The emergency telephone number should be easily remembered.

9. First-aiders and ambulance personnel should be capable of safely reaching people who are injured, wherever they may be.

12.1.3. Rescue

10. If workers become ill or are injured in places with difficult access and cannot get themselves back to where they can receive help, it may be necessary to rescue them. Such places may include:

- holds of bulk carriers with access only available by hold ladder;
- tops of lighting towers some 50 m high with access only by vertical ladders;
- dry dock pumping pits 25 m deep with access only by staples on the pit walls;
- cabs of container or dry bulk transporter cranes;

- jibs of general cargo cranes;
- outboard gangways of large container ships beyond the reach of the crane; or
- water in the port (see section 12.1.7).

11. In each case, the situation should be assessed and the need for a possible rescue considered. Where necessary, the means of carrying out the rescue should be planned taking into account the need to prevent further injuries during rescue that could result from lack of oxygen, hazardous substances, electricity or other hazards.

12. The possible need for special equipment should be considered. Once rescuers reach a casualty, special lifting/lowering devices and harnesses are often needed for evacuation. Plans should assume that the casualty is unable to assist in any way. Any special equipment should be light and easily transported. It may have to be carried or lifted up and down vertical ladders, possibly following a complete loss of electrical power. The equipment should be capable of being erected or deployed with a minimum of delay. Exercises in the use of the equipment should be held at regular intervals.

12.1.4. Property damage

13. In many cases of property damage, emergency action may be necessary to prevent potential injuries by making the site safe and recovering equipment before repairs can be undertaken.

14. The emergency arrangements should take account of the possible need for heavy lifting equipment and other specialized plant, and persons with particular or specialist expertise.

12.1.5. Fire

15. Emergency arrangements in the event of fire should be additional to the fire precautions described in section 3.1.4 and

the various steps taken to prevent the outbreak of fire, such as fire protection of buildings, control of flammable substances and materials and sources of ignition including smoking, and regular inspection of premises and operations.

16. If a fire is discovered, the alarm should be raised immediately as trivial fires frequently develop into serious fires. Everyone should be instructed how to activate the fire alarm in the event that a fire is detected. False fire alarms should be avoided and investigated and action taken where appropriate.

17. The emergency plan should set out the action to be taken when the alarm is raised. This should include alerting relevant emergency services. The action to be taken may well vary between different groups in different locations.

18. When evacuation of an area is necessary, all workers should leave the area immediately by the nearest safe route and go to the appropriate fire assembly point. At the fire assembly point, a check should be carried out to ensure that nobody is missing.

19. Fire extinguishers should only be used by persons who have had appropriate training and experience in their use and when it is safe for them to do so. Persons using fire extinguishers should be aware of circumstances when the use of inappropriate extinguishers or equipment could be dangerous. This includes the use of water on electrical equipment and on materials that react with water.

20. Appropriate emergency access for trained firefighters and their equipment, and means of escape in case of fire, should be kept clear at all times.

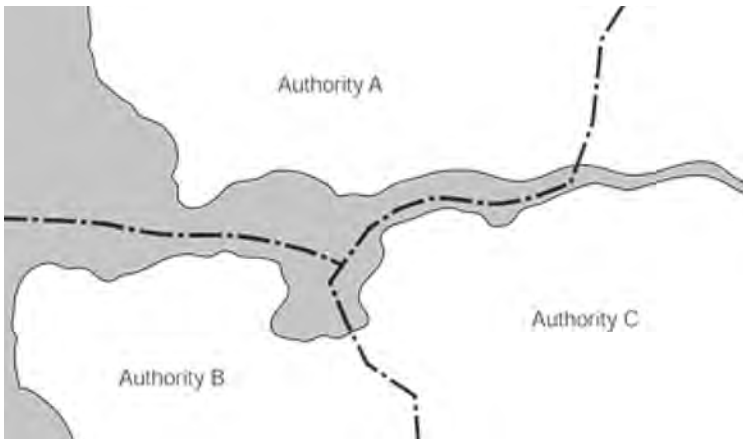
21. The dangers to workers in the event of fire demand urgent positive action following the discovery of a fire. Fire drills should be carried out at appropriate regular intervals.

22. Arrangements in the event of fire should include arrangements relating to fires on ships and the action to be taken by ships in the event of fire on shore. These should cover fires on ships anywhere within the area of responsibility of the port authority.

23. Fire precautions and emergency arrangements in the event of fire should be coordinated throughout the port area in consultation with the local fire authority. This may be under the lead of the overall port or port authority in accordance with relevant local by-laws or other legal requirements. When appropriate, specific fire precaution measures should be devised in consultation with relevant bodies and specialists.

24. Where attendance by different fire authorities may be necessary owing to the boundaries between their areas of responsibility, it is essential to ensure that no confusion can arise in the event of an incident on or near the boundary (figure 110). This is particularly likely to occur when such boundaries run along rivers.

Figure 110. Boundaries in a river or estuary



12.1.6. Cargo spillage

25. Spillage of cargo containing dangerous goods may pose a threat to persons in the immediate area. Emergency arrangements should include safe means of identifying the cargo, isolating a leak and, if necessary, rendering it harmless.

26. Hazardous spillages should only be dealt with by trained personnel. Such personnel may be from local emergency services, other specialists or portworkers appropriately trained to deal with low-level emergencies. In every case, the immediate action should be:

- evacuation of the area;
- safe removal of any casualties; and
- identification of the spillage.

27. Arrangements to deal with cargo spillages should take into account the fact that it may be necessary to deal with cargo spillages or leakage that occur on board a ship during a voyage when the ship enters the port.

28. Whenever possible, an isolated area should be set aside to which a leaking receptacle, container or vehicle can be taken. Such areas should be bunded with drain sumps connected to sealed systems or interceptors, as appropriate, to prevent contamination of the nearby waters (see also section 6.3.7).

29. Any arrangement for the disposal of spillages should take into account potential environmental hazards (see Chapter 13). Sweeping or washing residues over the edge of the quay should be prohibited.

12.1.7. Falls into water

30. By the nature of ports, falls into water are a commonplace hazard, and not all portworkers who may fall into water

may be able to swim. Means by which such persons can rapidly escape from the water or be rescued should be provided.

31. The survival of workers awaiting rescue from water will be aided by the wearing of appropriate buoyancy aids or life jackets, and by the availability of quayside ladders (see section 3.3.5) and life-saving equipment, including chains, handholds or other means to enable persons to support themselves in the water (see section 3.3.6).

32. The emergency arrangements should take into account the fact that it will not be appropriate for many workers to wear buoyancy aids or life jackets at all times. It should be recognized that buoyancy aids only provide support to conscious wearers who are able to swim and help themselves, but life jackets will support their wearers, particularly those who are unable to swim, injured, exhausted or unconscious. Buoyancy aids may be suitable in sheltered water where there are other persons in the vicinity and rescue can be expected very quickly. Such garments are lightweight and offer very little hindrance to movements. Life jackets are the most effective means, and modern designs of the self-inflating type allow them to be worn by workers undertaking manual tasks such as the mooring of ships. Life jackets should generally be worn when working afloat.

33. Speed is essential for the rescue of persons in the water, as it can prevent a fall into the water from having tragic results. Means of rescuing should, therefore, be capable of being deployed very quickly. Delay may result in workers clinging to a fixed floating object after a simple fall being affected by fright, cold water, currents and tide, and may soon make them lose consciousness and let go.

34. Suitable rescue motorized boats should be available as necessary, particularly where there is a fast-flowing current

and the work is done on board barges or other small ships away from the quay. Rescue boats should be capable of being crewed by at least one trained first-aider and mobilized rapidly. When the ship being worked is moored at a distance from the quay, the boat for rescue purposes may be the tender used to carry the workers, with at least one suitable person responsible for manning the boat in the event of an alarm. The use of powerful rubber dinghies with very small height above the water makes it possible to grasp victims and haul them on board without difficulty, and as their hull is fairly flexible there is less likelihood of it injuring the casualty if he or she is struck by it. Rescue boats with higher freeboards should preferably have recovery devices and/or stern platforms and ladders.

35. When victims have been taken out of the water, they should be warmed, their wet clothes should be taken off if possible and they should be wrapped in blankets or other suitable wrapping.

36. If a victim no longer seems to be breathing, artificial respiration should be applied by the mouth-to-mouth method or, if that is not possible, by the Holger-Nielsen method. Resuscitation may be stimulated by using a bladder to administer oxygen or by giving injections, but only appropriately qualified persons with special training should give such treatment.

12.1.8. Failure of services

37. Consideration should be given to the effect of a failure of essential services, such as electricity or communications that could affect a limited area or the entire port premises. The failure may be part of a wider emergency, such as a severe storm, or an isolated event, such as the severing of cables during construction operations.

12.1.9. Severe weather and other natural hazards

38. Ports may suffer from a variety of natural events. These include:

- high winds and severe storms;
- flooding from tsunamis, abnormal tides, river water, land water or a combination of both;
- snow and ice;
- temperature extremes;
- earthquakes; or
- volcanic eruptions.

39. Arrangements should be made with a reliable weather service to obtain warnings of adverse weather conditions in good time to enable appropriate action to be taken before the arrival of the adverse weather. The action may include:

- stopping cargo handling;
- moving and securing large cranes and other objects likely to be affected by the predicted conditions;
- deploying sandbags and other flood-protection equipment; or
- evacuation.

40. Snow and ice are likely to result in slippery surfaces for people and machines, and a film or covering of ice may develop on some cargoes, making them heavier, very slippery to walk on and difficult to handle. Particular care should be taken in such conditions, and suitable thermal clothing and good footwear with slip-resistant soles and/or slip-resistant overshoes should be provided and worn. Other precautions may include the availability of stocks of rock salt to treat roads, pathways and cargo handling areas, regular mechanical or manual sweeping of outside surfaces, and chains or studs on tyres.

41. The benefits of pre-planning should be clear, with foresight being better than hindsight.

12.1.10. Major hazard installations

42. Some ports may be major hazard installations because of the storage or other activities of specified threshold quantities of hazardous substances in the port, or be adjacent to such an installation. In such cases the relevant national legal requirements and guidance given in the ILO code of practice *Prevention of major industrial accidents* should be followed.

12.2. Emergency planning

12.2.1. General requirements

43. Emergencies should be anticipated, and arrangements for them prepared and published as an emergency plan. Guidance on emergency planning at ports is contained in the IMO's *Recommendations on the Safe Transport of Dangerous Goods and Related Activities in Port Areas*, the UNEP/IMO programme *Awareness and Preparedness for Emergencies at Local Level (APELL) for Port Areas* and the OECD's *Guidance concerning chemical safety in port areas*.

44. The port should have an overall emergency plan. In addition, each enterprise in the port should have its own emergency plan. All such plans should be compatible and harmonized with one another, and should include arrangements for alerting the port authority to emergencies in individual terminals. References to port emergency plans (section 12.2.5) below are equally applicable to ports and terminals.

45. Port emergency plans should be harmonized with national emergency plans, local community emergency plans and the plans of other enterprises such as local industrial plants or in-port-area airports.

12.2.2. Scope

46. The overall objectives of an emergency plan are to:

- contain and control emergency incidents;
- safeguard people in the port and neighbouring area; and
- reduce the effects of an incident, and minimize damage to property and the environment.

47. The plan should cover the entire port area and all activities within that area. As such, it should include, as appropriate, the harbour area within the port's limits. On the shoreside, it should cover the quayside, the ship alongside, terminal areas, roadways, locksides (where relevant), administrative buildings, supporting facilities and other premises within the port area.

48. Some ports have operational heliports or airports situated within or close to the port area. In such situations, the possibility of air emergencies should also be considered.

49. Port security access arrangements should be harmonized with emergency response services to ensure that there is no delay of access due to port facility entrance closures or controls.

12.2.3. Responsibilities

50. Prime responsibility for the emergency plan should rest with the port authority. The authority should develop and publish it in consultation with other interested organizations.

51. Within the port authority, it should be clear where the responsibility lies for developing and updating the plan. This is often with the harbour master, but may lie elsewhere.

52. Within a terminal, the owner or operator is responsible for the production of the emergency plan, but this duty usually devolves upon the terminal manager.

12.2.4. Liaison

53. There should be full and proper consultation with all interested parties during the preparation of emergency plans, including those that have their own emergency plans. Port emergency plans should take into account the possibility of an event in the port affecting neighbouring premises and an event in neighbouring premises affecting the port premises.

54. The organizations and groups to be consulted in developing the plan and in any revision of it should include, as appropriate:

- berth operators;
- port users;
- government departments;
- local communities;
- workers;
- waste disposal authorities; and
- water authorities.

12.2.5. Emergency plans

12.2.5.1. General requirements

55. The plan should be concerned with four factors, namely:

- the hazard and nature of an event and its possible extent;
- the risk and probability of its occurrence;
- the consequences and the possible effect on people and the environment; and
- the means and actions to be taken to minimize the consequences of the event.

56. An effective port emergency plan is one that clearly sets out the actions to be taken in simple terms. It should be flexible,

and capable of responding effectively to any emergency that might arise. The framework should include:

- identifying responsible persons to take control;
- provision of an emergency control centre;
- arrangements to assess the situation;
- the initiation of remedial action;
- provision for monitoring events as they develop; and
- a mechanism to determine the presence and location of all persons located in the port or port facility at the moment when an emergency arises.

57. The plan should be based on the particular circumstances of the port, including its geographical position, its cargoes, the numbers of people employed in the port, the possible presence of the public (as passengers, residents or for other reasons), and the possible proximity of schools, hospitals and housing outside the port boundary.

58. The basic plan should be concerned with overall procedure and control. It should be supplemented by more detailed plans for specific types of emergencies. Although each should follow the same overall procedures and control, the detailed planned actions will necessarily differ; for example, response to a severe high wind will be very different from the response to a major fire or explosion.

59. The plan should cover all types of emergencies that could occur in the port and include responses that are appropriate to the severity of the incident. The response should be capable of being scaled up or down as an incident progresses.

60. Simple routine responses will be appropriate for many minor emergencies. For major emergencies, a major emergency plan will be necessary.

12.2.5.2. Essential personnel

61. It is essential that the plan identify appropriate key personnel to control an emergency and assign specific responsibilities to them.

62. The two key persons are the *main controller* and the *incident controller*. The plan should specify who should undertake each role in an emergency.

63. The main controller should have overall responsibility for directing operations. This could be the port captain, harbour master or the chief of the fire services.

64. The incident controller should take charge at the scene of the incident and, in the initial stages, may also act as main controller. Consequently, the incident controller should have a comprehensive knowledge of the emergency plan and the situation within the port at any given time. This could be the operations shift manager.

65. All appointments should be formal and made in writing. The appointment should be specific by name or by position and should not be left to be determined at the time of an incident.

66. Provision should be made for:

- sickness, leave or other absence (need for deputies to be specified);
- incidents occurring at any time of the day and night on any day of the year, irrespective of whether the port is operational or not; and
- continuous cover over every work period.

67. Other groups of important personnel include those who will advise the main controller and implement his or her decisions, such as representatives of shipping companies, berth operators, port users, and specialist advisers, as well as those who

will act as marshals or runners, or undertake emergency work in other supporting roles. All should be clearly identified and able to be rapidly contacted in an emergency.

12.2.5.3. Roles

68. On being made aware of an incident that is, or could develop into, a major emergency:

- the incident controller should proceed to the scene, and assess the nature and size of the occurrence and whether it constitutes a major emergency or might do so. On deciding that there is or could be a major emergency, the incident controller should activate the major emergency plan, take charge of the area and assume the duties of the main controller until the main controller arrives and takes over; and
- the main controller should proceed to the emergency control centre, take over control and declare a formal emergency situation, if and when appropriate, and then take appropriate action depending upon the situation.

69. The main controller may call out key personnel and directly exercise operational control of parts of the port area outside the affected area, as well as: continually review and assess developments; direct such closing of berths and their evacuation as may be necessary; liaise with chief officers of the fire and police services and with the local authority; and ensure that statements are issued to the relevant authorities and the news media. A log should be kept of the entire emergency.

70. The incident controller's first steps should be to safely close down and evacuate the immediate area of the incident, and any other areas likely to be affected, and to ensure that the emergency services have been called and key personnel summoned.

71. The incident controller's main responsibility is to direct operations at the scene of the incident, and this will include rescue and firefighting operations (until taken over by the emergency services), searching for casualties and evacuation of all non-essential personnel. The incident controller should set up a communications point with radio, telephone, electronic or messenger links, as necessary, with the emergency control centre, advise and inform the emergency services as required, and brief the main controller on a regular basis.

12.2.5.4. Emergency control centre

72. An emergency control centre should be established from which the main responses to the emergency should be directed and coordinated. The main controller, key personnel and senior officers of the emergency services should be based there. The centre should be:

- located, designed and equipped to remain operational throughout an emergency;
- equipped to receive and send information and directions to and from the incident controller, other parts of the port area and areas outside it;
- equipped with a sufficient number of internal and external telephones, at least one of which should be ex-directory or outgoing only; and
- provided with detailed maps of the port area, an up to date call-out list of key personnel, the site of major hazard sites within or near the port area, and the location of relevant emergency equipment such as safety equipment, fire-water systems and fire-extinguishing materials, neutralization materials, absorbent materials and oil booms.

73. Details should be retained of external specialists, sources of specialist equipment, advice and information, and publications that might contain valuable information such as the *International Maritime Dangerous Goods Code (IMDG Code)*, its supplements the *Emergency Schedules (EmS),* the *Medical First Aid Guide (MFAG)*, or a suitable computer database. Up to date home and out-of-hours telephone numbers of all key personnel, external specialists and equipment persons should be kept in the centre.

74. Facilities should be provided for the media during an emergency. These should be separate from the emergency control centre to prevent media requests distracting those in operational control of the emergency.

12.2.5.5. Publication, exercise and review

75. The emergency plan should be published within a reasonable time of finalization, and made available to all those who are concerned with its contents and activation in an emergency.

76. Plans should also be exercised. The use of plans in live incidents can be taken as a test of the relevant part of the plan. In the absence of such incidents, it is recommended that the plan, or some part of it, should be exercised on a regular basis. The frequency should be determined in the light of local circumstances, but it is recommended that it should be no longer than three years.

77. All emergency plans should be subject to review. The use of the plan in a live incident can be used as part of a systematic review of the operation of the plan. In the absence of live incidents, the most common review period is 12 months, although this would depend on local circumstances. It is recommended that the review period should generally be no longer than three years.

12.3. Emergency equipment

78. Suitable emergency equipment should be provided for both major and more routine emergencies.

79. All ports should be equipped with first-aid boxes, complete with appropriate items, stretchers and arrangements for calling an ambulance (see section 9.3.2). The contents of the boxes should be determined by an assessment, and should be checked frequently and restocked as necessary.

80. Suitable means for assisting persons who have fallen into the water should be deployed at relevant intervals along quays and other areas where portworkers may work near water (see sections 3.3.6 and 12.1.7).

81. Suitable spillage control equipment should be provided in accordance with the emergency plan and be held so as to be readily available.

13. Other relevant matters

13.1. Environment

13.1.1. General requirements

1. Port authorities should promote sustainable development and exercise control over their activities by applying environmental protection policies to their operations.

2. This can be achieved by developing an environmental management system that will implement management and control methods that prevent or minimize damage to the environment.

3. Many of the precautions detailed elsewhere in this code of practice which are intended to prevent injury and ill health to portworkers should also be beneficial to the environment. The precautions described in this chapter are not aimed at the prevention of injury or ill health.

13.1.2. Environmental management systems

4. A suitable environmental management system should include:

- an environmental policy statement;
- suitable objectives and targets;
- allocation of environmental protection responsibilities to individual workers;
- environmental awareness training;
- environmental management practices;
- assessment of compliance and effectiveness; and
- periodical review of the environmental protection programme.

5. The policy statement should clearly state the port authority's commitment to environmental protection.

6. The objectives should include:

- identifying key environmental implications for the authority's port operations in order that managers and supervisors understand the relationship between port work and the environment;
- identifying relevant key national environmental legal requirements;
- ensuring that managers and supervisors are suitably and adequately trained to carry out their environmental responsibilities;
- ensuring that assessments of possible environmental impacts are carried out before acceptance of cargoes that might have the potential to harm the environment;
- providing guidance on environmental management practices in order to minimize the risks associated with port operations; and
- dealing properly with complaints.

7. International standard ISO 14001 *Environmental management systems – Specifications with guidance for use* gives general guidance on maintaining a satisfactory quality of environmental provision.

8. All workers involved in port operations should be given appropriate responsibility, within their normal functions, to ensure that the environmental management system is complied with and is successful.

13.1.3. Environmental aspects of port operations

9. Potential environmental concerns that may arise from port operations include:

- emissions to air;
- marine pollution;
- land contamination;
- nuisance and other local community issues, e.g. noise, dust and odours; and
- waste and its management.

To achieve the above, effective public relations should be established between the port authority, the port employers, the portworkers and the local community in order to ensure that the community is aware of issues affecting it and the port authority and/or employers and portworkers or their representatives take account of community concerns.

13.1.4. Precautions

10. Every effort should be made to eliminate, restrict, control or minimize environmental concerns. Equipment design, site layout and work systems and arrangements should be organized with such objectives in mind.

11. In particular:

- every effort should be made to prevent dust or emissions becoming airborne and spreading into the atmosphere and the surrounding neighbourhood;
- every effort should be made to avoid spillage of cargoes into the water;
- any spillage on the terminal should be cleared up quickly and safely. It should not be washed into the drains where it might pollute the water or the land;
- every effort should be made to reduce noise emissions that might disturb nearby neighbourhoods, especially during work outside normal hours; and

- consideration should be given to lighting arrangements that avoid undue glare disturbing nearby neighbourhoods.

13.2. Security

12. Port-related security issues should be addressed in accordance with the ILO/IMO code of practice *Security in ports* (2004), and, as appropriate, with the IMO's *ISPS Code, 2003 edition (International Ship and Port Facility Security Code and SOLAS Amendments, 2002)*.

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International Labour Organization

Convention

No.	Title
27	Marking of Weight (Packages Transported by Vessels) Convention, 1929
111	Discrimination (Employment and Occupation) Convention, 1958
148	Working Environment (Air Pollution, Noise and Vibration) Convention, 1977
152	Occupational Safety and Health (Dock Work) Convention, 1979
155	Occupational Safety and Health Convention, 1981 [and Protocol, 2002]
161	Occupational Health Services Convention, 1985
170	Chemicals Convention, 1990
174	Prevention of Major Industrial Accidents Convention, 1993
187	Promotional Framework for Occupational Safety and Health Convention, 2006

Recommendation

No.	Title
156	Working Environment (Air Pollution, Noise and Vibration) Recommendation, 1977
160	Occupational Safety and Health (Dock Work) Recommendation, 1979

164 Occupational Safety and Health Recommendation, 1981

171 Occupational Health Services Recommendation, 1985

177 Chemicals Recommendation, 1990

181 Prevention of Major Industrial Accidents Recommendation, 1993

197 Promotional Framework for Occupational Safety and Health Recommendation, 2006

200 HIV and AIDS Recommendation, 2010

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No.	Title
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ISO 830	*Freight containers – Vocabulary*
ISO 1496	*Series 1 freight containers – Specification and testing*
ISO 2415	*Forged shackles for general lifting purposes – Dee shackles and bow shackles*
ISO 2867	*Earth-moving machinery – Access systems*
ISO 3874	*Series 1 freight containers – Handling and securing*
ISO 4301	*Cranes – Classifications, 1–5*
ISO 4308	*Cranes and lifting appliances – Section of wire ropes*

ISO 4309	*Cranes – Wire ropes – Code of practice for examination and discard*
ISO 4310	*Cranes – Test code and procedures*
ISO 7752	*Lifting appliances – Controls – Layout and characteristics*
ISO 8087	*Mobile cranes – Drum and sheave sizes*
ISO 8566	*Cranes – Cabins*
ISO 9926	*Cranes – Training of drivers*
ISO 10245	*Cranes – Limiting and indicating devices*
ISO 12480	*Cranes – Safe use – Part 1: General*
ISO 14001	*Environmental management systems – Specifications with guidance for use*
ISO 14122-4	*Safety of machinery – Permanent means of access to machinery – Part 4: Fixed ladders*
ISO 14829	*Freight containers – Straddle carriers for freight container handling – Calculation of stability*
ISO 15513	*Cranes – Competency requirements for crane drivers (operators), slingers, signallers and assessors*
ISO 15871	*Industrial Trucks – Specifications for indicator lights for container handling and grappler arm operations*

International Maritime Organization

Conventions

International Convention for the Safety of Life at Sea (SOLAS), 1974

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Safe Handling of Forest Products Safety, International Safety Panel Briefing Pamphlet 23.

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IAPH/ICS/OCIMF: *International safety guide for chemical tankers and terminals* (fifth edition, 2006; CD-ROM).

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Relevant web sites

ILO	www.ilo.org
IMO	www.imo.org
United Nations	www.un.org
UNEP	www.unep.org
IAPH	www.iaphworldports.org
ITF	http://www.itfglobal.org
ICHCA International Ltd.	www.ichca.com
ICS and ISF	www.marisec.org
ISO	www.iso.org
OCIMF	www.ocimf.com
OECD	www.oecd.org
Nautical Institute	www.nautinst.org
SIGTTO	www.sigtto.org

Appendix A

Testing of lifting appliances

A.1. General provisions

A.1.1. Every lifting appliance should be tested in accordance with the provisions of Appendix D, section D.1:

- before being taken into use for the first time;
- at least once in every period of five years if it is a lifting appliance on a ship; and
- after the renewal or repair of any stress-bearing part.

A.1.2. Testing of the complete appliance is not necessary when a part is renewed or repaired, and the part is separately subjected to the same stress to which it would have been subjected if it had been tested in situ during the testing of the complete appliance.

A.1.3. Every test should be carried out:

- by a competent person;
- in daylight, provided that the latitude of the place of testing so allows; otherwise, adequate lighting should be provided;
- at a time when the wind force and/or gusting does not exceed the wind force/gusting limits for which the lifting appliance was designed; and
- after all prudent precautions have been taken to ensure the safety of all persons carrying out the testing and others who may be in the vicinity at the time of the test.

A.2. Precautions before testing

A.2.1. If the stability of a ship is liable to be endangered by the test unless certain precautions, such as proper ballasting, are taken, the competent person should give notice to the master or person in charge of the ship of the date and time of the test, the amount of test load to be applied and the maximum outreach of the lifting appliance over the side of the ship. The competent person should not undertake or witness the test unless written confirmation from the master or person in charge has been received, indicating that the stability of the ship will not be endangered by the test and that the ship's deck and hatch covers are sufficiently strong to support the weight of the test load.

A.2.2. In the case of a gantry crane able to move on tracks along the deck, proper measures should be taken to ensure that movement of the crane along the track with the test load suspended can be safely controlled.

A.2.3. All temporary guys or stays for the mast or Samson posts and, where applicable, special load-slewing guys should be rigged.

A.3. Test weights

A.3.1. The weights used for making up a test load should be suitable for the purpose and be of verified weight.

A.3.2. All cast weights and, where practicable, other weights should be weighed on a machine of certified accuracy. If weighing is not practicable, the weight should be determined by calculation, the calculations retained and a copy appended to the test certificate, when issued.

A.3.3. The weight of the test load (including the weight of its lifting gear) should not be less than the figure determined from Appendix D and should not exceed it by more than 2.5 per cent.

A.4. Derricks and derrick cranes

A.4.1. All tests, except tests following the repair or renewal of a part, should be carried out by means of test weights. Tests following the repair or renewal of a part may use a spring or hydraulic weighing machine, suitably and safely anchored, provided that this may be so rigged that the part is subjected to the calculated stress to which it would be subjected if the derrick were tested by means of dead weights. When a spring or hydraulic weighing machine is used, it should be accurate to within ±2.5 per cent and the tension should be applied for a sufficiently long period to ensure that the machine's indicator remains constant for not less than five minutes.

A.4.2. A derrick should be tested with the boom at its maximum outreach corresponding to its lowest inclination to the horizontal marked upon it or to be marked upon it in accordance with section 4.3.1, paragraph 106:

- in the two extreme positions of the slewing range; and
- in the midship position.

A.4.3. In the case of a derrick, the boom and test load should be raised by the derrick's own winches with the boom in one of the positions indicated in paragraph A.4.2. It should be raised by the span winch or winches as high as possible in order that as many rope layers as possible may be reeled on the winch drum.

A.4.4. In each of the three positions indicated in paragraph A.4.2, the safe working load should be lowered at the normal lowering speed of the derrick for a distance of approximately 3 m and then braked sharply.

A.4.5. It should be demonstrated that the test load can be held stationary when the winch drive is switched off.

A.4.6. During the test it should be ascertained that, in all positions of the derrick, all parts are free to take up their appropriate positions and all ropes are running freely and are reeling up properly on the winch drums.

A.4.7. Where a derrick is designed to be used in union purchase:

- it should be tested in union purchase with its associated derrick and rigged in accordance with the ship's rigging plan. The test load should be manoeuvred throughout the working range of the union purchase and raised to such a height that the angle between the two hoist ropes is as near as possible to 120° at some position of the working range; and
- the test should be repeated with derricks rigged over the opposite side of the ship.

A.4.8. Where the derrick is fitted with a span gear winch, the winch should be tested with the derrick it serves and each sprocket should be subjected to load.

A.4.9. Upon completion of tests with the test load, each winch should be tested with its safe working load suspended and the derrick placed in various positions, such that each winch serving the derrick is subjected to loading while having the maximum working length of rope layered on its drum.

A.5. Cranes

A.5.1. Test weights only should be employed.

A.5.2. Before any test is carried out, it should be ascertained, from the manufacturer's rating or known design limitations, that the crane has been designed to withstand the impositions of the test load not only as regards its structural strength but also its stability, where this is appropriate.

A.5.3. It should be ascertained – not merely assumed – that, where appropriate, the crane is properly ballasted or counterbalanced.

A.5.4. Only an experienced competent operator should be employed during the test.

A.5.5. A mobile crane should be on level ground that is sufficiently firm to ensure that indentation or subsidence does not take place. Its outriggers (if provided) should be properly deployed and, where necessary, should be resting on timber or similar supports.

A.5.6. Tracks and rails should be checked for soundness.

A.5.7. Tyre pressures (where applicable) should be correct.

A.5.8. The safe working load limiter (section 4.1.6, paragraph 28) should be disconnected if it is of a type liable to be damaged by the test loading.

A.5.9. When a crane is tested in the "free on wheels" condition, the axle springs or shock absorbers should be chocked or locked.

A.5.10. The radius at which the test load should be applied should be measured in accordance with section 4.1.4, paragraph 16.

A.5.11. In every case, the test load should be raised sufficiently to subject every tooth in the gear wheels to loading.

A.5.12. A test load should not be deposited upon soft muddy ground, as the momentary extra resistance caused by suction between the load and the ground may be a source of danger when the load is lifted again.

A.5.13. Where a crane is secured to the structure of a building, the test should not be carried out until the owner of the building has confirmed in writing that the structure is

sufficiently strong to withstand the extra strain imposed on it during the test.

A.5.14. When gantry cranes, transporters and similar lifting appliances are tested, the crane should be positioned approximately midway between any two adjacent gantry track supports. The test load should be lifted just clear of the ground and slowly traversed from one end of the bridge span to the other. In the case of a transporter, the crab or trolley supporting the test load should be slowly traversed along the entire length of the track. In the case of a gantry crane on board ship, the test load should be slowly traversed along the entire length of the track with the test load as far as possible on one side, and then again with the test load as far as possible on the other side.

A.5.15. When a mobile crane is tested, no overload test should be carried out before it has been ascertained that the crane has a sufficient margin of stability. A stability test on the crane should have been carried out by the manufacturer or, in the case of a series produced crane, on the prototype model of that crane.

A.5.16. When any other crane is tested, such as a derrick crane that has a rigid back-stay anchored to the ground or is ballasted, an anchoring or ballast test should be carried out if the safety of the anchoring or ballasting is in doubt. The amount of test load and the manner of its application should be indicated by the manufacturer or determined by a competent person. The load should be applied with the jib or boom in a position where:

- the maximum pull on the anchorage or ballasting is achieved; or
- a reduced load at an increased radius gives an equivalent pull.

A.5.17. When a crane has a jib or boom of variable length, the test indicated in paragraph A.5.16 should be conducted with

the jib or boom at its maximum length, at its minimum length, and at a length approximately midway between the maximum and minimum lengths.

A.5.18. When a boom is fitted with a fly jib or provided with more than one fly jib of different lengths, the test should be conducted on the shortest jib in combination with the main boom length that gives the greatest rated load on the fly jib. The test should also be conducted on the longest fly jib in combination with the main boom length that gives the greatest rated load on the fly jib. A further test should be conducted on the longest possible combination of main and fly jibs. Before these tests are carried out, the manufacturer's table of safe working loads for all combinations of boom length and fly jib or jibs should be made available to the competent person conducting the tests. The tests should be carried out at the position of least stability as defined by the manufacturer.

A.5.19. Where the safe working load of a crane varies according to whether it is used with stabilizing spreaders or "free on wheels", the above tests, as appropriate, should be carried out for each condition.

A.5.20. After the load test, the crane should be put through all its motions at their maximum rated speeds with the safe working load suspended, except that if the crane can freely slew through 360°, slewing should be restricted to not more than two complete turns from start to stop. All brakes should be tested.

A.5.21. Tests should also be carried out with the jib or boom at such an angle of rotation and elevation as to create the conditions of least stability as defined by the manufacturer or a competent person.

A.5.22. After the overload test, the automatic safe load indicator should be reconnected and tested by progressively

applying a load to the crane until the visual and audible warnings operate. The load should be lowered to the ground on each occasion that an increment of load is applied, and then hoisted. If this is not done, the hysteresis effect in the crane's structure may result in unreliable readings.

A.5.23. All limit switches should be tested to ascertain that they are functioning correctly.

A.5.24. Upon completion of the test, the lifting appliance should be thoroughly examined by a competent person in accordance with Appendix C.

Appendix B

Testing of loose gear

B.1. General provisions

B.1.1 Every item of loose gear, other than a cargo block, should be tested in accordance with the provisions of Appendix D, section D.3.

B.1.2. Every cargo block should be tested in accordance with the provisions of Appendix D, section D.2.

B.1.3. Every item of loose gear, including cargo blocks, lifting beams and lifting frames, should be tested:

- before it is taken into service for the first time; and
- after any renewal or repair of a stress-bearing part.

B.2. Physical testing equipment

B.2.1. Recording test equipment used in carrying out overload proof tests, either of assembled units or of loose gear components, should have been tested for accuracy by a competent person at least once during the 12 months preceding the test.

B.2.2. Tests should be performed with equipment that meets the standards set by the national authority, or any appropriate standard that has been verified as meeting the requirements of a national authority or other standard.

B.2.3. Machine errors should be taken into account in conducting tests.

B.2.4. A copy of relevant test reports of the testing machine should be displayed.

B.2.5. The characteristics and capacity of the recording test equipment used should be suitable for the proof tests performed.

B.2.6. Where the safe working load of the loose gear is so high or is of such a size that a testing machine is not available for applying the proof test load, or where it is not practicable to do so, the test may be carried out by suspending the gear from a suitable structure or lifting appliance and applying test weights. The weights should comply with the requirements of Appendix A, section A.3.

B.2.7. The test load on a suspended beam or frame should be applied in such a way that it will impose the maximum stress in the beam or frame. All fittings such as hooks, rings and chains should be tested independently before being fitted to the beam.

B.2.8. A pulley block should, whenever possible, be tested with its sheaves reeved, the end of the rope being properly anchored to the becket of the block. Where this is not practicable, the becket should be tested independently.

B.2.9. Slings with crate clamps, barrel hooks, plate clamps or other similar devices should be tested as nearly as possible in the manner in which they are used, i.e. at the angle at which the clamp or other device is designed to be used. The clamp or other device should be applied to a baulk of timber or special steel jig such that its holding or gripping strength is tested.

B.2.10. Upon completion of the test, the loose gear should be thoroughly examined by a competent person in accordance with Appendix C.

Appendix C

Thorough examination of lifting appliances and loose gear

C.1. General provisions

C.1.1. Where the competent person considers it necessary, parts of the lifting appliance or loose gear should be dismantled by a skilled person to the extent required by the competent person.

C.1.2. In the case of ship's gear, the examination should include associated ship's fittings such as deck eyes, mast bands, temporary stays and cleats.

C.1.3. In the case of ships' cranes, the examination should include the means of connecting the crane to the ships' superstructure.

C.1.4. Where the competent person considers it necessary, any parts of a lifting appliance or loose gear that may be dismantled reasonably readily should be so dismantled.

C.1.5. No lifting appliance should be used unless it has been thoroughly examined:

- after every test carried out in accordance with Appendix A, paragraph A.1.1; and
- at least once during the preceding 12 months.

C.1.6. Where the crane is fitted with a slewing ring, it should be checked for wear at every thorough examination or survey and at shorter intervals if recommended by the manufacturer. For cranes where the wear is approaching the maximum permitted, consideration should be given to more frequent checks.

C.1.7. Where the crane is secured to the ship's superstructure by holding down bolts, at each thorough examination or survey, the torque in the bolts should be checked against that specified by the manufacturer. Any bolts found to be under the required torque should be removed and examined before being refitted to the correct torque. In addition, at each thorough examination or survey a representative sample of bolts should be removed for examination. At least one sample should be taken from each of the four quadrants of the structure and their position recorded. At subsequent thorough examinations, other bolts should be selected so that, over time, all bolts are examined.

C.1.8. No loose gear should be used unless it has been thoroughly examined:

- after every test carried out in accordance with Appendix B, section B.1; and
- after placing in service, at least once during the preceding 12 months.

C.1.9. Every part of a lifting appliance or gear specified by the competent person should be properly cleaned and prepared before the examination.

Appendix D

Test loading

D.1 Lifting appliances

The test load applied to a lifting appliance should be as follows:

Safe working load (SWL) of the appliance (tonnes)	Test load (tonnes)
Up to 20	25 per cent greater than SWL
21–50	5 tonnes greater than SWL
51 and above	10 per cent greater than SWL

D.2. Cargo or pulley blocks

The test load applied to a cargo or pulley block should be as follows:

SWL (tonnes)	Test load (tonnes)
Single-sheave block: All safe working loads	4 x SWL
Multi-sheave block:	
Up to 25	2 x SWL
26–160	(0.933 x SWL) + 27
161 and above	1.1 x SWL

D.3. Loose gear

The test load applied to an item of loose gear should be as follows:

SWL (of the loose gear) (tonnes)	Test load (tonnes)
Chain, hook, shackle, ring, link, clamp and similar gear:	
Up to 25	2 x SWL
26 and above	(1.22 x SWL) + 20

SWL (of the loose gear) (tonnes)	Test load (tonnes)
Lifting beam, lifting frame and similar gear:	
Up to 10	2 x SWL
11–160	(1.04 x SWL) + 9.6
161 and above	1.1 x SWL

Appendix E

Factor of safety (coefficient of utilization)

E.1. Wire rope [1]

E.1.1. For a wire rope used in the construction of a sling or forming part of a derrick, derrick crane or crane on board ship, the factor of safety should be:

- in the case of a wire rope forming part of a sling:

Safe working load of the sling (SWL)[2]	Factor
Up to and including 10 tonnes	5
Over 10 tonnes up to and including 160 tonnes	$\frac{10\,000}{(8.85 \times \text{SWL}) + 1{,}910}$
Over 160 tonnes	3

- in the case of a wire rope forming an integral part of a derrick, etc.

Safe working load of the derrick, derrick crane, etc. (SWL)	Factor
Up to and including 160 tonnes	$\frac{10\,000}{(8.85 \times \text{SWL}) + 1{,}910}$
Over 160 tonnes	3

[1] See Chapter 4, section 4.4.3, in particular para. 188.

[2] In the case of multi-legged slings, this is the safe working load of the complete sling.

E.1.2. For a wire rope forming part of a crane other than on board ship, the factor of safety should be:

- calculated according to the first formula in paragraph E.1.1; and
- as given in a recognized national or international standard to which the appliance has been designed and constructed.

E.2. Fibre rope

E.2.1. For cable or hawser-laid synthetic or natural fibre ropes and slings, the factor of safety should be a minimum of 6. For most cargo-handling uses it is recommended that 8 be used.

E.3. Woven webbing slings

E.3.1. For synthetic woven webbing slings, the factor of safety should be a minimum of 6.

E.4. General requirements

E.4.1. The factors of safety in E.1, E.2 and E.3 should be adopted unless other requirements are laid down in a recognized national or international standard.

Appendix F

Steel quality grade mark

F.1. The quality grade mark to be placed on any steel component of loose gear in accordance with section 4.2.6, paragraph 87, should be as follows:

Quality grade mark	Grade of steel	Mean stress (N/mm²)
L	Mild	300
M	Higher tensile	400
P	Alloy	500
S	Alloy	630
T	Alloy	800

F.2. The third column of the table above relates to the mean stress in a piece of chain made up in accordance with the appropriate ISO standard for the material at the breaking load specified in the standard.

Appendix G

Heat treatment of wrought iron

G.1. General provisions

G.1.1. Heat treatment of wrought-iron gear should consist of heating the gear uniformly in a suitably constructed muffle furnace until the whole of the metal has attained a temperature between 600˚C (1,100˚F) and 650˚C (1,200˚F), then withdrawing the gear from the furnace and allowing it to cool uniformly.

G.1.2. If the past history of wrought-iron gear is not known, or if it is suspected that the gear has been heat-treated at an incorrect temperature, before putting it to work it should be given normalizing treatment (950˚–1,000˚C or 1,750˚–1,830˚F) followed by uniform cooling. Precautions should be taken during the heat treatment to prevent excessive scaling.

G.1.3. Sling assemblies should be made of materials having similar properties.

G.1.4. However, if the assembly has some components of wrought iron and others of mild steel (e.g. mild-steel hooks permanently connected to wrought-iron chains), it should be normalized at a temperature between 920˚ and 950˚C (1,700˚ and 1,750˚F), removed from the furnace and cooled uniformly.

Appendix H

Marking of single-sheave blocks

H.1. General provisions

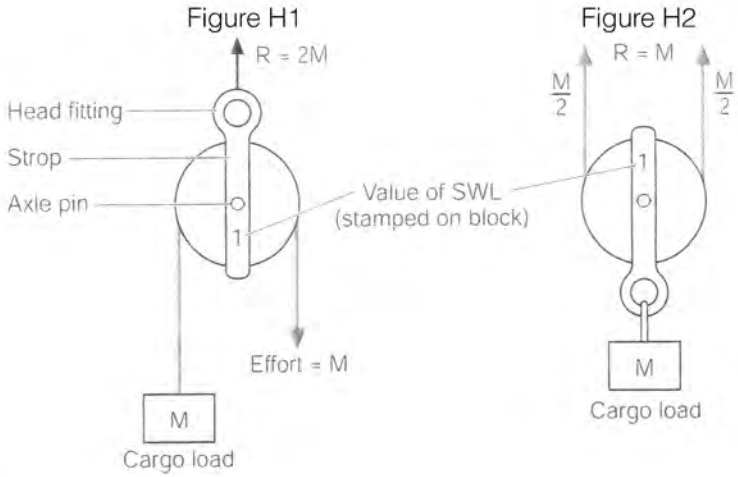
H.1.1. The safe working load (SWL) of a single-sheave block in a derrick rig should be marked in accordance with the following indications. For the sake of simplicity, the effect of friction and rope stiffness (i.e. the effort required to bend the rope round the sheave) has been ignored. In practice, the assessment of the SWL of the block, as in paragraph H.2.2, ignores friction and rope stiffness. These factors should nevertheless be taken into account when determining the resultant force on the head fittings of the heel blocks, span gear blocks and other equipment. This is the responsibility of the competent person who prepares the ship's rigging plan.

H.2. Method

H.2.1. A single-sheave block may be rigged at various positions in the derrick rig, for example in the span gear, upper and lower cargo blocks or heel blocks, and may be used with or without a becket.

H.2.2. The SWL of a single-sheave block is always assessed in accordance with one fundamental condition of loading, i.e. where the block is suspended by its head fitting and the dead weight or cargo load is attached to a wire rope passing round the sheave in such a way that the hauling part is parallel to the part to which the load is attached (figure H1). *The SWL marked on the block is the dead weight (*M *tonnes) that can be safely lifted by the block when rigged in this way.*

Figure H (1, 2). Safe working loads of single-sheave blocks



H.2.3. When the block is rigged as in paragraph H.2.2, the resultant force on the head fitting is twice the SWL marked on the block, i.e. 2*M* tonnes. The block manufacturer should design the block in such a way that the head fitting, axle pin and strop are capable of safely withstanding the resultant force of 2*M* tonnes. Consequently, a proof load of twice the designed SWL, i.e. 4*M* tonnes, should be applied to the block.

H.2.4. When the block is rigged as a lower cargo block, i.e. when the dead weight or cargo load is secured directly to the head fitting (the block therefore being upside down) instead of to the rope passing round the sheave (figure H2), the SWL marked on the block is unchanged. The resultant force or load now acting on the head fitting is only *M* tonnes. However, as the block has been designed to safely withstand a resultant force on the head fitting of 2*M* tonnes, it follows that the block is safe

to lift a dead weight or cargo load of 2*M* tonnes which gives the same stress in the block as when it is rigged as in figure H1. However, national regulations normally prohibit the use of a lifting device to lift a load in excess of the SWL marked on it, and in all but this particular case this is the correct procedure. In this particular case, and only in this case, the regulations should allow that a single-sheave block may lift twice the SWL marked on it when rigged as in figure H2 only.

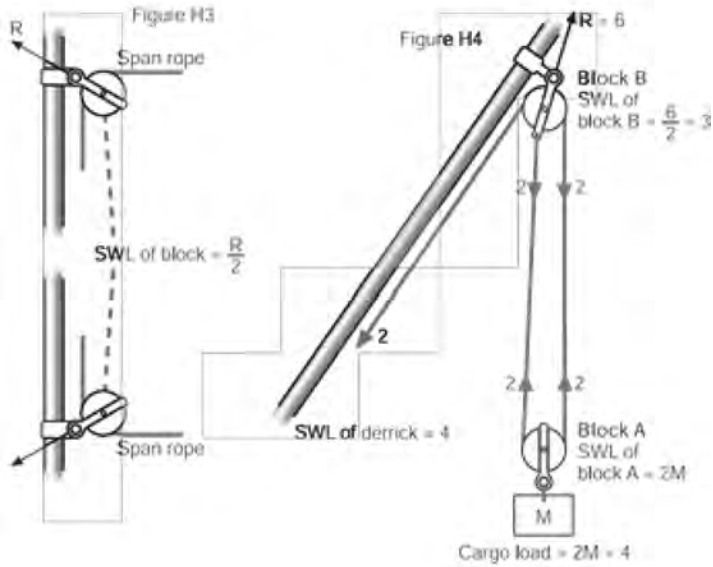
H.2.5. When a suitable size of single-sheave block is to be selected for use elsewhere in the rig (for example, in a masthead span block or a derrick heel block), the maximum resultant force on the head fitting arising from the tension in the span rope should first be determined (figure H3). This force can be obtained from the rigging plan (see section 4.3.1, paragraph 99). The value of this resultant force varies according to the angle of the derrick boom to the horizontal, so that the rigging plan should show the maximum value. If this resultant force is represented by *R* tonnes, the correct block to be used at this position would be marked with an SWL equal to one-half of the resultant force (i.e. *R*/2 tonnes). However, it is extremely important to note that the shackle and link used to attach this block to the mast eye *should have and be marked with an SWL equal to* R *tonnes*. This applies to all shackles and links used for connecting blocks elsewhere in the derrick rig.

H.2.6. In the case of the rig shown in figure H4 (sometimes termed the "gun-tackle rig"), actual figures will serve best to explain the principle of application. Suppose the derrick is marked "SWL 4 tonnes", which is the dead weight or cargo load that can be safely handled by the derrick as a whole. It follows from paragraph H.2.4 that the lower cargo block A will be marked with a SWL of 2 tonnes, but is permitted to support a cargo load of 4 tonnes. The upper block B will have a resultant

force on its head fitting of 6 tonnes (however, see paragraph H.1.1), so that the SWL of the block selected for fitting here would be $R/2$ (i.e. 6/2 or 3 tonnes). For the purpose of these examples, the fact that all the wires are not parallel has been ignored, although in practice this would not be so and the true resultant would be shown on the rigging plan.

H.2.7. Another common single-sheave block rig is shown in figure H5. The lower cargo block A would, as before, have a SWL of 2 tonnes marked on it, since this is another case

Figure H (3, 4, 5, 6). Safe working loads of single-sheave blocks



where the load is directly attached to the head of the block, thus making it subject to the dispensation allowed under paragraph H.2.4, i.e. a cargo load of 4 tonnes could be lifted. The block in position B would, as explained in paragraph H.2.5, be one having a SWL of one-half the resultant force *R* marked on it.

H.2.8. The rig shown in figure H6 incorporates a single-sheave block (A) fitted with a becket. The upper block will in this case be a multi-sheave block and should therefore be dealt with in accordance with section 4.4.5, paragraph 240. The cargo load is attached directly to the lower block and the dispensation allowed under paragraph H.2.4 applies to it, i.e. it is stamped *M* tonnes but can lift 2*M* tonnes. The only effect of the becket as far as the lower single-sheave block is concerned is to reduce the tension in the wire rope from *M* to 2*M*/3 tonnes (i.e. from 2 to $1^1/_3$ tonnes). If this were a permanent rig, a smaller size of rope would clearly be used.

H.2.9. The SWL of a single-sheave block fitted with a becket is assessed in the same way as other single-sheave blocks, i.e. according to paragraph H.2.2.

Figure H5, H6

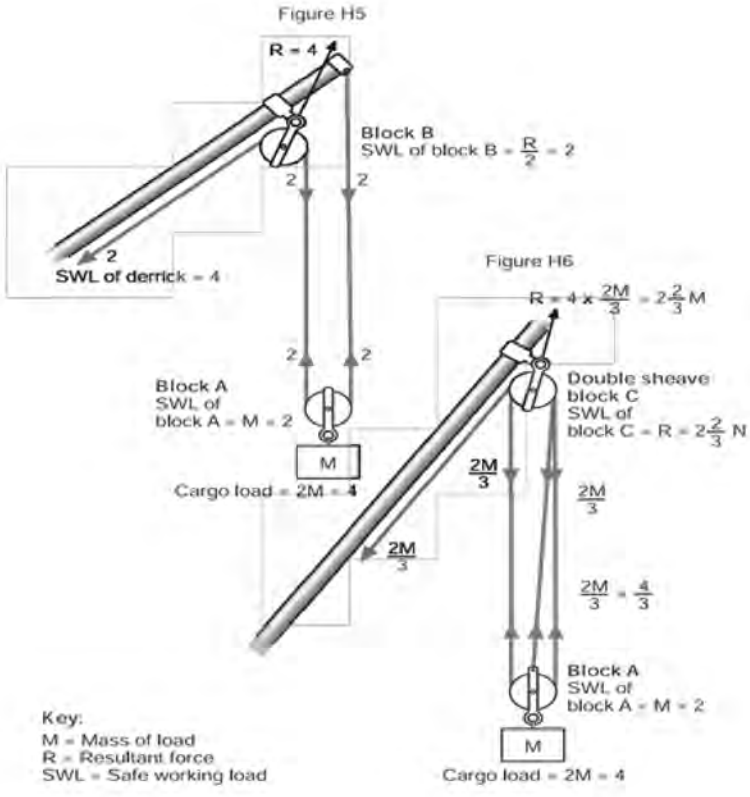


Figure H5
R = 4
Block B
SWL of block B = R/2 = 2
2
2
2
SWL of derrick = 4
2
2
Block A
SWL of
block A = M = 2
M
Cargo load = 2M = 4
Figure H6
R = 4 x 2M/3 = 2 2/3 M
Double sheave
block C
SWL of
block C = R = 2 2/3 N
2M/3
2M/3
2M/3
2M/3 = 4/3
Block A
SWL of
block A = M = 2
M
Cargo load = 2M = 4
Key:
M = Mass of load
R = Resultant force
SWL = Safe working load

Appendix I

Sample sexual harassment policy

I.1. Company X prohibits sexual harassment of its employees and applicants for employment by any employee, non-employee or applicant. Such conduct may result in disciplinary action up to and including dismissal.

I.2. This policy covers all employees. The company will not tolerate, condone or allow sexual harassment, whether engaged in by fellow employees, supervisors, or other non-employees who conduct business with the company.

I.3. Sexual harassment is any behaviour that includes unwelcome sexual advances and other verbal or physical conduct of a sexual nature when:

- submission to, or rejection of, such conduct is used as the basis for promotions or other employment decisions;
- the conduct unreasonably interferes with an individual's job performance or creates an intimidating, hostile or offensive work environment.

Company X employees are entitled to work in an environment free from sexual harassment and a hostile or offensive working environment. We recognize sexual harassment as unlawful discrimination, as is conduct that belittles or demeans any individual on the basis of race, religion, national origin, sexual preference, age, disability, or other similar characteristics or circumstances.

No manager or supervisor should threaten or imply that an employee's refusal to submit to sexual advances will adversely affect that person's employment, compensation, advancement,

assigned duties, or any other term or condition of employment or career development. Sexual joking, lewd pictures and any conduct that tends to make employees of one gender "sex objects" are prohibited.

I.4. Employees who have complaints of sexual harassment should (and are encouraged to) report such complaints to their supervisor. If this person is the cause of the offending conduct, the employee may report this matter directly to [specify various officials (e.g. director of human resources, designated contact manager, etc.)]. Your complaint will be promptly and thoroughly investigated. Confidentiality of reports and investigations of sexual harassment will be maintained to the greatest extent possible.

I.5. Any manager, supervisor or employee who, after appropriate investigation, is found to have engaged in sexual harassment of another employee will be subject to disciplinary action, up to and including dismissal.

I.6. If any party directly involved in a sexual harassment investigation is dissatisfied with the outcome or resolution, that individual has the right to appeal the decision. The dissatisfied party should submit his or her written comments to [specify official (e.g. gender committee, contact manager)].

I.7. The company will not in any way retaliate against any individual who makes a report of sexual harassment nor permit any employee to do so. Retaliation is a serious violation of this sexual harassment policy and should be reported immediately. Any person found to have retaliated against another individual for reporting sexual harassment will be subject to appropriate disciplinary action, up to and including dismissal.

Source: This guidance was developed by the Ethical Trading Initiative in consultation with its tripartite membership. It is extracted from a training manual for supervisors and managers which aims to assist employers and unions in tackling sexual harassment in agriculture.

Appendix J

J.1. HIV and AIDS and the world of work

J.1.1. General principles enumerated in the HIV and AIDS Recommendation, 2010 (No. 200)

J.1.1.1. Recognition of HIV and AIDS as a workplace issue

The response to HIV and AIDS should be recognized and treated as a workplace issue and should be recognized as contributing to the realization of human rights, fundamental freedoms and gender equality for all workers, their families and dependants.

J.1.1.2. Scope of application

Recommendation No. 200 applies to all workers working under all forms or arrangements, and at all workplaces, including persons in any employment or occupation; those in training, including interns and apprentices; volunteers; jobseekers and job applicants; and laid-off and suspended workers. It also applies to all sectors of economic activity, including the private and public sectors and the formal and informal economies; and armed forces and uniformed services.

J.1.1.3. Non-discrimination

There should be no discrimination or stigmatization of workers for employment purposes on the basis of real or perceived HIV status, or for belonging to regions of the world or segments of the population perceived to be at greater risk or more vulnerable to HIV infection, including sexual orientation.

There should be no discrimination for accessing employment opportunities. There should be no mandatory HIV testing or screening or disclosure of HIV status. A medical

examination should only establish the fitness to carry out the work in question.

There should be no discrimination during the employment relationship. All workers should enjoy equal access to terms and conditions of employment, including equal access to employment-related benefits for accessing training, promotion and for accessing social security schemes and occupational insurance schemes, or in relation to benefits under such schemes, including for health care and disability, and death and survivors' benefits.

Actions taken in and through the world of work should prevent and prohibit violence and harassment in the workplace.

Real or perceived HIV status should not be a cause for termination of the employment relationship. Temporary absences of workers living with HIV due to being ill or providing caregiving duties should be treated as absences for other health reasons, taking into account the Termination of Employment Convention, 1982 (No. 158).

Workers living with HIV-related illnesses should not be denied the possibility of continuing to carry out their work, with reasonable accommodation if necessary, for as long as they are medically fit to do so. Measures to redeploy such workers to work reasonably adapted to their abilities, to find other work through training or to facilitate their return to work should be encouraged.

J.1.1.4. Gender equality

Even though HIV affects both men and women, women and girls are at greater risk and more vulnerable to HIV infection and are disproportionately affected by the HIV pandemic compared to men as a result of gender inequality. Women's empowerment is therefore a key factor in the response to HIV. Therefore all actions in and through the world of work should

contribute to gender equality for all women and men and promote their active participation, including their empowerment.

J.1.1.5. Privacy and confidentiality

All workers, their families and dependants should enjoy the protection of their privacy, including keeping all HIV-related information confidential. Access to HIV-related information should be governed by rules of confidentiality consistent with the ILO code of practice, *Protection of workers' personal data*, 1997, and other relevant international data protection standards.

J.1.1.6. A safe and healthy working environment

The working environment should be safe and healthy for all workers in order to prevent HIV transmission. Occupational health services and workplace mechanisms related to occupational safety and health should address HIV and tuberculosis. Prevention measures should include the modes of HIV transmission and how to protect yourself from transmission, including universal precaution, accident and hazard prevention measures, etc.

Workers with an occupational risk of HIV transmission should be provided with specific training, personal protective equipment and post-exposure prophylaxis. When occupational transmission of HIV has occurred and a direct link can be established between the occupation and HIV transmission, it should be recognized as an occupational disease or accident, in accordance with national procedures and definitions and a reference to the List of Occupational Diseases Recommendation, 2002 (No. 194).

J.1.1.7. Social dialogue

All actions taken on HIV in and through the world of work should be based on cooperation and trust among employers and

workers and their representatives, and governments, with the active involvement of workers living with HIV.

J.1.1.8. Prevention of new HIV infections is a fundamental priority

It is a fundamental priority to prevent new HIV infections in all actions taken in and through the world of work. Prevention information should include the modes of HIV transmission and encourage confidential voluntary HIV testing (VCT) with pre- and post-counselling. It should be adapted to national conditions, the type of workplace and take into account gender, cultural, social and economic concerns. All prevention measures should be accurate, up to date, relevant and timely and be made available and accessible in a culturally sensitive format and language through the different channels of communication available. They should aim to help men and women to understand and reduce the risk of all modes of HIV transmission and understand the importance of changing risk behaviours related to infection. Prevention measures should include access to all means of prevention, including availability of male and female condoms.

Prevention measures should also promote the protection of sexual and reproductive health and rights of men and women.

All awareness-raising activities should emphasize that HIV is not transmitted by casual contact and a person living with HIV should not be considered a workplace hazard.

J.1.1.9. Access to treatment, care and support measures

All workplace health interventions should be linked to public health services. All workers, their families and dependants should be entitled to health services and should benefit from full access to health care. This should include access to free or affordable voluntary counselling and HIV testing;

antiretroviral treatment with adherence education, information and support; proper nutrition consistent with treatment; treatment for opportunistic infections, sexually transmitted infections and other HIV-related illness, including tuberculosis; and support and prevention programmes for persons living with HIV, including psychosocial support.

J.1.1.10. Dispute resolution procedures for alleged violation of the rights enumerated in Recommendation No. 200

When existing measures against employment-related discrimination in the workplace are inadequate for providing effective protection, these should either be adapted or new ones be put in place to ensure an effective and transparent implementation.

An easily accessible dispute resolution procedure should be made available for any alleged violation of the prohibition to request mandatory HIV testing or screening and any breach of confidentiality of HIV-related information.

Safety and health in ports

Despite new and sophisticated innovations, port work is still regarded as an occupation with very high accident rates. Every port, in light of its specific circumstances, needs to develop working practices that safeguard the safety and health of portworkers. This code of practice revises the ILO code of practice *Safety and health in ports* (2005), and provides advice and assistance to all those charged with the management, operation, maintenance and development of ports, and the safety of portworkers.

The revised code, adopted in November 2016 by a meeting of experts drawing upon the knowledge and experience of governments, employers, workers and other participants, builds on the earlier versions. In doing so, it addresses safety and health hazards that have emerged in the past decade, issues related to automated port operations, and, in recognition of the increased participation of women in the port workforce, sexual harassment and the provision of workplace facilities for both men and women.

The code contains many technical illustrations and examples of good practice, covering all aspects of port operations. It will be a valuable tool for all who are seeking to improve safety and health in the port sector, to reduce costs associated with occupational injuries and diseases, and to help ensure that all portworkers benefit from decent work.

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