ICHCA International Limited

INTERNATIONAL SAFETY PANEL
SAFETY BRIEFING PAMPHLET SERIES #34

Container Top Safety

by

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Other titles in many of the series are in preparation

This publication is one of a series developed by the International Safety Panel ("Safety Panel") of ICHCA International Limited ("ICHCA"). The series is designed to inform those involved in the cargo-handling field of various practical health and safety issues. ICHCA aims to encourage port safety, the reduction of accidents in port work and the protection of port workers' health.

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ICHCA International Limited - INTERNATIONAL SAFETY PANEL

The International Safety Panel is composed of safety and training officers and directors, transport consultants, representatives from leading safety and training organisations, enforcement agencies, trade unions, insurance interests, institutions and leading authorities on the subject area from around the world.

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After obtaining a degree in chemical engineering at Imperial College in London, John Alexander joined HM Factory Inspectorate in 1957. He worked for the Inspectorate and the Health and Safety Executive in England and Scotland for over 36 years. For the last eight of those years he had a national responsibility for matters relating to the inspection of docks and inland waterways.

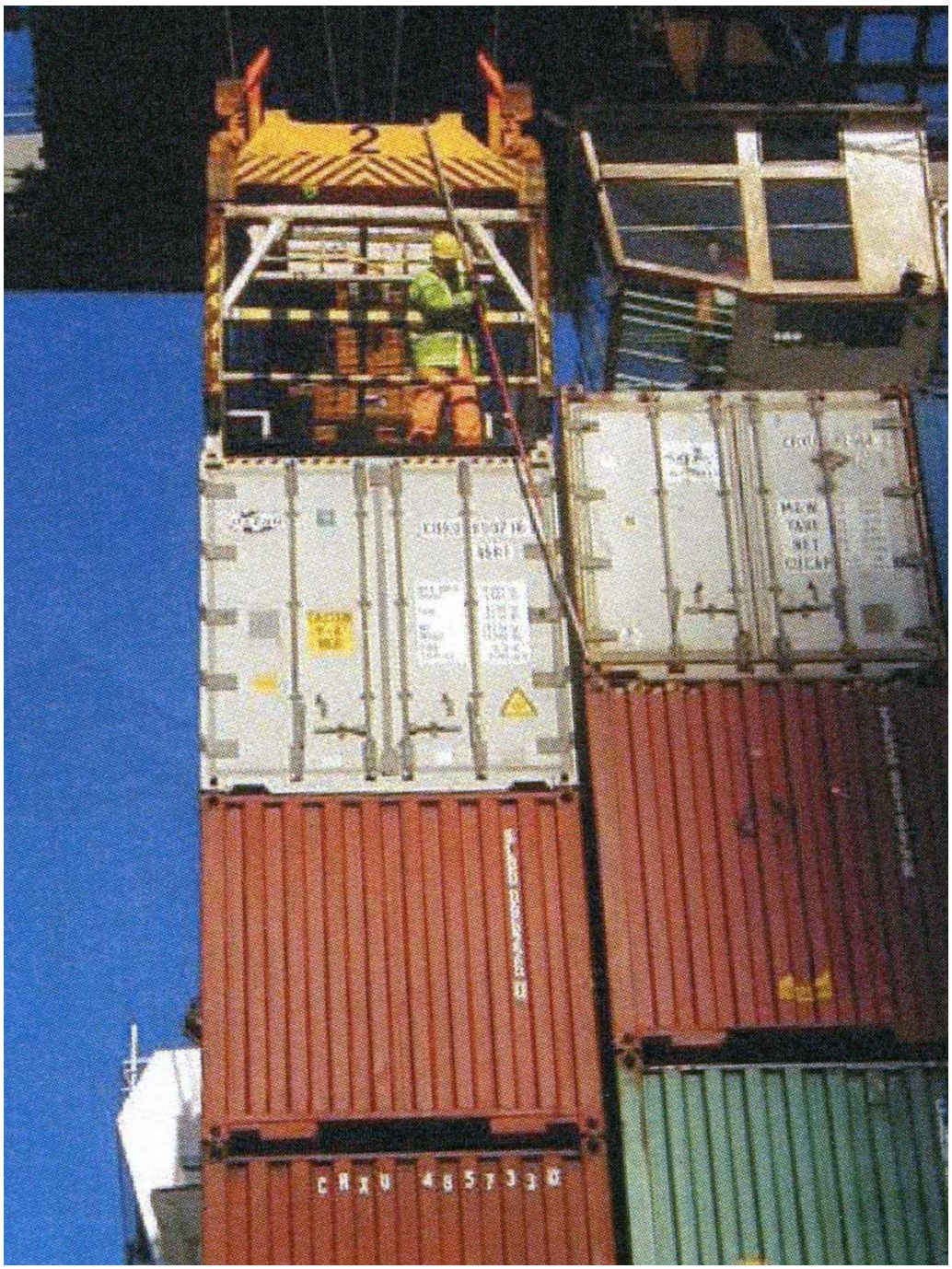
Since his retirement from the Health and Safety Executive in 1995, he has continued to work with the ports industry as a consultant.

He has been a founder member of the ICHCA International Safety Panel since it was set up in 1990.

The Publication

This Safety Briefing Pamphlet has been developed in response to the IMO adopting and publishing its MSC 1/circ.1352 in 2010 on the safe lashing of deck containers. It, therefore, is aimed at dealing with the issues of container top working as referenced in that circular. In part, therefore, it replaces RP#4 Container Top Safety but not completely and there are some aspects of that Research Paper that are still relevant and not dealt with in this publication.

CONTAINER TOP SAFETY



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CONTAINER TOP SAFETY

1 INTRODUCTION

This Briefing Pamphlet, BP# 34, is effectively the fourth edition of guidance that was originally published by ICHCA in 1980. Although the need for workers to go onto the tops of containers has been considerably reduced over the last thirty years, it is likely that in some circumstances access to such workplaces will still be needed for several years. This guidance draws attention to:

- developments that have taken place since 1980,
- the relevant international requirements relating to work on top of containers,
- safe means of access to the tops of containers when work on of them is necessary,
- means of protection for those who have to work there, and,
- relevant operational considerations.

1.2 It is believed that this guidance, and the guidance in Briefing Pamphlet, BP# 35, *Provisions for the Safe Lashing of Deck Containers,* represents a reasonable summary of the methods available to ensure the safety of workers who load and unload containers on ships. It is hoped that the information in them will assist Governments to develop national standards for the protection of the persons who carry out this work. It is also intended to help employers to develop and implement safe systems of work that are appropriate for their particular operations on ship or on shore and to decide which precautions and safe systems of work are appropriate for their operations in their terminals in the light of the law in their country.

1.3 There is no one simple solution to the problems connected with the safety of persons who need to work on the tops of containers. All terminals are different and need to adopt solutions that are appropriate to their operations. What will be needed may be a combination of precautions, as appropriate and necessary. What will be practicable in one terminal and for one method of cargo handling may not be practicable in another and what is practicable in a highly developed country will differ from that in a less developed country. Therefore, it is intended to give readers information on a number of different methods of tackling problems connected with work that is necessarily carried out on the tops of containers on ships and on shore to help them to determine what is appropriate for their operations.

2 DEVELOPMENTS SINCE 1980

2.1 Concerns on container top safety were first referred to ICHCA's secretariat by its New Zealand section, following a fatal accident to a ship's officer in 1979. After a worldwide survey into work on the tops of freight containers on board ships, ICHCA published "*Container Top Safety - An Overview*" in January 1980. This considered the reasons why container top work was necessary and the precautions that might be taken during such work. It acknowledged that there were difficulties in getting workers to the tops of containers and dangers when working on such unprotected places.

2.2 At the outset of marine containerisation, deck stows were low (usually only two high) and it was not considered necessary to go onto the tops of individual freight containers. However, as container ships got larger and average container payloads were found to be less than half the permitted maximum, the possibility of increasing on-deck stacking heights was appreciated. By 1979, with containers then being stowed up to five high on the decks of container ships, these could be some 13.7 m (45 ft)

above the ship's deck and even higher above open holds. Whilst a number of precautions could be taken, it was considered that the ultimate solution should be the elimination of the need for personnel to go onto the tops of containers by altering the type of lashing equipment on container ships so that the handling and securing of containers could be safely carried out from deck level or elsewhere. It was accepted that there was no easy answer to the problem. Consequently it was felt that the subject should be considered long and hard by all those concerned in a spirit of co-operation, rather than by taking the view that "it's the other guy's problem".

2.3 The height of deck stows has increased dramatically, subject only to the restraints of the strength of hatch covers and the securing system, the stability of the ship, and visibility for navigation,. By 2009 stows in holds were up to eleven high and deck stows were up to nine high with deck stows of five or six high quite common on container ships. Hatchless container ships had stows of up to thirteen high but access to them was not necessary as all the containers were within cell guides. Proposals for conventional container ships with even higher deck stows are now being considered.

2.4 In the years since 1980 a variety of ideas were developed, for securing containers on ships, for access devices to be used by stevedores and for securing such devices to container cranes. In addition, terminal health and safety laws have increasingly reflected modern cargo handling techniques, prompted by a thorough revision of the International Labour Office (ILO) 1932 Convention on dock work. ILO Convention 152 '*Occupational Safety and Health (Dock Work)*' and the associated ILO Recommendation 160 were adopted in June 1979. As a result, new and revised national and local safety rules have reflected improved procedures and systems of work.

2.5 In the late 1980s ICHCA decided that the problem should be looked at again. The scope of the topic was widened to include workplace safety on the tops of containers and safe access to them, both on shore as well as on ships. Work on non-cellular ships and at inland container storage depots and repair bases was also included.

2.6 *Container Top Safety* was published in 1989. In addition to reporting the results of the 1988 survey, it included illustrations and information about many of the safety devices then known to be in use and summaries of the current legal requirements and recommendations that related to the topic. It also included examples of relevant local rules, posters and leaflets. The booklet noted that despite the obvious dangers, there had been remarkably few accidents over the years to persons working on the tops of containers. However, although falls from the tops of containers would almost certainly result in serious injury or death, some considered that as other aspects of lashing operations regularly resulted in injuries, attention should also be focused on them rather than just on container top operations. Whilst it was accepted that there should be priorities, it was considered that where the potential for injury is so great, each company and trade union concerned should ask itself whether it can afford to ignore the possibility of falls and consequential serious injury. It was a situation where the industry could be wise before the event, rather than waiting for an accident to happen before reacting. By then it was clear that there were a number of ways in which the problem could be tackled. What was needed, at that time, was the will to tackle it and the determination to make the system selected work in a safe and efficient manner.

2.7 Progress has continued to be made. This includes a number of welcome developments in connection with container securing devices and systems. These include the development of semi-automatic twistlocks, dual function twistlocks, latchlocks, other new container securing devices and the design of hatchless container ships, which have all considerably reduced the need for persons to work on the tops of

containers, and the design of equipment for safe access and fall protection. In a number of countries laws relating to work on the tops of containers have been developed and increasingly enforced. Of particular significance was the 1997 revision of the United States Safety and Health Regulations for Longshoring, 29 CFR Part 1918. Since 26 July 1999, this has required that where a container gantry crane is used to handle containers in the United States, no employee shall be on the top of a container, except under specified limited conditions. It also requires that positive container-securing devices, such as semi-automatic twistlocks, shall be used. This clearly has implications for other countries, as it affects methods of work in other ports that handle containers on ships to or from the United States.

2.8 More recent developments have included the Winsafe wand system and the Peck & Hale concept for a Universal Container Locking System. A system is currently being developed that will tell a crane operator that a twistlock or other container securing device is stuck in a corner fitting. This will eliminate the need for a person to go aloft to identify the problem before another person can go to deal with it.

2.9 ICHCA's International Safety Panel, was established in 1990. In 1998 the Panel concluded that the time had come to once again update the guidance on container top safety that was available to the industry. A third survey was carried out and its scope was widened to include lashing operations on board ships. Additional enquiries were also made of various sources and further information was received from a number of organisations and individuals. "*Container Top Safety, Lashing and Other Related Matters*" was published in 1999 as ICHCA Research Paper No. 4.

2.10 In recent years the cargo handling industry has welcomed the recognition by the International Maritime Organization (IMO) of the importance of the ship/shore interface. Different parties under differing legal regimes may carry out cargo handling and associated operations by different methods in different places. A particular operation may be carried out by ships' crew or by stevedores or jointly by both, depending on circumstances. However, in all cases there must be a shared concern for the safety of all who are involved. This must relate to both ship and shore personnel, as both are liable to be injured, or even killed, by the actions of those carrying out the operations.

2.11 Work on the tops of freight containers is one example of such an operation. While stevedores in ports usually carry out container securing operations, ships' crew may also carry out securing operations, particularly in the case of small container feeder ships. Crew members may also have to go onto the tops of containers while at sea to check and tighten or add to lashings and other container securing devices. Not only is container top work liable to have to be carried out by both ship and shore personnel at different times, but the actions of personnel at one terminal may affect the method of work, and safety, of those who later have to handle the containers at another terminal, often in another country.

2.12 In 2005 IMO's Maritime Safety Committee (MSC) agreed that its Dangerous Goods, Solid Cargoes and Containers Sub-Committee (DSC) should develop guidance on providing a safe working arrangements for the securing of containers on ships, including safe access, equipment, place and method of work, and that this should be included in a revised edition of IMO's "*Code of Safe Practice for Cargo Stowage and Securing*" (the CSS Code). The guidance was developed by DSC and is now Annex 14 of the CSS Code. This was approved by MSC in May 2010 and published as MSC.1/Circ.1352. Member Governments of IMO were invited to bring the Annex to the attention of ship owners, ship operators, ship masters and crews and to all other parties concerned and, in particular, to encourage ship owners and terminal operators

to apply it in its entirety to new container ships from 2015 and the principles of the guidance to existing ships as far as is practicable.

2.13 ICHCA's International Safety Panel took an active part in the developments of Annex 14 and considered that its guidance in RP#4 should be updated and that the new BP# 34 "*Container Top Safety*" should deal solely with matters relating to work on or near the tops of containers and BP# 35 "*Safe Lashing of Deck Containers*" should deal with the lashing of containers from decks and lashing bridges on ships. This leaves a number of other issues regarding lashing dealt with in RP#4 still relevant and not dealt with in the two new publications.

3 THE CURRENT SITUATION

3.1 It is now generally recognised that there are serious risks to persons working unprotected on the tops of containers.

3.2 The fact that there have been surprisingly few reported fatal or serious accidents to persons working at the open edges of the tops of containers is no justification for failing to take action to protect workers from the obvious, serious hazards associated with such work. The accidents that do occur are often serious or fatal.

3.3 One of the fundamental rules for dealing with safety hazards is to deal with them at source. In the case of container top operations, this is an option that is not available to stevedores or ships' crews. In both cases, they have to work the ship as it is. The only people who can deal with the problem at source are those who order, design, and build ships. It is only they who can develop safe systems of stowing and securing containers on board ships that avoid the need for persons to work at the open edges of the tops of containers. However, the development of such systems is a long term solution. In the meantime, work on the tops of containers of existing ships may often continue to be necessary. It is essential that persons carrying out such work do so in accordance with a safe system of work.

3.4 There are many reasons why persons may need to go onto the tops of containers. The main reason for doing so is to attach or detach twistlocks, cones or other securing equipment. Other reasons include attaching lifting gear to overheight containers or non-containerised cargo and steadying or guiding loads. However, the use of spreaders with gather guides to locate them on containers has greatly reduced the need for access to handle lifting gear. Access may also be required to deal with operational faults or faulty gear or equipment, to access equipment in stacks of refrigerated containers or roof bars on open top containers, or, to carry out inspection and repair of containers.

3.5 Despite the large number of cellular hold container ships that have been built in recent years, many containers are carried on deck or in the holds of other types of ships.

3.6 On shore, many containers are kept at terminals and inland container depots. Although access may often only be needed to the tops of containers one high, access may sometimes be needed to stacks of empty containers to secure them in order to prevent containers being dislodged in high winds. Some storage depots use tower cranes to stack empty containers as much as eleven high and require employees to work on the top of containers up to the full height of the stack.

3.7 The original publication in 1980 considered the possibility of painting the tops of containers with slip resistant paint. Container manufacturers generally accept that their containers are likely to be walked upon and the second (1988) survey reported that if a customer, i.e. a container purchaser, asked for a special coating, then it could be applied. However, the impression given was that this was seldom requested. A comment was made that, although such coatings did provide additional safety, they were rather expensive and were not able to be applied by many automatic paint application systems. One container manufacturer stated that it specifically did not paint the roofs of its containers and that this might have the effect of increasing the slip-resistance/resistant of the surface. Another commented that it had only been asked to supply such coatings by the offshore oil industry. It was concluded that it was extremely unlikely that many containers would be so treated. Even if they were, their surface would not necessarily be safe as it might be made slippery by adverse weather or by the presence of other substances or materials on it, such as oil or split cargo. As the number of containers in service has been steadily increasing, an estimated 18 million containers (about 24 million TEUs) were believed to be in service in 2009, it is most unlikely that the container being handled will have a non-slip coating on its roof. Therefore, it is essential that systems of work on top of containers take into account the possibility of a worker slipping.

3.8 Similarly the use of slip resistant footwear cannot be seen as a complete answer to the problem. However, there is no doubt that the wearing of a strong pair of industrial boots or shoes with appropriate slip resistant soles will assist the wearer to keep a secure footing. This should be considered as one practical measure that can, and should, reasonably be taken to increase the safety of workers. Although the use of such footwear is believed to have increased considerably, the use of slip resistant footwear is still far from universal. In some less developed countries, no footwear or ‘flip-flops’ are used. This is totally inappropriate.

3.9 The increased use of safety helmets and high visibility clothing by stevedores and others in recent years has been a welcome development. Whilst such equipment provides no protection against falls, it will significantly increase safety. Twistlocks and lashing equipment falling onto people continue to be problems but the wearing of a safety helmet has undoubtedly prevented serious injuries and, on several occasions, deaths. The use of high visibility jackets and other clothing assists in making persons conspicuous to crane drivers and others so that they are less likely to be inadvertently struck by containers, spreaders or vehicles.

3.10 The hazards of working on the tops of containers are self evident and there is no doubt that such work has a high potential for serious injury or death. Consequently, the situation demands that when such work is necessary, appropriate preventative action be taken by the implementation of safe systems of work.

3.11 Over the years a variety of accidents has taken place in connection with container top working. Of particular concern in the early surveys was the number of accidents involving the use of portable ladders. These have now been considerably reduced, but not eliminated, by the increasing use of other, safer, means of access. Typical accidents continue to include slipping or tripping while on the tops of containers, falls from containers, falling down gaps between containers, being stuck by moving equipment, such as spreaders and personnel cages and falls on over-height or open top containers. Falls from containers often result from slips on the tops of containers, being struck by moving equipment or failing to keep track of one’s position when near the edge of a container. Slips may result from rain, ice, bird droppings or other materials and tripping may be caused by portable equipment or other items on the tops of containers

4 LEGAL REQUIREMENTS AND GUIDANCE

International

International Labour Office

4.1 The first International Labour Office (ILO) Convention on the protection of dockers against accidents was ILO Convention No. 28 of 1929. This was revised and replaced first by Convention, No. 32 in 1932 and more recently by Convention, No. 152 in 1979. Convention No 152 is complemented by ILO Recommendation No. 160, which was adopted at the same time. The Convention and Recommendation have been generally accepted as the framework on which most modern dock safety laws have been based. In 2005 ILO published a Code of Practice "*Safety and Health in Ports*". This was a revised and combined edition of a 1958 Guide and a 1977 Code of Practice that were both entitled "*Safety and health in dock work*".

4.2 Taken together the three current ILO documents set out clear principles relating to work on the tops of containers. Article 31 of Convention 152 requires freight container terminals to be laid out and operated to ensure the safety of workers so far as is reasonably practical and the provision of means for ensuring the safety of workers lashing or unlashing containers on ships. Paragraph 22 of Recommendation 160 supplements this by requiring every reasonable measure to be taken to minimise risks of accidents when work has to be carried out on top of freight containers. The ILO Code of Practice has a separate section (section 7.8) on work on container ships. Section 7.8.3 relates to container top working on ships. Guidance on access and lashing cages is contained in section 3.6.2.9. Sections 7.8.3 and 3.6.2.9 of the Code are reproduced in full in Appendix 1 together with the relevant extracts from Convention 152 and Recommendation 160. Although there have been many developments in connection with container top working in the thirty years since ILO Convention 152 and Recommendation 160 were published, the principles contained in them generally remain valid.

4.3 Reflection of international instruments in national domestic legislation can be very time consuming, particularly if the subject has a low profile. The number of countries that have ratified ILO Convention 152 in almost thirty years can only be described as disappointing, although it has to be acknowledged that a number of other countries have implemented it without ratification. Some countries are unable to ratify Conventions owing to the federal nature of their constitution, but have nevertheless based their dock safety laws on them. At least one country considers it unnecessary to ratify the Convention as its requirements are already covered by its national legislation. A number of countries have general legislation that relates to work at heights. This includes work on the tops of containers, both on ships and on shore. Some countries also have specific legislation relating to such work. However, it is not necessary to wait until there is a specific legal requirement before taking action to prevent accidents that can clearly be seen to be likely to happen and potentially fatal.

International Maritime Organization

4.4 The International Maritime Organization has considered the problems associated with the safety of persons working on the tops of containers on ships on a number of occasions following the first meeting of its Working Group on the Ship/Port Interface in 1992. It has been recognised that this is a difficult problem that is of concern to both seafarers and terminal employees. As the long term solutions at source are matters within the control of those who order, design and build ships (see paragraph 3.3),

ICHCA welcomed the issue of Maritime Safety Circular MSC/Circ.886 '*Recommendation on safety of personnel during container securing operations*' by IMO in January 1999. This reminded container vessel owners and designers of the dangers associated with container securing operations and urged them to develop container securing systems which are safe by design, with the aim of eliminating the need for work on the tops of containers. The full Circular is in Appendix 2.

4.5 Many container top operations are associated with the lashing of containers on board ships. In May 2010 IMO approved the amendment of Resolution A.533 (13) on the elements to be taken into account when considering the safe stowage and securing of cargo units on board ships to include the safe access, safe place of work, illumination and working conditions for all persons engaged in work connected with cargo stowage and securing. In addition, it approved the new Annex 14 of the *Code of Safe Practice for Cargo Stowage and Securing* (the CSS Code). Guidance on Annex 14 of the CSS Code is reflected in this Briefing Pamphlet and in BP#35 *Safe Lashing of Deck Containers*. Extracts of the relevant text of Annex 14 are in Appendix 2.

4.6 Although Annex 14 of the CSS Code deals principally with the lashing of containers from the deck and lashing bridges and platforms on ships, section 6 of the Annex requires that risk assessments should be carried out at the design stage of ships to ensure that container securing operations can be safely carried out in all anticipated container configurations. The aim of ship designers should be to eliminate the need to access and work on the tops of deck stows. Risk assessments should include consideration of hazards associated with slips, trips and falls, particularly falls from heights with a view to eliminating or minimising work on top of containers or in other equally hazardous areas. The requirements of Annex 14 will fully apply to all containerships, the keels of which are laid or that are at a similar stage of construction on or after 1 January 2015. The principles of the guidance in sections 6 (Design) and 7.2 (Operational Procedures) of the Annex should be applied to existing containerships as far as practical by the flag State Administration with the understanding that such ships would not be required to be enlarged or undergo other major structural modifications.

4.7 Section 7 of Annex 14 relates to operational procedures and requires that when work on the tops of containers cannot be avoided, safe means of access to them should be provided. It recommends that the access should be by a safety cage lifted by a spreader and that a safe system of work should be developed and implemented to ensure the safety of persons on the tops of containers. Fall prevention equipment should be used rather than fall arrest equipment whenever it is practical.

Regional and national legislation

4.8 During most of the twentieth century there was little specific legislation relating to the prevention of falls from heights of more than 2 m, or 6 ft 6 ins, that applied to industries other than construction and shipbuilding. Legislation relating to dock work related to falls from the edges of holds. There was no legislation that related directly to work on the tops of containers. Although concerns about the hazards of such work had been recognised since the late 1970s, it was not until the 1990s that significant action was taken. In many countries this was taken under general legislation that required the provision of safe places and methods of work.

4.9 In 1991 the German Liability Insurance Association published guidance on personal safety cages for container handling (U 008.2). During the same decade a number of countries introduced requirements for the protection of persons working on containers

from which they could fall more than 2.5 or 3 m, effectively more than one container high, and published guidance on how to protect such workers.

4.10 Probably the most significant development in connection with container top working was the revision by the Occupational Safety and Health Administration (OSHA) of the United States of Part 1918 of the Federal Regulations, Safety and Health Regulations for Longshoring, which came into force in January 1998. Rule 1918.85 deals with containerised cargo operations and sub paragraphs (g) to (l) refer specifically to access to the tops of containers and work on the tops of containers. See Appendix 3.

4.11 The Rule requires that where a container gantry crane is used to hoist containers in the United States the employer shall ensure that positive container-securing devices, such as semi-automatic twistlocks and above deck cell guides are used. Employers must also ensure that no employee is on the top of a container unless such work is necessary, and cannot be eliminated by the use of positive container-securing devices. When such work is necessary workers must be protected by a fall protection system. Such work may include the fitting or removal of bridge clamps, hooking up or detaching over-height containers and the freeing of jammed semi-automatic twistlocks. Fall protection must also be provided for any employees on top of a container on a ship who are working within three feet of an unprotected edge of the container from which they can fall eight feet or more. Fall protection is not required when it can be demonstrated that this would be infeasible or create a greater hazard due to specified causes. In these cases the employer has to alert the employees about the fall hazard and instruct them in ways to minimise it.

4.12 The revision of the US Rules was fundamental. Not only did it apply to work on top of all containers, including those that were only one high, but it tackled the problem at source by seeking to eliminate the need for such work to be carried out by requiring the use of positive container securing devices, such as semi automatic twistlocks (SATLs). It also influenced work in other countries as the SATLs or other devices had to be inserted or removed in ports at the other end of voyages to or from the United States

Local

4.13 International and national laws can only be written in general terms and cannot reflect the differing circumstances of every individual port or company. Consequently, terminals and companies should draw up their own detailed rules and safe systems of work to implement their national laws in the context of their particular premises and operations. These should be based on the results of risk assessments of the workplace and the operations and hazards identified. In recent years a number of ports in different countries have become owned by international organisations. Several such organisations seek to implement common safe systems of work in all their ports. Safe working on the tops of containers is an obvious, and welcome, target for such an approach.

5 CONTAINER SECURING SYSTEMS

5.1 The means by which containers are secured will often determine the extent to which it may be necessary for persons to work on the tops of containers. If the containers are on a ship, all items of lashing and securing equipment are ships' gear. Although the selection of the gear is not a matter that is under the control of terminals, the working practices of stevedores who have to handle it may be determined by national legislation and local rules and regulations.

5.2 International standard ISO 3874:1997, *Series 1 Freight Containers - Handling and Securing*, and Amendment 1 of 2000 contains information on the basic requirements, for securing containers for transport by ship, road or rail. Amendment 1 includes specifications of securing devices such as twistlocks, latchlocks, stacking fittings (cones) and lashing rod systems. Figure 1 shows a number of typical items of lashing and securing equipment. ISO 3874 does not currently include lockable stacking cones (figure 2) which operate in a similar way to SATLs

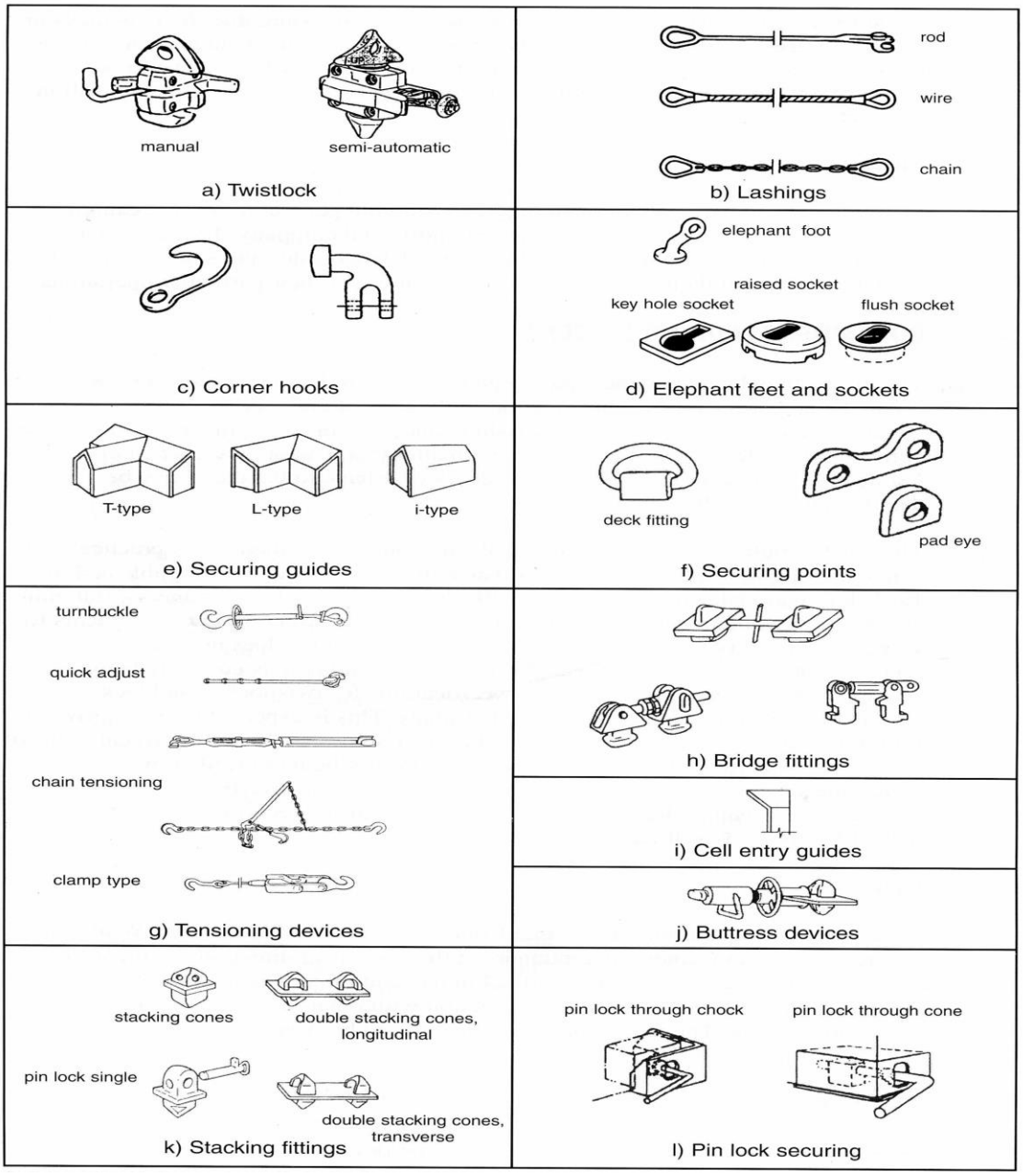

Figure 1 Examples of typical securing and lashing Equipment (ISO 3874 Figure 22).

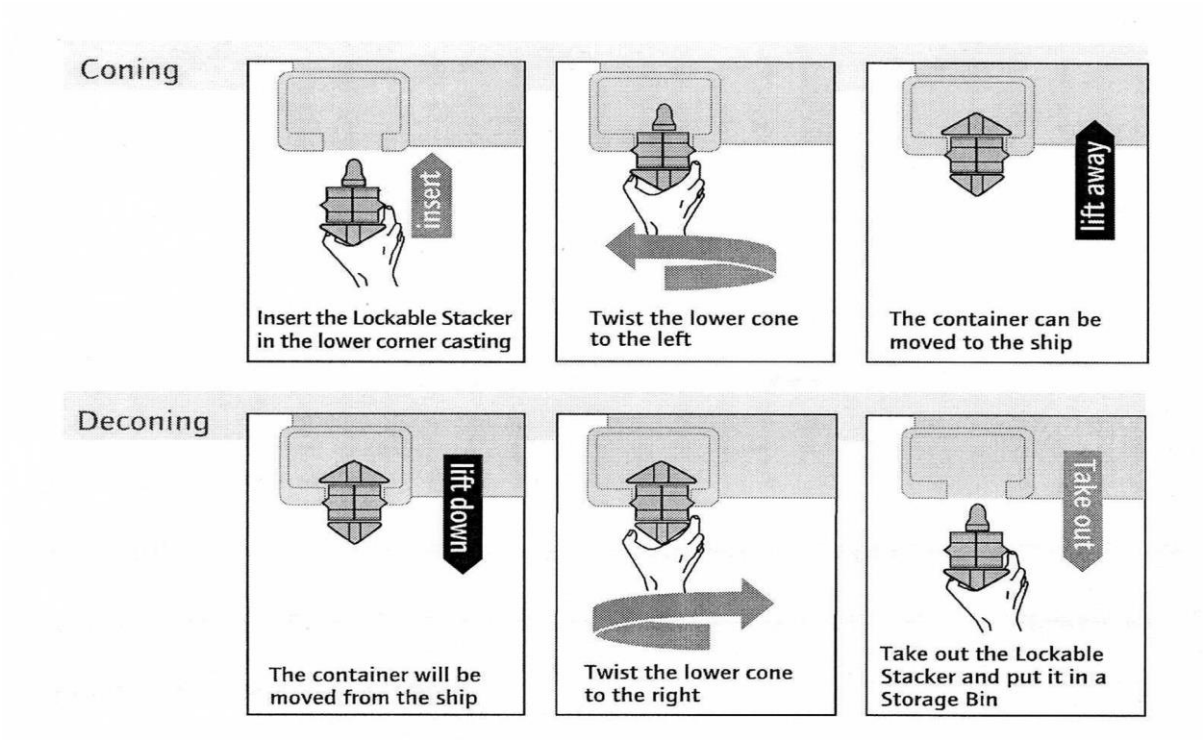

Figure 2 Use of lockable stacking cones.

5.3 The use of SATLs has considerably reduced the need for access to the tops of containers on deck. Lashing poles up to 11.8 m long are available and are said to enable SATLs between the fifth and sixth tiers of containers to be operated. However, such long poles are unwieldy and very difficult to control. Many ports only use lashing poles to operate twistlocks up to the bottom of the third tier from the deck or a lashing bridge or platform. Access to the tops of containers above that level may still be necessary in order to operate twistlocks out of reach by lashing poles from below (figures 3 and 4).

Unlocking semi-automatic twistlocks from above by a twistlock pole with triangular actuator

Figure 3 Locked.

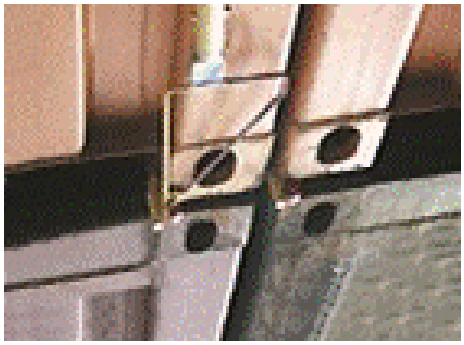

Figure 4 Unlocked.

5.4 The use of lashing bridges (figure 5) across a ship between container stacks allows lashing to be carried out from the bridges to higher tiers of containers, as well as easier access to the corner fittings of containers for securing purposes. In many cases they may eliminate the need for persons to go on to the tops of containers.

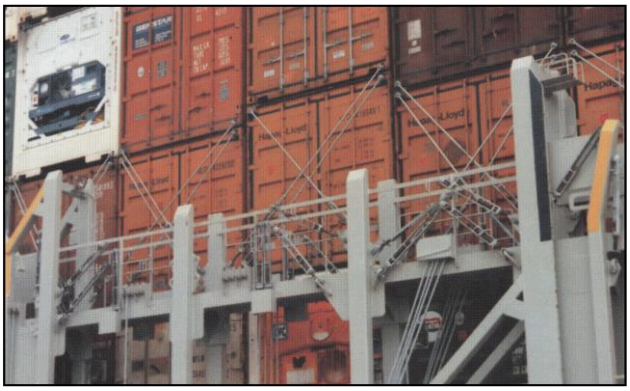

Figure 5 Lashing bridge on ship.

5.5 The need for separate container lashing systems can be avoided completely by the use of on-deck cell guides (figure 6). Stacks of containers in on-deck cell guides may be up to five high and in on hatchless container ships (figure 7) the stacks in cell guides may be as much as thirteen high with no need for access to the tops of containers in normal circumstances. However, hatchless container ships have not proved to be popular with ship owners and charterers. Any containers stacked above on-deck cell guides would require securing by twistlocks.

Figure 6 Cell guides and lashing bridge on a ship.

Figure 7 Hatchless container ships.

5.6 Although access to the tops of containers in the holds of cellular containers ships is not normally necessary, it could be necessary when two 20 ft containers are stowed in a 40 ft slot. Access may also be necessary to the tops of containers stacked in the holds or on the decks of conventional cargo ships. The use of stacking cones which can be locked in the bottom corner fittings of containers on shore (figure 2) can prevent the need for such access.

6 MEANS OF ACCESS TO THE TOPS OF CONTAINERS

Access to the tops of containers on board ships

6.1 When access is necessary onto the tops of containers on board ships, it should be by means of a personnel cage whenever this is practicable. When this is not practicable, it should be by means of a suitably protected platform on the headblock of a crane or on a spreader. Ladders should not be used for access to the tops of containers on board ships unless no other safer means of access is available. When access by ladder is necessary, appropriate precautions should be taken to prevent the ladder slipping (see 6.18) and their use should be limited to access to the tops of containers two high. Climbing up the doors of containers should be strictly prohibited.

6.2 On occasions access to corner fittings of containers or to lashing equipment on containers may be needed but it should not be necessary for workers to go onto the tops of containers when the work can be carried out from the deck, from a lashing bridge or from a personnel cage or a gondola.

Personnel cages

6.3 The use of personnel cages has increased considerably over the years and is now the norm in many countries, both for access to the tops of containers and for carrying out work on the tops of them. Considerable thought has gone into the design of such cages. Originally such cages were modified containers but increasingly cages are purpose designed and built (figures 8 to 13). They are generally 20 ft frames with ISO container corner fittings so that standard spreaders can lift them. 40 ft and telescopic cages, that are designed to be lifted by spreaders of any length, are also available (figures 14 and 15).

Figure 8 Early personnel cage.

Figure 9 Personnel cage.

Figure 10 Personnel cage with single gate per side.

Figure 11 Personnel cage with two gates per side

Figure 12 Personnel cage. Note white panels to aid alignment with roll trailer

Figure 13 20 ft personnel cage with Recessed ends

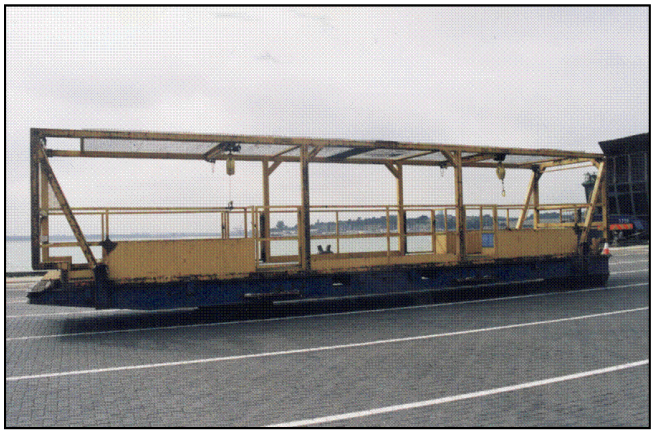

Figure 14 40 ft personnel cage with recessed ends.

Figure 15 Telescopic personnel cage. Effectively two 10 ft cages mounted at opposite ends of a 20 ft frame. These can be moved apart to work on 40 ft containers.

6.4 As personnel cages carry people rather than cargo, it is essential to ensure that the cage does not become detached from a spreader. This should be achieved by a secondary means of locking the cage onto the spreader when the cage is in use. Methods of secondary locking include the manual attachment of chains at each corner of the cage, the use of hand operated locking pins and the provision of an additional automatically operated twistlock at both ends of the spreader (figures 16 to 23). At least one terminal isolates the twistlock mechanism on the spreader when a cage carrying personnel is attached.

Figure 16 Chains for secondary means of attachment at corners of personnel cage

Figure 17 Secondary means of attachment. Chains attached between personnel cage and spreader.

Figure 18 Secondary means of attachment. Pin engaging in link on spreader

Figure 19 Secondary means of attachment Locking control lever for twistlocks on the top of a personnel cage.

Figure 20 Secondary means of attachment Twistlocks on top of a cage below an additional beam on a spreader.

Figure 21 Secondary means of attachment. Twistlocks on top of a cage engaged in an additional beam below a spreader

Figure 22 Secondary means of attachment .Additional twistlock at the end of a spreader frame

Figure 23 Secondary means of attachment. Pocket on top of an overheight frame into which twistlock in figure 22 locks. Similar pockets can be fitted to personnel cages

6.5 Many terminals take additional precautions when workers are lifted in personnel cages (see 8.1 and 8.2 below). The most common precaution is to restrict the operating speed of the crane.

6.6 Personnel cages should be fitted with an upper guard rail 1m (3ft 3in) above their base, an intermediate guard rail and 150mm (6in) high toe boards to prevent the fall of material onto persons below. The upper guard rail should be recessed or an additional handrail should be provided inside the top rail in order to prevent hands being trapped between the rail and a container or other object (figure 24). As persons in cages may wear gloves, there should be a distance of 90 mm (3½ in) between hand rails or

handholds and the inside of the cage. Mesh or other suitable protection should be provided on the sides and ends of the cage to prevent trapping (figure 25). Suitable protection on the top of the cage should also be provided to provide protection from objects falling from above.

Figure 24 Recessed handrails inside personnel cage

Figure 25 Protected side and ends of personnel cage

6.7 Personnel cages should be built to allow access to twistlocks, including manual or damaged twistlocks, or other container securing devices from within the cage, This may be recessing the bottom ends or corners or by hinged flaps or by cut outs in the corners of the floor of the cage. (Figures 14 and 25 to 31). As twistlock operations are likely to be carried out when kneeling, open grid flooring across the ends of the cage may be padded or covered in rubber. Some terminals provide kneepads to improve working conditions (figure 31). Low level hand holds at the ends of cages are also helpful.

Figure 26 Personnel cage with curved corner recesses

Figure 27 Personnel cage with recessed corners

Figure 28 Personnel cage with recessed corners with hinged flaps

*Figure 29 Hinged **c**orner flap closed. Note low hand rail*

Figure 30 Hinged corner flaps half opened. Note deflectors at edges of recess

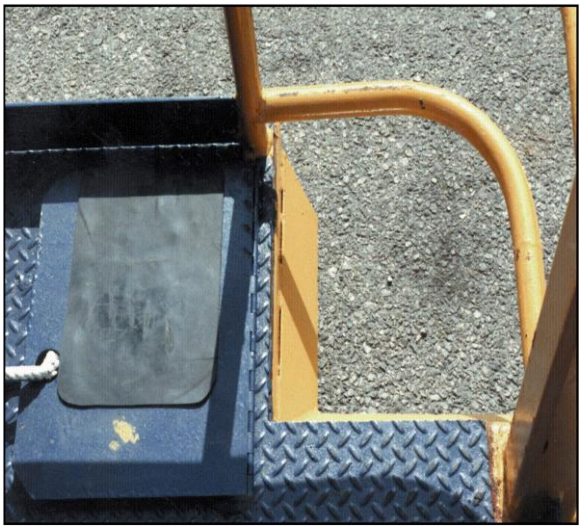

Figure 31 Hinged corner flaps fully open. Note padding on underside of flap.

6.8 Doors or gates of personnel cages should open inwards and be self closing to ensure that they do not open accidentally during travel (figure 32). Chains should not be used in place of doors as they may be left unhooked and do not always prevent persons from falling out.

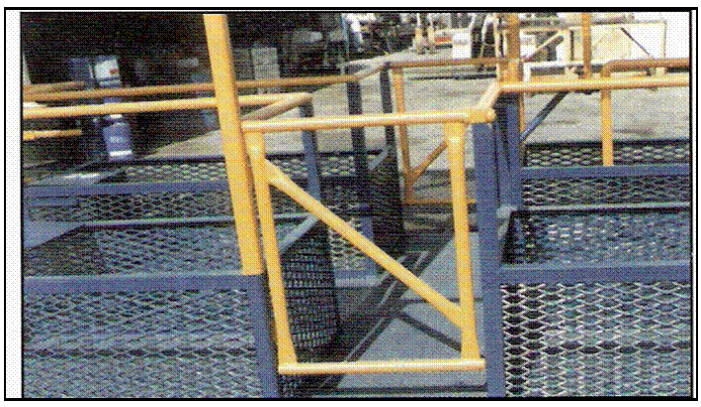

Figure 32 Inward opening self closing gates on personnel cage.

6.9 Bins for carrying twistlocks or other container securing equipment should be provided inside a cage (figures 33 to 36). Solid tops of twistlock bins can be used as seats. The provision of seats in cages allows persons in the cage to be more stable during transfer operations between the ship and quay. Hooks for stowing twistlock poles and a rescue hook (see 9.10) should also be provided (figure 36). A notice in the cage should give clear instructions for the safe use of the cage (figures 37 to 39).

Figure 33 Bins for container securing equipment. Note recessed hand rail and raised end floor

Figure 34 Bins for container securing equipment. The lid can be used as seating when it is closed.

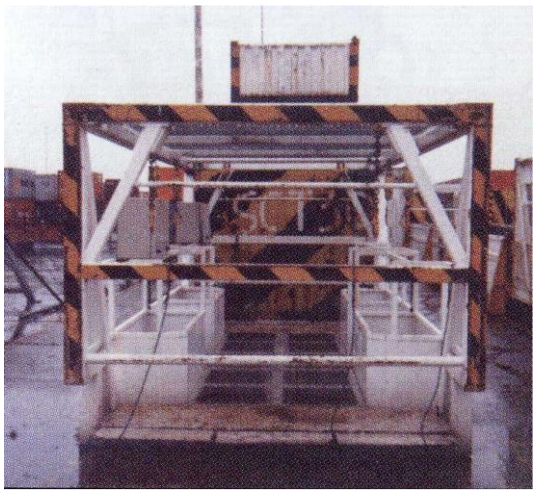

Figure 35 Bins for container securing equipment in a personnel cage with recessed ends

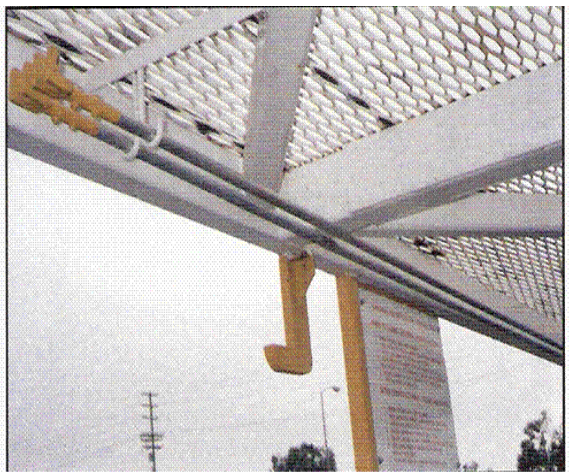

Figure 36 Hooks on roof for twistlock poles or rescue hooks. Note roof covering.

Figure 37 Operating instructions in cage. Note mandatory sign to wear safety harness.

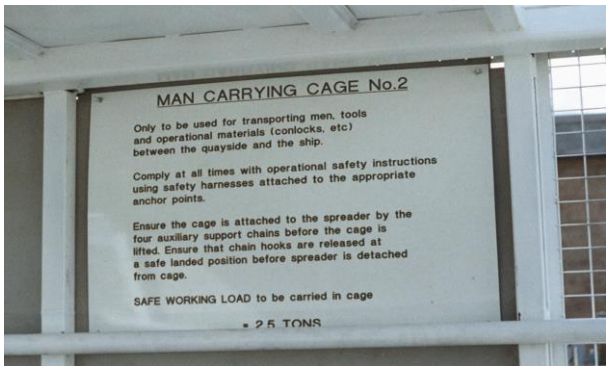

Figure 38 Operating instructions for man carrying (personnel) cage.

Figure 39 Operating instructions for man riding apparatus (personnel cage).

Platforms on headblocks or spreaders

6.10 When it is not practicable to use a personnel cage, a platform may be provided on the headblock or spreader of a cranes to lift persons onto the tops of containers. However, it should be noted that riding on such platforms is prohibited in some countries. Examples are shown in figures 40 to 43.

Figure 40 Personnel platform on headblock

Figure 41 Personnel platform on telescopic spreader

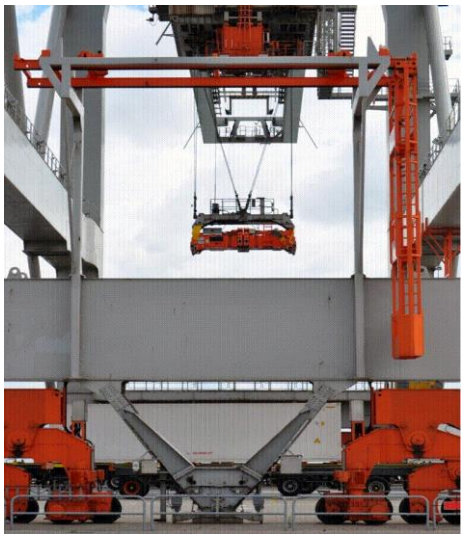

Figure 42 Personnel platform on headblock. Note gondola on stillage on cill beam of crane.

Figure 43 Personnel cage on headblock. Note full protection on sides and top, gate and good access.

6.11 Platforms on headblocks or spreaders should be protected in the same way as personnel cages. They should be covered, have upper and mid guard rails, and toe boards and mesh to prevent any materials falling onto persons below. The upper guard rail should be recessed inside the platform or an inner hand rail provided. If any moving machinery, such as in-running nips between crane wires and pulleys, is within reach from the platform, it should be appropriately guarded. Where practicable, an emergency stop button should be provided on the platform.

Gondolas

6.12 The use of gondolas, referred to as torpedoes in some ports, may avoid the need for persons to go onto the tops of containers and enable lashing and a number of other operations to be carried out safely. In effect gondolas are smaller personnel cages that intended to be used between or alongside container stacks. Gondolas should preferably be rigidly attached to spreaders (figure 44) in order to minimise sway and the associated trapping hazards. Rigid attachment increases both safety and productivity. Supporting gondolas by wire strops makes them very susceptible to sway and so more difficult to control. Gondolas that are supported by wire ropes should have larger top and bottom frames in order to prevent trapping of hands (figure 45).

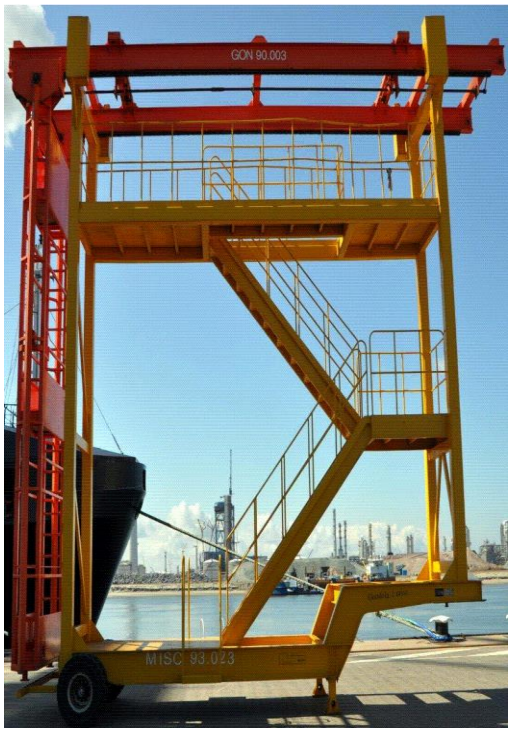

Figure 44 Rigid gondolas on trailer stillage.

Figure 45 Wire rope supported gondolas. Note platform narrower than top and bottom.

6.13 Gondolas should be protected in the same way as personnel cages (see 6.3 to 6.9). They should be attached to spreaders with secondary means of attachment (figure 46), be covered, have upper and mid guard rails, and toe boards and mesh to prevent any materials falling onto persons below. As gondolas are likely to be deployed close to

containers, it is particularly important that an inner hand rails is provided or hand rails are recessed in order to prevent hands being trapped between the gondola and containers. Doors or gates should be robust, self closing and inward opening. Secondary means of locking the gondola onto the spreader when it is in use should also be provided.

Figure 46 Secondary means of attachment by manual twistlocks on top of gondola.

Access to the tops of containers on shore

Containers

6.14 Only a few containers, usually tank containers, have ladders that can be used as a means of access incorporated in them (figure 47). These are unlikely to be adequate if equipment has to be carried up to the top of the container. Climbing up the doors of containers should be strictly prohibited. Attempts to do so have resulted in a number of injuries.

Figure 47 Ladders on ends of tank containers and on reach truck.

Mobile elevating work platforms

6.15 Mobile elevating work platforms (MEWPs) include mobile hydraulic platforms, sometimes referred to as ‘cherry pickers’ (figures 48 and 49) and scissor lifts. MEWPs

are specifically designed to enable short term work at heights in different locations to be carried out safely and easily. Their use could include access to the electrical connections of refrigerated containers, maintenance purposes and securing blocks of containers against anticipated severe weather. Owing o their versatility, their use can be expected to continue to grow. It is essential that MEWPs are used in strict compliance with the manufacturer's instructions. Particular attention needs to be paid to the suitability of the surface on which they are used and ensuring that any outriggers are correctly deployed when necessary. Guidance has been published in ISO 3691 *'Industrial Trucks'*. Some MEWPs are only designed for work from within their cage and should not be used as a means of access to other work places.

Figure 48 Use of MEWP (Mobile Elevating Work Platform). Note protection of worker in cage.

Figure 49 Use of MEWP to access Containers.

Lift Trucks

6.16 A few reach trucks have been fitted with ladders (figure 47) that can be used as access to the top of a container. The use of enclosed platforms on fork lifts trucks (figure 50) has largely been replaced by the use of MEWPs which are specifically designed for access to temporary work places. If a lift truck is used, the platform should be securely attached to it. A dedicated truck can allow the working platform to be integrated with the truck to which it is fitted, although this will require modifications to be made to the truck. This may allow platform mounted controls, including an emergency stop, to be fitted. Many cages for use with lift trucks are only designed for work from within them and should not be used as a means of access to other work places. Some countries prohibit the lifting of people by lift trucks that cannot be controlled by the person on the platform. A lift truck should never travel with a person on an elevated platform.

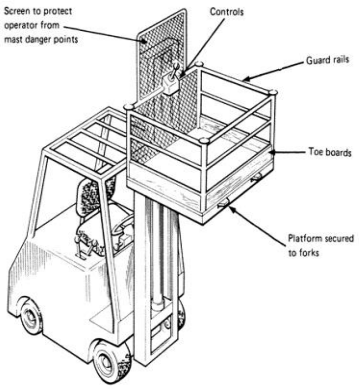

Figure 50 Personnel platform on fork lift truck.

Mobile steps or platforms

6.17 Fixed platforms can often be used for access for inspection of containers on entry into terminals or in container depots or repair areas (figure 51 and 52). Mobile steps (figure 53) or platforms for access to containers tend to be substantial items of equipment which may not be easy to handle. Consequently, they are only likely to be used in a limited area. Variants include modifications to pick – up type trucks to include steps and platforms and ladders and wheeled ladders should be locked when they are in use.

Figure 51 Access platforms for inspection of containers.

Figure 52 Container top protections in a tank container depot.

Figure 53 Mobile step accesses to containers.

Portable ladders

6.18 The use of portable ladders has lead to numerous accidents and injuries over the years. As purpose designed access equipment is now widely available, the use of portable ladders should be the option of last resort when no safer means of access is available. The precautions to be taken when using portable ladders are well established. They are summarised in paragraphs 6.1.2.6- 8 of the ILO Code of Practice *'Safety and Health in Ports'.* Whenever it is practicable, portable ladders should be secured to prevent them slipping. When this is not practicable, a ladder should be steadied by a second person. As far as possible portable ladders should be used with a height to base ratio of four to one; this corresponds with an angle of about

75°. When their use is necessary portable ladders should extend about 1 metre above the top of a container. As portable ladders are likely to be carried around frequently, they should be made of aluminium in order to be as light as possible.

6.19 Portable ladders are particularly liable to damage. It is essential that appropriate arrangements be made to ensure that all ladders are maintained in good condition. Ladders with missing rungs or with cracked or otherwise damaged stiles should not be used. Wooden ladders should not be painted or treated to hide cracks or other defects. When ladders are not in use they should be kept safely in a dry ventilated space away from heat sources. All portable ladders should be inspected regularly by a competent person and a record of the inspections kept.

WORK ON TOP OF CONTAINERS

7.1 Although the need for persons to work at the open edges of containers has been considerably reduced over the last ten years by the increasingly wide use of SATLs and may be still further reduced by future development of positive container- securing devices and the design of ships, it is likely that the need for some persons to work on the tops of containers may never be completely eliminated. It is clear that in at least some circumstances, there will continue to be a need for persons to carry out some such work for the foreseeable future. Circumstances in which it is likely to be needed from time to time include the freeing of jammed twistlocks and the removal of a cone or twistlock in a top corner aperture that is preventing the entry of a spreader twistlock, a SATL or other container securing device below a container into a corner aperture. When work on the tops of containers is necessary, it is essential that risk assessments of the hazards of the work are carried out and that appropriate safe systems of work are developed and used in order to protect workers from falling and other severe hazards. This section describes a number of methods that are known to have been developed for this purpose and other relevant matters. The control of container operations is dealt with in section 8.

7.2 Methods for carrying out work on the tops of containers can be divided into those that apply to:

- work that can be carried out from a suitably protected position; this may be on or in container access equipment, and,
- work that has to be carried out on the tops of containers.

Work from container access equipment

7.3 Work on the tops of containers on ships can often be carried out from within personnel cages or gondolas. Less usually, the work can be carried out from platforms on crane spreaders or headblocks (see 6.10 and 6.11 and figure 54)), or, where necessary and appropriate, from portable ladders. On shore such work can be carried out from personnel cages, protected platforms on mobile access equipment such as MEWPs, mobile steps or portable ladders.

Figure 54 Work from a platform on a spreader.

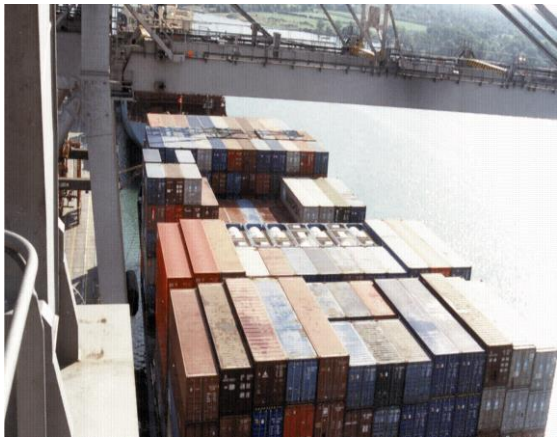

Figure 55 Different heights of stacks on a ship.

7.4 Work can be carried out directly from a personnel cage that has been landed on a container. This may be necessary to work on a single stack of containers (a 'castle' or 'chimney' stow) or in a canyon between containers. If stacks include containers of different heights (8ft, 8ft 6in and 9ft 6in), (figure 55) the operation may be made more difficult and particular care needs to be taken. In some terminals a cage landed on the top of a container may be required to be secured to it.

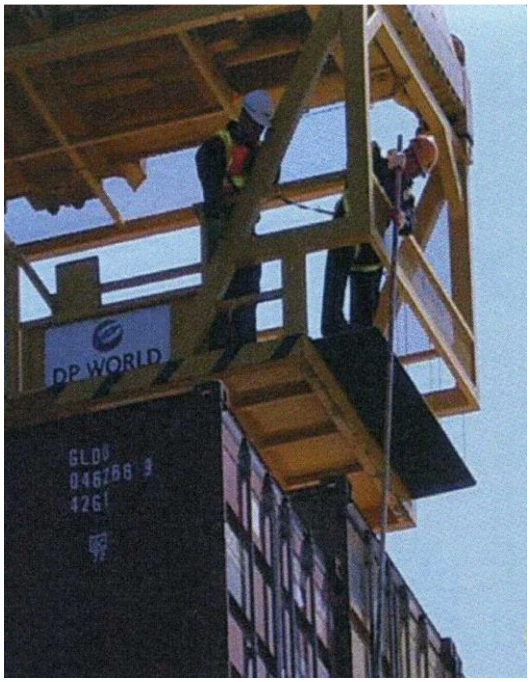

Figure 56 Unlocking twistlocks from personnel cage above.

Figure 57 Unlocking personnel cage from above.

7.5 Work can also be carried out from cages suspended a short height above the top of a stow and moved across it, either a container at a time or at a slow continuous speed (figures 55 and 56). Movement of distances of one container width at a time is likely to be necessary if a twistlock pole is to be used over a rail of a cage to unlock twistlocks between containers below it

7.6 Access to twistlocks or other container-securing devices on the top of a stack can be safely obtained through cut-outs or hinged flaps in the corners or ends of the floor of a cage (see 6.6 and figures 58 to 60).It is important to ensure that hands are not trapped between the top of a twistlock in a corner fitting of a container in the stow and the frame of the cage, particularly if the cage is to be moved steadily across the stow. This can be avoided by designing the corners of the cage so that hands will be deflected or recessing the whole of the bottom ends of the cage (figures 28 to 31 and 58 to 60).

Figure 58 Access to twistlock through end of cage.

Figure 59 Access to manual twistlock through end of personnel cage.

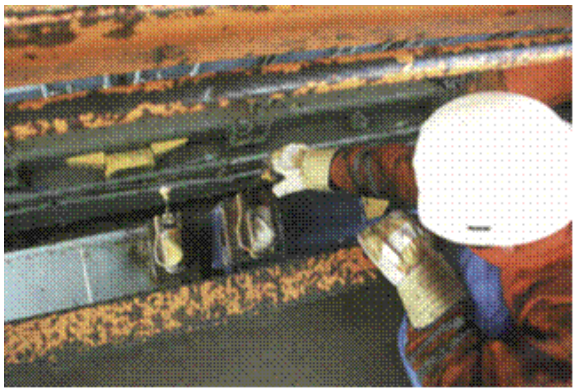

Figure 60 Access to manual twistlock through end of personnel cage.

Figure 61 Work from a suspended personnel cage.

Figure 62 Work from a gondola supported by wire strops.

7.7 Work can also be carried out from cages or gondolas suspended between or to the side of stows (figures 63 and 64). In addition to inserting, unlocking or removing twistlocks, gondolas are also used to insert or remove lashing bars and other container securing devices. If long, heavy lashing bars have to be used, working from a gondola may well be easier, safer and quicker than work from the deck of a ship. Figure 65 shows a concept for a double gondola that could span a complete row of containers. When not in use, gondolas and cages can be stowed on the framework of a container crane or on a special stillage (figures 13, 42, 66 and 67).

Figure 63 Three tier rigidly attached gondola for working between container stacks.

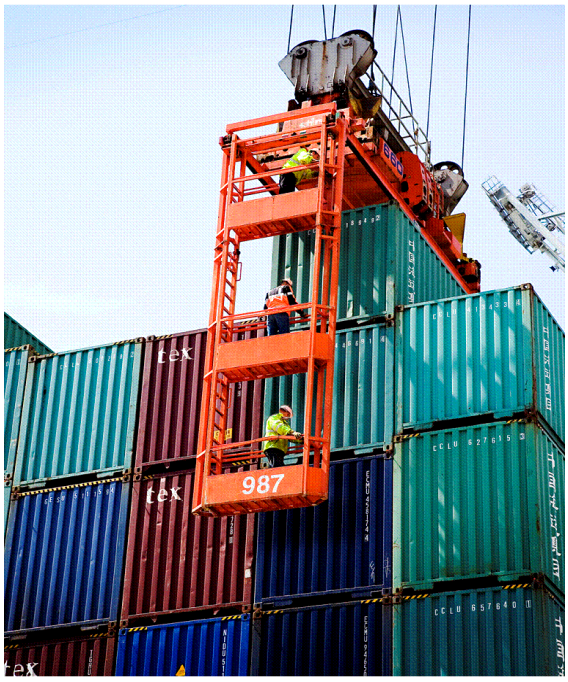

Figure 64 Three tier rigidly attached gondola working to side of container stacks.

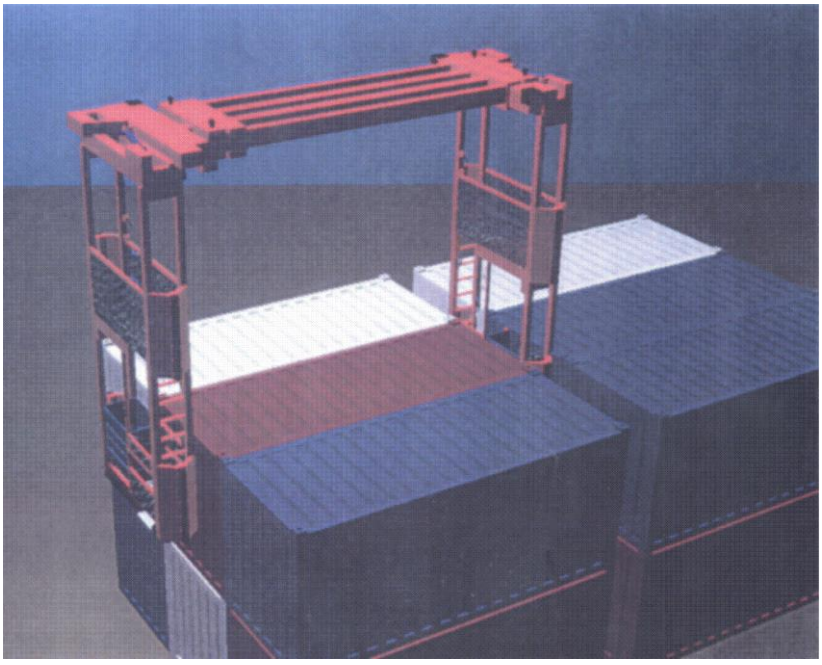

Figure 65 Concept for a double gondola providing access to both ends of the stack at the same time.

Figure 66 20 ft personnel cage stowed on cill of container crane.

Figure 67 40 ft Double personnel cage stowed on crane cill. The centre section can be lifted separately by a 20 ft spreader.

Work from landed container access equipment

7.8 Another method of working is for a personnel cage to be landed on a stow and for persons protected by an appropriate fall prevention or fall protection system to work outside it. This can allow the crane to work elsewhere while work is being carried out on the tops of containers (figures 68 to 71). The crane should not be working in the same row outboard of those on the tops of containers and should be separated from them by the width of at least one container. The work can also be carried out by persons protected by a fall protection system attached to a landed spreader (figures 72 to 77) or headblock. However, this does not permit the crane to work elsewhere while the container top work is in progress.

Figure 68 Unlocking twistlocks while secured to landed personnel cage.

Figure 69 working on tops of containers while secured to landed personnel cage.

Figure 70 working from landed personnel cage on a feeder ship.

Figure 71 Worker shown in figure 71.

Figure 72 Personnel cage with access gates in sides and recessed ends.

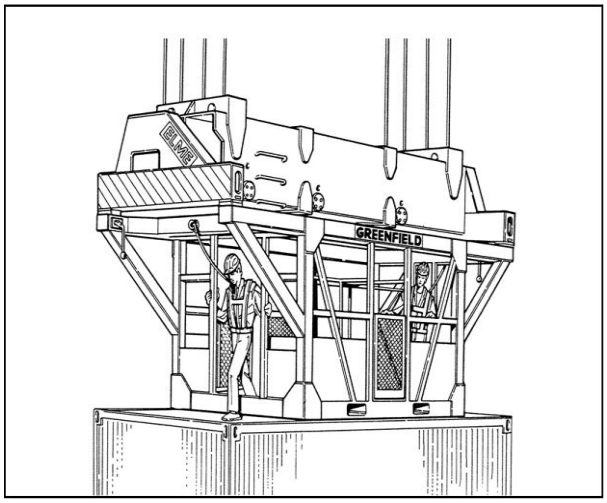

Figure 73 Use of personnel cage shown in figure 72.

Figure 74 Access to container corner fitting on inland waterway barge protected from landed spreader.

Figure 75 Work on container corner fitting protected from landed spreader.

Figure 76 Work on top of containers while protected. Note 'fuse' to limit forces on man and harness in the event of a fall

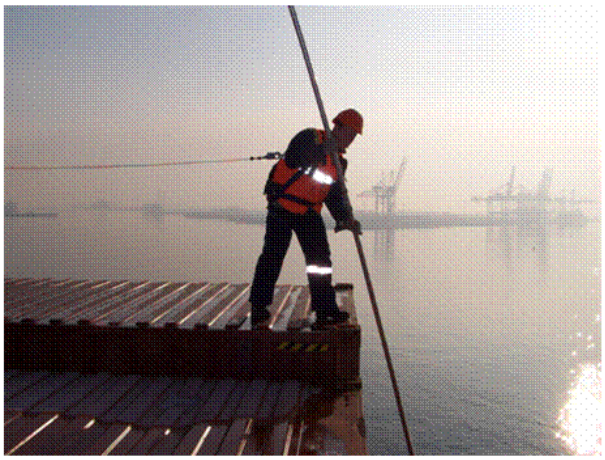

Figure 77 Container top works protected by landed personnel cage

Work secured to suspended equipment

7.9 Work can be carried out on the tops of containers using an appropriate fall protection system secured to a suitable anchorage on personnel cages, spreaders or headblocks that are not landed (figures 78 to 81). These may be traversed across the stow from outboard towards the quay as the work is carried out. Although this method does not allow the crane to work elsewhere, it is likely to enable the work to be carried out far quicker than if the crane has to return a number of times to move a landed cage or spreader

Figure 78 Personnel cage above a stow of containers on a ship.

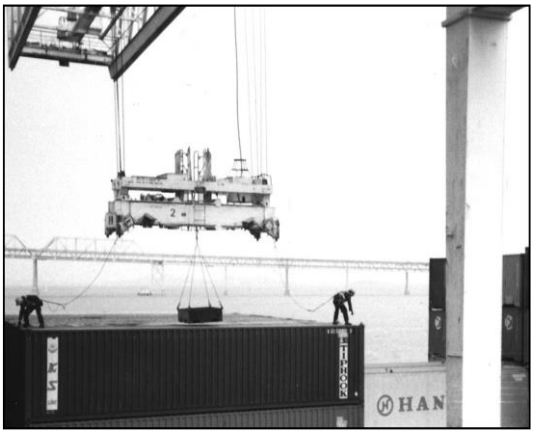

Figure 79 Removing twistlocks while attached to a spreader.

Figure 80 Removing twistlocks while attached to a personnel frame.

Figure 81 Work with modified half height container with hinged end fences.

7.10 One system uses a modified half height container (figure 81). Eight foot long hinged fences are provided at both corners on the seaward side of the modified container. When the fences are hinged out, they provide protection for persons working at the end of the stow, particularly persons using poles to release twistlocks on lower tiers. The workers are secured to the half height container by simple waist lines that prevent them from going beyond the edge of containers. Work starts at the seaward end of the stow and moves towards the quay. The half height container and many other cages include bins or lockers to hold the twistlocks or other container securing devices that are to be inserted or removed. If work is carried out attached to such containers or a spreader or headblock that does not have adequate stowage space, a separate basket or other receptacle for container securing devices can be attached to or suspended from them (figures 79, 80, 82 and 83).

Figure 82Twistlock basket suspended from spreader.

Figure 83 Twistlock basket suspended from spreader.

Work with portable personnel securing systems

7.11 A number of fall protection systems have been developed using portable anchorages that are inserted into corner castings of containers or other equipment.

7.12 In 1980 the original ICHCA overview of container top safety referred to the use of rings set up on container tops and even rings set in the container structure. Another system that was developed consisted of a span rope secured between fittings in two diagonally opposite corner castings in the top of a container. Stevedores were then secured to the span rope by short lifelines and the diagonal fixings moved one at a time alternately across the stow. However the system was not successful. It was found to be cumbersome and the span rope was felt to be a tripping hazard. A somewhat similar system that used a taut wire rope along a flatrack, which was used for access and to carry equipment, was also developed. This system was also found to be unsuccessful as the rope tended to chafe and to need frequent maintenance.

7.13 The “Eddie” (figure 84) is one device that has been developed. Eddies can be used in pairs. A suitably protected person can insert an “Eddie” in a corner casting at the opposite ends of a container in a stow. Once the “Eddies” are inserted, two persons protected by them work at the opposite end of containers from their “Eddie” (figure 85). Up to four containers on each side of an “Eddie” can be worked before it is necessary to relocate it. Detailed procedures have been devised to ensure the protection of persons locating the device or working at the outer edges of inboard or outboard containers. The device can be used on the top of a stow on a ship when

there is insufficient clearance below a container crane to allow the use of a personnel cage. The use of this device may not be permitted in some countries.

Figure 84 The "Eddie", portable adaptor bracket and fall arrest block.

Figure 85 The "Eddie" in use on the tops of containers.

7.14 Another system that has been developed more recently is the Wand system (Figures 86 to 88). This attaches the lifeline to the anchor portion of the Wand. There are two versions that can be deployed while standing three feet from the edge of the tops of containers as required by the United States Rule. The Top Lock Wand locks into a top aperture of a corner fitting. The Top Access End Lock Wand locks into a side aperture of a corner fitting. A twistlock may be in the top aperture at the same time. A third version, the End Lock Wand, is for use in vertical aperture of a corner fitting of a container above the person to be protected (figure 88).

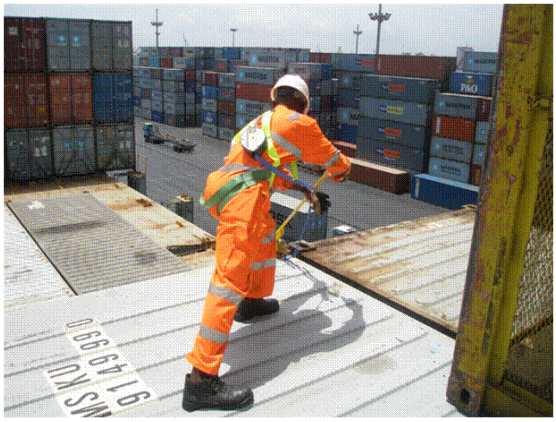

Figure 86 Inserting Top Lock Container Wand while 3 ft from open edge.

Figure 87 Working attached to Top Lock Container Wand.

Figure 88 Protections from End Lock Container Wand.

7.15 Workers on the top of containers on shore can also be protected by the use of purpose built frames which can be taken to site by reach trucks (figures 89 and 90).

Figure 89 Mobile frames to protect workers on top of containers and similar workplaces.

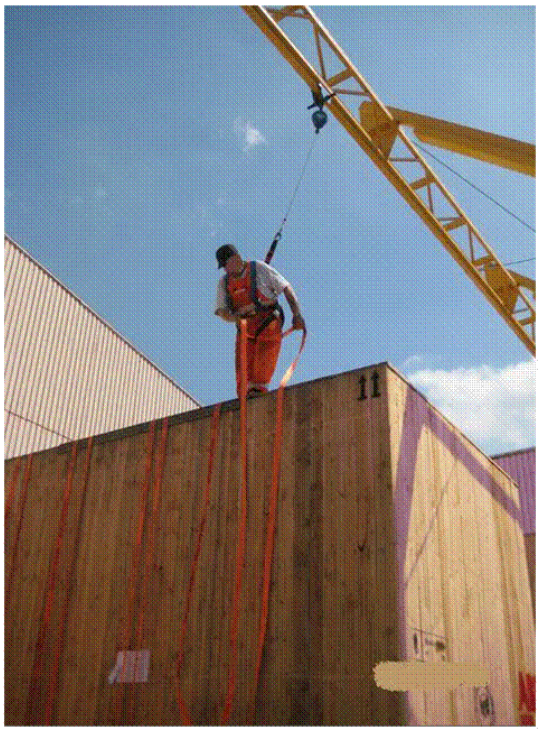

Figure 90 Worker on top of case protected from mobile frame.

Work with jib cranes

7.16 The systems that have been described so far have all been related to containers being handled by container gantry quay cranes. Containers are also handled by jib cranes. These may be ships' cranes, fixed or rail mounted shore cranes, or mobile cranes. Although high capacity mobile cranes are increasingly being used in terminals, containers handled by jib cranes are fewer in number than those handled by container gantry cranes. Jib cranes also tend to be used to handle containers in smaller stows on smaller ships. These are often feeder ships, general cargo ships or combi ships. Containers handled by jib cranes are more liable to sway and consequently are more difficult to handle. As with any swinging load, there is a danger of persons being trapped and crushed between the container being handled and other containers or fixtures on ship or shore.

7.17 When containers have to be handled by jib cranes, the need for people to work on the tops of containers should be avoided whenever possible. This can often be avoided by the use of SATLs. When such work has necessarily to be carried out on the tops of containers it should be undertaken in accordance with a safe system of work. The work needs to be carried out by competent, experienced workers who are fully aware of its additional hazards and who follow carefully developed safe systems of work. Adequate supervision is essential to ensure that the procedures that have been developed are followed in practice.

7.17 Common reasons for persons to work on the top of containers handled by jib cranes

include steadying and guiding containers into position in a stow on a ship, inserting or removing twistlocks or cones and attaching or detaching lifting gear. The use of fall protection equipment by persons carrying out such work is unpopular with some, who feel that it may impede their movement if they have to get out of the way of a swinging container. It may also be difficult to provide a suitably positioned anchorage for such equipment. These are difficulties that have to be acknowledged and are additional reasons for work on tops of containers to be eliminated wherever practicable and for the implementation of safe systems of work when this is not practicable. Where possible, containers should be guided into position from a safe place by the use of tag lines rather than by persons on the tops of containers.

7.18 In many cases access to the tops of containers to attach or detach lifting gear has been associated with the use of four legged slings to lift containers, despite the limitations on the use of such slings for this purpose in ISO 3874: 1997 '*Series 1 freight containers - Handling and securing*'. The need to use slings should be avoided by the use of spreader frames. An increasingly wide range of spreaders is now available ranging from the simple to highly sophisticated. Spreaders may be manually or electrically operated. Some incorporate a spring-loaded locking/unlocking mechanism on the spreader that does not require any alteration to a crane so that the spreader can be attached to the crane in the normal way. When jib cranes are regularly used to handle containers they should be used with a self-locking/unlocking spreader fitted with a rotator.

7.19 When using jib cranes, personnel cages or gondolas should be used whenever possible for access to, and work on, tops of containers. In some situations it may be desirable to secure the cage when it is landed on containers on a ship. The installation of pillars at the centre or at each end of a spreader or frame (figures 91 and 92) is one way of providing anchorages for fall arrest equipment when working with jib cranes.

Figure 91 Centre pillar anchorage for personnel protection.

Figure 92 End pillar anchorage for personnel protection.

8 OPERATIONAL ASPECTS

Control of container top operations

8.1 Container cranes are designed primarily to lift containers and in many cases the lifting of persons by them was not considered when they were built. The situation is similar to that relating to lifts in buildings where passenger lifts are required to have additional precautions to those required on goods lifts. The most usual restriction is on the operating speed of the crane. The maximum speed of hoist and trolley drives should be limited to 150 ft per minute (0.76 m per second) when the crane is carrying persons. Other precautions include the prohibition of the crane carrying containers or travelling along the quay when carrying persons, the use of 'dead man' controls, double wire purchases, safety cut-outs, safety belts and limits on the number of persons that may be carried at one time. Some cranes are fitted with fall protection equipment that remains attached to the crane at all times. Where practicable, container cranes that are used to carry persons should be fitted with an emergency stop button that is accessible to the persons being carried and a control monitoring system that will detect serious errors.

8.2 Where persons are working on the tops of containers, in conjunction with a crane, it is essential that communication with the crane driver is unambiguous. There should be one person in charge of each operation on the tops of containers and the crane driver should only take instructions to move from that person. Communication with the crane driver can be by radio, hand signals or by a third party such as a supervisor. If radios are used, care needs to be taken in allocating channels to ensure that an instruction to one crane driver is not acted upon by another. It will often be advisable for there to be at least two persons in the cage with one person only having the task of communicating with the crane driver. This is a legal requirement in some countries where the risks to a single person working in or from a cage are considered to be unacceptable, even when they are equipped with a hands free radio set. For most of the time, the body of the person working on the container is likely to obstruct the view of the crane driver and prevent clear sight of what is happening below. At least one port requires radio silence on the channel while persons are in a cage other than those involved with the operation.

Chimney stows and canyons

8.3 Access to a single stack (a 'chimney' stow) or canyons between containers has caused difficulties because of the need to obtain access to each container separately to insert or remove twistlocks. While such work can be carried out from a suitable personnel cage, this needs to be lifted and moved each time. This need can be minimised by the use of semi-automatic twistlocks which will eliminate, or considerably reduce, the number of times access will be required. When access is necessary, the use of a cage such as that shown in figure 73 may be appropriate. In canyons, the End Lock Container Wand System (figure 88) may also be useful.

Flat-racks, open top, overheight, soft top and tank containers

8.4 Difficulties may also occur when access is necessary to block stows of flat-racks, open top, overheight, soft top or tank containers, which do not have solid rigid roofs. It is helpful if ship planners are able to arrange for such containers to be in alternate rows with conventional closed containers so that there is safe access to both sides of these types of containers from the tops of closed containers. Some tank containers only have end frames with no longitudinal members. The use of overheight lifting

frames (figures 93 and 94) can avoid the need to manually connect lifting gear to containers with overheight cargo.

Figure 93 Overheight frame.

Figure 94 Overheight frame.

Non-containerised cargo

8.5 Similar problems may occur in connection with the stowage of non containerised cargo on top of containers. This has been particularly so in connection with the carriage of motor vehicles but these are now often transported inside containers. Ship planners should ensure that non containerised cargo is not stowed in a position that will prevent the use of container access equipment and the deployment of safety equipment.

Feeder ships

8.6 Whilst many stows on feeder ships may be two or three high, some may be up to six high. Particular care needs to be taken when working small feeder ships. The stability of such ships can easily be affected by the handling of even one container. Persons working on these ships should be aware of this and be prepared for the ship to roll when a container is loaded or discharged. On a small ship even the movement of water, the wakes of passing ships or the landing of a personnel cage can cause the ship to roll. In such circumstances it may be preferable not to land the cage but to work from a suspended cage which is positioned above, or moved across, the stow as appropriate.

Limited air draught

8.7 In some circumstances, such as at 0r near high tide, limited clearance between the top tier of containers on a ship and the spreader of a quay crane may prevent the use of a conventional full height personnel cage. Rather than waiting until there are more favourable tidal conditions, some terminals have used half height personnel cages. However such cages will not be suitable for carrying persons and a specially constructed air-draught cage (figure 95) should be used.

Figure 95 Air draught personnel cage lifted by a 20 ft spreader.

Lighting

8.8 Appropriate lighting should be provided if work on the tops of containers is necessary during the hours of darkness. This may be by from luminaries on container quay cranes. Guidance on lighting levels is contained in section 3.1.3 of the ILO Code of Practice *Safety and Health in Ports.*

Adverse weather

8.9 Adverse weather may severely affect the safety of persons working on the tops of containers. The safe system of work for work on the tops of containers should clearly identify the conditions under which such work should be stopped. This will often be in the event of high wind speeds. The limiting conditions are likely to be lower than the conditions under which all container handing operations should stop. The conditions should be carefully defined and should include limits relating to gusts as well as to steady wind speeds. The period over which winds or gusts should be measured should be clearly defined.

Work in holds of non-cellular ships

8.10 Containers are sometimes stacked in the holds of non cellular ships and access to the tops of them may be necessary. This can often be avoided by the use of SATLs and / or stacking cones (figure 2). When access is necessary it may not be possible to use cages in the usual manner and other access methods, such as some of those that are used on shore may be necessary. Similar problems may occur in connection with the securing of container stacks on the decks of general cargo ships or bulk carriers.

Changing crane drivers

8.11 It has been reported that persons in personnel cages or platforms on spreaders have been left suspended for a period whilst crane drivers were changed. Any cage or other device in or on which persons are being carried should be landed before crane drivers are changed. Safe systems of work should require a driver to be in the cab at the controls at all times when persons are in personnel cages, gondolas or on platforms on spreaders or headblocks

Jammed twistlocks or containers

8.12 Even in ships with cell guides, problems may sometimes occur which make it necessary for a person to go into the stack or onto the tops of containers. The most common reason is to free a jammed twistlock or other container securing device. Some ports minimise the occurrence of jammed twistlocks by specifying that the twistlock unlocking force of a spreader shall be 50% greater than the locking torque.

8.13 The freeing of jammed container securing devices are operations that need to be undertaken by experienced persons who are aware of the potential dangers, including those from the container suddenly moving when the jam is released. Appendix 4 contains an example of guidance. Similar guidance was originally published following a fatality in a terminal when attempts were being made to free jammed twistlocks. The container was suddenly released and swung forward hitting a terminal operator on the head. The operator had been watching the operation from a lashing bridge and died two days later from his injuries. Dangers may also arise during the freeing and unloading of containers that may have shifted due to severe weather during a voyage.

8.14 Some ships and terminals have developed special tools to enable them to free jammed twistlocks. A number of such tools are illustrated in Appendix 4. All persons using such tools should be trained in their safe use and aware of the hazards of being trapped or struck by the tool or the container if the jam is suddenly freed.

Rescue

8.15 It has to be acknowledged that accidents do happen from time to time for various reasons. All container terminals should have emergency plans for the rescue of persons who may be injured in the event of an accident. The emergency plans should also cover rescue in the event of a sudden medical emergency, such as a heart attack. One terminal has a purpose built personnel cage (figure 96) to assist in the recovery of casualties. The use of rescue hooks (see 9.10 below) allows rapid recovery of a worker that falls over the edge of a container so minimising the risks of suspension trauma. By the perverse nature of things, on occasions illness or injuries occur in remote areas where rescue may be difficult. Such places have included the outboard walkway of a large container ship that was just beyond the reach of the container crane and some areas of holds. Following one such an accident a terminal developed a portable manual crane that can be taken to site by hand and quickly erected in the corner casting of a container (figures 97 to 102).

Figure 96 Rescue cage allowing easy access to the casualty.

Figure 97 Transportable components of crane.

Figure 98 Crane base unit mounted in a container corner fitting.

Figure 99 Crane pillar mounted on base unit.

Figure 100 Crane jib mounted on pillar.

Figure 101 Crane complete with winch.

Figure 102 Casualty raised.

9 OTHER CONSIDERATIONS

Selection, training, supervision and further education

9.1 Not all persons are suitable to carry out work on the tops of containers. Container top workers should be carefully selected. They should be able to demonstrate an aptitude to work at heights without being foolhardy. The work is arduous and those who carry it out need to be physically fit. A medical examination prior to starting such work is recommended. In some countries and terminals periodic medical examinations are also carried out.

9.2 The provision of appropriate equipment whether or not it is provided in accordance with a legal requirement will not ensure the implementation of a safe system of work. After a safe system of work has been developed, in consultation with those who will be involved, it is essential that adequate training is given to ensure that it is fully understood. Commitment to its continuing implementation by management is also necessary, both by senior management and by the supervisors who are directly in control of the day –to-day operations. Figure 103 shows training in progress at one terminal. In a number of countries terminal workers are briefed at the beginning of each shift by their supervisors. This may take the form of a briefing on the task for the day and any personnel protective equipment that may be necessary. In addition, 'tool box talks' are given at intervals in some terminals to remind workers of particular safety topics.

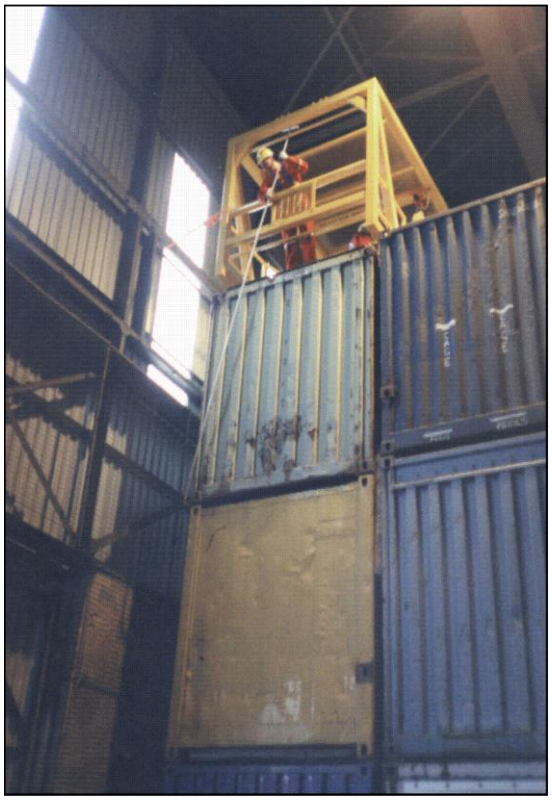

Figure 103 Trainees practicing use of twistlock poles in a terminal training centre.

9.3 From time to time, on-going refresher training or re-education is also necessary to ensure that unsatisfactory and unauthorised practices do not creep in and to deal with problems that have arisen but may not have been anticipated.

9.4 The use of posters, pocket leaflets and handbooks to highlight particular matters or remind those concerned of correct procedures can also be useful.

Fall protection systems

9.5 A fall protection system is the most important item of personal protective equipment to be used when work at or near the open edges of the tops of containers is necessary. It consists of a lifeline connecting the person protected to an anchorage point.

9.6 A fall protection system may be one of two types:

- Fall prevention systems, such as fencing, prevent a person falling off the open edge of a container
- Fall arrest systems only allow a person who falls off the open edge of a container to fall a short distance which is unlikely to result in serious injury.

A fixed length lifeline or lanyard may be satisfactory for use in a fall prevention system. Whenever possible a fall prevention system should be used rather than a fall arrest system.

9.7 A fall prevention system will not necessarily prevent a person's legs falling off the edge of a container but will prevent the whole body falling off the container. The lifeline of a fall prevention system may be attached to the wearer by a simple waist belt but a full body harness is strongly recommended. In order to prevent serious injuries to the back and internal organs in the event of a fall, some countries prohibit

9.8 Fall arrest systems incorporate lifelines attached to inertia reels that lock in the event of a sudden jerk, in the same way as inertia reel car seat belts. As required by the United States Rule such systems should incorporate an energy absorbing mechanism, sometimes referred to as a 'fuse' (figure 76), to reduce the arresting force applied by the equipment to a falling person. The incorporation of an inertia reel allows a person to work further from the anchorage point than is possible using a fall prevention system. The anchorage point for an inertia reel block should be carefully positioned in relation to the place where the person it is to protect is to work (figures 104 to 110). The manufacturer's advice should always be taken into account when selecting an appropriate anchorage point for an inertia reel block, as some blocks are only suitable for use in connection with direct vertical loads. Figure 112 is an example of such advice. The lifeline of a fall arrest system should be attached to a full body harness (figure 111) to prevent the wearer being subjected to dangerous deceleration forces in the event of a fall from a container. This is a legal requirement in the United States, Europe and some other countries.

Figure 104 Fall arrest block anchorages to eyes at the top of a personnel cage.

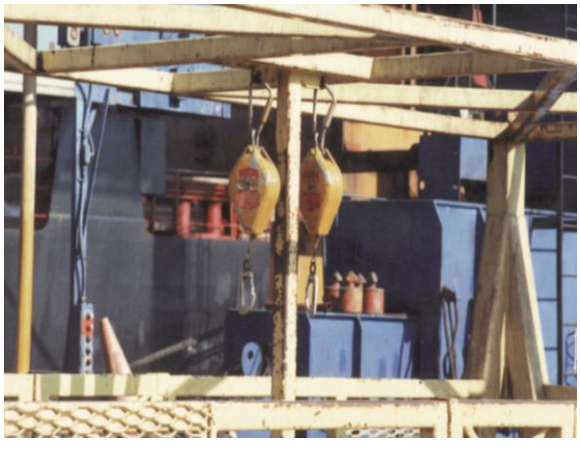

Figure 105 Fall arrest block anchorages to eyes at the centre of a personnel cage

Figure 106 Fall arrest block anchorages to trolleys on runway beams at top of a personnel cage.

Figure 107 Personnel cage including four fall arrest blocks on runway beams

Figure 108 Twistlock basket frame with a pivoted beam at each end on which a fall arrest block can be attached to a trolley

Figure 109 Pivoted beam at each end on a spreader with a fall arrest block attached to a trolley

Figure 110 Identification of fall arrest anchorage location on spreader.

Figure 111 Attachment of fall protection to full body harness

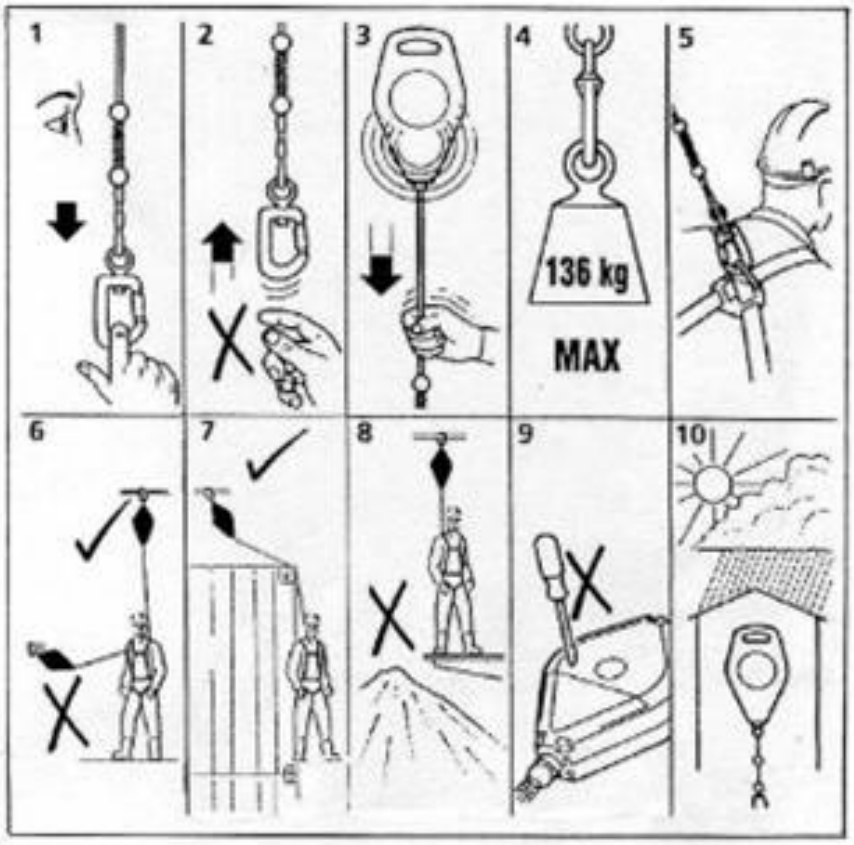

Figure 112 Pictorial advice on the correct use of a fall arrest block.

9.9 The lifelines of fall protection and fall arrest systems should be thoroughly examined at appropriate intervals and inspected daily before use. Any lifeline that is damaged by cuts, abrasions or chemicals should not be used. Lifelines not in use should be carefully stored and protected from weather and ultra violet light.

9.10 Although a fall arrest system will prevent the obvious immediate hazards of falls from heights, it may itself lead to potentially fatal consequences due to suspension trauma. Suspension trauma may occur within five to twenty minutes and can rapidly lead to death. It results from the venous pooling of blood in the lower extremities, usually the legs, of a person hanging in a harness. This can be prevented by the rapid rescue of the person in the harness and by the person in the harness using their leg muscles to keep blood circulating. This may be helped by pushing with the feet against the side of a container or by alternate knees bend and leg raises and rotating and flexing the feet and ankles. It is essential that anyone who uses fall arrest equipment is aware of the hazards and trained in the action to be taken in the event of a fall. Figures 113 and 114 show the use of a lightweight rescue device that can be rapidly deployed. It is recommended that a rescue hook is kept in each personnel cage in order to enable a person who has fallen from a container to be rescued very rapidly. A person who has been recovered from being suspended in a harness must NEVER be laid down but should be kept in a sitting or huddled position for at least 30 minutes and then taken to a hospital for checks. ICHCA Safety Panel Briefing Pamphlet No 22 *Suspension Trauma* contains further advice.

Figure 113 Rescue Pole

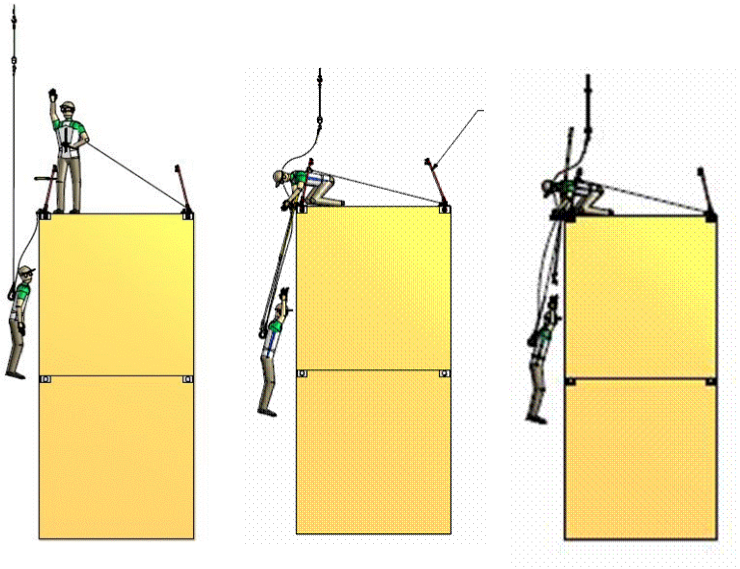

Figure 114 Use of rescue pole

Hook on to casualty. *Release pole.* *Lift*

9.11 If a person falls from a container, the fall protection system will be subjected to sudden shock loading. The system should not be used again until all its components have been inspected by a competent person and found to be undamaged and suitable for further use.

9.12 When deciding the method of attachment of lifelines to anchorages, care should be taken to ensure that the lifeline cannot be accidentally disengaged. Any karabiners used should be of the screw-gate type. Spring-gate karabiners should not be used for this purpose as they have been known to open unintentionally with fatal consequences.

9.13 Particular care should be taken when selecting harnesses, and other types of safety equipment, to choose a type that provides the protection that is necessary and is as comfortable as practicable. Cumbersome and uncomfortable safety equipment will meet with wearer resistance. Selection should be made in consultation with those who will be wearing the equipment in practice. There is understandable reluctance on the part of some workers to appreciate the reason for the need to wear a full body harness in conjunction with fall arrest equipment. One terminal overcame this by simulation. Those concerned were first fitted with a full body harness and then hoisted and held some two feet above the ground. This was then repeated wearing a waist belt. After only a few moments hoisted in the waist belt, even the most vociferous complainer was convinced that the full body harness offered the most protection and comfort. The importance of selecting well designed safety equipment would be better understood by those responsible for its selection if they wore the equipment being considered under operating conditions for a suitable period.

9.14 Fall protection equipment that is not in use should be stowed in a suitable place. Figure 115 shows an example in a personnel cage but it is preferable for the equipment to be issued individually or as and when required.

Figure 115 Locker for storage of Fall protection equipment

Other personal protective equipment

9.15 The need to wear good slip resistant industrial footwear when working on the tops of containers should be self evident.

9.16 The need for the use of safety helmets is now generally accepted. Although it is not often possible to prove that accidents have been prevented, it is easily demonstrated in the case of safety helmets. There have been several incidents involving falling twistlocks or lashing equipment where the wearing of a safety helmet has prevented, what would clearly have been, serious or fatal accidents. One worker who had resisted the compulsory wearing of safety helmets later changed his mind when he acknowledged that the safety helmet that he had been made to wear had undoubtedly saved his life. A worker in another country survived being hit by a semi-automatic twistlock that fell out of a container and fell more than 10 m onto his helmet. These are only two examples of a number of similar incidents. A number of ports use safety helmets with short visors in order to prevent neck stress.

9.17 The use of high visibility clothing has also increased considerably in recent years. All too frequently accidents involve persons who have not been seen by others. High visibility clothing should be worn by all those involved with container top operations. It should not impede operations. One piece overalls should normally be worn but additional suitable high visibility clothing will be necessary in adverse weather conditions.

9.18 The use of leather or other appropriate gloves when handling twistlocks is recommended.

10 THE FUTURE

10.1 Administrations should review their legislation relating to safety in dock work with a view to reflecting the current international standards, including International Labour Office Convention 152 of 1979, section 7.8.3 of the associated Code of Practice on Safety and Health in Ports and the relevant sections of Annex 14 of the IMO Code of Safe Practice for Cargo Stowage and Securing and IMO MSC/Circ.886.

10.2 From 2015 all new container ships should have been designed to eliminate or minimise the need for persons to go onto the tops of containers.

10.3 In the meantime and for ships built before 2015, ship owners and terminal operators should take into account MSC/Circ.886 and Annex 14 of the IMO Code of Safe Practice for Cargo Stowage and Securing and seek to eliminate or minimise the need for persons to work on the tops of containers so far as is practicable.

10.4 Wherever practicable ships should be equipped with semi-automatic twistlocks, or other appropriate container securing devices, to minimise the need for workers to go onto the tops of containers on ships and to enable container handling operations to be carried out safely in accordance with the laws of different countries.

10.5 All terminals and employers of labour should aim to eliminate the need for persons to work on the tops of containers whenever possible.

10.6 All terminals and employers of labour that necessarily has to work on the tops of containers should develop strategies and procedures to deal with the problems of ensuring the safety of such persons. These procedures could differ between the short and the long term.

10.7 In the short term persons should only work on the tops of containers on ships from inside a personnel cage or, if they cannot do so, they should work in accordance with a safe system of work with a suitable fall protection system, preferably a fall prevention, system that is secured to an appropriate anchorage point.

10.8 All persons who necessarily work on the tops of containers should be instructed on the hazards of such work and be suitably trained. Training should include awareness of the hazards of suspension trauma and the procedures to initiate rescue procedures in the event of a fall from a container.

10.9 Management and supervision should ensure that the safe methods of work that have been devised to ensure the safety of those who necessarily work on the tops of containers are followed in practice.

10.10 New developments will continue to take place. Whilst these may provide solutions to existing problems, some may give rise to new problems.

10.11 Whatever their nature, future developments should incorporate or be incorporated in a safe system of work including the three basic elements;

- the procedure
- appropriate instruction and training and
- supervision to ensure the procedures are followed.

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APPENDIX 1 (see paragraph 4.2)

INTERNATIONAL LABOUR OFFICE REFERENCES TO CONTAINER TOP WORKING

THE OCCUPATIONAL SAFETY AND HEALTH (DOCK WORK) CONVENTION, 1979
ILO CONVENTION 152

PART II. GENERAL PROVISIONS

Article 4

1. National laws or regulations shall prescribe that measures complying with Part III of this convention be taken as regards dock work with a view to -

(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 any workplace;

(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; …

****

ILO RECOMMENDATION 160

THE OCCUPATIONAL SAFETY AND HEALTH (DOCK WORK) RECOMENDATION, 1979

PART II. GENERAL PROVISIONS

4 In developing measures under Article 4, paragraph 1, of the Occupational Safety and Health (Dock Work) Convention, 1979, each Member should take into consideration the technical suggestions in the latest edition of the Code of Practice on safety and health in dock work published by the International Labour Office in so far as they appear to be appropriate and relevant in the light of national circumstances and conditions.

5 In taking the measures referred to in Article 4, paragraph 1, of the Occupational Safety and Health (Dock Work) Convention 1979, each Member should take account of the provisions of Part III of this Recommendation, which are supplementary to those set out in Part II of the Convention.

PART III. TECHNICAL MATTERS

22 Every reasonable measure should be taken to minimise risks of accident when work has to be carried out on top of freight containers.

****

ILO CODE OF PRACTICE

SAFETY AND HEALTH IN PORTS, 2005

3.6.2.9 Access or lashing cages

1 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. Most cages are 20 or 40 feet long 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.

Figure 22

2 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 hand rail should be proved 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 should be provided 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
  - The provision of an additional automatically operated twistlock at both ends of the spreader.
- A notice giving instructions for safe use.

3 The bottom corners of the cage may be recessed and the end of the floor of the cage 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.

4 An emergency stop button should be provided where possible.

5 Radio communication with the crane operator should be provided.

7.8.3 Container top working

1 When work on container tops cannot be avoided, safe means of access to them should be provided.

2 Access to the tops of containers should be from part of the ship's permanent superstructure whenever possible. This may be from lashing bridges.

3 When such access is not possible,* 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
- Platform built on header block.

* Some countries do not allow riding on platforms.

4 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
- All parts of the body, particularly the hands and head, should be kept inside the cage or platform at all times.

5 Portworkers should never climb up the ends of containers.

6 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 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 portworkers have safe access.

7 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. Fall arrest systems limit the distance a person can fall from an open edge.

8 The choice of system actually used will be influenced by the equipment used to secure 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 4 high have be unlocked by pole either from the topmost tier or from a gondola at the side of the stow.

9 When a purpose built access cage is used, it can be moved slowly across the top of each tier of containers while workers in it place or remove twistlocks. Great care should be given 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 control the operation at all times.

10 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 the attachment to the reel and to aid recovery.

11 Other systems or methods may be used in connection with container top working, provided that they ensure the safety of portworkers at all times.

12 Work on top of containers should cease in high wind conditions (see section 11.1.9).

13 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 combi ships, where freight containers are stowed and lashed.

14 Further guidance on safe working on tops of containers is in the ICHCA International Ltd. "*Container top safety, lashing and other related matters",* International Safety Panel Research Paper No. 4*.* *

* ICHCA International Research Paper No 4 has now been withdrawn and replaced by Briefing Pamphlets 34 *Container Top Safety* and Briefing Pamphlet 35 *Safe Lashing of Deck Containers.*

APPENDIX 2 **(**see paragraphs 4.4 and 4.5)

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MSC/Circ.886
21 December 1998

RECOMMENDATION ON SAFETY OF PERSONNEL DURING CONTAINER SECURING OPERATIONS

1 The Maritime Safety Committee, at its seventieth session (7 to 11 December 1998) expressed serious concern at the dangers to personnel working at the top of containers during container securing operations, which result from container securing arrangements being located in difficult and dangerous locations, and approved the Recommendation on safety of personnel during container securing operations, as set out in the annex.

2 Member Governments are invited to bring this Recommendation to the attention of port authorities, containership owners, designers and all other parties concerned and to consider other positive measures to address this problem in port and when approving cargo securing arrangements, as appropriate.

***

ANNEX

RECOMMENDATION ON SAFETY OF PERSONNEL DURING CONTAINER SECURING OPERATIONS

It has been noted that a number of fatal accidents to crew and dockworkers have involved falls om the top of containers during container securing and unsecuring operations. Although fall protection nd fall arrest systems and equipment are available for use whenever container top work is involved, ey are cumbersome and reduce the speed of loading and unloading operations of a ship, and thus of mited use and effect.

The conventional means of securing containers in non-cellular deck spaces are heavy and ifficult to handle, resulting in accidents and non-fatal physical injuries. Newly developed equipment ch as semi-automatic and dual function twistlocks are only partially effective in eliminating danger. hey depend on the stacking height of containers on deck not exceeding four and require a safe work lace on the quayside for their application or removal.

A safer environment for personnel involved in the securing of containers can be achieved by hipowners and ship designers focusing on the safety of container securement at the initial stages of the uilding of a ship, rather than relying on operational methods for this purpose after the ship is built. uch successful current design ideas include:

.1 **Hatchless holds**

These containership designs usually have cell guides to the full height of stowage and do not normally require container top working.

.2 **Flexible boxship arrangements**

These designs are involved on deck cell guides which can be altered in length to accommodate the different lengths of container currently used in the industry, e.g. 20, 30 or 40 feet.

.3 **Deck cell guides**

This usually means either "hatchless holds" or a hatchless ship, but designs exist with cell guides on deck but also with hatch covers. Although deck cell guides have a good safety and securement record, they can create operational inconvenience when loading the varying lengths of container that are commonly in use.

.4 **Lashing frames**

These are mobile personnel carriers by which lashing personnel work on the twistlocks without having to climb upon the container tops. These are often used from container gantries but are operationally more convenient when independent of the shore gantries so that lashing/unlashing can continue without interfering with, and causing delay to, the loading/unloading operation.

.5 **Lashing platforms**

These are permanent or partly mobile platforms, whereby access to deck twistlocks etc can be achieved without having to climb on the top of the container.

4 In addition to these alternative arrangements, new and equally effective concepts are likely t evolve if increased attention is given to the achievement of safe securing and unsecuring of containe at the ship design stage instead of relying upon operational methods for this purpose. If the process c securing is made safer for the personnel involved and more efficient, a reduction in the loss of containe overboard will provide financial and environmental benefits.

5 Containership owners and designers are therefore reminded of the dangers associated wit container securing operations and urged to use and develop container securing systems which are saf by design, with the aim of eliminating the need for container top work, work in other equally hazardou locations, or the handling by crew or dock workers of heavy and unwieldy securing equipment.

MSC.1/Circ.1352

AMENDMENTS TO THE CODE OF SAFE PRACTICE FOR CARGO STOWAGE AND SECURING (CSS CODE)

1 The Maritime Safety Committee, at its eighty-seventh session (12 to 21 May 2010), approved amendments to the Code of Safe Practice for Cargo Stowage and Securing (CSS Code), set out in the annex.

2 Member Governments are invited to bring the annexed Amendments to the CSS Code to the attention of shipowners, ship operators, shipmasters and crews and all other parties concerned and, in particular, encourage shipowners and terminal operators to:

.1 apply the annexed amendments in its entirety for containerships, the keels of which were laid or which are at a similar stage of construction on or after 1 January 2015;

.2 apply sections 4.4 (Training and familiarization), 7.1 (Introduction), 7.3 (Maintenance) and section 8 (Specialized container safety design) to existing containerships, the keels of which were laid or which are at a similar stage of construction before 1 January 2015; and

.3 apply the principles of this guidance contained in sections 6 (Design) and 7.2 (Operational procedures) to existing containerships as far as practical by the flag State Administration with the understanding that existing ships would not be required to be enlarged or undergo other major structural modifications as determined.

CSS ANNEX 14 GUIDANCE ON PROVIDING SAFE WORKING CONDITIONS FOR SECURING OF CONTAINERS ON DECK

1 Aim

To ensure that persons engaged in carrying out container securing operations on deck have safe working conditions and, in particular safe access, appropriate securing equipment and safe places of work.

4.1 Introduction

4.1.1 Injuries to dockworkers on board visiting ships account for the majority of accidents that occur within container ports, with the most common activity that involves such injuries being the lashing/unlashing of deck containers. Ships' crew engaged in securing operations face similar dangers.

4.1.2 During the design and construction of containerships the provision of a safe place of work for lashing personnel is essential.

4.1.3 Container shipowners and designers are reminded of the dangers associated with container securing operations and urged to develop and use container securing systems which are safe by design. The aim should be to eliminate or at least minimize the need for:

.1 container top work;

.2 work in other equally hazardous locations; and

.3 the use of heavy and difficult to handle securing equipment.

4.1.4 It should be borne in mind that providing safe working conditions for securing containers deals with matters relating to design, operation, and maintenance, and that the problems on large containerships are not the same as on smaller ones.

5 RESPONSIBILITIES OF INVOLVED PARTIES

5.5 Containership terminal operators should ensure that the recommendations of relevant parts of this annex are complied with.

6 DESIGN

6.1 General design considerations

6.1.1 *Risk assessment*

6.1.1.1 Risk assessments should be performed at the design stage taking into account the recommendations of this annex to ensure that securing operations can be safely carried out in all anticipated container configurations. This assessment should be conducted with a view toward developing the Cargo Safe Access Plan (CSAP). Hazards to be assessed should include but not be limited to:

.1 slips, trips and falls;

.2 falls from height;

.7 the adequacy of the access to all areas that is necessary to safely perform container securing operations;

7.2 Operational procedures

7.2.2 *Container top working*

7.2.2.1 When work on container tops can not be avoided, safe means of access should be provided by the container cargo operation terminal, unless the ship has appropriate means of access in accordance with the CSAP.

7.2.2.2 Recommended practice involves the use of a safety cage lifted by a spreader to minimize the risk to personnel.

MSC.1/Circ.1354

ANNEX

AMENDMENTS TO THE ELEMENTS TO BE TAKEN INTO ACCOUNT WHEN CONSIDERING THE SAFE STOWAGE AND SECURING OF CARGO UNITS AND VEHICLES IN SHIPS (RESOLUTION A.533(13))

2 General elements

1 A new subparagraph .3 is added to paragraph 2.1 as follows:

".3 Safe access and safe places of work are provided for persons engaged in work connected with cargo stowage and securing."

APPENDIX 3 (See paragraph 4.10)

US FEDERAL REGULATIONS 29 CFR PART 1918, SAFETY AND HEALTH REGULATIONS FOR LONGSHORING, AND PART 1917, MARINE TERMINALS

§ 1918.85 Containerised cargo operations

(g) *Safe container top access.* A safe means of access shall be provided for each employee required to work on the top of an intermodal container. Unless ladders are used for access, such means shall comply with the requirements of §1917.45(j) * of this chapter.

*** § 1917.45 Cranes and derricks:** *[As amended in 1997]*

(j) *Protection for employees being hoisted.*

(1) No employee shall be hoisted by the load hoisting apparatus of a crane or derrick except:

(i) On intermodal container spreaders, equipped in accordance with paragraph (j) (8) of this section; or

(ii) In a boatswain's chair or other device rigged to prevent it from accidental disengagement from the hook or supporting member; or

(iii) On a platform meeting the following requirements:

(A) Enclosed by a railing or other means providing protection equivalent to that described in § 1917.112(c) *[Criteria for guard rails. Not included in this extract]*. If equipped with open railings, the platform shall be fitted with toe boards;

(B) Having a safety factor of four based on ultimate strength;

(C) Bearing a plate or permanent marking indicating maximum load rating, which shall not be exceeded, and the weight of the platform itself;

(D) Equipped with a device to prevent access doors, when used, from opening accidentally;

(E) Equipped with overhead protection for employees on the platform if they are exposed to falling objects or overhead hazards;

(F) Secured to the load line by means other than wedge and socket attachments, unless the free (bitter) end of the line is secured back to itself by a clamp placed as close above the wedge as possible.

(2) Except in an emergency, the hoisting mechanism of all cranes or derricks used to hoist personnel shall operate only in power up and power down, with automatic brake application when not hoisting or lowering.

(3) Variable radius booms of a crane or derrick used to hoist personnel shall be so constructed or secured as to prevent accidental boom movement.

(4) Platforms or devices used to hoist employees shall be inspected for defects before each day's use and shall be removed from service if defective.

(5) Employees being hoisted shall remain in continuous sight of and communication with the operator or signalman.

(6) Operators shall remain at the controls when employees are hoisted.

(7) Cranes shall not travel while employees are hoisted, except in emergency or in normal tier to tier transfer of employees during container operations.

(8) When intermodal container spreaders are used to transfer employees to or from the tops of containers, the spreaders shall be equipped with a personnel platform equipped with fixed railings , provided that the railings have one or more openings for access. The openings shall be fitted with a means of closure, such as chains or hooks. Existing railings shall be at least 36 inches (0.91 m) in height. New railings installed after October 3, 1983 shall be 42 inches (1.07 m), plus or minus 3 inches (7.6 cm), in height. The provisions of paragraphs (j) (1) (iii) (C), (j) (1) (iii) (D), and (j) (iii) (F) of this section also apply to personnel platforms when such container spreaders are used.

(9) Employees shall not be hoisted on intermodal container spreaders while a load is engaged.

(10) All cranes and derricks used to hoist personnel shall be equipped with an anti-two-blocking device.

(h) *Employee hoisting prohibition.* Employees shall not be hoisted on intermodal container spreaders while a load is engaged

(i) *Portable ladder access*. When other safer means are available, portable ladders shall not be used in gaining access to container stacks more than two containers high.

(j) *Fall protection.*

(1) *Containers being handled by container gantry cranes.*

(i) After July 26, 1999, where a container gantry crane is being used to handle containers, the employer shall ensure that no employee is on top of a container. Exemption: An employee may be on top of a container only to perform a necessary function that cannot be eliminated by the use of positive container securing devices.*

* Examples of work that may not be eliminated by positive container securing devices and that may require employees to work on top of containers include, but are not limited to; installing or removing bridge clamps; hooking up or detaching over-height containers; or freeing a jammed semi-automatic twist lock

(ii) After July 26, 1999, the employer shall ensure that positive container securing devices, such as semi-automatic twist locks and above deck cell guides, are used whenever container gantry cranes are used to hoist containers.

(iii) The employer shall ensure that each employee on top of a container is protected from fall hazards by a fall protection system meeting the requirements of paragraph (k) of this section.

(2) *Containers being handled by other hoisting devices.* Where containers are being handled by hoisting devices other than container gantry cranes, the employer shall ensure that each employee on top of a container is protected by a fall protection system meeting the requirements of paragraph (k) of this section.

(3) *Other exposure to fall hazards.* The employer shall ensure that each employee exposed to a fall hazard is protected by a fall protection system meeting the requirements of paragraph (k) of this section. Exception: Where the employer can demonstrate that fall protection for an employee would be infeasible or create a greater hazard due to vessel design, container design, container storage, other cargo stowage, container handling equipment, lifting gear or port conditions, the employer shall alert the affected employee about the fall hazard and instruct the employee in ways to minimise that hazard.

(k) *Fall protection systems.* When fall protection systems required by paragraph (j) of this section are employed, the following shall apply:

(1) Each fall protection system component, except anchorages, shall have fall arrest / restraint as its only use.

(2) Each fall protection system subjected to impact loading shall be immediately withdrawn from service and not used again until inspected and determined by a designated person to be undamaged and suitable for use.

(3) Each fall protection shall be rigged so that a falling employee cannot contact any lower level stowage or vessel structure.

(4) Each fall protection adopted for use shall have an energy absorbing mechanism that will produce an arresting force on an employee of not greater than 1800 pounds (8 kN).

(5) Each component of a fall protection system shall be designed and used to prevent accidental disengagement.

(6) Each fall protection system's fixed anchorages shall be capable of sustaining a force of 5,000 pounds (22.2 kN) or be certified as capable of sustaining at least twice the potential impact load of an employee's fall. Such certification must be made by a qualified person.* When more than one employee is attached to an anchorage, these limits shall be multiplied by the number of employees attached.

* For the purposes of this paragraph, qualified person means one with a recognised degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project or product.

(7) When "live" (activated) container gantry crane lifting beams or attached devices are used as anchorage points, the following requirements apply:

(i) The crane shall be placed into a "slow" speed mode;

(ii) The crane shall be equipped with a remote shut-off switch that can stop trolley, gantry, and hoist functions, and that it is in the control of the employee(s) attached to the beam; and

(iii) a visible or audible indicator shall be present to alert the exposed employee(s) when the remote shut-off is operational.

(8) Fall protection system components, other than the anchorages, shall be certified as a unit of being capable of sustaining at least twice the potential impact load of an employee's fall. Such certification shall be made by a qualified person.*

* For the purposes of this paragraph, qualified means one with a recognised degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project or product.

(9) Each fall protection system shall incorporate the use of a full body harness.

(10) Each device, such as a safety cage, used to transport an employee(s) by being attached to a container gantry crane spreader, shall have a secondary means to prevent accidental disengagement and the secondary means shall be engaged.

(11) Each fall protection system shall be inspected before each day's use by a designated person. Any defective components shall be removed from service.

(12) Before using any fall protection system, the employee shall be trained in the use and application limits of the system, proper hookup, anchoring and tie-off techniques, methods of use, and proper methods of equipment inspection and storage.

(13) The employer shall establish and implement a procedure to retrieve personnel safely in case of a fall.

(l) Working along unguarded edges. The employer shall provide, and ensure that the employee use, fall protection meeting the requirements of paragraph (k) of this section whenever the employee works along an unguarded edge where a fall hazard exists (see § 1918.2)*

* **§ 1918.2 Definitions:** *Fall hazard* means the following situations:
(1) Whenever employees are working within three feet (.9 m) of the unprotected edge of a work surface that is 8 feet or more (2.4 m) above the adjoining surface and twelve inches (.3 m) or more, horizontally, from the adjacent surface; or
(2) Whenever weather conditions may impair the vision or sound footing of employees working on the top of containers.

APPENDIX 4 (see paragraph 8.13 and 8.14)

The freeing of jammed semi-automatic twistlocks on board ships

The *Guidance for Freeing Inoperable Semi-Automatic TwistLocks* that follows was developed by the Longshore Work Group of the Maritime Advisory Committee for Occupational Safety and Health (MACOSH) in the United States. On 14 July 2010 this document was submitted by the full MACOSH Committee to the Occupational Health and Safety Administration with a recommendation for consideration for approval and publication.

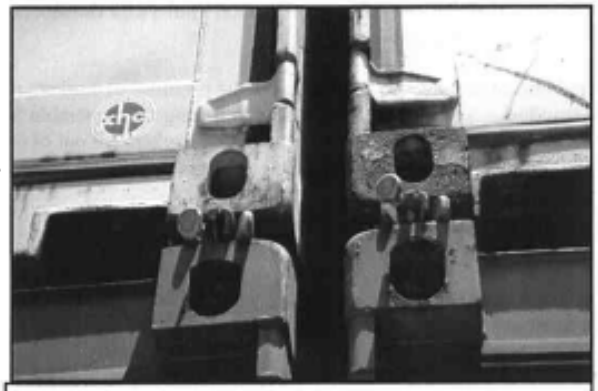
Guidance for Freeing Inoperable Semi-Automatic TwistLocks (SATLs)

Background: As containerized transport expanded during the 1970's and into the 1980's, ships were designed and built exclusively for their transport. Eventually ships were built which can carry several thousand containers. In order to prevent unintentional movement of containers and improve the stability of stacked containers, a number of devices were developed to secure containers to each other in cohesive "blocks". Stacking cones and twistlocks were first employed in the 1970's and 1980's followed by the introduction of SATL's. In order to improve the safety of longshore workers, OSHA mandated the use of positive container securing devices in 1999 (e.g. SATLs and above deck cell guides) whenever container gantry cranes are used to hoist containers (29 CFR 1918.85(j)).

Inoperable SATLs are a serious problem onboard container ships where containers are lifted with fast, high capacity gantry cranes. This "Guidance for Freeing Inoperative Semi Automatic Twist locks (SATLs)" provides practical recommendations to help marine terminal employers and employees reduce the number and severity of injuries related to inoperable SATLs in their workplace.

The intent of this guidance document is to provide options for supervision and workers on how to safely deal with inoperable SATLs. Management and labor organizations nationwide have contributed their knowledge and lessons learned.

Issue: Vessel and Marine Terminal Operators can be confronted with situations where an installed SATL becomes inoperable because it is jammed, stuck, and/or defective. This necessitates additional action by longshore workers or vessel personnel. Dealing with inoperative SATLs may pose a hazardous work environment depending on its location. Care should be taken to ensure that the work is carried out in the safest manner possible.



A typical SATL installation between two containers.

SATLs can become inoperable for a variety of reasons including:

- The unlocking mechanism (pig-tail) on the SATL can break off.
- Container movement during transit at sea can damage/distort corner fittings and can cause an SATL to jam.
- Improperly inserted SATLs may lead to jamming and can prevent access to the releasing wire.
- Internal parts of an SATL may become corroded from extended exposure to the salt environment and jam.
- Internal parts of an SATL may become damaged or bent from being over stressed and jam.

Basic principles:

Safety Supervision:

The foreman or supervision should not attempt to deal with the situation alone. They need to retain the safety focus and safety awareness for all persons in the area and especially the ones manipulating the SATL.

Persons holding the SATL open when attempting to lift the container must ensure that they are not in the bight

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between the container and the ships structure because the container may "pop" free and swing.

Safe access:

OSHA regulations generally prohibit employees from going on top of a container. However exceptions in 29 CFR 1918.85 (j) allow employees to perform necessary functions which cannot be eliminated by the use of positive container securing devices. Examples given include freeing an inoperative SATL.

Safe access must be provided before attempting to unlock an inoperative SATL. If containers are only two high, ladders meeting the requirements in 29 CFR 1918.24 may provide adequate access. When the inoperative SATL is located in a container stacked more than two high (SATL is in top of a two high container or higher) an alternate means of access must be provided. One way to create access is to remove the containers to the level of the container with the inoperative SATL to provide a container top work platform next to the inoperative SATL. Once the adjacent cell is empty, a worker can be safely carried aloft to gain access. Persons carried aloft must wear fall protection in accordance with 1918.85(j) if working within 3 feet of an unguarded edge. 29 CFR 1918.66 (c) outlines protection for employees being hoisted.

Lifting operations:

The foreman or supervision should be in direct contact with the crane operator and direct all movement of the crane from a safe vantage point - with good visibility of the operation.

The foreman or supervision must know the positions of workers in the area and who is to be directly involved in freeing the inoperable SATL. The foreman or supervision must ensure that workers are out of the bight and well back in safe positions. All persons not directly involved with the operation should remain clear of the area.

Foreman must direct crane

Defective devices:

All inoperative SATLs should be replaced. Defective SATL's should be set aside and segregated and either replaced or not re-used until repaired.

While receiving ports will have to deal with inoperative SATLs, employees at out load ports can help by segregating inoperative SATLs (ones with damaged wires, or which do not move freely) and by ensuring that they install SATLs correctly (right side up and with wires pointing towards the ends.)

Possible solutions for separating containers connected with inoperative installed SATLs:

The following solutions have been developed as an array of guidance. This guidance is ordered from the simpler solutions to the more complex as a progression. OSHA recommends that the simpler solutions be tried first, if possible, before going to the next measure:

1. SATL locked but intact: If SATL is a two wire version, re-cycle the inoperative SATL and reset it to the unlocked position. Observe/confirm that the SATL is installed in the proper manner. If it is installed upside down two wire versions may be unlocked by, pulling the opposite pig tail. On a single wire version, if the SATL is inserted upside-down, the wire can be pushed up, instead of being pulled down.

2. **SATL inserted so that unlocking wires are facing inward rather than outward:** Usually these SATLs can be unlocked by reaching in between the two containers to grab the appropriate SATL wire with a set of long han-

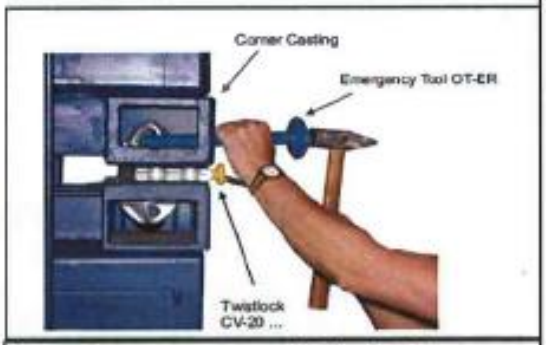
dled slip joint pliers.

3. SATL will not stay unlocked and keeps re-locking each time the crane operator attempts to lift it: If the SATL will not stay open, the SATL must be forced into the open position with a device inserted into the corner casting, or—if the releasing wires are intact—by pulling continually on the releasing wire. There are several methods which may be used to attempt to do this.

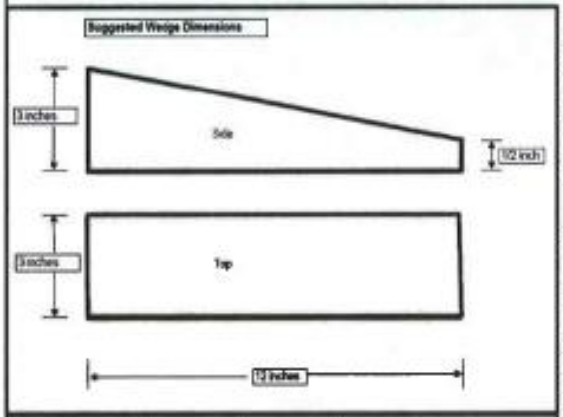
a. If the unlocking wires are intact, then pulling on the correct wire may cause the SATL to stay unlocked. However constant tension must be maintained on the SATL while the containers are being separated. The employee holding the SATL in the unlocked position must ensure that they are not caught in the bight between the container and the ships structure if the container "pops" free and swings. Devices such as hooks attached to wires may allow employees to hold the SATL in an unlocked position while not exposing them to a crushing hazard can be fabricated. When a container with an inoperable SATL is separated and lifted overhead, employees must be aware of the potential that the SATL may fall out.

b. If the unlocking wire is broken and the SATL is not spring loaded, the manufacturer's tool may be used as a punch to reposition the SATL head to the unlocked position. If the unlocking wire is broken and the SATL is spring loaded, a tool made from a wooden wedge and inserted into the corner casting of the container can be used to push the lock mechanism open and hold it open. A piece of steel rod or "rebar" could be used in a similar fashion. However the utilization of wooden wedging devices reduces the potential for the metal bar or SATL to fall out. Manufacturers have also developed specialty tools which can be clamped on to the container to force the SATL to the open position. A simple wedge is relatively easy to make locally.

Wedge inserted into a Container Side View



MacGregor emergency tool. The device is used to drive the tab of the SATL into the open or unlocked position.



How to make a wooden wedge

In all cases where the rebar, wedge, or special tool is left in place when the container is lifted, employees should be aware of the potential that it might fall out sometime while the container is being hoisted. All employees should stay well away from the container until it is landed and the tool removed.

5. Once an SATL is jammed open with a wedge or tool, the Crane operator should be directed and guided by the foreman or supervision—who should stand in a safe location—and communicate with the crane operator by radio—to try to manipulate and lift the container until it separates. If the SATL inadvertently breaks, a thorough inspection of the upper and lower corner castings of the

(Continued on page 4)

(Continued from page 3)
two containers involved should be made.

6. If the previous attempts to free the SATL are unsuccessful and hot work on the vessel has been ruled out, the next option to consider is to relock all SATLs, establish a safe work zone around the entire area and carefully move the two interconnected containers to the nearest location where the inoperative SATL can be reached and safely addressed. This may entail an emergency lift to move the containers from a wing location to the nearest point of rest, such as a hatch cover or an adjacent cell. As a last resort, it may involve an emergency lift to move the containers to the highline or apron. These types of lifts should be performed with the container crane operating in a slow speed mode. Forman or supervision must ensure that the load to be lifted does not exceed the capacity of the crane. The employer should establish a safe work zone within which employees may not be present when the two interconnected containers are in motion. The safe work zone should be sufficient in size to protect employees in the event that a container drops or separates and swings.

7. If the previous options are not successful, then burning off the SATL could be considered. This option should only be considered if there are no flammables or combustibles in the container or near by. The U.S. Coast Guard or local authorities may require a hot work permit before allowing any cutting or burning to commence on the ship. If this method is employed, care must be taken to provide a safe access, set a fire watch and carefully burn off the head of the SATL without damaging the corner casting of the container. The ship's crew should be asked to assemble fire extinguishers, fire hoses, and a bucket of water which is handy for dousing the small pieces of hot metal that are a by product of cutting off cones. Qualified persons should inspect the container corner castings after burning off an SATL to ensure that the opening to which an SATL will be connected has not been enlarged or that the corner casting is not otherwise damaged. If the container is found to be damaged it must be taken out of service until satisfactory repairs have been made (29 CFR 1917.71(g)).

Cutting the shaft of an inoperable SATL

Photo showing where SATL was cut off.

In Summary: Inoperable SATL's represent an "upset" condition and must be approached with due regard for safety. Each situation needs to be evaluated on an individual basis. The evolution needs to be controlled by supervision from start to finish in order to be safe and successful.