

SIP 007 - GUIDANCE ON LOADING AND UNLOADING OF DRY BULK CARGO



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1. INTRODUCTION

- 1.1. The Health and Safety Executive provided support to Port Skills and Safety in producing this guidance, which is aimed at improvements within the Ports industry. This guidance may go further than the minimum you need to do to comply with the law regarding health and safety.
- 1.2. It is for companies operating in the UK ports industry with responsibility for the safe design, construction, operation, management and maintenance of ports and terminal facilities and management of port and terminal activities. It will also be useful to employees and their representatives.
- 1.3. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance, you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance. If the guidance goes beyond compliance, then this will be clearly identified.
- 1.4. Regulations in this document are referred to by title but not year, because they are amended from time to time and the reader should always seek the current version. Acts are given a year as they tend to change less frequently. The list of references at the end of this document however does include a year that was correct at the time of publication.
- 1.5. Guidance within these shaded areas of this document denotes that the contents go beyond statutory compliance and are industry recommended best practice. These guidelines are not mandatory, though the legislation referenced below is. Individual organisations have a duty of care to those who might be affected by their operations and are responsible for devising arrangements that meet their obligations.
- 1.6. For the purposes of this guidance document Dry Bulk includes:
 - 1.6.1. Free flowing solids not otherwise packaged.
 - 1.6.2. Grain, grain products, glass, oilseeds, copra, wood, ores, coal, coal products, direct reduced iron, metal waste.
- 1.7. Bagged cargo is covered in [SiP002 General Cargo](#). Biomass is covered in a separate to be developed guidance SiP022 Biomass. The guidance is aimed at routine operations and does not cover some of the specialised high-risk activities associated with handling dangerous goods or which are subject to the Control of Major Accident Hazards Regulations.

2. REGULATORY FRAMEWORK AND GUIDANCE

- 2.1. The two principal relevant pieces of law are the [Health and Safety at Work etc. Act \(HSWA\) 1974](#), and the [Management of Health and Safety at Work Regulations \(MHSWR\)](#), which set out the basic requirements to ensure, so far as is reasonably practicable, the health, safety and welfare of all involved.
- 2.2. Port specific, Merchant Shipping and other legislation applies and should be referred to.

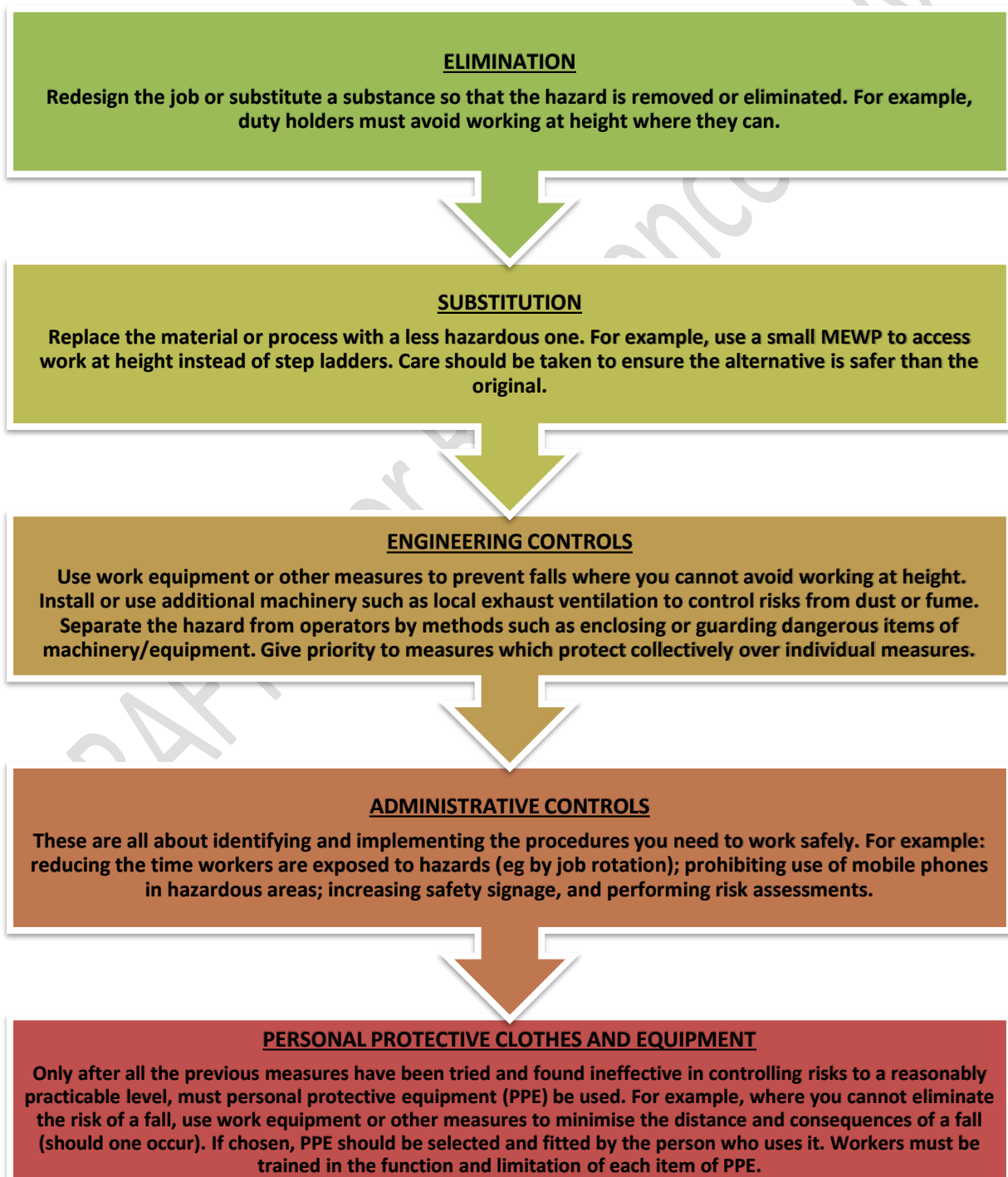
- 2.3. Approved Code of Practice (ACOP) L148 'Safety in Docks' was introduced on 6 April 2014: <http://www.hse.gov.uk/pubns/books/l148.htm>
- 2.4. The PSS/HSE Safety in Ports guidance suite, available from the PSS website at: <https://www.portskillsandsafety.co.uk/resources> is an important supplement to Safety in Docks ACOP L148.
- 2.5. The guidance is aimed at routine operations and does not cover some of the specialised and high-risk activities associated with handling dangerous goods and hazardous cargoes, or major hazards sites which are subject to the Control of Major Accident Hazards Regulations for which specialist advice may be required.
- 2.6. Reference can also be made to the International Labour Organisation's (ILO) Code of Practice on Safety and Health in Ports (ILO 152): http://www.ilo.org/sector/activities/sectoral-meetings/WCMS_546257/lang-en/index.htm

3. HEALTH

- 3.1. The wide range of activities in ports can give rise to possible health risks such as exposure to dusty cargoes; back injuries, sprains, and strains from lifting and handling, pushing and pulling; noise and vibration. There is specific legislation including the Control of Substances Hazardous to Health Regulations, the Control of Noise at Work Regulations, the Manual Handling Operations Regulations and Personal Protective Equipment at Work Regulations.
- 3.2. While there is reference to some specific health risks in these guidance documents, it is not possible to cover all the issues. Further information and guidance on the identification, assessment and reduction or avoidance of such risks can be found on the HSE website at:
 - 3.2.1. Ports web pages:
<http://www.hse.gov.uk/ports/index.htm>
 - 3.2.2. Control of Substances Hazardous to Health:
<http://www.hse.gov.uk/coshh/index.htm>
 - 3.2.3. HSE Whole Body Vibration in Ports Information Paper
<http://www.hse.gov.uk/vibration/wbv/ports.pdf>
 - 3.2.4. Musculoskeletal disorders (MSDs)
<http://www.hse.gov.uk/msd/index.htm>
 - 3.2.5. Noise at Work
<http://www.hse.gov.uk/noise/>
 - 3.2.6. Personal Protective Equipment
<http://www.hse.gov.uk/toolbox/ppe.htm>
 - 3.2.7. Vibration at Work
<http://www.hse.gov.uk/vibration/>

4. RISK ASSESSMENT

- 4.1. Risk Assessments must be undertaken in accordance with the Management of Health and Safety at Work Regulations. The risk assessment must consider the risks, not only to permanent employees but also to others including non-permanent employees (NPE's), ship's crew, passengers and visitors that may be affected by the activity. The appropriate control measures must be introduced and should consider collective measures ahead of personal or individual measures.
- 4.2. Risks should be reduced to as low as is reasonably practicable by taking preventative measures in order of priority below. The diagram below sets out an ideal order to follow when planning to reduce risk.



Reference: HSE Leadership and Worker Involvement Toolkit. Available at <http://www.hse.gov.uk/construction/lwit/assets/downloads/hierarchy-risk-controls.pdf>

4.3. Risk assessments must be reviewed:

- regularly
- immediately after any incident
- when there are significant changes to the operation

4.4. Most accidents and near misses can be avoided if the risks from the work are suitably and sufficiently assessed and appropriate control methods are adopted.

4.5. A risk assessment should record the significant hazards and risks of an operation together with the relevant control measures. In port operations risk assessments should consider changes such as tidal changes, weather, trim, list, load/cargo and vessel dynamics

4.6. Planning and work execution is discussed in HS(G) 177, Managing Health and Safety in dockwork: <http://www.hse.gov.uk/pubns/books/hsg177.htm>

4.7. The Health and Safety at Work Act 1974 applies on board a ship when shore-based workers are engaged in cargo handling or other tasks on board. Cargo handling may include, but is not limited to:

- loading, unloading, stowing, unstowing, pouring, trimming, classifying, sizing, stacking, unstacking
- composing and decomposing unit loads
- services in relation to cargo or goods such as tallying, weighing, measuring, cubing, checking, receiving, guarding, delivering, sampling and sealing, lashing and unlashng.

4.8. The Health and Safety at Work Act 1974 also applies to the Master and ship's crew when working with shore-based personnel on board ship.

4.9. A signed agreement or an agreed and recorded system of work with the master of each vessel is recommended. This is not a legal requirement but may help to ensure effective co-ordination with other parties.

4.10. Regulations made under the Health and Safety at Work Act 1974; such as:

- The Management of Health and Safety at Work Regulations
- The Lifting Operations and Lifting Equipment Regulations
- The Provision and Use of Work Equipment Regulations

do **not** apply to a master or crew of a ship, or any persons employing them, in relation to:

- safe access, plant and equipment which remain on board the ship.
- any undertakings or work which are carried out on board ship solely by the master and the crew.

Instead, the Merchant Shipping Act 1894 and related Merchant Shipping Regulations impose similar duties on board ship in UK territorial waters.

4.11. A ship's Master has duties under the Health and Safety at Work Act 1974 in relation to the ship's crew who are put ashore to perform their own tasks. For example, loading ship's stores or carrying out maintenance work on their ship. Those duties extend to plant and equipment (for example a forklift truck) under the Master's control being used ashore by ship's crew, or when used by shore-based workers ashore or on-board ship.

4.12. For dry bulk cargos you may also require additional specific risk assessments to comply with COSHH and DSEAR regulations.

- <http://www.hse.gov.uk/pubns/books/l15.htm>
- <http://www.hse.gov.uk/pubns/books/l138.htm>

5. CONSULTATION, COOPERATION AND COORDINATION

5.1. **Consultation:** Employers have a duty to consult with their employees, or their representatives, on health and safety matters. By gaining worker involvement on health and safety through two-way communication, concerns can be raised and solved together, and views and information can be sought and exchanged in a timely manner.

5.1.1. See HSE pages: Consulting and involving your workers
<http://www.hse.gov.uk/involvement/index.htm>

5.2. **Cooperation and Coordination:** Cooperation and coordination between shipside and landside employers is required. Employers must therefore carry out risk assessments and develop safe systems of work (in consultation with the workers involved) that all parties agree to, so that the respective employers can co-operate effectively with each other.

6. VESSEL ACCESS

6.1. The requirements for safe access to and on vessels are contained within the [ACOP Safety in docks \(L148\)](#) and [SiP014 Safe access and egress](#)

6.2. In general access onto the vessel should be provided by the ship's accommodation ladder or by the ship's gangway. This should be properly rigged and if over water include a safety net. Safe access and egress to the ladder should be maintained shore-side throughout the working of the vessel.

6.3. The supervisor should check that access to/from the vessel and to/from the ships hold or onto deck cargo is in good repair, correctly positioned and in working order before commencement of the operation.

- 6.4. People should be aware that ship holds, stairwells and access ways may be contaminated by hazardous fumes or gases or could have dangerously low levels of oxygen. As such they should be treated as a confined space. Further general advice and guidance can be found in [SiP 015 Confined Spaces](#).
- 6.5. It may be sufficient to ventilate spaces such as ship's holds by simply opening hatches and access ways and allowing time for the atmosphere to normalise. Similarly, a period with the doors open may provide sufficient ventilation for a stairwell. In either case, measures should be put in place (such as setting a chain with appropriate signage or flashing light across the entrance) to alert personnel and control access during venting. The hatch/access ways not in use shall remain closed or have restricted access.
- 6.6. Testing to ensure the atmosphere is safe, including the existence of adequate oxygen to support life and to test for the presence of toxic or poisonous gases can be achieved in three ways:
- a) fixed installed monitors for foreseeable gases.
 - b) portable reactant tube aspirators
 - c) personal/portable gas detector monitors
- Work should not commence until the area and access / egress routes have been tested and found to be safe.
- 6.7. Personnel should not be put at risk from falls. If a safe means of access is not available, consideration must be given to the provision and use of alternative access arrangements. For example, a personnel cage suitably rated and secured in accordance with the requirements of the [Lifting Operations and Lifting Equipment Regulations \(LOLER\)](#). A suitable and sufficient risk assessment should be conducted for any work at height.
- 6.8. Once shore side personnel have gained safe access to a hold, safe access/egress must be maintained. This can be achieved by creating a safe systems of work Entry and exit points should be kept clear and cargo should not be allowed to build up as this could impede access in emergencies. If access is gained by a personnel cage, where possible, the cage must be retained on the lifting device until alternative safe access is provided. Where this is not practicable, the personnel cage should be readily available. Arrangements must be in place to facilitate a rescue in an emergency.
- 6.9. Access across cargo may present a risk of slips, trips, or falls e.g., gaining access to scrap metal which may have hidden voids. Particular care should be taken not to step into or jump over gaps.
- 6.10. Personnel required to work on cargo may be presented with stows for loading or discharge with one or multiple shear drops. Where working close to an unprotected edge, the risks associated with working at heights must be assessed. Control measures to mitigate the risks associated with working at heights may include (but are not limited to) safety nets, lifelines with safety harnesses or fall arrest systems.

7. HAZARDS & MANAGEMENT CONTROLS

7.1. Typical hazards to personnel when engaged in loading and unloading ships carrying dry bulk cargoes include but are not limited to;

7.2. Cargo Hazards

- 7.2.1. Loose bulk cargo (such as grain or coal) will move/flow until it reaches its 'Angle of Repose'. This is the steepest angle at which a sloping surface formed of loose material is stable. The cargo may become unstable again. This could be based on several factors including but not limited to vessel movement, hold design (tanks and bulkheads), grabbing and loading operations. This could create a risk for persons who require access to the hold during operations (i.e., for sampling) becoming buried or crushed.
- 7.2.2. The cargo may or may not be classified as hazardous but may have characteristics that make handling more dangerous, for example chemical reaction, spontaneous ignition, explosion, reduction of oxygen in the atmosphere, production of or release of toxic or flammable gases.
- 7.2.3. There is potential for fire to cause multiple injuries and death. Controls are essential to protect personnel. Consequences of fires in dry bulk cargoes over and above injury and death include damage to vessels, plant, and equipment. These have a clear cost in loss of product, repair, replacement, down time, investigation, and reputation.
- 7.2.4. Fires and/or explosions can be caused by dusty cargoes building up on heated surfaces, electrical equipment, conveyors, or places where sparks can be generated.

7.3. Cargo Hazard - Management Controls

- 7.3.1. Conduct cargo specific risk assessments.
- 7.3.2. Ensure that the build-up of sheer faces of cargo is minimised and implement appropriate exclusion zones where necessary.
- 7.3.3. Identify hatch entry process and control access to and from holds at all times.
- 7.3.4. The requirements of the [Dangerous Goods in Harbour Areas Regulations \(DGHAR\)](#), the [International Maritime Dangerous Goods Code](#), and other relevant legislation may apply to the transport, storage or handling of the cargo must be considered.
- 7.3.5. Classified hazardous cargoes should be declared in the relevant shipping information but this may not always be the case. Always check the Safety Data Sheet (SDS) for every new cargo and re-check the sheet for known/repeat cargo to ensure the latest version is available.

- 7.3.6. Storage of some commodities in specified amounts may require compliance with the [Control of Major Accident Hazard Regulations \(COMAH\)](#).
- 7.3.7. For certain cargoes it will be necessary to have specifically trained personnel available to advise on the safe systems of work to follow. Examples include Explosive Security Officers, Radiation Protection Advisor/Supervisors and Dangerous Goods Safety Advisors.
- 7.3.8. The main fire prevention management control measures include but are not limited to:
- Storage and stack management
 - Temperature monitoring and thermal imaging in the hold
 - Control of ignition sources
 - Ventilation of explosive/flammable gasses
 - Fire Fighting Systems
 - Cleaning
- 7.3.9. Further general advice and information can be found in 'Fire Prevention and Management Controls' in the to be developed guidance SiP022 Biomass

7.4. Dust Hazard

- 7.4.1. Exposure to dusty cargoes and hazardous substances can cause.
- significant risks to health and lead to long term ill-health such as Chronic Obstructive Pulmonary Disease (COPD).
 - fire and explosion risks,
- 7.4.2. because of this a COSHH assessment should be undertaken. In order to manage these risks, consideration should be given to the nature of the cargo and the SDS, and specialist advice sought where necessary. Further general advice and guidance can be found on COSHH and COPD from the HSE website
- <http://www.hse.gov.uk/coshh/index.htm>
 - <http://www.hse.gov.uk/copd/index.htm>

7.5. Dust Hazard - Management Controls

- 7.5.1. Exposure to dust should be avoided. If this is not possible then it should be adequately controlled. The level of control of exposure required will depend on the potential health effects of the dust.
- 7.5.2. Some ways to control exposure include but are not limited to.
- Design tasks to reduce the amount of dust generated.
 - Restrict staff entry to dusty areas.

- Use totally enclosed, continuous handling systems - these usually provide the best control.
- Suppress dust with sprays of water or other binding agents where safe and appropriate.
- Excluding or controlling any sources of ignition, e.g., use of protected lighting.
- Ensure all equipment used to reduce dust exposure is properly cleaned, maintained and in efficient working order.
- Provide suitable air filtration systems to the cabs of vehicles used to handle dusty cargoes.
- The use of permit to work systems for activities such as hot work in affected areas.
- Maintaining good housekeeping i.e., avoiding or minimising the build-up or release of dust.
- Provide adequate information, instruction, and training to workers so that they are aware of the health risks and able to use the control measures properly.
- Provide and use respiratory protective equipment (RPE) - this should be suitable for its purpose, maintained and compatible with other protective equipment worn. The use of RPE should be supported by face-fit testing, this is essential if proper use of the RPE necessitates close fitting to the wearer's facial features. RPE should be applied as a last resort after other measures have been taken.
- If required provide health surveillance for workers.

7.6. Plant and Equipment hazards

7.6.1. Plant and equipment hazards include but are not limited to:

- Being struck by work equipment involved in the operation, such as lifting equipment, cargo or vehicles on the vessel and shore.
- Being struck by falling components/parts of lifting equipment/plant & machinery.
- Work equipment including but not limited to, grabs, chutes, conveyors, throwers, suction devices, augers, excavators, loading shovels, bagging plant, screening equipment, grading, or processing plant could cause injury by entrapment, entanglement, or impact.
- Fires and/or explosions can be caused by dusty cargoes building up on heated surfaces of plant and equipment.

7.6.2. Plant and equipment used in general cargo includes but is not limited to:

- Loading shovels and attachments
- Tug-masters or lorries (internal shunt units)
- Excavators
- Bulldozers

- Hoppers
- Conveyors
- Stacker/reclaimers
- Cranes
- Ship loaders/unloaders
- Suction unloaders
- Screw/displacement unloaders
- Chutes/spouts/throwers



Examples of loading shovels, excavators and bulldozers conveyor systems used that may be utilised in ship holds, on the quay side or in storage sheds



7.7. Plant and Equipment - Management Controls

- 7.7.1. [The Provision and Use of Work Equipment Regulations \(PUWER\)](#) place duties on people and companies who own, operate, or have control over work equipment. There are also responsibilities for businesses and organisations whose employees use work equipment, whether it is owned by them or not.
- 7.7.2. When selecting work equipment, the specific hazards of the cargo and the way in which the equipment will be used must be considered in a risk assessment to ensure the equipment is suitable and fit for purpose.

- 7.7.3. Fixed quayside cranes, ships cranes or derricks and mobile cranes are commonly used to load and unload cargos. All those responsible for planning, supervising, and executing lifting operations / equipment should remain aware of crane frequency rates and the design life of the crane to ensure it is suitable for the operation it is used for.
- 7.7.4. Cargo handling equipment used for loading or discharging, (i.e., loading shovels/ material handlers) should be fit for purpose. Companies should consider (but not be not limited to).
- The lifting capacity (Working Load Limit) of the machine
 - The size of the bucket
 - The ground on which the loader is being used
 - The density of the product.
- 7.7.5. Plant and equipment used for these operations should.
- Be equipped with appropriate safety systems (including but not limited) to Roll-Over and Falling-Object Protection Structures (Rops and Fops), fire suppression, and reversing cameras.
 - Have suitable maintenance and inspection regimes in line with manufacturer's instructions and the nature of operation
 - A thorough cleaning, preparation, periodical cleaning, and monitoring system to protect the operator and the asset
- 7.7.6. In situations where mobile machinery is operated on top of cargo, there are risks from: overturning, sliding, sinking, falling or damage. A suitable area should be prepared prior to lifting the machine into the cargo to ensure it can be safely accessed and operated.



- 7.7.7. A safe system should be in place when machinery, manual trimmers and ship crew are present in the hold at the same time. The



Systems must be in place to keep personnel away from grabs during hold operations

mechanical trimmer must be protected from dusts by engineering measures such as a filtered, pressurised safety cab

- 7.7.8. When trimming inside a hold, banksmen must have suitable means of communication with the crane operator to ensure the grab does not present a risk to the mechanical or manual trimmers.
- 7.7.9. Access control to fixed plant installations may be required to ensure safety of personnel, where a risk exists from nip, entanglement and crushing. Procedures must be in place to ensure that equipment is isolated, locked, tagged, and supported by a permit to work system for maintenance, inspection, cleaning, clearing of blockages or any other intrusive activities
- 7.7.10. Further advice and guidance can be found in The Approved Code of Practice and Guidance on PUWER from the HSE

- <http://www.hse.gov.uk/pubns/books/l22.htm>

7.8. Work at Height Hazards & Management Controls

- 7.8.1. Hazards will be present when working at height on top of stacks of bulk cargo or at the edge of a trench while removing bulk solids.
- 7.8.2. Please refer to 'Planning of Operations' and 'Hierarchy of risk controls for work at Height' within section 8 of this document.

7.9. Hazardous Atmospheres and Confined Spaces - Hazards

- 7.9.1. A confined space is a place which is substantially enclosed (though not always entirely) and where severe injury can occur from hazardous substances or conditions within the space or nearby (e.g., lack of oxygen). There are many parts of a ship that have the potential to become a confined space, including but not limited to: stairwells, paint stores and chain lockers. A ship's hold can be substantially enclosed, for example, when its hatches are/ have been closed.

7.9.2. Oxygen depletion is the single largest cause of death in confined spaces and is a significant risk while carrying certain cargoes due to the inherent properties of the material. It can occur through but not limited to; self-heating, oxidation of metals and ores and by decomposition of vegetable or animal origin materials (e.g., vegetable oils, animal fats, grain, other organic materials, or their residues).

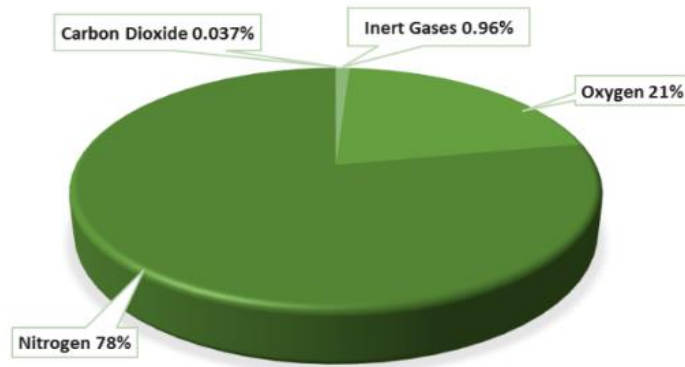
7.9.3. The materials below include some of the cargoes handled in UK ports that are known to be capable of causing oxygen depletion. Oxygen depletion may also be caused by flammable or spontaneously combustible materials and by materials with high metal content:

- Grain, grain products and residues from grain processing (such as bran, crushed grain, crushed malt, or meal), hops, malt husks and spent malt
- Oilseeds as well as products and residues from oilseeds (such as seed expellers, seed cake, oil cake and meal)
- Copra
- Wood in such forms as round wood logs, pulpwood, woodchips, wood shavings, wood pulp pellets and sawdust
- Jute, hemp, flax, sisal, kapok, cotton, and other vegetable fibres (such as esparto grass/Spanish grass, hay, straw, bhusa), empty bags, cotton waste, animal fibres, animal and vegetable fabric, wool waste, and rags
- Fishmeal and fish scrap
- Sulphidic ores and ore concentrates.
- Charcoal, coal, and coal products
- Direct reduced iron (DRI)
- Metal wastes, scrap, chips, iron swarf, steel and other turnings, borings, drillings, shavings, filings, and cuttings

7.9.4. The atmosphere in any enclosed space may be deficient in oxygen and/or contain flammable and/or toxic gases or vapours. Such an unsafe atmosphere could also subsequently occur in a space previously found to be safe. Unsafe atmosphere may also be present in spaces adjacent to where a hazard is known to be present.

7.10. Oxygen Depletion

7.10.1. Oxygen depletion can occur within spaces used to store or transport dry bulk cargo. Creating an asphyxiation risk for those working in these spaces e.g. ships holds and access stair wells. The risk of asphyxiation and history of fatal accidents make this a top priority for application of controls.



Relative composition of normal atmosphere

- 7.10.2. Oxygen is the only gas that supports life. The normal concentration of oxygen in the air is approximately 21%.
- 7.10.3. A person's ability to concentrate, think and make decisions is impaired when the oxygen concentration falls only slightly below this. These effects are not noticeable to the affected individual.
- 7.10.4. If the oxygen concentration in air decreases or, if the concentration of any other gases increases, a situation is rapidly reached where the risks of asphyxiation are significant.
- 7.10.5. Oxygen depletion may be caused by the removal of oxygen from the air (for example absorption by timber products) or by the displacement of oxygen by other gases such as Carbon Dioxide.
- 7.10.6. The following table indicates approximate effects and symptoms, which may vary depending on the individual related to the Oxygen level present.

Oxygen	Effects and Symptoms
18-21%	No discernible symptoms can be detected by the individual
11-18%	Reduction of physical and intellectual performance without the sufferer being aware.
8-11%	Possibility of fainting within a few minutes without warning. Risk of death where below 11%.
6-8%	Fainting occurs after a short time. Resuscitation possible if carried out immediately.
0-6%	Fainting almost immediate. Brain damage, even if rescued.

7.11. Carbon Monoxide

- 7.11.1. Carbon monoxide is a colourless, odourless, highly toxic, flammable gas formed by incomplete combustion of carbon and is a common off-gassing product from many types of stored dry bulk cargo. Off-gassing effects must be controlled and minimised to protect workers from dangerous atmospheres, especially Carbon Monoxide.
- 7.11.2. When Carbon Monoxide enters the body, it prevents the blood from bringing oxygen to cells, tissues, and organs. Early symptoms of Carbon Monoxide poisoning can mimic many common ailments and may easily be confused with food poisoning, viral infections, flu, or simple tiredness. Symptoms include but are not limited to headaches or dizziness, breathlessness; nausea; loss of consciousness, tiredness, pains in the chest or stomach, erratic behaviour, and visual complications.
- 7.11.3. Toxic gas exposure, such as Carbon Monoxide poisoning is one of the most serious risks associated with dry bulk cargo.
- 7.11.4. Levels of just 1% Carbon Monoxide (10,000ppm) could be rapidly fatal to an exposed, unprotected individual and levels must be monitored closely with ventilation controls used to prevent toxic build-up of gas.
- 7.11.5. In a space such as an unventilated ship's hold or stairwell, increased carbon monoxide can lead to a potentially fatal reduction in the oxygen concentration as well as presenting toxic and fire risks. For example, Carbon Monoxide concentration of approximately 1% has been measured in a sealed cargo hold of a ship containing wood pellets some 18 days after the cargo was loaded. The oxygen concentration was less than 1%. The cargo hold was enclosed and there was a clear risk of oxygen depletion and potential noxious fume. The hold in this example would be a Confined Space.

- 7.11.6. The following table indicates approximate effects and symptoms, which may vary depending on the individual related to the Carbon Monoxide level present.

Carbon Monoxide	Effects and Symptoms
0.1% 100 ppm	Slight headache in 2-3 hours
0.2% 200 ppm	Dizziness, nausea, fatigue and headache within 2-3 hours
0.4% 400 ppm	Dizziness, nausea, fatigue and headache within 1-2 hours. Life threatening in 3 hours
0.8% 800 ppm	Dizziness, nausea and convulsions within 45 minutes. Death within 2-3 hours
0.16% 1,600 ppm	Headache, dizziness and nausea within 20 minutes. Death in less than 2 hours
0.32% 3,200 ppm	Headache, dizziness and nausea in 5-10 minutes. Death within 30 minutes
0.64% 6,400 ppm	Headache, dizziness and nausea in 1-2 minutes. Death in less than 20 minutes
1.28% 12,800 ppm	Death in less than 3 minutes

- 7.11.7. See the International Maritime Solid Bulk Cargoes (IMSBC) Code, for wood pellets and generation of carbon monoxide and risk assess for the dry bulk cargo product in question.
- 7.11.8. At the time of publishing the workplace exposure limits in [EH40](#) for Carbon Monoxide are:
- Long-term exposure limit (8-hr reference period) of 20 ppm
 - Short-term exposure limit (15-minute reference period) of 100 ppm

7.12. Carbon Dioxide

- 7.12.1. Carbon Dioxide is naturally present in the air at a concentration of about 0.037% (370 ppm) and is not harmful to health at low concentrations. At room temperature and atmospheric pressure Carbon Dioxide is a colourless and odourless gas. Therefore, people are unable to see it or smell it even at elevated concentrations. It is not flammable and will not support combustion. As the concentration of Carbon Dioxide in air rises it can cause headaches, dizziness, confusion, and loss of consciousness. It is heavier than air, fatalities from asphyxiation have occurred when, at high concentrations, it has entered spaces such as tanks, sumps or cellars and displaced Oxygen. It is possible for CO₂ to accumulate in trenches or depressions outside following leaks. This is more likely to occur following a pressurised release where the released CO₂ is colder than the surrounding air.

- 7.12.2. In Great Britain, Carbon Dioxide is classed as a ‘substance hazardous to health’ under the Control of Substances Hazardous to Health Regulations (COSHH). The HSE publication ‘[EH40/2005 Workplace exposure limits](#)’ provides exposure limits for airborne concentrations of hazardous substances in the workplace. Workplace exposure is calculated by taking an average over a specified period. At the time of publishing the workplace exposure limits for Carbon Dioxide are:
- Long-term exposure limit (8-hr reference period) of 5000 ppm
 - Short-term exposure limit (15-minute reference period) of 15000 ppm

The following table indicates approximate effects and symptoms, which may vary depending on the individual related to the Carbon Dioxide level present.

Carbon Dioxide	Effects and Symptoms
2-3% 20,000-30,000 ppm	Shortness of breath, deep breathing
5-7.5% 50,000-75,000 ppm	Breathing becomes heavy. Sweating, pulse quickens, headaches, dizziness, restlessness, breathlessness, increased heart rate and blood pressure, visual distortion
10% 100,000 ppm	Impaired hearing, nausea, vomiting, loss of consciousness
30% 300,000 ppm	Coma, convulsions, death

7.13. Noxious gases, organic residues and organic volatiles including Methane.

- 7.13.1. There is evidence from incidents and research that storage of some dry bulk cargo in enclosed spaces may lead to an accumulation of noxious gases and organic residues. Life threatening levels of gases have been demonstrated and fatalities have occurred amongst those working in these circumstances.
- 7.13.2. There is evidence of high emissions of organic volatiles (methane, butane equivalents, ethylene, and propylene), carbon dioxide and carbon monoxide during bulk transport and storage. Levels of gases such as carbon dioxide have been determined to exceed occupational exposure limits in some scenarios. Potentially there could be risk of operator error since at lower concentration noxious gases and volatile organic constituents can rapidly disrupt brain function and hand-eye coordination.
- 7.13.3. Evidence of ill health associated with exposure to volatiles emitted from dry bulk cargo is less strong and should be risk assessed and controlled on a case-by-case basis.
- 7.13.4. For more advice and information see Public Health England guidance on Methane: health effects and incident management:

<https://www.gov.uk/government/publications/methane-properties-uses-and-incident-management>

7.14. Hazardous Atmospheres and Confined Spaces - Management Controls

7.14.1. A build-up of Carbon Monoxide, Carbon Dioxide and/or a depletion in Oxygen levels in an enclosed space has proved tragically fatal in the past. Organisations handling dry bulk cargo must put measures in place to manage respiratory risks.

7.14.2. The main controls include but are not limited to:

- Competent design of storage and handling installations
- Operational planning
- Ventilation
- Controlling access
- Gas testing and monitoring
- Personal Protective Equipment
- Instruction, Information and Training
- Emergency planning

7.14.3. For further advice and information, you can watch the (Free) training video from PSS on Confined Spaces Awareness
<https://www.portskillsandsafety.co.uk/staying-safe-ports-confined-spaces>

7.15. Fumigants and Biological Hazards

7.15.1. Bulk cargoes may be carried whilst under fumigation. Fumigants are not always spent and can reactivate during discharge. Spaces adjacent to fumigated spaces should be treated as if fumigated.

7.15.2. Hazards include but are not limited to.

- Asphyxiation risk
- Dermatitis and contact risk.
- Biological hazards include mould and fungus.
- Insects

7.15.3. Further general advice and information can be found on the HSE and MAIB websites.

- [Fumigation: Health & safety guidance for employers & technicians carrying out fumigation operations HSG251](#)
- The [MAIB website](#) includes a search function which visitors can use to research past and ongoing investigations

7.16. Fumigants and Biological Hazards - Management Controls

7.16.1. Some dry bulk cargo, if allowed to get wet and left for a period, may decompose and form mould. Workers should also be trained to understand the risks. There is the potential for mould/spores to occur in some work areas, for example filtration systems, plant air conditioning equipment and changing facilities. These may require enhanced cleaning and replacement regimes.

7.16.2. If a vessel is either under or suspected to be under fumigation the vessel should be certified gas free by the fumigating organisation who would need to provide

evidence (e.g., post job testing and supporting documentation) which the ship would need to validate by either witnessing, document review or by follow-on atmosphere testing (or all of these) and the hatches allowed to ventilate before entry.

- 7.16.3. Managers / Supervisors need to ensure that suitable and sufficient risk assessment is conducted to ensure work can be safely executed in the subject area. The risk assessment is to be supported by pre-job briefings making sure that work personnel fully understand how to identify the potential fumigants and the supporting risk management and related emergency response arrangements.
- 7.16.4. A COSHH assessment must be carried out to determine the risk from exposure to fumigants and biological hazards. This should identify suitable controls, that should be put in place before work starts. This may include respiratory protection. Workplace exposure limits have been set on the concentrations of many substances including fumigants that can be present in workplace air. These are maximum permissible limits and the principles of as low as reasonably practicable should be applied to protect workers. Employers should always refer to [EH40](#), available from the HSE.
- 7.16.5. When required staff should have suitable fumigant detection equipment and be trained in its safe use.
- 7.16.6. PPE should be selected so it is both adequate, suitable for the task and complies with the [Personal Protective Equipment Regulations](#)
- 7.16.7. With dermatitis, the primary controls are around provision of personal protective equipment, adequate personal washing facilities and training of operatives in appropriate hygiene controls. Risk assessment should be used to determine the type and extent of facilities required.
- 7.16.8. Arrangements should be put in place to adequately wash and/or safely dispose/exchange dirty workwear where there is an identified risk. Workwear should be adequate for the hazards, for example covering arms and legs where there is a potential contact hazard.
- 7.16.9. A risk assessment should be undertaken for to identify if any personnel require Medical Surveillance. If it is shown to be required, it must be provided. For more advice and information refer to:
 - [SiP011 – Sources of Occupational Health Information](#)
 - [SiP017 - Fitness to Work and Occupational Health in Ports](#)
- 7.16.10. It is important that the qualities of the product, design of the ship and method of the handling operation are carefully considered to ensure that any operation is carried out as safely as reasonably practicable.

8. PLANNING OF CARGO OPERATIONS

- 8.1. To ensure that operations are conducted safely they need to be properly planned and executed. Additional guidance can be found in the [Bulk Loading and Unloading \(BLU\) Code](#) and Manual which can be purchased from IMO and [MCA Safe Loading and Unloading of Bulk Carriers Guidance](#).
- 8.2. A record should be made for each ship visit which ideally includes: the ship load/discharge plan; landside storage arrangements; personnel, plant and equipment involved; any specific traffic routes and any other hazards. Where appropriate, information should be given to the personnel involved as part of a “toolbox talk” and training records maintained.
- 8.3. Though not a duty, it is industry good practice to have an “activity file” for arriving vessels that is made accessible to the supervisor / foreman / operators. Information should be sought from the agent or ship prior to arrival as appropriate. The file may include items such as:

- Any identified hazards
- SDS and COSHH assessments for the commodities being handled.
- Photographs
- Ladders and access ways
- Lighting
- Personnel and equipment requirement
- Inspection certification

8.4. Inspecting the cargo

- 8.4.1. The cargo and access to holds should be inspected, if this is not possible the employer still needs to ensure their employees safety. Such an inspection should ensure access ways and holds are gas free before access is granted and that there is appropriate monitoring throughout the operation. For certain cargoes personal gas monitoring will be appropriate. For more advice and information see [SiP015 Confined spaces in ports](#).
- 8.4.2. The inspection should ensure that the cargo is in a safe condition to be handled. Bulk cargoes can spontaneously combust, develop hot spots, emit dangerous gases, liquefy, develop biological hazards, and become unstable.
- 8.4.3. In situations when the cargo cannot be properly inspected until loading commences, such as when loading direct from delivery vehicles. It should be monitored during loading/unloading.
- 8.4.4. Safe access and egress should be monitored and maintained during the operation.

8.5. Site conditions

- 8.5.1. The condition and location of the site chosen for cargo storage on port premises must be fit for purpose. It should be suitable to accept the weights and configurations of the cargo and accept the vehicles being used for the operation. Further advice and information on storage can be found in [SiP008 Storage of dry bulk cargo](#).

8.6. Vessel Lifting Equipment and Accessories

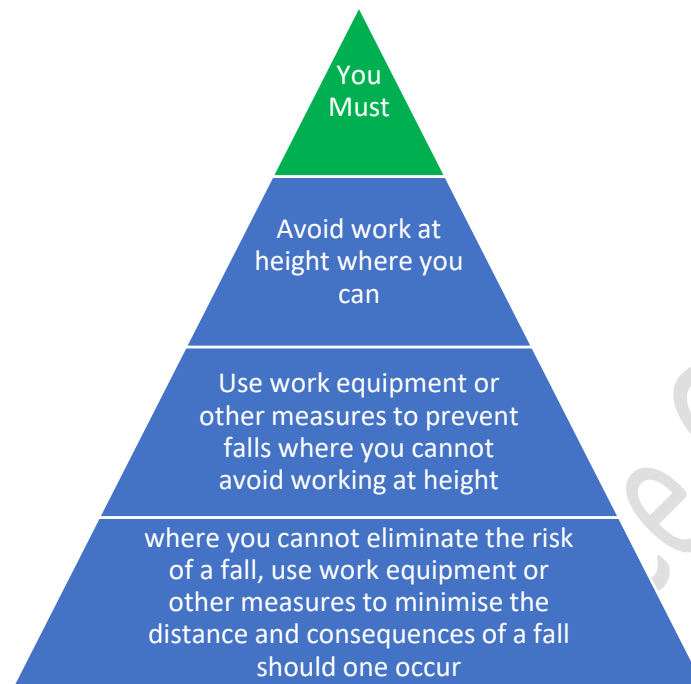
- 8.7. The merchant shipping version of The Lifting Operations & Lifting Equipment Regulations (LOLER) applies to all British registered vessels and all foreign registered vessels whilst in UK territorial waters, therefore similar standards as stated above are imposed on all vessels in UK ports.
- 8.8. Before using ships' lifting equipment or accessories, the ships' documentation must be checked to confirm that thorough examination, inspection and testing of the lifting equipment and accessories concerned complies with LOLER. It is also prudent for a competent person to undertake pre-use checks and undertake a visual examination of ship lifting equipment and accessories where possible.
- 8.9. Ideally there should be a period of familiarisation on the specific lifting equipment concerned before putting into use.

8.10. Work at height – Hierarchy of controls

- 8.10.1. Comprehensive guidance on reducing risks from work at height, the hierarchy of controls and the use of personal protective equipment such as work restraint systems (fall arrest, fall prevention or work positioning systems) can be found on the [HSE website](#), in the [HSE brief guide to the Work at Regulations](#) and the [ACOP Safety in Docks \(L148\)](#)
- 8.10.2. The Regulations set out a hierarchy for managing and selecting equipment for work at height and determining how to work at height safely. The hierarchy must be followed systematically. Only when one level is not reasonably practicable may the next level be considered. It is not acceptable to select work

equipment from lower down the hierarchy (e.g., personal fall arrest, such as harnesses and lanyards) in the first instance.

8.10.3. Duty holders must:



- avoid work at height where they can.
- use work equipment or other measures to prevent falls where they cannot avoid working at height
- where they cannot eliminate the risk of a fall, use work equipment or other measures to minimise the distance and consequences of a fall should one occur
- devise a suitable rescue plan.
- train employees in the specific selection and use of work at height equipment and rescue methods

8.10.4. Planning: discussions with customers and ships' agents at the early planning stage can often reduce or eliminate the risks from work at height. Consideration should be given to the type, shape and size of vessel, the configuration of cargo stows at point of loading and splicing cargo to eliminate gaps at the end of stows.

8.10.5. The ship should be loaded or discharged in such a manner to reduce the risk of falls to the lowest level reasonably practicable. Considering that the height and configuration of the cargo stow is constantly changing, therefore so is the risk. When loading, consideration should be given to aid safe discharge at the next port.

8.10.6. Consider minimising the amount of time and number of people exposed to work at height.

8.10.7. A suitable on-site rescue plan covering emergency measures must be in place to ensure a prompt response to an incident. The plan should not solely rely on

the emergency services. It should ensure that those involved in the rescue are not put at risk. See also [SiP016 Emergency Planning in Ports](#)

- 8.10.8. Personnel should not be put at risk from falls. If a safe means of access to the cargo/vessel is not available, consideration should be given, subject to a risk assessment, to the provision and use of alternative access arrangements. Please refer to section 6.7.



Hold access ladders may become damaged

- 8.10.9. Personnel required to work on cargo may be presented with stows for loading or discharge with one or multiple shear drops. This is covered within section 6.
- 8.10.10. Procedures must be provided and maintained to mitigate the risks of falling cargo. Loads (grabs) and equipment should not be lifted over the heads of personnel / mechanical trimmers (personnel in cab).
- 8.10.11. Consideration should be given to the natural angle of repose of the cargo, the shape of the hold will also add an element to the behaviour of the cargo.
- 8.10.12. The risks of slips and falls when walking across cargo stows may be increased in adverse weather (high temperatures, snow, ice, or rain)

9. LOADING AND UNLOADING OPERATIONS - PLANNING FOR SAFE HANDLING

- 9.1. The Safe Loading and Unloading of Bulk Carrier Regulations along with the [BLU Code](#), BLU Manual and [International Maritime Solid Bulk Cargoes \(IMSBC\) Code](#), provide a framework for the handling of cargo to & from this type of vessel. However, these deal principally with the safety of the ship. The purpose of this document is to focus primarily on the safety of those involved in the loading and unloading operations. Both the Blu Code and the Safe Loading & Unloading of Bulk Carrier Regulations require operations to be planned and agreed between the ship and terminal. Such an

agreement ensures that all parties know what is going on and allows operations to be undertaken safely.

9.2. A terminal operation manual, nominated terminal representative, agreed loading/unloading plan and accredited quality management system assist with ensuring operations are suitably conducted. This is laid out in the requirements of the Safe Loading and Unloading of Bulk Carrier Regulations, for ships that meet that definition of a Bulk Carrier.

9.3. The Safe Loading & Unloading of Bulk Carrier Regulations define a bulk carrier as.

- any ship of over 500 gross tonnes or more:
- constructed with a single deck, topside tanks and hopper side tanks in cargo spaces and intended primarily to carry dry bulk cargo in bulk; or
- an ore carrier, where “ore carrier” means a sea-going single deck ship having two longitudinal bulkheads and a double bottom throughout the cargo region and intended for the carriage of ore cargoes in the centre holds only; or
- a combination carrier means a tanker designed to carry oil or alternatively solid bulk cargo

9.4 Dry bulk cargoes may be carried in ships that do not meet this definition. Consequently, terminal operators must risk assess each operation on its own merits. The terminal remains responsible for the health and safety of its staff and others who may be affected by the operation. The terminal must ensure an adequate risk assessment is carried out.

9.4. Dry bulk cargoes may create problems that affect the environment. It is important that terminals handling dry-bulk cargo consider the environmental impact. Controls will generally go hand in hand with the safe handling of these products. For Example: use of water suppression systems



Examples of dust suppression using water sprays

9.5. VESSEL LOADING/UNLOADING PLAN AND RISK ASSESSMENT

9.6. There are situations when ships arrive in ports for unloading without providing the cargo handler prior notification of how the ship is stowed.

9.7. A pre arrival vessel loading plan should be available for all loading and lifting operations. These plans are prepared in consultation with the master or chief officer of the ship, ship's agent and/or the terminal representative.

9.8. Loading and unloading risks must be assessed by competent person(s). Possible risk factors include but are not limited to:

- The risks to the health and safety of persons in the cargo handling operation areas and the safety of persons entering the ships compartments, regarding build-up of toxic gases, oxygen depletion, dusts, and ill health effects from cargoes
- Working at height

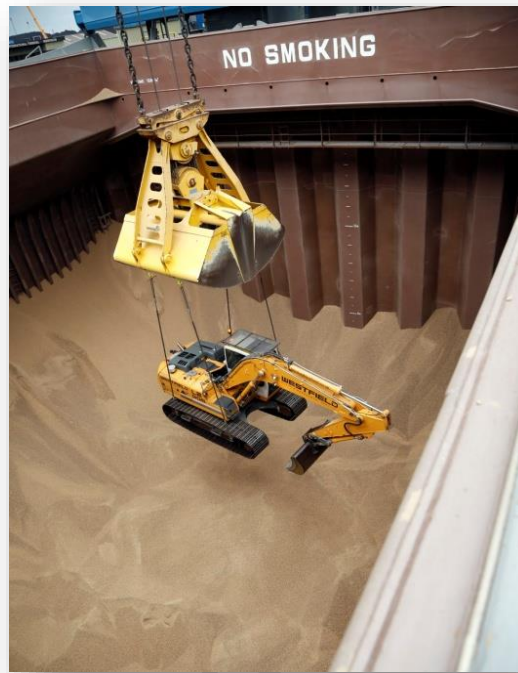
- Safe means of access and egress.
 - to and from tops of cargo stows
 - to and from the ship's holds at all stages of loading i.e. Where hold ladders are fitted at one end of the hold, the load plan should be designed to ensure that access to it remains unrestricted during the cargo handling operation.
- Shifted cargo during sea passage.
- The potential for cargo shift during unloading
- The condition of cargo, for example deterioration from water ingress during passage
- Changes in state of cargo, for example, change in density, liquification or solidification
- Manual handling e.g., trimming, cleaning out operations.
- The rate and order in which the ship's holds are to be loaded. The ship will require all cargo operations to be undertaken in a manner and compliant with the vessel's loading procedures as required by the [International Safety Management \(ISM\) Code](#). This may require cargo handling to be suspended whilst ballasting/de-ballasting takes place. Particularly with large vessels the ship's Master will need to ensure the stresses imposed on the ship's hull are always acceptable.

9.9. Effective communication, cooperation and coordination between ship, shipping agents and terminal representatives are important to ensure that all aspects of operations are managed safely.

9.10. Details of the vessel loading/unloading plans and risk assessment must be disseminated to all persons involved in operations, this can be achieved via toolbox talks or pre-job briefings delivered by the work teams' management / supervision.

10. SLINGING AND LIFTING OPERATIONS - GENERAL

- 10.1. Lifting operations in ports are subject to specific legislation including: The Lifting Operations & Lifting Equipment Regulations (LOLER), The Provision & Use of Work Equipment Regulations (PUWER), [The Merchant Shipping and Fishing Vessel \(Lifting Operations & Lifting Equipment\) Regulations \(MSLOLER\)](#), and [The Merchant Shipping & Fishing Vessels \(Provision and Use of Work Equipment\) Regulations \(MSPUWER\)](#).



An excavator being lowered into a levelled area.

- 10.2. So as not to cause confusion with the different terms used to describe lifting equipment, LOLER clearly uses the following definitions:
- **"Lifting equipment"** means work equipment for lifting or lowering loads and includes lifting attachments used for anchoring, fixing, or supporting the equipment.
 - **"Accessory for lifting"** means any equipment used to attach the load to lifting equipment, providing a link between the two.
- 10.3. In the port industry accessories for lifting are sometimes referred to as 'lifting accessories'
- 10.4. The regulations aim to reduce risks to people's health and safety from lifting equipment provided for use at work. The regulations require that lifting equipment provided for use at work is:
- 10.4.1. strong and stable enough for use and marked to indicate working load limits
 - 10.4.2. positioned and installed to minimise risks.

- 10.4.3. used safely, i.e., the work is properly planned, organised, and performed by competent people
- 10.4.4. subject to ongoing thorough examination and, where appropriate, inspection by competent people
- 10.5. Equipment and accessories that are exposed to conditions that can cause deterioration and that could lead to dangerous situations must:
 - 10.5.1. be thoroughly examined in accordance with an appropriate written examination scheme, and
 - in the case of lifting equipment for lifting persons, or an accessory for lifting, at least every 6 months [note: this also applies to ship's lifting equipment]
 - in the case of other lifting equipment, at least every 12 months
 - and each time that exceptional circumstances have occurred, e.g., if it is damaged or fails, is out of use for lengthy periods, or if there is a major change in how it is used which is likely to affect its integrity.
 - 10.5.2. Lifting equipment should be inspected by a competent person (refer LOLER) at suitable intervals between thorough examinations as identified by risk assessment.
- 10.6. It is essential to identify that all lifting equipment and lifting accessories are within the correct inspection (thorough examination) period. One way of doing this is by using a system of colour coding.
- 10.7. All equipment should be checked by a competent person before use. If there is any doubt as to the suitability of lifting equipment and lifting accessories, they must not be used, and be removed from use.
- 10.8. The term 'load' within LOLER includes lifting a person. Equipment used for lifting people must be designed for such use and checked prior to use. If using ship's equipment for lifting people, the certification and condition of the equipment must still be checked by a competent person prior to use.
- 10.9. The frequency of inspection might need to be increased for other reasons including but not limited to environmental factors or high frequency of use. This should be identified as part of the risk assessment.
- 10.10. Hired equipment should be received with all maintenance and inspection records up to date. Where the length of hire extends past the inspection date, the individual responsible for the hiring should be responsible for ensuring inspections are completed and recorded.

- 10.11. Original equipment lifting eyes as fitted to plant and machinery may not be designed for repetitive lifting operations and as such need to be inspected prior to use and if damaged, alternate lifting arrangements will be needed for such equipment



Original equipment lifting eye showing signs of deformation following multiple lifts.

11. SLINGING AND LIFTING OPERATIONS - PLANNING

- 11.1. Factors to consider in planning and carrying out slinging and lifting of loads include but are not limited to:
- Lifting operations must be planned by a competent person, who should have adequate practical and theoretical knowledge and experience of planning lifting operations. Certain lifting operations may require specialist training and/or advice
 - Vessel roll should be included in the risk assessment as this has the potential to affect cargo stability. The potential for other cargo movement may be also exacerbated when heavy loads are lifted into or out of adjacent hatches or using ships lifting equipment. Ranging of the vessel whilst on the berth e.g., longitudinal movement caused by other passing vessels should also be considered
 - Procedures should be established and followed for the selection and use of suitable lifting equipment and accessories.
 - A competent person should ensure that the strength and stability of the lifting equipment and accessories is adequate for the task for which it is intended. Lifting equipment and lifting accessories should be included in lifting operation risk assessments
 - Take all practicable steps to avoid people being struck by loads or lifting equipment and do not lift over people. Lifts should not take place over areas where people are likely to be working or passing. Where it can be avoided,

loads should not be suspended over occupied areas. Where it can be avoided, the risks to people must be minimised by safe systems of work and appropriate precautions. Where loads are suspended for significant periods, the area below them should be classed as a danger zone where access is restricted. The lifting route should be planned to avoid cargo passing over hazardous plant and/or other material to minimise possible secondary hazards from impact

- Port operatives involved in trimming or slinging must be in a place of safety during lifting operations, no one should stand on or under the load at any time.
- If a crane operator is unsure that operatives are in a safe position, then the lift should be suspended until it is safe to continue
- A suitable landing site should be prepared as part of the pre-planning stage of any lifting operation. The site should be kept free of debris to minimise slips, trips and falls during the unloading operation and a final clear-up should leave the area clean and ready for future use
- Housekeeping standards and arrangements should be included in the safe system of work to ensure that the work area is maintained clear of items which may present risks such as slips, trips and falls

Selection of Lifting Equipment and Accessories

- When handling equipment (e.g., loading shovels, bulldozers, or excavators) is being lifted into or out of ship's holds, selection and use of equipment, accessories and safe slinging methods should be appropriate to the lift. Only certified lifting points on handling equipment should be used and these must be suitable, fit for purpose and inspected as required.
- The weight of the cargo to be lifted should be confirmed or estimated so that the Working Load Limit (WLL) of the lifting equipment and accessories is not exceeded. It may be necessary to determine the density, roll centre, gravity, or stowage factor of the cargo to establish the weight of cargo within a grab
 - Note: The term Working Load Limit (WLL) has replaced SWL as the load beyond which lifting equipment should not be used. WLL is the load value assigned to the 'maximum' safe working load under ideal conditions (by calculation) and in most cases WLL will be the same as the SWL. However, depending on the conditions of use, it may be necessary for the competent person to reduce the WLL to a practical SWL; it is this figure which should be marked on equipment to comply with reg.7 (and be used in determining its safe use for the purposes of reg.8). SWL may be the same or less than WLL but can never be more.
- When selecting lifting equipment and accessories to handle cargo that has been stowed unprotected, allowance should be made for products that may have absorbed moisture. Absorbed moisture can significantly increase the nominal weight of the cargo.
- Lifting/spreader beams may be required when:
 - there is a danger of the lifting accessories coming together allowing the load to become unstable
 - or where the angles created by the lifting accessories are excessive as to exceed WLL and prevent safe lifting.

The purpose of the spreader is to even the strain upon the single legs of the accessories, and to protect the load from damage. Single items should not be lifted on one end of a spreader beam

- Multi-bag slinging should avoid varying sizes of bag.
- Where an operator is familiar with the principles of a type of equipment but is unfamiliar with the specific item of equipment, the operator is to be provided with a period of familiarisation on the specific equipment and its operation

Pre-Use Check

- A visual check of all lifting equipment and accessories to be used should be carried out by a competent person prior to each use. Lifting equipment/accessories which show signs of damage must be segregated from the operation for further examination, repair, or disposal. If there is any doubt over the integrity of any lifting equipment or accessory, it should not be used, and the issue should be reported to the supervisor or person in charge of the operation.



Inspection of lifting accessories prior to use

Load Integrity

- As a general principal: “The load should be as safe in the air as it was on the ground”
- All loads to be lifted must:
 - Be held securely by the lifting accessories.
 - Not damage or be damaged by the lifting accessories.
 - Be slung so that it will not suffer collapse, change of form or posture or internal displacement when subjected to jerks, swings, or bumps
- Where the integrity of a load is compromised a safe method of re-slinging must be devised by a competent person. The safe method should ensure operatives are not put at risk while re-slinging is undertaken
- Before sending cargo or handling equipment into or out of a vessel the load should be test lifted so that the total weight is taken up by the lifting equipment. This will result in the load “floating”, and a check can then be made of the balance, stability, and general security of the load from a relatively safe position. If there are any doubts about the safety and security of the lift,

then the load must be set down and the lifting accessories re-positioned followed by further “re floating” and re-checking

Grabs

- Grabs, lifting equipment and accessories should be suitable for the task. Arrangements should be in place to ensure that the correct lifting equipment and accessories are available for each operation
- Grabs should be maintained to ensure there is minimum leaking of cargo



An excavator slung under a bulk grab.

- In some cases, grabs are fitted with lifting points and tested for lifting equipment such as loading shovels. When using this lifting arrangement care should be taken when lowering off. To avoid the equipment being lifted being struck by the grab
- Grabs, lifting equipment and lifting accessories must be monitored during use and if there is any doubt as to their suitability they must be removed from use.
- In addition, any equipment or accessories used to lift personnel should have a pre-use check

Personnel Lifting

- Personnel should not be lifted into or out of ship's holds in plant and equipment. If it is necessary to lift personnel into or out of a ship's hold due to ships access being unavailable, a suitable personnel basket should be used along with a crane and ancillary equipment inspected as required by LOLER for lifting persons.

12. SLINGING AND LIFTING OPERATIONS - COMMUNICATION

- 12.1. Clear lines of communication must be established and maintained between all those involved in a lifting operation. Visual and voice communications from the banksman to the crane operator must be clear, agreed and understood. Where voice communication cannot be established. Where hand signals are used, they should be consistent with the code of signals. [BS 7121 – Code of Practice for Safe Use of Cranes – Part 1, General](#)”.

- 12.2. A banksman should not be engaged in any other role during the lifting operation. The banksman should have a clear view of the path of the load and remain in a safe position in view by or able to communicate effectively with the operator of the lifting equipment. If the banksman is unable to maintain a clear view of the path of the load, then they will need assistants, these assistants also should be in a safe position, and either be in view of the banksman or able to communicate effectively with them. The lifting equipment operator, banksman and, where applicable, any assistants to the banksman should use the same reliable means of effective communication, this could be using hand signals or radios.
- 12.3. The crane driver must only accept instructions from one nominated person, whether by radio, voice or through hand signals. The exception to this rule is the emergency stop signal, which any operative may give at any time to override a previous signal.



Emergency STOP signal

13. COMPETENCE, INFORMATION, INSTRUCTION, TRAINING AND SUPERVISION

- 13.1. A competent person is someone who has sufficient training, experience, and knowledge. The level of competence required will depend on the complexity of the situation.
- 13.2. All persons engaged in work must be trained and assessed as competent for the role that they are required to perform by a competent person. These persons must have their fitness for work assessed against the requirements for each task being performed.
- 13.3. Consideration should be given to the requirement for a drug and alcohol monitoring system to be in place.
- 13.4. All persons involved in handling operations must be provided with adequate information, instruction, training, and supervision. This is particularly important

where non-permanent employees (NPEs) are utilised who may be generally competent but have limited experience of the lifting operation or type of cargo to be handled.

- 13.5. All persons involved in port working must know who is in control of the operation. This is particularly important where NPEs are working alongside permanent employees.
- 13.6. The banksman is a crucial role within any lifting and slinging operation, it is important that they are trained, knowledgeable and have a thorough understanding of the task and activity to be deemed competent. The banksman should not be engaged in any other activities during any part of the lifting operations.
- 13.7. Supervisors should be trained, competent and experienced in the areas of work that they are supervising (e.g., safe lifting and slinging practices) and have access to relevant competent advice and assistance.
- 13.8. For routine lifting operations the planning of each individual lifting operation will usually be a matter for the people using the lifting equipment such as the slinger or equipment operator. The person carrying out this part of the planning exercise should have appropriate knowledge and expertise.
- 13.9. The “Load Handler” or “Slinger” should have the necessary competence to select suitable accessories. They should receive adequate information and have practical experience on the principles of:
- Selection, use, care, and maintenance of lifting accessories
 - Limitations of use
 - Methods of slinging loads
 - Methods of rating multi legged slings
 - Interpretation of markings on lifting accessories
 - De-rating of lifting accessories for weather conditions
- 13.10. Additional Advice and Information can be found in [Refer to SiP 018 Safety induction and training](#)

14. RELEVANT LEGISLATION AND GUIDANCE

- 14.1. Relevant legislation and guidance include but are not limited to the following. These are the correct at the time of publishing, but the reader should always seek out the most current version.
- 14.2. The current versions of other PSS Safety in Ports Guidance documents can be found at: <https://www.portskillsandsafety.co.uk/resources>
- 14.3. The free training video resource from PSS on Confined Spaces Awareness can be found at: <https://www.portskillsandsafety.co.uk/staying-safe-ports-confined-spaces>

- 14.3.1. BLU Code (Unloading of Bulk Carriers) - Manual on loading and unloading of solid bulk cargoes for terminal representatives
<https://www.imo.org/en/OurWork/Safety/Pages/BLU-Code-and-BLU-Manual.aspx>
- 14.3.2. British Standards Institute (BSI) – Code of practice for safe use of cranes (BS 7121) (NB this is a Paid Publication and its reference is included for general interest)
<https://landingpage.bsigroup.com/LandingPage/Series?UPI=BS%207121>
- 14.3.3. Code of Safe Working Practices for Merchant Seafarers (COSWP);
<https://www.gov.uk/government/publications/code-of-safe-working-practices-for-merchant-seafarers>
- 14.3.4. Confined Spaces Regulations 1997
<http://www.hse.gov.uk/confinedspace/>
- 14.3.5. Consulting and involving your workers:
<http://www.hse.gov.uk/involvement/index.htm>
- 14.3.6. Control of Major Accident Hazards Regulations (COMAH) 2015
<http://www.hse.gov.uk/comah/>
- 14.3.7. Control of Substances Hazardous to Health Regulations (COSHH) 2002
<http://www.hse.gov.uk/coshh/index.htm>
- 14.3.8. Control of Vibration at Work Regulations 2005
<http://www.hse.gov.uk/vibration/wbv/regulations.htm>
- 14.3.9. Dangerous Goods in Harbour Areas Regulations 2016
<http://www.hse.gov.uk/pubns/books/l155.htm>
- 14.3.10. Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002
<http://www.hse.gov.uk/fireandexplosion/dsear.htm>
- 14.3.11. Fumigation : HSE guidance for employers & technicians carrying out Fumigation operations (HSG251)
<http://www.hse.gov.uk/pubns/books/hsg251.htm>
- 14.3.12. Health and Safety (Safety Signs and Signals) Regulations 1996;
<http://www.hse.gov.uk/pubns/books/l64.htm>
- 14.3.13. Health and Safety at Work etc. Act (HSWA) 1974
<http://www.hse.gov.uk/legislation/hswa.htm>
- 14.3.14. HSE Whole Body Vibration in Ports Information Paper
<http://www.hse.gov.uk/vibration/wbv/ports.pdf>
- 14.3.15. International Labour Organisation’s (ILO) Code of Practice on Safety and Health in Ports (ILO 152)
<https://www.imo.org/en/OurWork/Facilitation/Pages/ILOCode-Default.aspx>
- 14.3.16. International Maritime Dangerous Goods Code (IMDG)
<https://www.imo.org/en/OurWork/Safety/Pages/DangerousGoods-default.aspx>

- 14.3.17. International Safety Management (ISM) Code
<http://www.imo.org/en/OurWork/HumanElement/SafetyManagement/Pages/ISMCode.aspx>
- 14.3.18. International Maritime Solid Bulk Cargoes (IMSBC) Code (NB this is a Paid Publication and its reference is included for general interest)
<https://www.imo.org/en/OurWork/Safety/Pages/CargoesInBulk-default.aspx>
- 14.3.19. Lifting Equipment at Work
<http://www.hse.gov.uk/pubns/indg290.htm>
- 14.3.20. Lifting Operations and Lifting Equipment Regulations (LOLER) 1998
<http://www.hse.gov.uk/work-equipment-machinery/loler.htm>
- 14.3.21. Load Security HSE web page
<http://www.hse.gov.uk/logistics/load-security.htm>
- 14.3.22. MAIB Investigation Report into a release of phosphine gas during cargo discharge on board Arklow Meadow:
<https://www.gov.uk/maib-reports/release-of-phosphine-gas-during-discharge-of-fumigated-maize-cargo-from-general-cargo-vessel-arklow-meadow-at-warrenpoint-northern-ireland>
- 14.3.23. Management of Health and Safety at Work Regulations 1999;
<http://www.hse.gov.uk/managing/index.htm>
- 14.3.24. Managing Health and Safety in Dockwork HS(G) 177
<http://www.hse.gov.uk/pubns/books/hsg177.htm>
- 14.3.25. Maritime Coastguard Agency (MCA) Working at Sea
<https://www.gov.uk/topic/working-sea/health-safety>
- 14.3.26. MCA Safe Loading and Unloading of Bulk Carriers 2003
[MCA Safe Loading and Unloading of Bulk Carriers Guidance.](https://www.gov.uk/government/publications/mca-safe-loading-and-unloading-of-bulk-carriers-guidance)
- 14.3.27. Merchant Shipping (Hatches and Lifting Plant) Regulations 1988
<https://www.legislation.gov.uk/uksi/1988/1639/contents/made>
- 14.3.28. Merchant Shipping (Safety at Work) (non-UK Ships) Regulations 1988
<https://www.legislation.gov.uk/uksi/1988/2274/contents/made>
- 14.3.29. Merchant Shipping and Fishing Vessel (Lifting Operations and Lifting Equipment) Regulations (LOLER) 2006
<https://www.legislation.gov.uk/uksi/2006/2184/contents>
- 14.3.30. Merchant Shipping and Fishing Vessel (Provision and Use of Work Equipment) Regulations (PUWER) 2006
<https://www.gov.uk/government/publications/guidance-applying-vessel-equipment-regulations-loler-and-puwer>
- 14.3.31. Musculoskeletal disorders (MSDs)
<https://www.hse.gov.uk/msd/>
- 14.3.32. Noise at Work
<http://www.hse.gov.uk/noise/>
- 14.3.33. Personal Protective Equipment
<http://www.hse.gov.uk/toolbox/ppe.htm>

- 14.3.34. Port Marine Safety Code (PMSC) and Guide to good practice on port marine operations
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918935/port-marine-safety-code.pdf
- 14.3.35. Ports web pages
<http://www.hse.gov.uk/ports/index.htm>
- 14.3.36. Provision and Use of Work Equipment Regulations (PUWER) 1998;
<http://www.hse.gov.uk/work-equipment-machinery/puwer.htm>
- 14.3.37. Public Health England guidance on Methane: health effects and incident management:
<https://www.gov.uk/government/publications/methane-properties-uses-and-incident-management>
- 14.3.38. Rider-operated lift trucks
<http://www.hse.gov.uk/pubns/books/l117.htm>
- 14.3.39. Safety in Docks ACOP L148
<http://www.hse.gov.uk/pubns/books/l148.htm>
- 14.3.40. The Electricity at Work Regulations 1989 and HSE guidance on electrical safety
<http://www.hse.gov.uk/electricity/index.htm>
- 14.3.41. The International Cargo Handling Coordination Association (ICHCA) guides
<https://ichca.com/publications>
- 14.3.42. Trade Assurance Scheme for Combinable Crops (TASCC) codes of practice (Storage, Haulage, Merchants and Testing Facilities)
<https://www.aictradeassurance.org.uk/tascc/about-tascc/>
- 14.3.43. Wood Pellet Association : Storage and Handling Advice
<http://www.pelletcouncil.org.uk/storage>
- 14.3.44. Work at Height Regulations 2005
<http://www.hse.gov.uk/work-at-height/index.htm>

15. DOCUMENT AUTHORS

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16. FURTHER INFORMATION

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