SIP 008 GUIDANCE ON STORAGE OF DRY BULK CARGO

DISCLAIMER

It is Port Skills and Safety (PSS) policy to obtain permission to link to external web sites, and contextual links are provided to such sites where appropriate to the industries business. PSS is not responsible for, and cannot guarantee the accuracy of, information on sites that it does not manage; nor should the inclusion of a hyperlink be taken to mean endorsement by PSS of the site to which it points.

Port Skills and Safety

Contents

1. INTRODUCTION 4
2. REGULATORY FRAMEWORK AND GUIDANCE 5
3. HEALTH 5
4. RISK ASSESSMENT 6
5. CONSULTATION, COOPERATION AND COORDINATION 9
6. COMMUNICATION 9
7. OCCUPATIONAL HEALTH AND RESPIRATORY HAZARDS 11
8. OCCUPATIONAL HEALTH AND RESPIRATORY MANAGEMENT CONTROLS 12
9. PLANNING OF OPERATIONS 14
10. RECORDS & PRODUCT INFORMATION 15
11. INSPECTING THE CARGO 16
12. GENERAL ACCESS TO CARGO STORAGE 17
13. SITE CONDITIONS FOR CARGO STORAGE 18
14. STORAGE CONDITIONS 19
15. HAZARDS 19
16. HAZARD MANAGEMENT CONTROLS 24
17. HAZARDOUS ATMOSPHERES - ASPHYXIATION AND OTHER NOXIOUS GASES ACUTE EFFECTS 26
18. HAZARDOUS ATMOSPHERES - MANAGEMENT CONTROLS 27
19. FUMIGANTS AND BIOLOGICAL HAZARDS - MANAGEMENT CONTROLS 30
20. TRANSPORT MANAGEMENT 30
21. DRY BULK MATERIAL HANDLING EQUIPMENT 31
22. CONVEYOR SYSTEMS 33
23. FIRE PREVENTION - MANAGEMENT CONTROLS 34
24. EXPLOSION 39

25. PREVENTING EXPLOSIONS - MANAGEMENT CONTROLS 40

26. WORKING AT HEIGHT 43

27. WORK AT HEIGHT HIERARCHY OF CONTROLS 43

28. INFORMATION, INSTRUCTION, TRAINING AND SUPERVISION 46

29. APPENDIX I 47

Hazardous Atmospheres - Asphyxiation & Other Noxious Gases Acute Effects 47

Oxygen Depletion 47

Carbon Monoxide 48

Carbon Dioxide 49

Methane 50

30. RELEVANT LEGISLATION AND GUIDANCE 51

31. DOCUMENT AUTHORS 54

32. FURTHER INFORMATION 54

33. COPYRIGHT 54

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 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. If you 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. 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 but is not limited to:

- Free flowing solids not otherwise packaged
- 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 joint guidance SiP022 Biomass. Guidance in this document 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. Including those 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

2.7. The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used or present in the workplace. More information and guidance can be found on the HSE website below:

- http://www.hse.gov.uk/fireandexplosion/dsear-regulations.htm
- http://www.hse.gov.uk/pUbns/priced/l138.pdf

2.8. The HSE guidance on workplace transport provides specific advice on controlling risks associated with workplace transport: http://www.hse.gov.uk/pubns/books/hsg136.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/

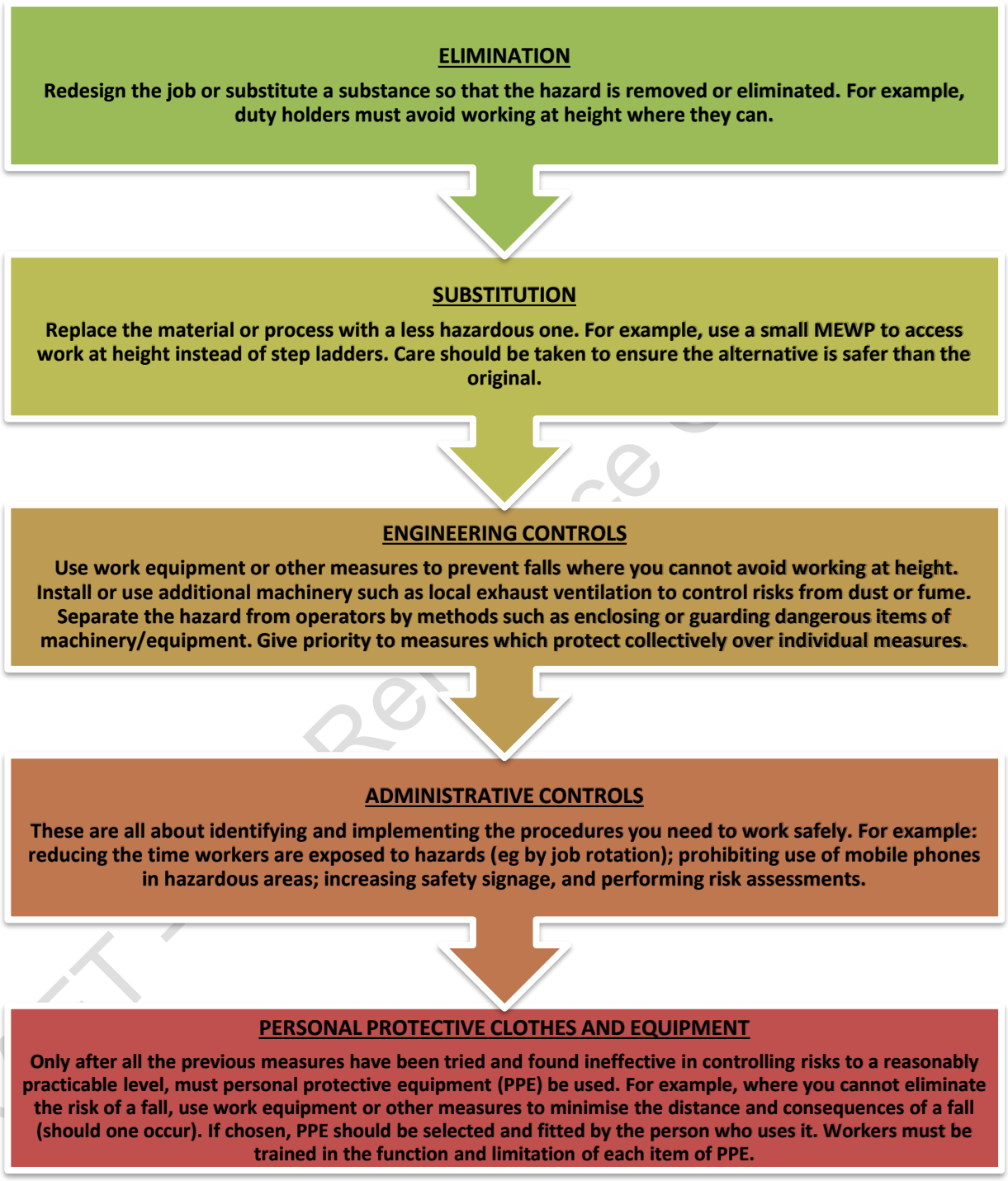
3.2.8. Manual Handling http://www.hse.gov.uk/pUbns/priced/l23.pdf

3.2.9. Respiratory Protective Equipment and Fit testing basics http://www.hse.gov.uk/respiratory-protective-equipment/basics.htm

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 to everyone involved or affected by the activity. This includes but is not limited to non-permanent employees (NPE's), ship's crew, passengers and visitors. The appropriate control measures must be introduced and should consider collective measures before 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 measures 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 are 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 unlashing.

4.8. The Health and Safety at Work Act 1974 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 in order to comply with the Control of Substances Hazardous Regulations (COSHH) and DSEAR regulations. More information and guidance can be found on the HSE website:

- http://www.hse.gov.uk/pubns/books/l5.htm
- http://www.hse.gov.uk/pubns/books/l138.htm
- http://www.hse.gov.uk/comah/guidance.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. COMMUNICATION

6.1. In addition to port and terminal staff there will be a significant number of visitors who need to be provided with appropriate information to ensure their own and other port and terminal users' safety. Visitors to operational areas need to be given

information appropriate to the risk such as plant movements, priority of movement, emergency and reporting procedures. This may be provided by means of a map and basic written instructions or pictograms to allow for the fact that some visitors may have a limited understanding of English. Consideration should be given to translation of materials into other languages

6.2. The design of ports and terminals is vital to ensure they operate safely. All terminals must have risk assessments carried out and safe systems of work in place. These should be communicated to all relevant parties, including (but not limited to): terminal staff, security, visitors, visiting hauliers and drivers, ship's crew, agents, ship's deliveries, emergency services, contractors and those who have business on the port or terminal

6.3. Clear lines of communication must be established and maintained between all those involved in the lifting operations. Visual and/or voice communications from the person directing the lifting operation (usually known in the port industry as the banksman, signaller or hatchway man) to the crane operator must be clear, agreed and understood. Where voice communication cannot be established then an agreed system for the use of hand signals must be followed, see Health and Safety (Safety Signs and Signals) Regulations – schedule 1.

6.4. Guidance on crane signals can be found in BS 7121 – Code of Practice for Safe Use of Cranes – Part 1, General. A banksman should stand in a secure position, where they can see the path of the load and be in a position, wherever possible, where they can be clearly seen by the crane operator, especially in situations where the lifting operation requires the use of hand signals. In situations where the banksman cannot be seen, radio communications or two banksmen should be used.

6.5. Where a banksman is actively involved in slinging/unslinging it is important that during the actual lift the banksman is focused solely on the lifting operation. The banksman should be clearly identified to the crane operator so there is no doubt as to who is providing the instructions.

6.6. The crane driver should only accept instructions from the banksman, whether by voice or through hand signals. The exception to this rule is the stop signal, which any operative may give at any time to override the previous signal.

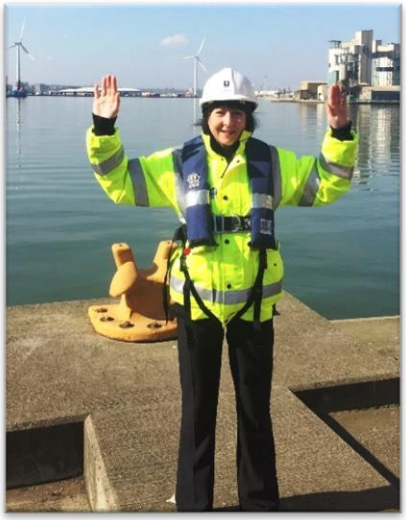


Photo 1 : Emergency Stop Signal.

7. OCCUPATIONAL HEALTH AND RESPIRATORY HAZARDS

7.1. Dust Hazards

7.1.1. Exposure to dust brings the potential for the development of respiratory impairment or allergy. It can increase the work related asthma risk by up to 50%. Certain dusts have been internationally recognised as Group 1 human carcinogens. Some products the effects are more likely to develop from long periods of exposure (potentially years or decades) rather than short term exposure. This is known as "long latency" occupational disease development.

7.1.2. Under COSHH the duty holder must ensure exposure limits are not exceeded. The duty under is to reduce exposure to as low as reasonably practicable. Organisations should have robust monitoring and control systems in place to keep exposure below occupational exposure limits.

7.1.3. Exposure limits for dusts can be found in the latest version of EH40 Workplace Exposure Limits.

7.2. Diesel Engine Exhaust Emissions

7.2.1. Consideration must be given to potential respiratory risks from plant and equipment used in operations, for example potential exposure to diesel engine exhaust emissions.

7.2.2. For more information and guidance see HSE guidance on Control of diesel engine exhaust emissions in the workplace

7.3. Toxins Phytosanitary/ Spores/ Mould Issues (inc farmer's lung)

7.3.1. Some products are more likely to support the growth of microorganisms and production of spores when damp. If organic cargos are allowed to get wet and left, it decomposes and mould can form. Naturally occurring bacteria and fungi on damp cargo can rapidly grow during storage. This can occur due to poor ventilation and or rain water ingress.

7.3.2. The spores produced become part of the organic dust released during any disturbance of the material

7.3.3. Exposure to these spores can cause rhinitis, itchy eyes, breathing difficulties and skin problems. If exposure to airborne spores is repeated and prolonged, those exposed may develop into chronic and debilitating lung conditions including asthma or extrinsic allergic alveolitis. These risks are also relevant where cargo is stored externally.

8. OCCUPATIONAL HEALTH AND RESPIRATORY MANAGEMENT CONTROLS

8.1. Respiratory risks to personnel must be identified through COSHH risk assessments and appropriate controls implemented. The approach must be to work from the hierarchy of controls eliminating the hazard where practicable.

8.2. The dust management arrangements discussed in this document include: non-destructive handling, low impact handling, water spray atomisers, air filtered cabs, hopper design, controlling access and cleaning. Monitoring including dust level measurement, medical surveillance and checking filters, must also be part of the controls applied to minimise the risk to personnel from respiratory hazards.

8.3. In addition product type, Safety Data Sheets (SDS) and personal protective equipment (PPE) may be required. PPE when working with bulk cargo may include head protection, safety shoes, coveralls (e.g. to prevent skin exposure) high visibility clothing, gloves, eye protection and respiratory protective equipment. Additional equipment may be appropriate according to local conditions, product type and local risk assessments.

8.4. PPE requirements should be written into procedures, signposted at entrances to facilities and enforced. Where there is a risk of contamination, suitable hygiene facilities should be provided for workers. Facilities should also be provided for cleaning, storing and disposal of PPE.

8.5. Respiratory Protective Equipment (RPE)

8.5.1. Selection, use and maintenance of RPE should be undertaken with reference to the manufacturer's information, COSHH risk assessment, HSE guidance and specialist expertise.

8.5.2. RPE must be:

- **Adequate** – right for the hazard and reduces exposure to the level required to protect the wearer's health
- **Suitable** – right for the wearer, task and environment, such that the wearer can work freely and without additional risks due to the RPE.

8.5.3. Where RPE is deemed appropriate it should be clear in the safe systems of work. Features such as: what type of equipment is necessary, what protection factor is required and where it is to be used should be identified. Unless a positive pressure system is used, the mask must be "Fit Tested" prior to use. The operator must be trained in its care and use. The effectiveness of all RPE will reduce with use and time. Disposable devices must be treated as such and re-usable devices must be well maintained and stored properly.

8.5.4. There is only room to identify basic principles here because of the specialist, technical requirements of selection and use of RPE. Further information and guidance is available at: HSG53 Respiratory Protective Equipment at work http://www.hse.gov.uk/pubns/books/hsg53.htm.

8.6. Toxins Phytosanitary/ Spores/ Mould Issues (inc farmer's lung)

8.6.1. Stock management and housekeeping are a primary control. Workers should be trained to understand the risks. Mouldy cargo is likely to smell. There is the potential for mould/spores to occur in filtration systems such as plant air conditioning equipment and changing facilities. These may require enhanced cleaning and replacement regimes.

8.6.2. If there is a requirement to handle mouldy material, a COSHH assessment should be conducted and suitable controls put in place.

8.7. Dermatitis and Contact Risk

8.7.1. The primary controls for dermatitis include but are not limited to the provision of PPE, adequate washing facilities and training of operatives in appropriate hygiene controls.

8.7.2. Risk assessment should be used to determine the type and extent of welfare facilities required.

8.7.3. Workwear should be adequate for the hazards, for example covering arms and legs where there is a potential contact hazard. Arrangements must be put in place to adequately wash /or safely dispose/exchange dirty workwear where risks are identified.

8.8. Medical Surveillance

8.8.1. A risk assessment should be undertaken for personnel who handle cargo in bulk storage facilities to identify if medical surveillance is required.

8.8.2. If surveillance is deemed appropriate, a two-stage surveillance process for exposure to dust should be implemented: (1) medical questionnaire then (2) lung function test if necessary.

8.8.3. The type and frequency of ongoing health surveillance, skin checks and respiratory testing will be dependent on exposure levels and advice from your Occupational Health professional.

8.8.4. Pre-employment medicals should identify any vulnerability or allergy to dust and it is recommended that this includes a lung function test and a skin check as well.

8.8.5. For further information, see also:

- HSG173 Monitoring strategies for toxic substances: http://www.hse.gov.uk/pubns/books/hsg173.htm
- SiP011 Sources of occupational health information: http://www.portskillsandsafety.co.uk/publications/safety_in_ports_sip_guidance_suite_all_18_documents

9. PLANNING OF OPERATIONS

9.1. To ensure that the operation is carried out as safely as reasonably practicable. The method of handling and the qualities of the product should be considered.

9.2. Operations need to be properly planned, consideration should be given to the nature and hazards of the **cargo**, and **activity**.

9.3. The impact of these activities on or by others (contractors and third parties) must be considered. This could include the planning of traffic routes used by different parties, or the use of access on and off the vessel. For more information and guidance on coordinating such activities see HSE guidance Managing Health & Safety in Dock work HSG177

9.4. Where practicable, agreement should be reached with customers, shippers, forwarders or receivers of cargoes to establish how long products will be stored. Other information such as temperature management plans should be agreed and exchanged. These plans should detail the types of actions required to mitigate a situation such as spreading the cargo out thinly across a safe area to allow it to cool.

9.5. Consideration should be given to stock rotation. A 'First In First Out' protocol should be adopted where practicable. (e.g. - ensure that cargo does not remain in the back inaccessible area of the shed for prolonged periods)

9.6. Plans for how, when and by what mode cargo will be collected, handled, stored, and forwarded should be agreed, documented and adequate information instruction and training given to those who require it.

9.7. Dangerous Goods

9.8. Where bulk cargo is a hazardous substance, the requirements of the Dangerous Goods in Harbour Areas Regulations, the International Maritime Solid Bulk Cargoes Code, the International Maritime Dangerous Goods Code and other relevant legislation may apply and must be considered.

9.9. It may be appropriate to designate specific areas of the port or terminal for dangerous goods (such as scrap metals that may contain radioactive substances). For more information and guidance on segregation of dangerous goods on the terminal areas see IMDG Code.

9.10. Storage of some commodities in specified amounts may require compliance with the Control of Major Accident Hazard Regulations (COMAH).

10. RECORDS & PRODUCT INFORMATION

10.1. A record should be made for each cargo which should include but is not limited to:

- Storage arrangements
- Records of any monitoring undertaken
- Personnel, plant and equipment involved
- Any specific traffic routes
- Any other hazards.

10.2. The customer should provide the operator with, but not limited to, the following written product safety data information for each type of cargo to be handled:

- Safety Data Sheet (SDS)

- Any additional Environmental characteristics of the product and details of any specific environmental controls that must be applied
- Typical moisture content
- Typical product density
- Typical angle of repose, to enable the operator to establish the area required for the cargo
- Characteristics of the product under storage conditions that may be relevant but not typically included in the SDS, including confirmation if the product has a tendency to self-heat

10.3. Prior to the arrival of each shipment of product, the customer will also provide the operator with the following information:

- Bill of Lading quantities
- Statement of Facts from the load port which may include information on where, how and in what conditions the cargo was loaded, which could affect its condition
- Phytosanitary certificate (if applicable) to determine if wood products meet the entry criteria

10.4. Upon the arrival of each shipment of product, the vessel's Master or representative should provide any additional information, as appropriate. (e.g. the voyage temperature)

10.5. Prior to commencing the work, appropriate information on risks and controls should be given to the personnel involved in the operation. This may be done as a pre-operational briefing such as a "tool box talk".

11. INSPECTING THE CARGO

11.1. Prior to receiving cargo to store where practicable, the cargo should be inspected, tested, and sampled. The inspection should ensure that the cargo is in a safe condition to be handled. Some bulk cargoes may spontaneously combust, develop hot spots, emit dangerous gases, liquefy, develop biological-hazards and/or become unstable. Therefore reading the supplied documentation is essential to ensure correct controls are adopted.

11.2. Depending on the physical characteristics of the cargo, there may be a requirement to monitor aspects such as temperature (e.g. grain, animal feeds) radiation (e.g. scrap metals, yellow cake) build up of toxic fumes (e.g. carbon monoxide) reduction of oxygen levels (e.g. wood chip, wood pellets)

11.3. Many cargoes when in store should be monitored for infestation from vermin and pests.

11.4. Where food grade products are stored there are legal requirements to be registered with the local authority and to apply appropriate controls.

11.5. Where animal feed products are being stored, industry codes of practice (e.g. relating to sampling) may apply.

12. GENERAL ACCESS TO CARGO STORAGE

12.1. Access to operational areas should be controlled and only authorised persons allowed in.

12.2. Subject to risk assessment, ports and terminals will require the mandatory wearing of high-visibility clothing and other PPE. All personnel entering ports and terminals including drivers must have relevant PPE which must be worn in line with site procedures and risk assessment.

12.3. Personnel should not be put at risk of falling. If a safe means of access to the cargo is not available, consideration should be given, subject to a risk assessment and in accordance with the Work at Height Regulations, for the provision and use of alternative access arrangements. An appropriately rated personnel carrying cage, lifted by crane in accordance with the requirements of the Lifting Operations and Lifting Equipment Regulations is an example of a suitable alternative access arrangement.

12.4. Access across cargo stows presents the risk of slips, trips or falls. Particular care should be taken not to step into or jump over any gaps. When working on cargo that has a curved or uneven surface, consideration should be given to the use of suitable wooden staging boards (Youngman's type), aluminium walkways or other suitable methods.

12.5. The risk of slips, trips and falls when walking across cargo stows may be increased when adverse weather conditions prevail e.g. extremes of high temperature, snow, ice and rain. For example, Cargoes arriving during the winter months or from Baltic Ports may be covered in ice. The risk of slipping / tripping / falling may be reduced by wearing appropriate footwear for example with studs or chains. The choice of footwear should consider individual circumstances and potential damage caused to the cargo. Other options may include: de-icing / clearing cargo tops or waiting for

improved conditions. Particular care should also be taken when walking on wrapped cargoes, particularly when wet, as this type of stow can be very slippery

13. SITE CONDITIONS FOR CARGO STORAGE

13.1. The condition and location of the site chosen for cargo storage must be fit for purpose. It should be suitable for the weights, configurations of the cargo and vehicles used in the operation.

13.2. Environmental Impact of cargo residue or dust must be considered and control measures such as dust suppression may be required. Dry bulk cargoes may be subject to licensing approval by the Local Authority and/or Environment Agency before they can be handled on the port.

13.3. Typical site conditions to be considered include but are not limited to;

- ground condition and suitability. The ground should be of suitable construction and well maintained
- arrangements for drainage and waste water contamination
- overhead power lines and/or roof structures being struck when tipping trailers or using long reach excavators
- presence of equipment such as overhead or ground level conveyer systems, storage bins, hoppers, stacker reclaimers
- vehicle fumes in storage areas
- obstructions in the handling area, waste materials/plastic banding, unused bearers, discarded packaging, other cargo and fixed immovable objects, (lighting towers, bollards and pillars) may present additional risks
- working in close proximity to other operations or activities, for example, public rights of way and third party premises/activities
- cargo weight, height and size of stows/heaps and quay/ground loading
- angles of repose, stack integrity and likelihood to flow
- adverse weather conditions
- lighting conditions

14. STORAGE CONDITIONS

14.1. Storage should be suitable for the cargo and properly maintained to ensure the product is protected from/not affected by the elements or other potential sources of contamination

14.2. Arrangements should be in place to prevent unauthorised access to the working area.

14.3. Separate products must not be stored or allowed to blend together unless this has been agreed with the customer and any consequent risks are managed

14.4. In large open stores it is good practice to maintain a minimum of 1m gap between cargoes to allow access for temperature monitoring and/or taking samples. In stores fitted with Individual bays, the walls of the bay will provide the required segregation of the product and protect integrity. The product should be stored to a level below the top of any retaining wall/barrier to avoid product spilling over.

14.5. Store design should be suited to the commodities being handled. Design criteria should include but is not limited to :

- the electrical installation
- access and egress arrangements for operations and emergencies
- traffic routes
- requirements for permanent or movable bulk walls
- maintenance and cleaning requirements
- design should address requirements under the Dangerous Substances and Explosives Atmospheres Regulations and the “ATEX Equipment Directive” as appropriate.

15. HAZARDS

15.1. Cargos may be classified as hazardous. These cargoes should be declared in the relevant shipping information. Always check the SDS for every new cargo. In case of known/repeat cargo, ensure the latest version is available.

15.2. Hazardous Atmospheres And Confined Spaces

15.2.1. A confined space is a place which is substantially enclosed (though not always entirely) and where serious injury can occur from hazardous substances or conditions within the space or nearby (e.g. lack of oxygen).

There are many parts of a store, such as: stairwells, which have the potential to become a confined space.

15.2.2. Oxygen depletion is the single largest cause of death in confined spaces and is a significant risk while storing certain cargoes due to the inherent properties of the material. It can occur through: self-heating, oxidation of metals and ores and by decomposition of materials of vegetable or animal origin

15.2.3. Certain cargoes handled in UK ports are known to be capable of causing oxygen depletion. These cargoes include but are not limited to :

- grain, grain products and residues from grain processing, hops, malt husks and spent malt
- oilseeds as well as products and residues from oilseeds
- copra
- wood in such forms as round wood logs, pulpwood, woodchips, shavings, pulp pellets and sawdust
- jute, hemp, flax, sisal, kapok, cotton and other vegetable fibres (such as esparto grass/Spanish grass, hay, straw, bhuna), empty bags, cotton waste, animal fibres, animal and vegetable fabric, wool waste and rags
- fishmeal and fish scrap
- sulfidic 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

oxygen depletion may also be caused by flammable or spontaneously combustible materials and materials with high metal content

15.2.4. 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 subsequently occur in a space previously found to be safe. Unsafe atmosphere may also be present in spaces adjacent to those spaces where a hazard is known to be present. See also SiP015 Confined Spaces in Ports

15.3. Access/egress to and from the storage areas

15.3.1. Hazards associated with access/egress to and from the storage areas include but are not limited to;

- Being struck by work equipment involved in the operation : eg lifting equipment, moving plant, items of cargo falling
- Handling of cargo may involve the use of, grabs, loading shovels, bull dozers, chutes, conveyors, throwers, suction devices, augers and other methods of handling that may create impact, entrapment or entanglement
- Moving vehicles (road, rail) plant and equipment create the risk of collisions with other vehicles, pedestrians or fixed objects. This could include being crushed against a fixed objects, or by shifting/falling cargo
- Operation of bagging plants, screening equipment, grading or processing plants and associated hazards. Hazard factors include;
    - manual handling,
    - temperature, Noise, Vibration, Fatigue
    - explosive atmosphere

15.4. Access/Egress to and from cargo within storage areas

15.4.1. Hazards associated with access/egress to and from the cargo within storage areas include but are not limited to;

- contact with chemicals or other substances hazardous to health. Dermatitis and contact risk, contact with insects, rodents, pigeons or any other vermin which may be present
- falls from height:
    - during silo, shed cargo access/egress
    - from access gantries
    - through gaps between adjacent cargo stows
    - from cargo stows at varying heights
    - when working near the edge of cargo stows
    - On top of stacks of bulk cargo

- On top of stacks of bulk cargo or at the edge of a trench while removing bulk solids
- falls on the same level into voids between cargo and walls/partitions or wells formed in the cargo stowage,
- the need to gain access to scrap metal which may have hidden voids or access for sampling free flowing bulk cargoes.

- slips, trips or falls while working on surfaces which may be uneven, unstable or slippery due to the presence of substances such as cargo residue, oils, ice, water, or protective wrapping
- collapse or shifting of the cargo stow, either before or during handling
- loose material bulk cargoes 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. A stable slope may become unstable again depending on a range of factors including but not limited to: movement of the plant, ground vibrations, design features of the store, grabbing or loading operations. This gives rise to a risk of persons becoming buried or crushed by bulk cargo including third parties who may need access to the cargo during sampling operations.

15.5. Fire and Self-heating

15.5.1. The potential exists for fire to cause multiple injuries and death. Controls are essential to protect personnel.

The main consequence of fires in dry bulk cargos has been damage to buildings, plant and equipment. These have a clear cost in loss of product, repair, and replacement, down time, investigation and reputation.

15.5.2. 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.

15.5.3. There is a risk that an ignition source could be delivered into the store. A fire due to an external ignition source is most likely to occur shortly after the store has been filled. However there have also been incidents where fire has occurred later due to an external ignition source. For example, failure of conveying plant or equipment associated with loading has

resulted in contact friction of parts leading to combustion of high dust deposits within the equipment.

15.5.4. Some products have a propensity to degrade and generate heat. Spontaneous combustion becomes more likely to occur the longer the product has been in storage. It is essential that the quality of the product from the ship is closely monitored before it is delivered to the store to minimise spontaneous combustion risk.

15.5.5. Incidents have occurred where water has got into through a non-watertight hatch. Parts of the cargo had crusted over, leading to a hot spot below. Exposure to moisture can also occur in non-watertight sheds or silos

15.6. Equipment fires

15.6.1. Incidents have occurred on material handling equipment such as loading shovels and skid steer loaders. Typically, they occur when dust builds up in engine bays and around hot components such as exhausts, leading to ignition. These examples below show damage to cabs and emphasise significant potential risk to the operator

Photos 2 : These examples above show damage to cabs due to equipment fire and emphasise significant potential risk to the operator.

16. HAZARD MANAGEMENT CONTROLS

16.1. Cargo Hazard – Management Controls

- Conduct cargo specific risk assessments.
- Ensure that the build-up of sheer faces of cargo is minimised and implement appropriate exclusion zones where necessary.
- Identify entry process and control access to and from silos, bays or sheds at all times.

16.2. Dust Hazard - Management Controls

16.2.1. 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.

16.2.2. Control measure include but are not limited to:

- Design tasks to reduce the amount of dust generated
- Use totally enclosed, continuous handling systems - these usually provide the best control and should be used whenever reasonably practicable
- Suppress dust with sprays of water or other binding agents where safe and appropriate
- Excluding or controlling any sources of ignition,
- Restrict staff entry to dusty areas
- The use of permit to work systems for activities such as hot work in affected areas
- Provide suitable air filtration systems to the cabs of vehicles used to handle dusty cargoes
- Ensure all equipment used to reduce dust exposure is properly cleaned, maintained and in efficient working order
- Maintaining good housekeeping
- Provide adequate information, instruction and training to workers
- Provide and use respiratory protective equipment (RPE)
- Where appropriate, provide health surveillance for workers

Photo 3 : Portable equipment being utilised to manage the risk of dusty cargos

16.2.3. Further information and guidance can be found on the HSE website

- http://www.hse.gov.uk/coshh/index.htm
- http://www.hse.gov.uk/copd/index.htm

17. HAZARDOUS ATMOSPHERES - ASPHYXIATION AND OTHER NOXIOUS GASES ACUTE EFFECTS

17.1. A build-up of carbon monoxide, carbon dioxide, methane and/or a depletion in oxygen levels in an enclosed space has proved tragically fatal. (For composition of normal atmosphere see figure below)

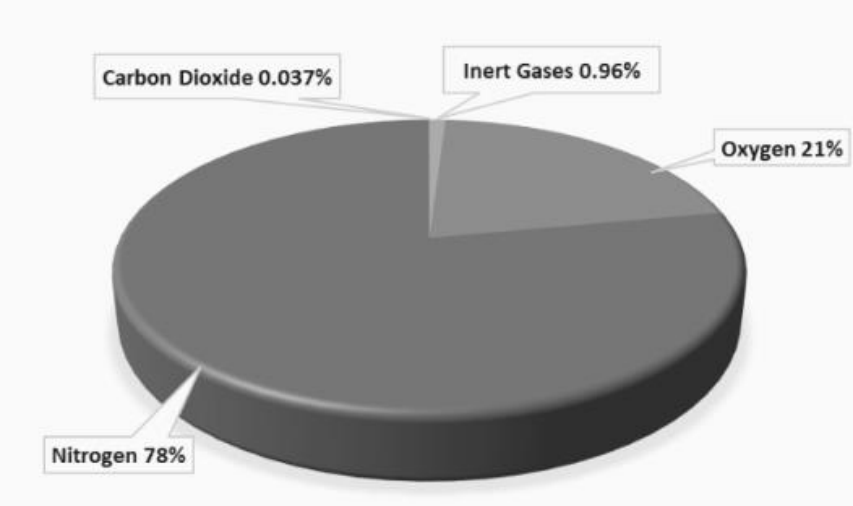


Photo 4 : Relative composition of normal atmosphere

17.2. Oxygen depletion can occur within spaces used to store or transport dry bulk cargo, creating an asphyxiation risk for those working in these spaces.

17.3. The very real risk of asphyxiation and history of fatal accidents make this a top priority for application of controls.

17.4. For more information and guidance on exposure limits and hazardous atmosphere see Appendix 1 and HSE webpages

18. HAZARDOUS ATMOSPHERES - MANAGEMENT CONTROLS

18.1. The main controls for the management of control hazards include but are not limited to:

- Competent design of storage and handling installations
- Operational planning
- Ventilation
- Controlling access
- Gas testing and monitoring

18.2. Competent Design of storage and handling installations

18.2.1. Design and construction of storage and handling installations, including external storage areas, should be undertaken with competent advice and risk review. Existing sheds and storage areas that were not purpose built for bulk storage will likely need to be adapted before use. High Carbon Monoxide levels above the store are less likely if the store top is fully plated and area is well ventilated

18.3. Ventilation

18.3.1. It may be sufficient to ventilate spaces such as silos by simply opening roof hatches or doors and allowing time for the atmosphere to normalise. Similarly, a period with the doors open may provide sufficient ventilation for a shed, store or stairwell. In either case, measures should be put in place to alert personnel and control access during venting such as setting a chain with flashing light across the shed entrance.

18.3.2. If a ventilation regime is deemed necessary by risk assessment, then suitable and sufficient measurement of gases should take place before personnel can commence working

18.3.3. If a space is closed off again during operations, for example to protect cargo from rain, additional ventilation and testing is likely to be required before work can re-commence

18.3.4. In some circumstances, forced ventilation may be necessary

18.4. Gas Testing and Monitoring

18.4.1. Ports and Terminals should have in place gas testing, monitoring and recording regimes to ensure the safety of all staff involved in handling cargoes that may give off hazardous gases. The characteristic of the products being handled must be analysed and measures put in place to

test for the gases likely to be encountered. This is likely to include a minimum of Oxygen and a maximum of Carbon Monoxide whenever cargo is stored in an enclosed space. No person should enter an enclosed place where oxygen depleting or gas generating cargo is stored without suitable and sufficient gas testing having taken place.

18.4.2. It is recommended that multi-gas detection equipment is used to ensure atmospheres are safe. This can be deployed and used by suitably trained workers or by professional chemists.

18.4.3. If circumstances change, such as hatches being closed, prior to allowing personnel to re-enter any space of compartment the gas tests must be undertaken again to confirm the atmosphere remains safe. If it is not safe, then no one must enter until it is made safe.

18.4.4. The Working Exposure Limit WEL and Short Term Exposure Limits for the gases generated by the products being handled should be known and understood by those concerned. Refer to the latest version of EH40 for updated exposure limits.

18.4.5. Testing for safe levels of oxygen must be undertaken where there is a risk and industry practice is that if levels fall below 20% entry is prohibited until the situation improves. Refer Appendix 1.

18.4.6. Storage sheds and silos should also be checked, monitored and managed as described above.

18.4.7. Enclosed areas of conveyors and associated systems including tunnels, trunk-ways, access routes etc. must also be tested prior to entering.

18.4.8. Ports and terminals should undertake their own pre-start and continuous monitoring as well as access control (in line with risk assessment)

18.5. Store Monitoring

18.5.1. Where no fixed gas detection is installed, monitoring should be regularly performed as determined by risk assessment. This is particularly important in the case of Carbon Monoxide.

18.5.2. Carbon Monoxide off-gassing from some organic products can increase with higher ambient temperature. so ambient temperature should be recorded.

18.6. Personal Monitoring within potentially hazardous atmospheres

18.6.1. Staff working in and amongst cargo storage should wear personal gas detectors and be trained in their use. Especially where risk assessment has identified a risk of exposure to hazardous atmospheres. It is best

practice for readings for a minimum of: Oxygen and Carbon Monoxide, are taken to guard against risk of non-breathable atmospheres.

18.6.2. Current industry practice is to use Oxygen monitoring to protect against Carbon Dioxide risk in personal monitoring. The % concentration at which CO2 becomes hazardous will have reduced Oxygen levels sufficiently that oxygen monitors will have already alarmed. The decision on which gasses/substances to monitor, should be made following risk assessment. Taking into account requirements under COSHH and other relevant regulations.

18.6.3. Gas detectors should be maintained calibrated and 'bump tested' according to manufacturer specifications. Operators may determine, subject to risk assessment, a more frequent bump test regime depending on use.

18.7. Emergency Planning

18.7.1. Procedures in the event of an alarm or emergency situation should be in place and routinely tested . This should include arrangements for safe evacuation in the event of a personal or area gas monitor alarm and also for the safe recovery of casualties from the space.

18.7.2. In addition to being a mandatory requirement for Confined Space access. It is industry good practice to engage with stakeholders such as local fire and emergency services and to provide relevant information to them about any particular risks associated with product stores.

18.8. Instruction, Information and Training

18.8.1. Persons expected to work with cargo should be given adequate information, instruction and training on the risk identified and their control measures

This includes:

- information and the methods of controlling risks to respiration,
- the use of any personal protective equipment
- how to respond in the event of alarms and emergencies.

19. FUMIGANTS AND BIOLOGICAL HAZARDS - MANAGEMENT CONTROLS

19.1. 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.

19.2. A COSHH assessment should be carried out to determine the risk from exposure to fumigants and suitable controls put in place which 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 the latest version of EH40, available from the HSE http://www.hse.gov.uk/pUbns/priced/eh40.pdf

19.3. Workers should also be trained to understand the risks. There is the potential for mould/spores to occur in filtration systems in work areas such as plant air conditioning equipment, changing facilities, etc. These may require enhanced cleaning and replacement regimes.

19.4. Workers should be trained to identify and recognise the different types of fumigants

19.5. Where applicable staff should have suitable fumigant detection equipment and be trained in their use

19.6. PPE should be selected so it is both adequate, suitable for the task and complies with the Personal Protective Equipment Regulations

19.7. Refer to section on Dermatitis and Contact Risk within this guidance for additional information

19.8. A risk assessment should be undertaken for personnel identify if Medical Surveillance should be put into place

19.9. For more information and guidance on fumigants, refer to PSS guidance SiP 024 – Safe Access and Hazardous Atmosphere in Freight Containers (pending final approval/publishing) and HSE guidance for Employers and Technicians Carrying out Fumigation Operations

20. TRANSPORT MANAGEMENT

20.1. The main hazards in ports and terminals occur at the interface between vehicles and pedestrians, and vehicles with other vehicles. Many serious injuries have

occurred with people getting access to or from plant and equipment that is in operation at terminals.

As such careful thought and planning must be given to traffic routes and the location of storage areas within the site. Traffic routes including interchanges and roundabouts etc. should be delineated so they are obvious to all users. Signage and markings as required by the Road Traffic Act and the Traffic Signs Regulations and General Directions are recommended, as these will be familiar to all drivers of road going vehicles including foreign drivers.

20.2. Detail as to transport issues may be found in the following:

- SiP001 - Guidance on Port and Terminal Planning
- HSE guidance on Workplace Transport Safety
- HSE webpage on Vehicles at Work

21. DRY BULK MATERIAL HANDLING EQUIPMENT

21.1. Plant used in general cargo handling may include but is not limited to:

- Loading shovels of varying sizes and attachments
- Tug-masters or lorries (internal shunt units)
- Excavators
- Bulldozers
- Hoppers
- Conveyors
- Stacker/reclaimers
- Cranes and attachments
- Skid-steer machines with various attachments
- Screw/displacement unloading equipment
- Bagging Equipment
- Screening equipment
- Chutes/spouts/throwers

21.2. All plant used for the movement of cargo should be suitable for the intended task.

21.3. When using loading shovels for cargo handling it is essential to consider the lifting capacity of the truck, the size of the bucket and the ground on which the truck is being used. Equipment drivers must be trained, competent and authorised.

21.4. Mobile machinery should only be operated on top of cargo where the risk of overturning, sliding, falling or damage has been assessed and controlled. A suitable area should be prepared prior to lifting the truck in, to ensure safe operation.

21.5. When cargo is being transported and handled by tipper lorries or similar equipment then cargo stability and security must be considered.

21.6. When transporting dry bulk in lorries it should be sheeted or sealed to control dust emissions and loss of cargo on the road

21.7. Where tipper lorries are used, hazards related to tipping operations should be considered including but not limited to:

- The possibility of overturning
- Ground conditions
- Location of driver and/or third parties during tipping operations
- Proximity of other vehicles during tipping operations
- Overhead hazards

21.8. Fixed mechanical handling systems such as conveyors, loaders/unloaders, present hazards during operations. When this equipment is maintained, systems such as permits to work may need to be in place.

Photo 5 : A loading shove working on cargo in a bulk shed

21.9. Cargo handling equipment should be maintained and inspected in accordance with the Provision and Use of Work Equipment Regulations (PUWER), The Lifting Operations and Lifting Equipment Regulations (LOLER).

21.10. Access control to fixed plant installations maybe required to ensure safety of personnel.

21.11. For more information and guidance refer to HSE guidance on Provision and Use of Work Equipment Regulations: Approved Code of Practice and Guidance

22. CONVEYOR SYSTEMS

22.1. Conveyor systems can be used for handling cargo. PUWER will apply to conveyor systems. They must be fit for purpose, properly designed and installed, regularly inspected and maintained. In some case the LOLER may apply.

22.2. General plant and machinery safety is addressed in other Safety in Ports guidance documents such as SiP002 General cargo: http://www.portskillsandsafety.co.uk/publications/safety_in_ports_sip_guidance_suite_all_18_documents

22.3. The main hazards to personnel from conveyor plant and associated machinery include (but are not limited to):

- Being trapped or struck by the machinery, for example by in-running nips between pulleys and belts
- Being buried in or struck by the materials being handled
- Falling, for example from the conveyor or into the chute

22.4. Controls should include (but are not limited to):

- Safety features included in the design.
- Guards must be fitted in all areas where trap or entanglement hazards exist
    - with appropriate safety interlocks with an audit system to check they are in use before and during operation
- Fire and explosion dampening systems should be considered and fitted if practicable to areas of conveyor systems where they may be of benefit

- Regular checks must be made to ensure conveyors are clear of obstructions and that belts do not rub against other objects. The friction generated may be sufficient to create enough heat to initiate a fire or explosion
- Permit systems, including for isolation procedures to ensure that the system can be safely maintained and operated
- Access controls, to ensure no unauthorised access to conveyors and any associated equipment
    - Staff operating and maintaining conveyors must be competent and have had suitable training
- Cleaning regimes, to regularly clean any conveyor system.
- Local rules: persons must not ride on belts, persons must not step on to a conveyor table or cross a conveyor, except by walkways or other designated means.

22.5. For more information and guidance refer to HSE guidance on Provision and Use of Work Equipment Regulations: Approved Code of Practice and Guidance

23. FIRE AND EXPLOSION PREVENTION - MANAGEMENT CONTROLS

23.1. Fire and explosion risks are interconnected. Many of the controls that are designed to prevent ignition are also applicable in prevention of explosions as discussed later in the document. Guidance on fire and explosion should be read in conjunction with one another to obtain a more complete understanding of the risks and controls.

23.2. The main prevention management control measures include (but are not limited to);

- Design of storage and handling installations
- Plant and equipment design and operation
- Non-destructive handling of cargo
- Control of ignition sources
- Spark detection within enclosed conveyor systems.
- Cleaning
- Zoning of plant and storage areas

- Enclosures and dust extraction / suppression
- Ventilation of explosive / flammable gasses
- Storage and stack management
- Temperature monitoring and thermal imaging of pile
- Monitoring for condensation or steam on top of a heap (this may indicate an exothermic reaction, biological or chemical activity
- Product condition monitoring in the store
- Fire fighting systems
- Emergency planning

23.3. Competent design of storage and handling installations

23.3.1. Bespoke stores and silos should be designed to minimise flat surfaces and voids in the walls and roof structures where dust can accumulate. Dust build up can increase the risk and/or severity of fires.

23.3.2. It is a recommendation that transfer towers should not be fully enclosed/confined structures as this can lead to a build-up of dust.

23.4. Non-destructive Handling of Cargo

23.4.1. “Reduce the dust, reduce the problem”

23.4.2. It is important to maintain the integrity of cargo during handling. Operational procedures and plant and equipment design should take in to account process to minimise handling and the resulting generation of dust. Degradation of the pellet causes additional dust, which then has to be controlled at every transfer point, chute, hopper, silo or store.

23.4.3. It is recommended that plant and equipment operators are trained in low impact handling techniques.

23.4.4. Other measures which may mitigate the generation of dust clouds around stockpiles include but are not limited to:

- Restricting discharge heights
- Tipping on to other product rather than shed floors
- Restricted vehicle speeds in dust prone areas

23.4.5. Non-destructive handling and dust reduction will also be key to managing the explosion and respiratory risks addressed in the document.

23.5. **Cleaning**. Cleaning regimes are an essential part of preventing the build-up of dust which can increase the risk and/or severity of fires. Cleaning is one of the most important controls for preventing fire as well as controlling respiratory and explosion risk. It is a must for ensuring safe operations and it should be an integral part of your risk management arrangements. See also Explosion management controls and respiratory protection below

23.6. Storage and Stack Management

23.6.1. The longer that any product which is prone to combustion stays in a single place, the greater the risk of self-heating and ignition. Where practicable, such material should not be stored for long periods.

23.6.2. Fire development is always in the direction of the supply of fresh oxygen. Therefore, a mass store should be sealed as much as practicable from both the bottom and the top to avoid any air ingress.

23.6.3. Certain products can be both combustible and prone to self-heating. it is important is to keep the stockpile dry. Exposure to rain, either directly or from leaking covers, or the formation of condensation, will encourage the growth of microorganisms and significantly accelerate heat production. Temperature rises of up to 2.4oC per hour have been measured in silos containing wood pellets. Although biological heat will stop when microorganisms are killed by high temperature (in the range 70-80oC for thermophilic organisms), chemical oxidation can take over, accelerating the self-heating process towards spontaneous combustion in a greatly reduced timeframe.

23.6.4. The cargo can be moved/rotated to prevent self-heating. There may be a trade off with additional handling leading to dust production. In the event of heating, it may be possible to use movement and segregation of parts of the heap to bring the heating/fire under control but this should be part of a planned incident response.

23.7. Condition monitoring of cargo within undercover stores and silos

23.7.1. Monitoring and recording within a store is recommended where there is a risk of fire/self-heating. Different approaches could include:

- Temperature probes, including checking for hot spots in silos
- Infrared detectors
- Sampling of gases that indicate early stages of combustion
- Closed circuit tv

- Visual checks of the stockpile in flat stores for evidence of "Damp Patches" that indicate possible condensed water, mould, smouldering or changes in physical characteristics

23.7.2. Some products to release Carbon Monoxide during storage, but the **level** and **rate** of increase of Carbon Monoxide will be much higher in the event of a fire. It is difficult to fix a specific Carbon Monoxide level to reliably alert the presence of fire. The level in ppm is dependent on factors such as how much ambient air is entering the store and mixing with it (dilution effect). Carbon Monoxide levels above 2000 ppm are a potential indicator but not a confirmation of a fire.

23.7.3. The rate of release of Carbon Monoxide can vary for different types of products, but is still considered a good indicator of whether Carbon Monoxide is being generated by normal off gassing or by a fire.

23.8. Condition monitoring of cargo in external storage

23.8.1. Consideration should be given, subject to risk assessments, to monitoring of certain bulk cargo in external storage areas. Different approaches may be appropriate according to the circumstances and may include:

- Temperature monitoring and recording
- Infrared detectors
- Closed Circuit TV
- Managing dwell times
- Visual checks for evidence of mould, smouldering or changes in physical characteristics

23.9. Mobile Plant and equipment selection, design and operation

23.9.1. Factors that should be considered when selecting or altering mobile plant and equipment for handling bulk cargo include but are not limited to:

- Dust control in the operator's cab
- Bio hazard inside the cab & air conditioning (eg. Mould growth)
- Bio hazard to service staff (eg. Mould growth)
- Temperature control in: engine bay, transmission, hydraulic tank & pump area.
- Fuel tank location & construction material

- Diesel Particulate Filter (DPF) re-generation times, cycles, exhaust & body temperature
- Engine cooling pack design & location
- Engine cooling Fan location
- Cooling air / dust route through engine bay, or cooling pack area
- Fire prevention
- Fire suppression and fire extinguisher systems
- Cleaning regime
- Sanitizing regime
- Timescale between thorough deep clean
- Use of compressed air for routine cleaning
- Use of water for routine cleaning

23.9.2. When using enclosed cabs on equipment to control dust exposure it is important to consider emergency escape in the event of a fire or mechanical failure. For example, a typical enclosed skid-steer type loader does not enable the operator to open the door if the bucket is raised. Where the primary means of egress might become unavailable, an alternative egress route such as an escape panel should be fitted.

23.9.3. If considering preparing plant and equipment for ATEX zoning, it is important to take into account the type of risk and protection required for the circumstances. For example, in the petro-chemical industry, protecting against gas and vapour is likely to be a priority whereas for wood pellet in ports the risks are more associated with flammable dusts. A suitable and sufficient risk assessment should be used to identify the risks to be controlled.

23.9.4. It is industry recommended good practice that the mobile plant is fitted with an automated fire suppression system.

23.10. Firefighting systems

23.10.1. Fires in silos or stores tend to be slow/smouldering due to the lack of oxygen. This typically gives the Incident Controller time to properly consider when to deploy the firefighting systems rather than triggering them when they are not required, which could also damage the associated plant.

23.10.2. Fire suppressant systems can use: foam, Nitrogen, Carbon Dioxide or water. Deluge systems such as water spray or 'hydro-mist' systems should be considered on conveyors and material transfer systems, subject to the assessed risk.

23.10.3. Fire emergency plans should be prepared. It is important to ensure procedures, planning, periodic exercising and early communication with emergency services are regularly carried out.

23.10.4. The emergency fire plan should take into account the environmental impact of containment and run-off of firefighting mediums such as water or foam. The potential need for containment and subsequent disposal of contaminated water should be considered as part of the risk assessment along with clean-up resources.

24. EXPLOSION

24.1. Cargo dust in certain conditions can explode. Different dust profiles present different hazards. Some dust accumulations may present more of a fire hazard than direct explosion hazard.

24.2. An explosion can start as a dust fire when it ignites finer dust that is dispersed into the air by some other mechanism.

24.3. Measurements of lower explosive limits of many materials are available. For many organic products the limit is in the range of 10-50g/m3. A dust cloud of this concentration resembles a very dense fog.

Figure 1 Explosion pentagon - conditions required for an explosion to take place

24.4. The secondary explosion following a primary explosion is where more fuel in the form of a dust cloud is thrown up into the atmosphere from the initial explosion and with an ignition source the results can be catastrophic.

- Explosion: a rapid increase in volume and release of energy in an extreme manner, usually with the generation of a high temperature
- Explosiveness: is a function of particle concentration, oxygen concentration and the energy of the ignition source or the temperature of the heat exerted by the wood pellet dust

24.5. Some cargo can give off explosive gasses e.g. decomposing organic materials can give rise to Methane.

24.6. For more information and guidance refer to HSE guidance on Safe handling of combustible dusts: Precautions against explosions

25. PREVENTING EXPLOSIONS - MANAGEMENT CONTROLS

25.1. Management controls to prevent explosions include but are not limited to:

- Competent design of storage and handling installations
- Spark detection within enclosed conveyor systems.
- Cleaning
- Zoning of plant and storage areas
- Dust suppression
- Enclosures and dust extraction
- Control of ignition sources
- Non-destructive handling
- Ventilation of explosive/flammable gasses
- Plant and equipment design and operation

25.2. Zoning Of Undercover Storage

25.2.1. Consideration should be given to the design of storage facilities. Sheds, bins, silos and other equipment used for the storage of dry bulk cargoes should be suitable for their intended use. This may include but is not limited to, subject to assessment of products to be stored, use of approved electrical installations and other equipment. Directive 94/9/EC also known as “ATEX 95” or “ATEX Equipment Directive” equipment and protective systems for use in potentially explosive atmospheres. For more information and guidance refer to the HSE webpages on ATEX and Explosive atmospheres

25.2.2. Areas should be assessed by a competent person and zoned according to risk with suitable and sufficient controls put into place. The ATEX directives specify zoning of dusts as follows:

- **Zone 20** - A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, for long periods or frequently

- **Zone 21 -** A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally
- **Zone 22 -** A place where an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur it will persist for a short period only

25.2.3. Zoning can be part of controls for wood pellet dust. However, wood chip can normally be safely stored outside and would therefore not necessarily require Dangerous Substances in Explosive Atmospheres Regulations zoning.

25.3. Enclosures And Dust Extraction

25.3.1. For internal storage, dust control equipment, usually fitted to transfer towers, hoppers and conveyors is designed to minimise dust concentrations/levels during transfer and handling.

25.3.2. A number of ports have introduced specialised hoppers and other dust containment methods to manage the dust during discharge. Features such as: non-return valves, negative pressure, dust extraction and positive pressure operator cabs have been introduced in the hopper design. Existing port hoppers designed for other products may lack suitable dust suppression and if used may require additional dust controls. Such features should have robust, documented, inspection and maintenance regimes in place. For example Local Exhaust Ventilation (LEV) requires statutory thorough examination & testing.

25.3.3. Loaded bulk shunt vehicles should be sheeted when moving around the port, regardless of the distance.

25.3.4. Use of automatic doors and sheeting features on Heavy Goods Vehicles (HGV) can also reduce dust dispersal and should be considered when sourcing HGV provision. Such automated equipment reduces the need for drivers to move around operational areas on foot and climb in and out of vehicles.

25.4. Spark Detection Within Enclosed Conveyor Systems

25.4.1. It is recommended that a suitable and sufficient spark detection system is installed at suitable points in the conveyor system as identified by risk assessment. Extinguishing systems should be installed where appropriate to prevent the sparks from igniting the collected material within the system.

25.5. Control Of Ignition Sources

25.5.1. Controls for ignition sources include but are not limited to:

- Specialised plant and equipment (for example ATEX rated)
- Intrinsically safe, low temperature lighting and other electrical equipment including portable electrical equipment
- Means of capturing 'tramp' metal such as magnets, metal detection, screening etc. that could create sparks
- Maintenance regimes
- Lagging or other means of controlling heat sources such as pipework or engine components
- Prohibition of smoking and e-cigarettes

25.5.2. The above list is not exhaustive and therefore it is important that the qualities and characteristics of the cargo product and design of the store and method of the handling operation are carefully considered to ensure that the operation is carried out in a safe manner as is reasonable practicable. It should also be a prerequisite that a SDS be supplied by the shipper for the cargoes to be handled.

25.6. Emergency Planning

25.6.1. It is essential that suitable and sufficient emergency plans are in place for vessels, handling areas and stores.

25.6.2. Stores should be designed with sufficient access for:

- personnel evacuation
- accessing "Hot Spot" locations so that hot biomass can be dug out and suitably cooled by spreading out at a very low height.

25.6.3. Factors for emergency planning should include but are not limited to:

- Physical aspects and layout of the space/area for safe access/egress and emergency response, casualty evacuation and clean-up
- Communications arrangements
- Provision of rescue and response equipment
- Trained emergency response personnel
- Incident management

- Practice/drill arrangements

25.6.4. For more information and guidance refer to PSS guidance SiP016 Emergency planning in ports

26. WORKING AT HEIGHT

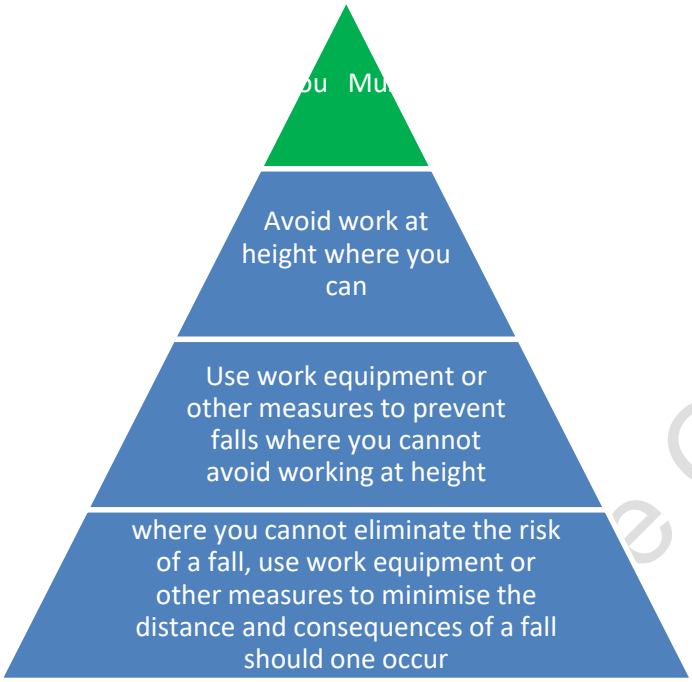
26.1. Personnel should not be put at risk from falls from height when working on stacks of bulk cargoes. A risk assessment should be carried out to consider suitable access. An example could be an appropriately rated and maintained personnel carrier.

26.2. The risks of slips and falls when walking across cargo stows may be increased in adverse weather where high temperatures, snow, ice and rain conditions prevail. The risk of slipping/falling in these conditions may be reduced by wearing appropriate footwear. It may also be appropriate to de-ice/clear cargo tops or to wait for improved climatic conditions.

26.3. There are several types of personal fall protection systems and equipment. Users of these systems require high levels of training and appropriate close supervision. Reference should be made to the guide to Selecting, using and maintaining personal fall protection equipment to ensure that the right type of fall protection equipment is used. http://www.hse.gov.uk/falls/downloads/ppe.pdf

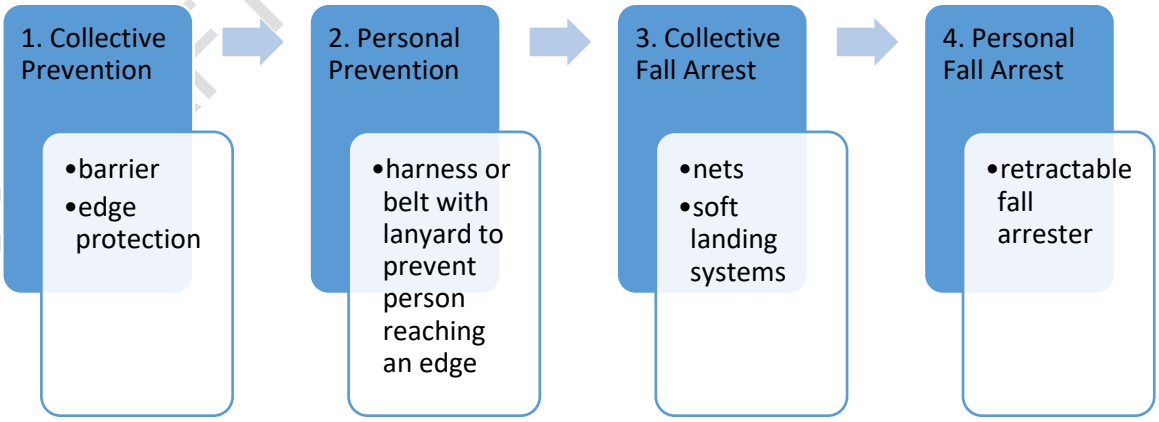
27. WORK AT HEIGHT HIERARCHY OF CONTROLS

27.1. 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 at: http://www.hse.gov.uk/toolbox/height.htm and in the brief guide to the Regulations http://www.hse.gov.uk/pubns/indg401.pdf, also refer to ACOP Safety in Docks (L148)



27.2. The Regulations set out a simple hierarchy for managing and selecting equipment for work at height and for determining how to work at height safely. The hierarchy has to be followed systematically and 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.

27.3. Order of consideration when using work equipment or other measures to prevent falls where work at height cannot be avoided:



27.4. Duty holders must:

27.4.1. avoid work at height where they can

27.4.2. use work equipment or other measures to prevent falls where they cannot avoid working at height

27.4.3. 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

27.4.4. devise a suitable rescue plan

27.5. Give consideration to minimise the amount of exposure time and the number of people exposed to work at height.

27.6. Suitable on site rescue plan covering emergency measures must be in place to ensure a prompt response to a fall situation. The plan should not solely rely on the Emergency services. Ensure that those involved in the rescue are not put at risk. See also SiP016 Emergency Planning in Ports

27.7. Safe By Position

27.8. The Work at Height Regulations do not set a minimum safe distance from an open edge where

27.9. Systems of work where an employee is simply instructed to stay away from an edge sit at the bottom of the hierarchy of controls. This should only be considered where there is a foreseeable risk of a person falling from height and if other control measures are not reasonably practicable, in such cases further measures such as additional supervisory control, instruction and training may be required. If employing this method of control, you must be able to robustly demonstrate that the risk has been fully assessed and that the implementation of no other method of control further up the hierarchy is reasonably practicable or necessary.

27.10. If using 'safe by position' as part of your system of work, considerations should include but are not limited to:

- The distance that work will be carried out from the open edge
- Limiting the duration of exposure
- Limiting the number of people being exposed
- Environmental conditions, such as wind, ice, fog, etc.
- Nature of the work, e.g. uneven cargo stowage
- Increasing the level of Supervision
- Human factors

27.11. Human factors research has found that people cannot concentrate on any task for 100% of the time and that during those lapses in concentration they can inadvertently encroach too close to an open edge with the risk of falling.

27.12. All personnel involved in working at height are required to be competent. This means that they need to have the necessary knowledge, skills and experience to do the work. This should include adequate instruction and training in how to work safely at height and in the selection and use of appropriate control measures. Training should be a combination of theoretical and on the job training.

28. INFORMATION, INSTRUCTION, TRAINING AND SUPERVISION

28.1. All workers engaged must be trained and assessed as competent for the roles that they are required to perform by a competent person. These workers must have their fitness for work assessed against the requirements for each task and consideration should be given to the requirement for a drug and alcohol monitoring to be in place.

28.2. One of the specialised training issues with dust generating cargos is that plant operators have appropriate instruction on non-destructive handling to reduce dust production

28.3. All persons involved in 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 particular operation.

28.4. 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.

28.5. Supervisors should be trained, competent and experienced in the areas of work that they are supervising and/or have access to relevant competent advice and assistance. For more information and guidance refer to PSS guidance SiP018 safety Induction and Training

29. APPENDIX I

Hazardous Atmospheres - Asphyxiation & Other Noxious Gases Acute Effects

Oxygen Depletion

29.1. Oxygen is the only gas that supports life. The normal concentration of oxygen in the air is approximately 20.9%[1].

29.2. Oxygen depletion can occur within freight containers. The very real risk of asphyxiation and history of fatal accidents make this a top priority for application of controls.

29.3. 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.

29.4. 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.

29.5. 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.

29.6. The following table indicates approximate effects and symptoms, which may vary depending on the individual.

Oxygen	Effects and Symptoms
20.9%	The normal concentration in the air that we breathe
<21%	Any depletion of oxygen concentration below 21 % should be regarded with concern and fully investigated
19.5%	As a minimum the oxygen concentration in the workplace should be maintained above 19.5 %
<18%	Atmospheres containing less than 18 % oxygen are potentially dangerous and entry into such areas must be prohibited unless appropriate safety controls are adopted
<10%	The risk of unconsciousness followed by brain damage or death due to asphyxia is greatly increased at oxygen concentrations below 10 %.

[1] Safe work in confined spaces ACOP L101

Oxygen	Effects and Symptoms
<6%	Immediate loss of consciousness occurs with less than 6 % of oxygen.
0%	Inhalation of only 2 breaths of nitrogen, or other inert gas containing no oxygen, causes immediate loss of consciousness and death within 2 minutes.

Source: British Compressed Gasses Association Guidance Note 11 Reduced Oxygen Atmospheres: The management of risk associated with reduced oxygen atmospheres resulting from the use of gases in the workplace.

Carbon Monoxide

29.7. Carbon monoxide is a colourless, odourless, highly toxic, flammable gas formed by incomplete combustion of carbon. It is a common off-gassing product from many types of stored dry bulk cargos. Off-gassing effects must be controlled and minimised to protect workers from dangerous atmospheres. Carbon monoxide is also found in the exhaust of engines and generators and its effects must be controlled and minimised to protect workers.

29.8. Toxic gas exposure, such as Carbon Monoxide poisoning is one of the most serious risks associated with dry bulk cargo.

29.9. 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 headaches or dizziness, breathlessness; nausea; loss of consciousness, tiredness, pains in the chest or stomach, erratic behaviour and visual problems.

29.10. Levels of just 1% carbon monoxide (10,000ppm) would 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.

29.11. In a space such as an unventilated freight container, increased carbon monoxide could lead to a fatal reduction in the oxygen concentration as well as presenting toxic and fire risks.

Carbon Monoxide		Effects and Symptoms
0.1%	100 ppm	Slight headache in 2-3 hours
0.2%	200 ppm	Slight headache within two to three hours; loss of judgment
0.4%	400 ppm	Frontal headache within one to two hours

Carbon Monoxide		Effects and Symptoms
0.8%	800 ppm	Dizziness, nausea, and convulsions within 45 min; insensible within 2 hours
0.16%	1,600 ppm	Headache, increased heart rate, dizziness, and nausea within 20 min; death in less than 2 hours
0.32%	3,200 ppm	Headache, dizziness and nausea in five to ten minutes. Death within 30 minutes.
0.64%	6,400 ppm	Headache and dizziness in one to two minutes. Convulsions, respiratory arrest, and death in less than 20 minutes.
1.28%	12,800 ppm	Unconsciousness after 2–3 breaths. Death in less than three minutes.

Source: Goldstein M (December 2008). "Carbon monoxide poisoning". Journal of Emergency Nursing. 34 (6): 538–542.

29.12. Refer to EH40 for the updated workplace exposure limits of carbon monoxide

Carbon Dioxide

29.13. 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 and, because of this, people are unable to see it or smell it 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. Since it is heavier than air, fatalities from asphyxiation have occurred when, at high concentrations, it has entered spaces and displaced oxygen.

29.14. In Great Britain carbon dioxide is classed as a 'substance hazardous to health' under COSHH. The HSE publication 'EH40/ Workplace exposure limits' http://www.hse.gov.uk/pubns/books/eh40.htm provides exposure limits for airborne concentrations of hazardous substances in the workplace. Workplace exposure is calculated by taking an average over a specified period of time. At the time of publishing the workplace exposure limits for carbon dioxide are:

29.14.1. Long-term exposure limit (8-hr reference period) – *Please refer to the latest edition of EH40*

29.14.2. Short-term exposure limit (15-minute reference period) - *Please refer to the latest edition of EH40*

Carbon Dioxide		Effects and Symptoms
2-3%	20,000-30,000 ppm	Unnoticed at rest, but on exertion there may be marked shortness of breath
3%	30,000 ppm	Breathing becomes noticeably deeper and more frequent at rest
3-5%	30,000 – 50,000 ppm	Breathing rhythm accelerates. Repeated exposure provokes headaches
5%	50,000 ppm	Breathing becomes extremely laboured, headaches, sweating and bounding pulse
7.5%	75,000 ppm	Rapid breathing, increased heart rate, headaches, sweating, dizziness, shortness of breath, muscular weakness, loss of mental abilities, drowsiness, and ringing in the ears
8-15%	80,000 – 150,000 ppm	Headache, vertigo, vomiting, loss of consciousness and possibly death if the patient is not immediately given oxygen
10%	100,000 ppm	Respiratory distress develops rapidly with loss of consciousness in 10-15 minutes
25%	250,000 ppm	Convulsions occur and rapid loss of consciousness ensues after a few breaths. Death will occur if level is maintained.

Source: IVHHN – Volcanic Gases and Aerosols Guidelines pg 19. [Table of Health effects of respiratory exposure to carbon dioxide, (Baxter, 2000; Faivre-Pierret and Le Guern, 1983; NIOSH, 1981)]

Methane

29.15. Methane may be given off by organic products if it is allowed to decompose. Methane is an odourless, colourless flammable gas and can give rise to increased fire and explosion risk in air at levels as low as 5 percent.

30. RELEVANT LEGISLATION AND GUIDANCE

30.1. Relevant legislation and guidance include but are not limited to the following. Please note that these are the correct versions at the time of publishing, but the reader should always seek out the most current version.

30.2. The current versions of other PSS Safety in Ports Guidance documents can be found at: https://www.portskillsandsafety.co.uk/resources

30.3. Code of Safe Working Practices for Merchant Seafarers (COSWP); https://www.gov.uk/government/publications/code-of-safe-working-practices-for-merchant-seafarers-coswp-amendment-7-2022

30.4. BSI Code of practice for safe use of cranes (Paid Publication) https://shop.bsigroup.com/ProductDetail/?pid=000000000030320608

30.5. Confined Spaces Regulations 1997 https://www.legislation.gov.uk/uksi/1997/1713/made

30.6. Consulting and involving your workers: http://www.hse.gov.uk/involvement/index.htm

30.7. Control of Major Accident Hazards Regulations (COMAH) 2015 https://www.legislation.gov.uk/uksi/2015/483/contents/made

30.8. Control of Substances Hazardous to Health Regulations (COSHH) 2002 https://www.legislation.gov.uk/uksi/2002/2677/regulation/7/made

30.9. Control of Vibration at Work Regulations 2005 http://www.hse.gov.uk/vibration/wbv/regulations.htm

30.10. Dangerous Goods in Harbour Areas Regulations 2016 http://www.hse.gov.uk/pubns/books/l155.htm

30.11. Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002 http://www.hse.gov.uk/fireandexplosion/dsear.htm

30.12. Health and Safety (Safety Signs and Signals) Regulations 1996; http://www.hse.gov.uk/pubns/books/l64.htm

30.13. Health and Safety at Work etc. Act (HSWA) 1974 http://www.hse.gov.uk/legislation/hswa.htm

30.14. HSE Guidance on Atex and Explosive Atmospheres http://www.hse.gov.uk/fireandexplosion/atex.htm#whatatex

30.15. HSE guidance on Control of diesel engine exhaust emissions in the workplace http://www.hse.gov.uk/pubns/books/hsg187.htm

30.16. HSE guidance on Handling Containers with Slewing Cranes; http://www.hse.gov.uk/foi/internalops/sims/cactus/5_05_09.htm

30.17. HSE guidance on workplace transport safety http://www.hse.gov.uk/pubns/books/hsg136.htm

30.18. HSE webpages on Chronic Obstructive Pulmonary Disease (COPD) http://www.hse.gov.uk/copd/index.htm

30.19. HSE Whole Body Vibration in Ports Information Paper http://www.hse.gov.uk/vibration/wbv/ports.pdf

30.20. ICHCA guides https://ichca.com/publications

30.21. 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

30.22. International Maritime Dangerous Goods Code (IMDG) http://www.imo.org/en/Publications/IMDGCode/Pages/Default.aspx

30.23. Lifting Equipment at Work: http://www.hse.gov.uk/pubns/indg290.htm

30.24. Lifting Operations and Lifting Equipment Regulations (LOLER) 1998; http://www.hse.gov.uk/work-equipment-machinery/loler.htm

30.25. Load Security HSE web page: http://www.hse.gov.uk/logistics/load-security.htm

30.26. Management of Health and Safety at Work Regulations 1999; http://www.hse.gov.uk/managing/index.htm

30.27. Managing Health and Safety in Dockwork HS(G) 177 http://www.hse.gov.uk/pubns/books/hsg177.htm

30.28. Merchant Shipping (Hatches and Lifting Plant) Regulations 1988; http://www.opsi.gov.uk/si/si1988/Uksi_19881639_en_1.htm

30.29. Merchant Shipping (Safety at Work) (non-UK Ships) Regulations 1988; http://www.opsi.gov.uk/si/si1988/Uksi_19882274_en_1.htm

30.30. Merchant Shipping and Fishing Vessel (Lifting Operations and Lifting Equipment) Regulations (LOLER) 2006 http://www.opsi.gov.uk/si/si2006/20062184.htm

30.31. 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

30.32. Musculoskeletal disorders (MSDs) http://www.hse.gov.uk/msd/index.htm

30.33. Noise at Work http://www.hse.gov.uk/noise/

30.34. Personal Protective Equipment
http://www.hse.gov.uk/toolbox/ppe.htm

30.35. Port Marine Safety Code (PMSC)
https://www.gov.uk/government/publications/port-marine-safety-code

30.36. Ports web pages
http://www.hse.gov.uk/ports/index.htm

30.37. Provision and Use of Work Equipment Regulations (PUWER) 1998;
http://www.hse.gov.uk/work-equipment-machinery/puwer.htm

30.38. Rider-operated lift trucks
http://www.hse.gov.uk/pubns/books/l117.htm

30.39. Safety in Docks ACOP L148 http://www.hse.gov.uk/pubns/books/l148.htm

30.40. The Electricity at Work Regulations 1989 and guidance on electrical safety
http://www.hse.gov.uk/electricity/index.htm

30.41. Work at Height Regulations 2005 http://www.hse.gov.uk/work-at-height/index.htm

31. DOCUMENT AUTHORS

This guidance document has been produced by Port Skills and Safety with the support of the Health and Safety Executive and representatives of the UK ports industry.

32. FURTHER INFORMATION

For further information, please contact:

Port Skills and Safety, First Floor, 30 Park Street, London SE1 9EQ

Tel: 020 7260 1790 Fax: 020 7260 1795 Email: info@portskillsandsafety.co.uk

33. COPYRIGHT