Contents

Why has this handbook been produced?........................................................................................................1
1. Introduction............................................................................................................................................1
2. Legal obligations....................................................................................................................................2
3. Consultation...........................................................................................................................................3
4. Training and supervision.....................................................................................................................4
5. Using these guidelines........................................................................................................................5
6. Building design and structure.............................................................................................................6
7. Workplace layout and facilities...........................................................................................................9
8. Traffic management............................................................................................................................16
9. Environmental conditions..................................................................................................................19
10. Hazardous manual handling.............................................................................................................24
11. Plant (machinery and equipment)......................................................................................................29
12. Emergency management..................................................................................................................34
13. Acknowledgements...........................................................................................................................37
14. Appendices.........................................................................................................................................38
   Appendix 1 – Process chart for the design of a safe cold storage workplace........................................38
   Appendix 2 – Wind chill program (chart)............................................................................................39
   Appendix 3 – Operation of LPG forklift trucks in poorly ventilated places........................................40
   Appendix 4 – Long-term fruit storage in controlled atmosphere rooms..............................................42
   Appendix 5 – Protective Clothing for Cold Storage – A user’s guide..................................................44
   Appendix 6 – Checklist: Anhydrous ammonia refrigerating systems................................................52

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This guidance has been reviewed and updated for the sole purpose of amending year and regulation references relating to the Occupational Health and Safety Regulations, in line with amendments which came into effect on 18 June 2017.
1. Introduction

Why has this handbook been produced?

Cold storage facilities pose a range of occupational health and safety risks that are responsible for hundreds of injuries every year. Many employees are injured seriously enough to need four or more weeks off work. Tragically, people have also died as a consequence of incidents associated with working in a cold storage facility.

This handbook provides health and safety information specific to cold storage facilities to help employers, Health and Safety Representatives (HSRs) and employees identify hazards and implement appropriate risk controls.

This handbook also provides advice for cold storage facility employers on how to ensure they comply with their duties and obligations under the Occupational Health and Safety Act 2004 (OHS Act) by:

- understanding the health and safety impact created by the tasks undertaken in cold work environments,
- identifying the importance and benefits associated with consultation during the design, construction and operation of cold storage facilities,
- identifying work areas and work processes involving tasks that present a risk to health and safety and could be adversely affected by environmental and atmospheric conditions (e.g. cold environments, contaminated or oxygen deficient atmospheres),
- providing practical risk control solutions to eliminate or reduce risks, and
- providing practical tools to help identify hazards and develop appropriate risk controls.
2. Legal obligations

The *Occupational Health and Safety (OHS) Act 2004* (S.21) requires employers, so far as is reasonably practicable, to provide and maintain a working environment that is safe and without risk to employees’ health. Part of this is providing employees with information, instruction, training and supervision to ensure they are able to perform their work in a safe manner and without risk to health.

This duty extends to contractors and employees of the contractor. Employers and operators of cold storage facilities should be aware they have a responsibility (S. 23) to others apart from employees.

Managers of cold storage facilities – as well as employees – have prescribed individual responsibilities (S. 25) as officers of a company (S. 144) for ensuring the health and safety of employees and others in the workplace.

The OHS Act also requires the designers of buildings and structures to design the building or structure to be safe and without risks to the health of those using it as a workplace (S. 28).

While the OHS Act prescribes the general principles and duty of care provisions of Victorian health and safety legislation, there are a number of specific hazard-based regulations (*Occupational Health and Safety Regulations 2017*) that require employers to identify and control risks, and consult with employees who are likely to be affected by any activity that relates to their health and safety.

**More information:**

*Occupational Health and Safety Act 2004*

*Occupational Health and Safety Regulations 2017*
3. Consultation

There are specific duties within the OHS Act (Part 4) and various sections of hazard-based regulations that equate employers to consult with employees who are, or are likely to be, affected by a range of health and safety matters. This includes identifying or assessing hazards or risks, making decisions on how to control risks or when changes are proposed that may affect employee health and safety.

Consultation must include independent contractors and employees of the independent contractor/s, including labour hire employees – provided that the action or decision involved is one the principal employer has, or should have, control over.

In situations where health and safety representatives (HSRs) are elected by employees to represent them, this consultation must involve the HSR (with or without the involvement of the employees directly). Effective consultation between employers, employees and HSRs working within cold storage facilities is necessary to ensure workplace hazards are identified and where possible eliminated or controlled.

There are many benefits that can be gained through meaningful consultation between employers and employees including:

- better outcomes resulting from employee input and a more comprehensive identification of potential workplace hazards and risk control options
- ownership by employees in relation to any of the decisions that are made to eliminate or reduce risk
- a more effective and efficient design and operation of plant and work processes
- a better and more effective workplace layout that produces considerable efficiency gains
- a healthy and safe workplace culture with a strong emphasis on cooperation, and
- improved productivity and a reduction in absenteeism.

It is important to recognise that effective consultation during the initial design and ongoing operation of cold storage facilities will assist employers and operators. It ensures plant and equipment, as well as the structure and layout, are efficient and suitable for the safe operation of the facility.

More information:

Occupational Health and Safety Act 2004
Occupational Health and Safety Regulations 2017
WorkSafe guidance and publications
4. Training and supervision

Training

Employers and operators of cold storage facilities have prescribed responsibilities to provide employees with information, instruction, training and supervision to enable them to perform work in a safe manner without risk to their health. These same duties extend to contractors and the employees of contractors.

Induction and ongoing hazard training for employees should be regularly reviewed to make sure the employer or operator of a cold storage facility – where necessary – modifies training to ensure it remains relevant to current operations and provides appropriate information and instruction to employees on any additions or changes to hazard-based policies or procedures.

While the formal recording of such training is not compulsory, it is important any training be competency based. Formally recording the training is recommended as it provides the employer with an accurate record of the training provided as well as confidence that it achieved the desired outcomes.

Induction training

The type of induction required for each site and/or task, provided to permanent, part time, or casual employees may vary from the level of induction provided to contractors and drivers.

Any training should include information identifying the relevant HSR for the designated work group (DWG), the procedure for reporting hazards and the issue resolution procedure used at the workplace.

The level of site induction training required may depend on factors such as:

- type of work and the level of expertise required by the person performing the work
- hazards and risks associated with the work
- specific area/s where the work is to be undertaken and any hazards that may exist there
- workplace hazards and the integrity and level of risk control measures in place
- level of supervisory control required and the contractual arrangements with the person and/or company involved.

Task-specific training

Any task or hazard-based training provided by the employer or cold storage facility operator to employees, contractors or others who may visit or undertake work at the site should:

- reinforce and/or complement the induction training already provided by employer or operator of the cold storage facility
- include information on any risks associated with the hazard
- include information and specific instruction or procedures for eliminating or mitigating any risk associated with the hazard
- encourage discussion and questions from participants to confirm understanding and clarify any misunderstandings
- include some form of competency-based assessment to ensure the training achieves desired outcomes.

Supervision

As well as providing training, employers must appropriately supervise all those working in or visiting the workplace. The level of supervision often depends on the workplace hazards, level of exposure and integrity of risk control measures in place. In workplaces where safe work procedures and employee training and instruction have been used as the primary risk control measure, a greater level of supervision is required.

More information:

Occupational Health and Safety Act 2004 (S. 21)
WorkSafe guidance and publications
5. Using these guidelines

How to use these guidelines

These guidelines have been divided into specific hazard or industry-based issues. While the following list may not cover all existing hazards or issues within cold storage facilities, the general principles may be applied to those areas not listed in this document.

The green, amber and red traffic light format will help you identify high-risk practices and assess your workplace in order to implement safer work practices. The rationale is simple: to reduce injury rates and compensation claims, high-risk situations must be addressed.

Companies undertaking work practices in the RED high-risk area should be aware that these activities may breach legislation and place the health and safety of their workers at risk.

Where high-risk practices are used and identified in your workplace, you should immediately consider practices in the GREEN low-risk column.

If not practicable, you should put in place the comparable practices in the AMBER medium-risk column. Generally, these only provide an interim solution as, in most instances, the GREEN solutions reflect good practice.

<table>
<thead>
<tr>
<th>High Risk</th>
<th>(Medium-risk)</th>
<th>(Low-risk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The practices in the red column should not be used in the workplaces; an employer who allows these practices to be used is likely to be in breach of OHS legislation.</td>
<td>The practices in the amber column are less effective in reducing risk compared to those in the green column and should generally be treated as interim solutions.</td>
<td>The practices in the green column are most effective at reducing risk and should be regarded as the target for all workplaces.</td>
</tr>
</tbody>
</table>

If, however, you are able to demonstrate an appropriate risk assessment process has been undertaken and you are able to verify the ‘reasonably practicable’ test has been applied to the implemented controls, measures in the amber range may be practicable.

These guidelines apply no matter what time of day or day of week.
6. Building design and structure

There are a number of structural design factors that should be considered when planning, designing or modifying any cold storage facility. When planning the design specifications for a new cold storage facility or modifications to an existing facility, the owners and operators are presented with an opportunity to capitalise on past experience and ensure the design, layout and selection/installation of plant and equipment utilises new technology to eliminate or reduce risk while at the same time improve productivity.

The following building design factors should be considered during the design of any new cold storage facility or modifications to any existing facility.

More information:
Design of a safe cold storage workplace chart (Appendix 1)

**Suspended ceilings**

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulated ceiling spaces or cavities used by employees or contractors for storage or maintenance that have:</td>
<td><strong>Suspended ceilings and ceiling cavities that have:</strong></td>
<td></td>
</tr>
<tr>
<td>- not been designed and constructed with safe means of access and egress</td>
<td>- appropriate means of access to and egress from the ceiling cavity</td>
<td></td>
</tr>
<tr>
<td>- no visible or prescribed maximum load capacity to ensure it will support the weight of persons and or material</td>
<td>- sufficient space and lighting for maintenance or the conduct of other activities in the space</td>
<td></td>
</tr>
<tr>
<td>- no perimeter or other appropriate fall protection.</td>
<td>- appropriately designated walkways and/or work platforms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- suitable weight rating and are capable of supporting workers and materials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- capability of bearing additional load from a build up of ice and water if the ceiling becomes wet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- strategically positioned drainage points capable of removing any build up of water.</td>
<td></td>
</tr>
</tbody>
</table>
6. Building design and structure

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| Well designed suspended ceiling providing a cavity space safe to access and work in. | provisions for a hoist or other mechanical aid used for raising and lowering tools and equipment. | Structural supports or columns throughout buildings that:  
  ▪ are positioned in or adjacent to vehicle or forklift traffic areas  
  ▪ are not clearly visible and easily defined  
  ▪ impede or restrict the movement of forklift and pedestrian traffic  
  ▪ increase thermal conduction.                                               |
| Structural supports or columns within traffic areas that are:  
  ▪ painted to increase visibility  
  ▪ appropriately covered to reduce impact and increase visibility. | Building and structure designed or modified to ensure:  
  ▪ no internal structural columns hinder or obstruct forklift or order picking activities  
  ▪ any internal structural supports or columns positioned within the building structure or racking  
  ▪ are insulated and heated to limit thermal conduction. | Structural supports or columns within traffic areas that are:  
  ▪ painted to increase visibility  
  ▪ appropriately covered to reduce impact and increase visibility. |

Structural supports
6. Building design and structure

### Air flows

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| Poor workplace design and layout with refrigeration plant and equipment that has:  
  - unnecessarily high air velocity that creates high wind chill  
  - fans directed onto employee work or traffic areas  
  - noise levels at or above the 85dB(A) exposure standard. | | Design layout and selection of plant to ensure:  
  - evaporators are positioned to reduce airflows and limit wind chill and snow formation  
  - there are safe and easy means of access to plant for maintenance staff  
  - air curtains or rapid roller doors provide warm work areas for employees while maintaining cold environment for product  
  - interlocked refrigeration fans that stop when people are in area. |

### Flooring systems

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| Poor concrete flooring system design and construction resulting in:  
  - tripping hazards created by uneven, cracked or broken concrete  
  - excessive number, size, and position of expansion joints  
  - unsafe internal forklift traffic areas and roadways created by uneven floor surface (due to number, size and position of expansion joints or frost heave). | Flat concrete flooring system that has:  
  - racking system strategically positioned over expansion joints  
  - metal plates fixed over expansion joints. | A well designed, constructed and maintained concrete slab floor that:  
  - is solidly constructed, level and free of cracks or damage  
  - is post-tensioned to remove need for expansion joints  
  - minimises the number and impact of expansion joints at design stage  
  - has sufficient insulation with a suitable vapour barrier or sub-floor heating to prevent frost heave  
  - is sealed to prevent or minimise concrete dust  
  - has joints protected with steel angles. |
7. Workplace layout and facilities

While the design, layout and specification of cold storage facilities provides the best opportunity to design and/or engineer out the risks to employees associated with workplace hazards, redesigning or modifying existing facilities can also be a cost-effective way to reduce risk. The re-design of the workplace layout and the relocation of existing amenities and facilities allow cold storage facility owners and operators to better utilise the existing structure while reducing risk and improving product flow.

Redesigning or modifying an existing facility also enables employers to add or reposition racking systems, ensure employee amenities are strategically positioned close to work areas, and that access to these amenities does not require employees or truck drivers to travel through forklift or vehicle traffic areas. These modifications also provide employers with an opportunity to explore the level of risk reduction and efficiency benefits associated with the introduction of the most recent and up-to-date technology in racking systems and traffic management.

More information:
AS/NZS 1680.1.2006
Interior and workplace lighting – General principles and recommendations

Visibility

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility has an inadequate level of visibility due to:</td>
<td>Facility has risk controls measures to improve visibility that include:</td>
<td>Good visibility as a result of the design and the layout of the facility which ensures that:</td>
</tr>
<tr>
<td>▪ poorly designed and positioned general or task lighting in traffic or work areas</td>
<td>▪ adequate general lighting with no consideration given to task lighting needs or shadows created by racking, etc.</td>
<td>▪ adequate lighting has been designed and appropriately positioned in all traffic and work areas</td>
</tr>
<tr>
<td>▪ product storage that is in or across designated walkways or roadways</td>
<td>▪ use of mirrors at blind corners</td>
<td>▪ unobstructed and clear walkways and roadways where:</td>
</tr>
<tr>
<td>▪ blind spots created by the temporary or permanent storage of product pallets adjacent to roadways or traffic areas</td>
<td>▪ use of bollards and/or gates at pedestrian and forklift intersections, or blind corners</td>
<td>– vehicles and pedestrian traffic have clear uninterrupted visibility along path of travel; and</td>
</tr>
<tr>
<td>▪ pedestrian, forklift and vehicle traffic intersections that create blind corners (e.g. ends of racking, doorways into and from trucks at loading dock).</td>
<td>▪ procedures requiring pedestrian, forklift and vehicle traffic to stop and look both ways at intersections</td>
<td>– layout and design of traffic and work areas eliminates pedestrian vehicle interaction (e.g. blind corners).</td>
</tr>
</tbody>
</table>

Refer: AS/NZS 1680.1.2006 Interior and workplace lighting – General principles and recommendations
## 7. Workplace layout and facilities

### Aisles

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| Poor workplace design and layout of storage and work areas due to aisles that:  
- are not wide enough to easily and safely manoeuvre forklift trucks or other equipment  
- terminate at blind corners and intersect with roadways or forklift traffic areas (e.g. ends of racking)  
- have product or material stored across or within aisles  
- are used by both pedestrian and vehicular traffic at the same time  
- have inadequate lighting due to position or type of lighting. | Use of risk controls and procedures for aisles that:  
- allocate an aisle for order picking or forklift use  
- have manually operated barriers or gates across aisles during order picking or use by forklifts  
- prescribe a three metre separation distance between pedestrian and forklifts  
- prescribe that pedestrians have right of way. | Well designed layout of storage areas with aisles that:  
- have sufficient and well designed lighting  
- have designated and physically separate pedestrian and forklift traffic areas (e.g. separate picking aisles)  
- are wide enough to manoeuvre forklifts and pallet trucks into position during the placement or retrieval of product  
- are wide enough to allow for expected volume of pedestrian traffic and any pedestrian carried loads  
- eliminate pedestrian and forklift intersections (blind corners) at the ends of racking aisles. |
## 7. Workplace layout and facilities

### Amenities

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities and amenities for employees such as lunch rooms, showers and toilets that:</td>
<td></td>
<td>Facilities and amenities that are:</td>
</tr>
<tr>
<td>▪ are not easily accessible or are located far away from work areas</td>
<td>▪ well designed, adequately equipped and clean</td>
<td>▪ well designed, adequately equipped and clean</td>
</tr>
<tr>
<td>▪ are poorly designed, unclean and/or not in a hygienic condition</td>
<td>▪ designed and equipped to accommodate the maximum number of employees and visitors (e.g. truck drivers)</td>
<td>▪ designed and equipped to accommodate the maximum number of employees and visitors (e.g. truck drivers)</td>
</tr>
<tr>
<td>▪ do not have any or adequate First Aid facilities and/or trained First Aid staff</td>
<td>▪ easily accessible from all work areas</td>
<td>▪ easily accessible from all work areas</td>
</tr>
<tr>
<td>▪ are poorly equipped and do not have adequate facilities for:</td>
<td>▪ located to eliminate or minimise any interaction between pedestrian and vehicle traffic</td>
<td>▪ located to eliminate or minimise any interaction between pedestrian and vehicle traffic</td>
</tr>
<tr>
<td>— peak number of employees (e.g. labour hire/casuals)</td>
<td>▪ well equipped with clean and comfortable warm up rooms</td>
<td>▪ well equipped with clean and comfortable warm up rooms</td>
</tr>
<tr>
<td>— truck drivers or visitors</td>
<td>▪ designed to allow for the storage and drying of employee PPE.</td>
<td>▪ designed to allow for the storage and drying of employee PPE.</td>
</tr>
<tr>
<td>▪ do not have appropriate warm up facilities that:</td>
<td>Refer: WorkSafe Compliance Code, Workplace Amenities and Work Environment</td>
<td>Refer: WorkSafe Compliance Code, Workplace Amenities and Work Environment</td>
</tr>
<tr>
<td>— are suitably heated</td>
<td>Appropriately designed and resourced First Aid facilities with sufficient numbers of trained staff who are accessible to employees.</td>
<td>Appropriately designed and resourced First Aid facilities with sufficient numbers of trained staff who are accessible to employees.</td>
</tr>
<tr>
<td>— are clean and well maintained</td>
<td>Refer: WorkSafe Compliance Code, First Aid in Workplaces</td>
<td>Refer: WorkSafe Compliance Code, First Aid in Workplaces</td>
</tr>
<tr>
<td>— have suitable drying cabinets for employee personal protective equipment (PPE).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Battery storage and recharging areas

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| Inappropriate and poorly designed battery recharging and storage areas that:  
  - are positioned on loading docks or high vehicular or forklift traffic areas  
  - are within enclosed confined areas/rooms with little or no natural/mechanical ventilation to disburse or remove fumes  
  - do not comply with the Dangerous Goods (Storage & Handling) Regulations 2012  
  - do not have enough space for manoeuvring and the safe operation of lifting equipment  
  - do not have appropriate PPE readily available for employees (e.g. face shields, gloves, aprons, boots)  
  - do not have appropriate and easily accessible emergency equipment (e.g. safety showers and eyewash facilities). | | Appropriately designed battery storage and recharging areas that:  
  - are naturally or mechanically ventilated  
  - are designed and operated in accordance with the Dangerous Goods (Storage & Handling) Regulations 2012  
  - Refer: AS 2359.6 Powered Industrial Trucks – Part 6 Safety Code |

**Appropriately designed battery storage and recharging areas that:**

- are naturally or mechanically ventilated
- are designed and operated in accordance with the Dangerous Goods (Storage & Handling) Regulations 2012

Refer: AS 2359.6 Powered Industrial Trucks – Part 6 Safety Code

**Appropriate space, ventilation and facilities to safely charge forklift batteries.**

- provide sufficient room for easy access and the safe use of lifting plant equipment to remove, store and replace batteries
- have batteries positioned on racks or secure charging locations providing protection from impact damage
- have charging systems designed and installed to suit the cold storage environment (e.g. moisture, water)
- have appropriate personal protective and emergency safety equipment (e.g. safety showers and eyewash facilities).

Refer: AS 4775.2007 Emergency eyewash and shower equipment
## 7. Workplace layout and facilities

### Racking systems

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorly designed racking systems that:</td>
<td></td>
<td>Appropriately selected, well designed racking systems that:</td>
</tr>
<tr>
<td>- do not identify safe working load (Rated Load Capacity)</td>
<td>- have been specifically selected for the purpose for which they are intended (e.g. manual order picking)</td>
<td></td>
</tr>
<tr>
<td>- are not appropriately designed or manufactured</td>
<td>- have been designed and installed to the appropriate standards and specifications</td>
<td></td>
</tr>
<tr>
<td><strong>Inappropriate racking used to stock product which is not rated, damaged and/or in poor condition.</strong></td>
<td>- are regularly inspected and maintained</td>
<td>-</td>
</tr>
<tr>
<td>- are overloaded or exceed manufacture specifications</td>
<td>- clearly display maximum height and rated capacity (kg) limits</td>
<td></td>
</tr>
<tr>
<td><strong>Product stacked haphazardly in aisles due to a lack of suitable racking space.</strong></td>
<td>- have appropriate levels of collision protection to prevent forklift damage and potential structural failure (e.g. bollards, barriers)</td>
<td></td>
</tr>
<tr>
<td>- exceed manufacturer’s maximum specified height for portable racking</td>
<td>- have design features that allow the easy placement and secure storage of pallets and product</td>
<td></td>
</tr>
<tr>
<td>- exceed manufacturer’s maximum stack height for stillages</td>
<td>- was designed and installed so as not to obstruct or restrict the effect of ceiling mounted sprinklers or other fire protection systems.</td>
<td></td>
</tr>
<tr>
<td>- are damaged or not maintained to manufacturer specifications</td>
<td>Refer: AS 4084 Supp 1-1993 : Steel storage racking – Commentary (Supplement to AS 4084-1993)</td>
<td></td>
</tr>
</tbody>
</table>
### Staging area

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate and poorly designed staging areas that:</td>
<td>A staging area that relies on procedures, line markings and other forms of administrative control measures to separate pedestrian and forklift traffic.</td>
<td>Staging areas which are well designed and have a layout that has:</td>
</tr>
<tr>
<td>• have no physical separation of pedestrian and forklift traffic areas</td>
<td></td>
<td>• all doorways between staging areas, refrigerated trucks, cool rooms and freezers have been designed to prevent snowing or a build up of ice on walls and floor areas</td>
</tr>
<tr>
<td>• have no designated area for the storage or holding of consignments</td>
<td></td>
<td>• enough space to cater for large consignments and overflow or peak workloads</td>
</tr>
<tr>
<td>• does not have protected or clearly defined roadways or walkways</td>
<td></td>
<td>• clearly marked holding areas defined and strictly maintained</td>
</tr>
<tr>
<td>• creates blind corners through the positioning of pallets of product next to pedestrian forklift intersections</td>
<td></td>
<td>• clearly defined and protected pedestrian walkways and work areas (e.g. physical guard railing or barriers).</td>
</tr>
<tr>
<td>• are crowded with not enough space for the number of consignments and safe movement of pedestrian and forklift traffic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Clearly marked staging aisles.*
### Dock levellers and loading ramps

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsuitable and poorly designed dock areas with dock levellers or loading ramps that:</td>
<td></td>
<td>Well designed dock areas with dock levellers and loading ramps that:</td>
</tr>
<tr>
<td>▪ are not suitable or cannot be adjusted to enable mechanical aids to be used during loading and unloading</td>
<td>▪ are suitable for the purpose for which they are intended and regularly inspected and appropriately maintained</td>
<td>▪ are suitable for the purpose for which they are intended and regularly inspected and appropriately maintained</td>
</tr>
<tr>
<td>▪ are not of sufficient size or structural capacity for the vehicles or the equipment being used</td>
<td>▪ are of sufficient size, structural capacity and are adjustable enabling the use of various mechanical aids used during the loading and unloading of trucks</td>
<td>▪ are of sufficient size, structural capacity and are adjustable enabling the use of various mechanical aids used during the loading and unloading of trucks</td>
</tr>
<tr>
<td>▪ cannot be retracted fully when not in use and so become a tripping hazard.</td>
<td>▪ provide safe same level access to the rear of trucks</td>
<td>▪ provide safe same level access to the rear of trucks</td>
</tr>
<tr>
<td></td>
<td>▪ fold away to form continuous surface with dock.</td>
<td>▪ fold away to form continuous surface with dock.</td>
</tr>
</tbody>
</table>
8. Traffic management

The constant movement of road transport vehicles, the operation of forklifts and other mobile plant – and the potential for interaction with pedestrians – presents significant traffic management issues in cold storage facilities.

Good traffic management is important for the safe and efficient movement of pedestrian and vehicles in and around cold storage facilities. Both the designers and operators of cold storage facilities have responsibilities to ensure the facility’s design, layout and operation eliminates, or reduces so far as is practicable, the risks associated with traffic management.

Working in the cold may mean that when vehicles with windscreens and pedestrians with glasses move from one temperature to another visibility is affected by condensation on the windscreens or glasses.

The cold environment and the movement of forklifts in and out of freezers may result in floors becoming wet and slippery. A traffic management plan must ensure issues to do with visibility and wet, slippery floors, and the risks these environmental conditions present, are considered and addressed.

Traffic management plans must be developed, implemented and regularly reviewed in consultation with employees. The consultative process can assist the cold storage facility owner and/or operator to identify, eliminate or significantly reduce any risk created by interactions between pedestrians, forklifts or other forms of vehicular traffic.

Broader consultation with employer and employee representative bodies can also assist in identifying new or advanced technologies that may eliminate or reduce risk while at the same time providing operators with substantial efficiency and productivity gains.

The following examples of high risk activities and corresponding risk control solutions are not exhaustive however they may assist the operators of cold storage facilities to identify and appropriately control risks associated with any interaction between pedestrians and vehicle traffic.

More information:

Australia Standard AS 4024.1
WorkSafe publications: Forklift Safety Reducing the Risk
Safety by Design – Eliminating manual handling injuries in road transport
### Traffic management:

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility does not have a traffic management plan to control risks associated with:</td>
<td>Facility relies on risk controls that:</td>
<td>Good workplace design and layout with a traffic management plan which ensures:</td>
</tr>
<tr>
<td>• poorly designed pedestrian and vehicular work areas</td>
<td>• consist solely of safe work procedures and signage</td>
<td>• the safe and efficient movement of pedestrian and vehicular traffic</td>
</tr>
<tr>
<td>• employees and visitors (e.g. truck drivers) having to cross vehicle traffic areas</td>
<td>• require all those on site to wear high visibility clothing</td>
<td>• facilities and amenities are strategically positioned to eliminate pedestrian</td>
</tr>
<tr>
<td>or roadways to access amenities or facilities</td>
<td>• require pedestrian and vehicle traffic to slow down, stop and look</td>
<td>and vehicular traffic interaction</td>
</tr>
<tr>
<td>• inadequate lighting and poor visibility</td>
<td>• require all forklifts and vehicles approaching intersections or entering or exiting</td>
<td>• traffic and work areas have sufficient lighting and there is good visibility</td>
</tr>
<tr>
<td>• blind corners where pedestrian and forklift or other vehicle traffic intersect</td>
<td>buildings to sound their horns</td>
<td>(e.g. street lighting at intersections)</td>
</tr>
<tr>
<td>(e.g. ends of racking, loading docks, doorways opening directly onto roadways)</td>
<td>• prescribe separation distances between pedestrian and forklift traffic</td>
<td>• pedestrian work areas and walkways are physically separated from forklift and</td>
</tr>
<tr>
<td>• vehicle and pedestrian traffic using the same aisles, roadways and doorways</td>
<td>• require forklifts and vehicles to give way to pedestrians</td>
<td>other vehicular traffic (e.g. elevated work areas and walkways)</td>
</tr>
<tr>
<td>• forklifts or other mobile plant operating in pedestrian work areas</td>
<td>• has floor line marking to define pedestrian work areas and walkways from forklift</td>
<td></td>
</tr>
<tr>
<td>• walkways and work areas with no physical separation between pedestrians and forklift</td>
<td>and other vehicular traffic areas</td>
<td></td>
</tr>
<tr>
<td>and vehicle traffic</td>
<td>• use bollards/gates across walkways to slow and obstruct pedestrian traffic</td>
<td></td>
</tr>
<tr>
<td>• a lack of sufficient room or area to safely manoeuvre forklifts or road transport</td>
<td>• has mirrors to increase visibility at blind corners.</td>
<td></td>
</tr>
<tr>
<td>vehicles.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Innovative racking design provides **safe walkways for pedestrians.**

- guard railing or physical barriers are positioned out from and across the front of pedestrian doorways leading to internal or external roadways
- protected walkways that change direction to increase visibility at doorways and pedestrian forklift intersections
- pedestrian walkways are suitable for the volume of pedestrian traffic
- there is sufficient space and room to safely manoeuvre forklifts
- the different characteristics, size and turning circles of various types of road transport vehicles.
## 8. Traffic management

### Forklift loading and unloading

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility has no adequate risk control measures to protect people during the loading and unloading of trucks and:</td>
<td>Facility relies on the use of administrative risk controls that may include:</td>
<td>Measure to control the risks to any pedestrian traffic during the loading and unloading of trucks on roadways or dock areas should ensure that:</td>
</tr>
<tr>
<td>- allows unrestricted access to the dock area by pedestrians during loading and unloading</td>
<td>- the use of spring loaded gates or bollards on walkways to impede pedestrian traffic and give them time to stop and look</td>
<td>- pedestrian access to the dock area during any loading and unloading of the truck by forklifts is restricted</td>
</tr>
<tr>
<td>- has designated pedestrian walkways that cross the path of reversing forklifts at blind corners (e.g. rear of trucks on dock area)</td>
<td>- strategically positioned mirrors at blind corners</td>
<td>- where pedestrian walkways are across the rear of trucks, there are electronic sensors and interlocked gates that prevent pedestrian access during forklift the operation of forklifts (Reference AS 4024)</td>
</tr>
<tr>
<td>- relies on signage as the only way to warn pedestrian, forklift operators and truck drivers to be aware of other traffic</td>
<td>- flashing or static lights to warn pedestrians of forklifts activity at the rear of trucks</td>
<td>- truck drivers are able to monitor and remotely supervise the loading of trucks through the use of remote visual and audio monitors</td>
</tr>
<tr>
<td>- relies on safe work procedures that require truck drivers, forklift operators, and pedestrians to stop and look when approaching or at intersections</td>
<td>- designated protected areas for drivers to stand during loading and unloading</td>
<td>- electronically interlocked systems that physically restrain trailers and prevent their deliberate or inadvertent movement from the loading dock until loading or unloading has been completed and dock doors are closed and locked</td>
</tr>
<tr>
<td>- does not prevent any deliberate or inadvertent movement of the truck during loading or unloading (e.g. driver may enter cab and move truck during loading/unloading process).</td>
<td>- signage used with other risk control measures</td>
<td>- appropriately designed and positioned signage is used in conjunction with other risk control measures.</td>
</tr>
</tbody>
</table>

- the use of spring loaded gates or bollards on walkways to impede pedestrian traffic and give them time to stop and look
- strategically positioned mirrors at blind corners
- flashing or static lights to warn pedestrians of forklifts activity at the rear of trucks
- designated protected areas for drivers to stand during loading and unloading
- signage used with other risk control measures
- safe work procedures designed to prevent the movement of trucks from the loading dock during loading and unloading (e.g. use of wheel chocks and the surrendering of keys).

- pedestrian access to the dock area during any loading and unloading of the truck by forklifts is restricted
- where pedestrian walkways are across the rear of trucks, there are electronic sensors and interlocked gates that prevent pedestrian access during forklift the operation of forklifts (Reference AS 4024)
- truck drivers are able to monitor and remotely supervise the loading of trucks through the use of remote visual and audio monitors
- electronically interlocked systems that physically restrain trailers and prevent their deliberate or inadvertent movement from the loading dock until loading or unloading has been completed and dock doors are closed and locked
- appropriately designed and positioned signage is used in conjunction with other risk control measures.
9. Environmental conditions

While there are some environmental factors specific to the cold storage industry, there are other environmental hazards and risks that are well known across a range of industries and as such have prescribed standards and well documented guidance material.

Environmental hazards in the cold storage industry include:

- working in cold conditions
- slips, trips and falls
- noise
- hazardous atmospheres
- lighting.

In workplaces where employee exposure to cold is identified as a workplace hazard employers must ensure appropriate risk-control measures that protect employees and ensure body heat is retained have been put in place.

Employers in the cold storage industry need to recognise the impact of cold stress and the potential for hypothermia, and how thermal stress may increase fatigue and affect the ability of individual employees to work in a manner that is safe and without risk to themselves and other employees.

The effects a cold work environment can have on individual employees should also be recognised and employers should conduct regular health monitoring to ensure exposure to cold, or rapid changes in temperature, do not have an adverse impact on the health and safety of employees.

Poorly ventilated spaces such as cool stores, freezer rooms and controlled atmosphere rooms may present hazardous atmospheres. A poorly ventilated space may become dangerous if there is an unsafe level of atmospheric contaminants or the oxygen level is unsafe.

Some examples of dangerous work in poorly ventilated places include:

- liquid petroleum gas (LPG), petrol or diesel forklift trucks in cool stores or freezer rooms – dangerous levels of carbon monoxide may build up where poorly tuned LPG, petrol or diesel forklift trucks operate and ventilation is insufficient
- activation of controlled atmosphere rooms used for long-term storage of fruit — the oxygen level in controlled atmosphere rooms may be as low as 2% and exposure will be life-threatening.

The following environmental hazards and the corresponding risk control measures are not exhaustive, however they may assist employers and the operators of cold storage facilities to identify and control risks:

**More information:**

- Operation of LPG forklift trucks in poorly ventilated places (Appendix 3)
- Long-term fruit storage in controlled atmosphere rooms (Appendix 4)
- Protective Clothing for Cold Storage – A Users’ Guide (Appendix 5)
9. Environmental conditions

### Cold

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| Exposure of employees to the effects of wind chill that may contribute to cold stress or hypothermia.  
*Refer: Wind chill chart (Appendix 2)* | Administrative risk control measures that prescribe:  
- time limits for employees working in the cold  
- rest periods for employees to spend in warm up rooms.  
The use of appropriate personal protective equipment that is:  
- provided and appropriately maintained  
- generically issued and suitable for the cold  
- supplied to employees to work in the cold for a limited period of time (e.g. five minutes in freezer). | Risk to employees from working in the cold and their exposure to thermal stress has been eliminated or controlled by:  
- using fully automated plant and equipment able to mechanically transfer product to and from cold storage areas  
- design and layout of the workplace and:  
  - the selection and positioning of refrigeration plant and equipment  
  - the velocity and direction of cold air from the refrigeration plant and equipment  
  - the use of forklifts and mobile plant fitted with insulated and heated cabins  
- elimination of physical activity that may cause sweating and a subsequent decrease in body temperature  
- pre-employment medical examinations and health monitoring systems are in place to ensure employees with medical or other conditions are not exposed to, and or affected, by the cold  
- individually issued and fitted personal protective clothing and equipment that is suitable for the cold work environment and replaced when wet or damaged.  
*Refer: Protective Clothing for Cold Storage – A Users’ Guide (Appendix 5)* |
| - a level of physical activity that results in sweating and a subsequent decrease in employee body temperature  
- inadequate supply of appropriate protective clothing and footwear  
- employees with medical or other conditions that may be affected by cold  
- employees who are more susceptible to cold stress due to effects of drugs or alcohol  
- employees who are not experienced or acclimatised to cold work environments are appropriately trained and supervised  
- thermal personal protective clothing and equipment that is inadequate and or poorly maintained. |
### 9. Environmental conditions

#### Slips, trips and falls

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees and visitors are exposed to slips, trips and falls as a result of:</td>
<td>▪ Administrative risk control measure that the workplace is reliant on to prevent slips, trips and falls includes:</td>
<td>Potential for slips, trips, and falls has been eliminated or appropriately controlled by:</td>
</tr>
<tr>
<td>▪ poor housekeeping, (e.g. pallets, boxes, plastic wrapping and other waste materials on floors in aisles, walkways or stairs)</td>
<td>▪ signage warning people of water and/or ice on floors</td>
<td>▪ temperature and controlled atmospheres at all entry points</td>
</tr>
<tr>
<td>▪ a build up of water or ice from poorly designed and insulated doorways (e.g. moist air entering freezer).</td>
<td>▪ procedures that:</td>
<td>▪ automatic use of air curtains or rapid opening and closing insulated curtains or doors</td>
</tr>
<tr>
<td></td>
<td>— promote good housekeeping</td>
<td>▪ immediate removal and appropriate disposal of all waste material</td>
</tr>
<tr>
<td></td>
<td>— require water on floors to be cleaned</td>
<td>▪ immediate removal and appropriate storage of empty pallets</td>
</tr>
<tr>
<td></td>
<td>— ensure water and ice on floors is covered with sugar or other suitable absorbent and non-slip material.</td>
<td>▪ use of slip resistant floor surfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ provision of appropriate footwear.</td>
</tr>
</tbody>
</table>

#### Noise

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sources of noise in the work environment that may exceed the prescribed employee exposure standard of 85 decibels (A weighted) averaged over an eight-hour period, and/or the 140 decibels (C weighted) peak level that has:</td>
<td>Determined that employee exposure to noise may exceed the exposure standard after the application of the hierarchy of control the employer has ensured that:</td>
<td>Employer or occupier of the cold storage facility has ensured that:</td>
</tr>
<tr>
<td>▪ not determined whether or not employee exposure to noise exceeds the prescribed exposure standard</td>
<td>▪ a written record of the risk-control measures has been developed and implemented in consultation with employees</td>
<td>▪ employee exposure to noise has been so far as is practicable controlled and therefore does not require the provision of hearing protective devices</td>
</tr>
<tr>
<td>▪ employee exposure determined to exceed the exposure standard, sources of noise have not been eliminated or so far as reasonably practicable controlled at the source</td>
<td>▪ written risk control measures are readily accessible to the HSR and employees affected by the proposed control measure</td>
<td>▪ design, layout, and purchase of plant and equipment controls employee exposure to noise</td>
</tr>
<tr>
<td>▪ not been considered during design and construction of the facility</td>
<td>▪ appropriately positioned signs prescribing the use of hearing protective devices</td>
<td>▪ policies and procedures are in place to ensure modifications to the workplace and purchase of plant and equipment will not introduce sources of noise that may exceed exposure standard.</td>
</tr>
<tr>
<td>▪ not been considered during the selection and positioning of refrigeration fans, compressors or other plant or equipment.</td>
<td>▪ employees and others at the workplace are provided with appropriate hearing protection devices.</td>
<td>Refer: Occupational Health and Safety Regulations 2017, Part 3.2 – Noise</td>
</tr>
<tr>
<td></td>
<td>▪ audiometric testing for employees exposed to noise levels that exceed the exposure standard is conducted</td>
<td>WorkSafe publication – Your Health and Safety Guide to Noise</td>
</tr>
<tr>
<td></td>
<td>▪ employees are provided with appropriate information, instruction and training on noise and the proper use of risk control measures.</td>
<td></td>
</tr>
</tbody>
</table>
## 9. Environmental conditions

### Hazardous atmospheres

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| • Hazardous work environment created by a carbon monoxide exhaust emission from the use of a petrol or diesel powered forklift truck or similar powered plant and equipment in poorly ventilated places such as freezers, chillers and cold store rooms. | Risk control measures and safe work procedures for employees entering or working in poorly ventilated places that include:  
  - regular testing and monitoring of exhaust emissions from LPG powered forklifts or similar plant operating in poorly ventilated places  
  - regular tuning of LPG powered forklifts to ensure exhaust emissions do not exceed prescribed limits  
  - formal recording of forklift maintenance including the testing and monitoring of exhaust emissions  
  - use of mechanical ventilation to clear any carbon monoxide or other airborne contaminant from within the work environment. | • Replacement of petrol, diesel and LPG forklift trucks with electric forklift trucks in all poorly ventilated places (e.g. freezers, chillers, and cold storage rooms).  
  Refer: Operation of LPG forklift trucks in poorly ventilated places (Appendix 3) |
| • Hazardous work environment created by excessive carbon monoxide emissions from the use of LPG powered forklift trucks or similar powered plant in poorly ventilated places such as freezers, chillers and cold store rooms. |                                                                                                              | • The use of remote or totally automated mechanical risk control measures that does not require anyone to enter a CA store room until the atmosphere is clear of any airborne contaminant and oxygen levels are at appropriate levels.  
  Refer: Long-term fruit storage in controlled atmosphere rooms (Appendix 4) |
| • There are no adequate risk-control measures in place to control the risk to employees from entering controlled atmosphere store rooms which may be contaminated and oxygen deficient. | Documented safe work procedures for those entering or working in Controlled Atmosphere (CA) store rooms include:  
  - appointing an authorised person responsible for formally monitoring, recording, and controlling all access to and from these rooms  
  - closely supervising all employees and all work within CA store rooms  
  - ensuring appropriate signage is displayed on doors and any entry point into a CA store room  
  - the provision of adequate natural or mechanical ventilation.  
  - monitoring oxygen levels before and during any entry into CA store rooms  
  - having appropriate control systems capable of securely isolating the system for charging the CA store room  
  - emergency procedures for the removal or rescue of people from the CA store room  
  - adequate training of employees who may be required to supervise or enter a CA store room. |                                                                                                              |
## Lighting

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| General and task lighting at the workplace for employees, forklift operators and truck drivers is inadequate and:  
  - general and task lighting does not meet the required lighting standards  
  - does not provide required degree of luminance  
  - is not inspected and tested to ensure an appropriate level of luminance is provided and maintained  
  - poor workplace design and layout creates shadows  
  - prevents or restricts easy access to lighting for maintenance purposes. | Internal and external general purpose and task lighting throughout the workplace has been designed and installed to ensure that:  
  - lighting provided is of an appropriate standard and provides adequate luminance  
  - lighting is suitable for its intended purpose, and can be easily reached for maintenance or to be replaced  
  - where a specific or high degree luminance is required, task and general lighting is regularly inspected and tested to ensure the appropriate level of lighting is maintained.  
Refer: AS 1680.1.2006 Interior and Workplace Lighting. |
In the cold storage industry, musculoskeletal disorders (MSD) caused as a result of hazardous manual handling tasks result in significant costs to the industry – in human and financial terms.

Manual order picking, manual loading and unloading of road transport vehicles and containers result in a number of these injuries. It is recognised that cold work environments may increase the likelihood and the potential severity of any injury or musculoskeletal disorder.

To control the risk to employees from hazardous manual handling, employers must consult with employees and relevant HSRs. Consultation may involve exploring benefits of any new technology which may be used in warehousing or other similar industry. The selection and implementation of appropriate technology can effectively control risks associated with hazardous manual handling while at the same time provide employers with efficiency gains and reduced costs.

The key to manual order picking is to ensure employees are able to handle items between shoulder and knee height at all times. This is referred to as the Best Working Zone (BWZ), and together with ensuring that the item and is close to their body, is the optimum position when lifting. Items can be maintained within the BWZ either through workplace design or by using appropriate equipment.

There are a number of other factors that must be considered to reduce the number of injuries in cold storage environments. These factors include the frequency of handling, the weight and shape of the object being lifted, the position of the object, the distance or reach required to lift, push or pull an object, whether handles are provided, any difficulty in handling the object (how slippery the object is), the use of gloves and any twisting of the body.
There are other environmental factors unique to the cold storage industry that must also be considered to reduce the risk of MSD to employees. These environmental factors relate to hazardous manual handling being undertaken in a cold work environment and the accumulation of water or ice on floor surfaces that may make floors slippery for employees working in that environment.

There are sections of the cold storage industry that have prescribed pick rates for employees. Unreasonable work practices may increase the risk of an MSD because they can encourage employees to skip meal and rest breaks to meet prescribed pick rates or achieve bonus payments.

Work practices that promote excessive work rates or extended shift lengths so employees can achieve bonuses should be avoided. Senior and line managers of these facilities have prescribed responsibilities under the Occupational Health and Safety Act 2004 either as officers of a company (S. 144) or as employees (S. 25) for ensuring the health and safety of fellow employees and others in the work place.

The Occupational Health and Safety Regulations 2017 (Part 3.1 – Hazardous Manual Handling) require an employer to identify work undertaken or to be undertaken by an employee involving hazardous manual handling. The employer must also ensure the risk of an MSD associated with hazardous manual handling is eliminated so far as is reasonably practicable. As a part of a review of hazardous manual handling following an MSD, it could well be expected that the contribution of the picking rate would be examined and possibly modified.

More information:

WorkSafe publications: Compliance Code for Hazardous Manual Handling
Manual Handling in the Red Meat Industry
## 10. Hazardous manual handling

### Order picking

<table>
<thead>
<tr>
<th>High risk examples</th>
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<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| - bending the back forward or sideways more than 20 degrees | Transferring product from pallets positioned on the floor within a racking system and on to pallets on the floor or lower shelves or trolleys. Picking or replenishing items from below knee height. | Reducing risks may involve changes to one or more of the following risk factors:  
  - adjustable shelf heights to allow employees to pick from Best Working Zone (BWZ)  
  - height adjustable pallet lifters or stands to allow employees to stack items onto pallets in BWZ  
  - pick rates that encourage employees to take rest breaks and work safely  
  - use of pick sticks  
  - to pull items towards themselves to eliminate forward reaching  
  - plastic slip sheets or solid top pallets to reduce resistance and the force required when sliding items. | Fully automated and computerised order picking facilities that do not require any manual handling of items. Racking design, workplace layout and work practices ensure that:  
  - all order picking undertaken ensures employees are always working within the BWZ. Carton live storage racking with no prescribed pick rates. |
| - twisting the back more than 20 degrees | | | |
| - lifting and lowering items and exerting force while in an awkward posture | | | |
| - exerting force while lifting lowering or twisting the back more than twice a minute | | | |
| - with long duration (> 30 minutes continuously or > 2 hours over the whole shift) | | | |
| - the application of high force to lift, carry, push, pull or otherwise move or restrain heavy loads. These actions may occur in situations listed under ‘potential source of risk’ or in combination with other work activities. | Lifting products from below the knees. Repetitive picking or replenishing items from above shoulder height with high force or long duration. Lifting products from above head height. | | |
| | Prescribed pick rates or bonus system encouraging hazardous manual handling to be undertaken without prescribed rest or meal breaks. | | |

- Well-designed racking systems with slip sheets or solid based plastic pallets on roller conveyor shelving that is sloped forward to decrease resistance and assist access to boxes at the rear of the pallet.
- Picking is to fixed height conveyor, adjustable height trolley, height adjustable pallet mover, or roll cage.
10. Hazardous manual handling

### Loading & unloading

<table>
<thead>
<tr>
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<th>Low risk solutions</th>
</tr>
</thead>
</table>
| Application of high force when lifting, carrying, and stacking items. Repetitive application of force while in an awkward posture, e.g. more than twice a minute, or with long duration (> 30 minutes continuously or > 2 hours over the whole shift). These actions may occur in situations listed under 'potential source of risk' or in combination with other work activities. | Manually handling items into or out of truck pans or containers, refrigerated or not, including:  
- handling items to the rear of the container or truck pan  
- carrying items into or out of containers or truck pans  
- securing or releasing load binders  
- installing or removing false floors  
- opening or closing doors. 
Product items may include carcasses, boxed cartons etc. 
Potential sources of risk include:  
- position of the product at pick up and at placement  
- work practices where employees do not take prescribed meal or rest breaks  
- weight of the item. | Reducing risk may involve changes that may impact on the risk factors through the use of one or more of the following:  
- a conveyor or other mechanical aid to transfer product into or out of truck pans or containers  
- a pallet lifter to present product within the BWZ during manual loading or unloading from pallets  
- job rotation and or regular rest breaks for employees involved in manual loading and unloading. | Eliminate or substantially reduce any risk to employees while loading and unloading refrigerated truck pans and/or containers employers should:  
- negotiate with suppliers and customers to ensure that product is supplied on slip sheets or pallets so any loading or unloading can be undertaken mechanically (e.g. forklift or walkie stacker), or  
- where manual loading and or unloading is required use height adjustable reach conveyor or similar mechanical aids to ensure employees are working within the BWZ. |

Extendable conveyor system to assist manual loading/unloading of containers
## Handling empty pallets

<table>
<thead>
<tr>
<th>High risk examples</th>
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<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
</table>
| High force – exerting high force while in an awkward posture. | **Removal of empty pallets**  
Manual removal of empty pallets from floor level within a racking system and onto a forklift or pallet jack for removal.  
Manually lifting, carrying or dragging and then stacking of empty wooden pallets.  
Potential source of risk:  
- pallets at ground level  
- size of pallets  
- weight of pallets can be up to 35 kg. | Reduction of risk may involve the use of mechanical aids or the use of one or more of the following;  
- use hand pallet jack to move pallets  
- use lighter weight softwood or plastic pallets, and/or  
- team handling of pallets within the BWZ. | Racking system, workplace design and layout, and work practices for the removal or transfer of pallets ensure that;  
- use of a racking system with roller conveyor shelving capable of discharging empty pallets for removal by forklift  
- removal, transfer, and stacking of pallets is done mechanically or by forklift or other form of mechanical aid  
- employees do not manually handle pallets. |
11. Plant (machinery and equipment)

While there are significant issues surrounding traffic management and the safe operation of machinery and equipment in the cold storage industry, there are similar concerns relating to the maintenance and operation of the numerous refrigeration systems used in these workplaces.

The storage and use of large quantities of anhydrous ammonia in refrigeration systems can pose a risk to employees, adjoining premises and surrounding community. The majority of risk and reported incidents where anhydrous ammonia has been involved are attributed to poor design and installation of refrigeration plant and/or a lack of inspection and maintenance and deficiencies with the plant operational procedures.

Refrigeration plant and equipment

While the duties on the designers, owners and operators of cold storage facilities to ensure the selection, use and maintenance of workplace plant and equipment does not present a risk to employees, employers must (S. 23) also ensure that other people who are not employees are also not exposed to risks arising from the conduct of the undertaking of the employer.

This means employers must ensure that any activity or the operation of plant and equipment at the workplace does not present a risk to employees, contractors or others.

A number of incidents and inspections of cold storage facilities have raised concerns about the safe operation and maintenance of refrigeration systems in cold storage facilities. These concerns relate to the risks to employees, adjoining premises and the surrounding community from the large quantities of anhydrous ammonia stored and used at the workplace. This concern, combined with lack of security at these sites can present a significant risk to the broader community.

Cold storage facilities must be proactive in the development and implementation of preventative maintenance programs and systems to effectively monitor and control the use of the plant and dangerous refrigerants.

Risk control regarding refrigeration plant should take into account the following aspects:

1. Design and construction of plant – the design of the refrigeration plant should meet published technical standards (e.g. Australian Standards) and the plant must be tested (e.g. hydrostatic pressure testing and x-ray examination) in line with the requirements of the relevant standard.

2. WorkSafe design registration – pressure vessels associated with the refrigeration plant may have to be Design Registered with WorkSafe if they are specified in Schedule 2 of the Occupational Health and Safety Regulations 2017. A design registration number must be provided to the customer by the supplier of the vessel.

3. Inspection and maintenance – refrigeration vessels covered by Schedule 2 and regulation 106 are required to be periodically inspected (frequency of inspection as per manufacturer recommendation or Australian Standard AS 3788:2006 Table 4.1). Ongoing preventative maintenance must be conducted in conjunction with periodic inspection of the plant.

4. Ammonia release – safe discharge of anhydrous ammonia to ensure excess refrigerant is discharged to a safe location (e.g. not inside confined rooms but away from employee work areas and neighbouring properties).

More information:

- AS/NZS 1677.2:1998 Refrigerating systems – Safety requirements for fixed applications
- AS 3788:2006 – Pressure Equipment – In service Inspection
- AS 3873:2001 – Pressure Equipment, Operation and Maintenance
- AS 4024.1:2006 – Safety of Machinery
- AS 2022:2003 – Anhydrous Ammonia (Storage & Handling)
- Checklist – Anhydrous Ammonia Refrigeration Systems (Appendix 6)
- Dangerous Goods Act 1985
- Dangerous Goods (Storage & Handling) Regulations 2012
### 11. Plant (machinery and equipment)

**Forklifts and material handling equipment**

Although forklifts and other forms of materials-handling equipment are extensively used in the cold storage industry, these items of plant type are overrepresented in the number of workplace incidents and fatalities. As a result, WorkSafe Victoria has developed and implemented a number of compliance based initiatives that include:

- a requirement for seatbelts to be retrospectively fitted to forklifts,
- the compulsory use of seat belts by forklift operators, and
- where there is interaction between pedestrian and forklift traffic, the development and implementation of an effective traffic management plan.

Features now readily available and that should be considered when leasing or purchasing forklift trucks include:

- ergonomic designs, including rotating cabins for travelling in reverse and fully adjustable tilting cabins for overhead work,
- electronic interlock or pedestrian-forklift zone sensing systems that effectively control forklift movement, operate boom gates on roadways or gate locking devices on pedestrian walkways,
- insulated and heated cabins to control employee exposure to wind chill, exposure, cold stress, and the level of fatigue from working in cold environments,
- air quality monitoring devices to continually monitor oxygen levels and air quality in freezers, cold stores or other confined areas of a cold storage facility,
- closed circuit television and mast mounted cameras for positioning and the retrieval of stock from the upper sections of racking, and
- computerised and electronic interlock devices to ensure seatbelts are worn by operators during forklift operation.

**More information:**

AS 4024.1 – Safety of Machinery

**WorkSafe publications:**

Forklift Safety Reducing the Risk

Safety by Design – Eliminating manual handling injuries in road transport
## 11. Plant (machinery and equipment)

### Forklifts and mobile plant

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inappropriate and poorly maintained forklifts:</td>
<td></td>
<td>Cold storage facility has been appropriately designed and uses well maintained battery or electric powered forklift trucks with:</td>
</tr>
<tr>
<td>▪ not fitted with seat belts</td>
<td></td>
<td>▪ computerised automatic guided vehicle (AGV) systems that do not require operators</td>
</tr>
<tr>
<td>▪ not appropriately inspected and tested</td>
<td></td>
<td>▪ interlocking devices to ensure the compulsory use of seat belts</td>
</tr>
<tr>
<td>▪ not maintained to manufacturer specifications</td>
<td></td>
<td>▪ fitted electronic interlock or pedestrian or forklift zone sensing systems that:</td>
</tr>
<tr>
<td>▪ not suitable for the work being undertaken</td>
<td></td>
<td>− effectively control forklift truck movement</td>
</tr>
<tr>
<td>▪ have attachments that are not matched to specific forklift</td>
<td></td>
<td>− operate roadway boom gates and gate locking devices on pedestrian walkways</td>
</tr>
<tr>
<td>▪ not compliant to the relevant standard</td>
<td></td>
<td>▪ heated cabins designed for work in cold environments</td>
</tr>
<tr>
<td>▪ has a compliance plate that is not authentic</td>
<td></td>
<td>▪ continually monitor air quality and oxygen levels</td>
</tr>
<tr>
<td>▪ operator has no forklift licence (to perform high risk work) and is not under training and instruction</td>
<td></td>
<td>▪ mast mounted cameras and closed circuit television monitors in forklift cabins for positioning and the retrieval of stock from the upper sections of racking</td>
</tr>
<tr>
<td>▪ operator has no experience operating equipment</td>
<td></td>
<td>▪ automatic height levelling systems pre-programmed to racking heights</td>
</tr>
</tbody>
</table>

Cold storage facility has been appropriately designed and uses well maintained battery or electric powered forklift trucks with:

- computerised automatic guided vehicle (AGV) systems that do not require operators
- interlocking devices to ensure the compulsory use of seat belts
- fitted electronic interlock or pedestrian or forklift zone sensing systems that:
  - effectively control forklift truck movement
  - operate roadway boom gates and gate locking devices on pedestrian walkways
- heated cabins designed for work in cold environments
- continually monitor air quality and oxygen levels
- mast mounted cameras and closed circuit television monitors in forklift cabins for positioning and the retrieval of stock from the upper sections of racking
- automatic height levelling systems pre-programmed to racking heights
- operated by competent, experienced and licensed persons.
## 11. Plant (machinery and equipment)

### Refrigeration plant and systems

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold storage facility refrigeration plant and system is in poor condition and:</td>
<td></td>
<td>Cold storage facility has a refrigeration system that has:</td>
</tr>
<tr>
<td>• has not been installed or maintained to the relevant standards</td>
<td></td>
<td>• been designed, installed, and is maintained to the relevant standards</td>
</tr>
<tr>
<td>• has piping, valves, gauges and other components that are not clearly marked and identified</td>
<td></td>
<td>• plant pipe work, gauges, valves and other components that are clearly labelled and readily identified</td>
</tr>
<tr>
<td>• pressure plant and equipment that is:</td>
<td></td>
<td>• pressure vessels registered with WorkSafe (applies to those specified in Schedule 2 of OHS Regulations 2017)</td>
</tr>
<tr>
<td>— not registered with WorkSafe</td>
<td></td>
<td>• inspections and testing by a suitably qualified person</td>
</tr>
<tr>
<td>— not appropriately inspected or tested by a suitably qualified person;</td>
<td></td>
<td>• operated by a competent and experienced person</td>
</tr>
<tr>
<td>• there is no maintenance program to ensure the safe operation of the refrigeration plant or systems</td>
<td></td>
<td>• fitted with appropriate safety features to detect and isolate any leak</td>
</tr>
<tr>
<td>• is not operated by an appropriately trained and competent person</td>
<td></td>
<td>• an alarm or other warning device to alert the appropriate persons when any leak is detected</td>
</tr>
<tr>
<td>• access to refrigeration plant is not securely restricted or appropriately controlled</td>
<td></td>
<td>• appropriately located relief valves and discharge piping outlets directed away from work areas and adjoining properties</td>
</tr>
<tr>
<td>• relief valves and discharge piping outlets are not appropriately located and are directed toward work areas or adjoining properties</td>
<td></td>
<td>• adequate security and restricted access to areas where plant is located.</td>
</tr>
<tr>
<td>• there is no monitoring of the refrigeration system to detect leaks</td>
<td></td>
<td>Refer: Dangerous Goods Act 1985</td>
</tr>
<tr>
<td>• there is no emergency management plan to effectively control risks to employees, adjoining premises or the local community.</td>
<td></td>
<td>Dangerous Goods (Storage &amp; Handling) Regulations 2012;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AS 3788:2006 – Pressure Equipment – In service Inspection;</td>
</tr>
</tbody>
</table>
### 11. Plant (machinery and equipment)

#### General plant

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant and machinery that:</td>
<td></td>
<td>Plant and machinery at the workplace is selected and purchased in consultation with employees to ensure:</td>
</tr>
<tr>
<td>• are not provided and or maintained in a condition that is safe to use</td>
<td></td>
<td>• all plant and equipment has been designed and manufactured to the appropriate standards</td>
</tr>
<tr>
<td>• does not have adequate guarding or suitable risk controls to prevent access to the dangerous parts of the machinery during its operation</td>
<td></td>
<td>• it is fitted with appropriate guarding to prevent access to the danger areas of the plant or equipment</td>
</tr>
<tr>
<td>• is not regularly inspected or tested to ensure that it remains safe to use</td>
<td></td>
<td>• it is inspected, tested and maintained to manufacturer specifications and the relevant standards</td>
</tr>
<tr>
<td>• has not been designed, and/or installed in line with manufacturer specifications or the appropriate standard</td>
<td></td>
<td>• employees have received adequate information, instruction and training before the commissioning or use of the plant or equipment</td>
</tr>
<tr>
<td>• does not have instructions or procedures necessary for the installation, use, and maintenance of the plant</td>
<td></td>
<td>Refer: AS 4024.1 Safety of Machinery</td>
</tr>
</tbody>
</table>

Refer: AS 4024.1 Safety of Machinery
12. Emergency management

Various factors must be considered by employers and operators of cold storage facilities when determining the types of hazards and the level of risk to employees, adjoining premises and the broader community during a fire or other emergency at the workplace.

The use of styrene as an insulation material, and the volume of anhydrous ammonia used and stored in refrigeration systems at cold storage facilities, needs to be considered when determining the potential type and consequence of any emergency at the workplace.

To mitigate the risks to those that may be affected by any emergency – particularly where substantial quantities of dangerous goods may be involved – there are prescriptive requirements designed to identify, assess and control risks.

A fire audit report is required to have been prepared and an emergency management plan developed.

Any emergency management plan must be developed in consultation with employees, and should involve both adjoining premises or workplaces and the emergency services that may be required to respond to any emergency situation at the workplace.

More information:

Dangerous Goods Act 1985

Dangerous Goods (Storage & Handling) Regulations 2012
12. Emergency management

Emergency management plan

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency management is inadequate:</td>
<td>The workplace has a formal emergency management plan and evacuation procedure:</td>
<td></td>
</tr>
<tr>
<td>• emergency management plan and emergency evacuation procedures has not been developed or tested</td>
<td>▪ developed and implemented in consultation with:</td>
<td>▪ potential emergencies identified, assessed and planned for:</td>
</tr>
<tr>
<td>• no adequate consultation with:</td>
<td>— employees and contractors</td>
<td>▪ consideration given to the impact on and from hazards and risks at adjoining premises</td>
</tr>
<tr>
<td>— employees and contractors</td>
<td>— relevant emergency services</td>
<td>▪ consideration given to ensure emergency services are able to respond in time</td>
</tr>
<tr>
<td>— emergency services</td>
<td>— adjoining premises and/or workplaces</td>
<td>▪ ensures is unrestricted access for emergency services</td>
</tr>
<tr>
<td>— adjoining premises or workplaces that may have an impact on or be affected by the emergency</td>
<td>— appropriate emergency services</td>
<td>▪ appropriate training and instruction provided to employees and visitors (e.g. contractors and truck drivers)</td>
</tr>
<tr>
<td>— appropriate emergency services</td>
<td></td>
<td>▪ there is an effective communication system (e.g. public address system) to all areas of the site</td>
</tr>
<tr>
<td>In the event of an emergency at the workplace:</td>
<td></td>
<td>▪ emergency communication system, evacuation drills and the emergency management plan is tested and reviewed regularly.</td>
</tr>
<tr>
<td>• access to the site or the location of the emergency is impeded or restricted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• emergency assembly areas are:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— not clearly marked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— poorly positioned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— not communicated to all those on site.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 12. Emergency management

#### Emergency management plan

<table>
<thead>
<tr>
<th>High risk examples</th>
<th>Medium risk solutions</th>
<th>Low risk solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility has not provided an adequate level of site security and:</td>
<td>Facility developed, and implemented an appropriate level of site security:</td>
<td></td>
</tr>
<tr>
<td>• unrestricted access to site</td>
<td>• strictly applied, monitored and regularly reviewed</td>
<td></td>
</tr>
<tr>
<td>• no control over unauthorised access to hazardous or high traffic areas, (e.g. dock area)</td>
<td>• effectively controls and monitors all access to and from the site (e.g. electronic swipe card for employees, and log in and out at security gate)</td>
<td></td>
</tr>
<tr>
<td>• unrestricted access to plant rooms and chemical and dangerous goods storage area.</td>
<td>• controls all access to hazardous areas (e.g. refrigeration plant, dock areas)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ensures supervisory control over all visitors and contractors.</td>
<td>Refer: Dangerous Goods Act 1985</td>
</tr>
</tbody>
</table>
13. Acknowledgements

WorkSafe would like to acknowledge and thank the following organisations and their individual representatives for their valuable contribution to the development of this guide:

- Shaw Idea P/L and the Cold Storage Project Steering Committee
- National Union of Workers
- Australian Metal Workers Union
- Australian Institute of Refrigeration Air-conditioning and Heating
- Australasian Meat Industry Employees Union
- Toyota Material Handling (Vic) P/L
- Transport Workers Union
- Dexion Australia P/L
- Dr Andrew Baigent (Consulting Engineer)
- Polar Fresh Chain Services P/L
- Coles Group Limited
- Versacold Logistic Limited
- Regal Cream Products P/L
- McKey Distributions P/L
- SWIRE Cold Storage Pty. Ltd.
- SPC ARDMONA Operations Limited
- P. Pullar & Co (Cobram) P/L
- Anspac Cold Storage P/L
- McCain Foods (Aust) P/L
## 14. Appendices

### Appendix 1

**Design of a safe cold storage workplace**

The following chart sets out the basic steps to establish an effective design process.

<table>
<thead>
<tr>
<th>Getting started</th>
<th>1. Establish specifications that consider:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.1 Client needs (e.g. efficient product movement/throughput, sufficient storage space).</td>
</tr>
<tr>
<td></td>
<td>1.2 Outcomes of preliminary consultation with users and suppliers.</td>
</tr>
<tr>
<td></td>
<td>1.3 Requirements of these guidelines, particularly the listed design factors to be considered.</td>
</tr>
</tbody>
</table>

*Employer to consult the relevant HSRs and workforce during the process*

<table>
<thead>
<tr>
<th>Develop design</th>
<th>2. Develop preliminary design options for consideration by client and users.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3. Consult with client, users and suppliers.</td>
</tr>
<tr>
<td></td>
<td>4. Determine design based on the outcomes of consultation.</td>
</tr>
<tr>
<td></td>
<td>5. Test, refine and validate design to ensure compliance with these guidelines.</td>
</tr>
</tbody>
</table>

| Build design | 6. Finalise and execute design. |

## Appendix 2

### Wind Chill Program

**Wind chill for temperatures from +5 to -20°C**

<table>
<thead>
<tr>
<th>Tair (°C)</th>
<th>V10 (km/h)</th>
<th>5</th>
<th>0</th>
<th>-5</th>
<th>-10</th>
<th>-15</th>
<th>-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>-2</td>
<td>-7</td>
<td>-13</td>
<td>-19</td>
<td>-24</td>
<td></td>
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<tr>
<td>10</td>
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<td>-3</td>
<td>-9</td>
<td>-15</td>
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<td>-27</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>-4</td>
<td>-11</td>
<td>-17</td>
<td>-23</td>
<td>-29</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>-5</td>
<td>-12</td>
<td>-18</td>
<td>-24</td>
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<td>-14</td>
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</tr>
<tr>
<td>40</td>
<td>1</td>
<td>-7</td>
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<td>-21</td>
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<td>-34</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>-1</td>
<td>-8</td>
<td>-15</td>
<td>-21</td>
<td>-28</td>
<td>-35</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>-1</td>
<td>-8</td>
<td>-15</td>
<td>-22</td>
<td>-29</td>
<td>-35</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>-2</td>
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<td>60</td>
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<td>-23</td>
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<td>-2</td>
<td>-9</td>
<td>-16</td>
<td>-23</td>
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<td></td>
</tr>
<tr>
<td>70</td>
<td>-2</td>
<td>-9</td>
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<tr>
<td>80</td>
<td>-3</td>
<td>-10</td>
<td>-17</td>
<td>-24</td>
<td>-31</td>
<td>-38</td>
<td></td>
</tr>
</tbody>
</table>

### Frostbite Guide

**Tair** = Actual Air Temperature in °C

**V10** = Wind Speed at 10 metres in km/h
(as reported in weather observations)

**Notes:**

1. For a given combination of temperature and wind speed, the wind chill index corresponds roughly to the temperature that one would feel in a very light wind. For example, a temperature of -25°C and a wind speed of 20 km/h give a wind chill index of -37. This means that, with a wind of 20 km/h and a temperature of -25°C, one would feel as if it were -37°C in a very light wind.

2. Wind chill does not affect objects and does not lower the actual temperature. It only describes how a human being would feel in the wind at the ambient temperature.

3. The wind chill index does not take into account the effect of sunshine. Bright sunshine may reduce the effect of wind chill (make it feel warmer) by 6 to 10 units.
Appendix 3

Operation of LPG forklift trucks in poorly ventilated places

Introduction

Forklifts are used in many industries to handle and move materials. Petrol, diesel and liquid petroleum gas (LPG) powered forklifts emit a range of hazardous airborne contaminants from their exhausts, including carbon monoxide (CO). LPG forklifts generally have a ‘cleaner’ exhaust than petrol or diesel powered engines, yet can still produce dangerous levels of CO and other airborne contaminants if they are used in a poorly ventilated place, such as a cool store or freezer room.

The use of poorly maintained LPG forklifts in poorly ventilated spaces poses significant risks.

The health effects of carbon monoxide (CO)

CO is a colourless and odourless gas. It interferes with oxygen delivery to the tissues in the body. The heart and the central nervous system are the main areas of the body affected by CO poisoning.

The early symptoms of CO poisoning include headaches and nausea. Prolonged exposure may result in dizziness, collapse, unconsciousness, coma and death. The severity of the effects depends on the level and length of exposure. As CO has no smell, people exposed to high levels may have little or no warning before they collapse. A person who has experienced a high level of exposure may suffer permanent damage to the heart or central nervous system.

Exposure standard for carbon monoxide

The Australian national exposure standard for CO is 30 parts per million (ppm) measured at the worker’s breathing zone averaged over an eight hour day (time weighted average or (TWA)), five day working week. Those using or interpreting exposure standards should refer to Safe Work Australia’s website that also considers short term exposure and the toxicological effects of CO.

Risk control measures

To eliminate the risk of CO poisoning, electric forklifts should be used in poorly ventilated areas. It is much safer to use electric forklifts for entry and work in poorly ventilated places such as cool stores and freezer rooms. Electric forklifts trucks should be used in preference to petrol, diesel or LPG-powered forklift trucks in poorly ventilated places.

Some workplaces use LPG forklifts in poorly ventilated places when battery powered or electric forklifts are not available or if their use is not practicable. If LPG forklifts are used in poorly ventilated places then a high level of control needs to be in place to make sure that employees are not exposed to a dangerous level of CO.

A documented safe work practice outlining the use of LPG forklifts in poorly ventilated spaces needs to be developed and put into practice, in consultation with health and safety representatives. A documented safe work procedure should address the following points:
Tuning, carburetion systems and fuel

- Test the exhaust emission levels in the tail pipe of the forklift
- Ensure the forklift is tuned to yield an exhaust gas containing:
  - not more than 0.2% (2000 ppm) CO at idling, and
  - not more than 0.1 % (1000 ppm) CO at speed (no load).

These tuning levels are readily achievable without affecting the performance of the LPG forklift and have been widely used in Australia for several decades.

- Retest and retune the forklift for CO emission:
  - each week until carburettor stability is known and at less frequent intervals after that,
  - if the brand or composition of the fuel changes, and
  - if work is carried out on the carburetion or ignition systems.

- Document the results of CO emission testing and tuning. This will help to assess the ability of the forklift to hold its tune. It will also help to identify the need for future maintenance through detecting early changes in the state of tune (maintenance on forklifts should follow the manufacturer’s recommendation).

- Seek a guarantee of consistent composition of automotive grade LPG from suppliers. If the propane/butane ratio of LPG changes between batches this will affect the concentration of CO emitted in the exhaust of forklifts.

- Fit a stable, tamper-resistant carburetion system to the LPG forklift.

- Avoid using dual fuel carburetion systems such as petrol and LPG. If dual fuel carburetion systems are used, ensure that forklifts are powered by LPG while entering and working in poorly ventilated places. Changing the fuel source between petrol and LPG will affect the tune of the engine, so ensure that engines are properly tuned and tested when operated in LPG mode.

- Consider fitting forklifts with a catalytic purifier to further lower CO emission. However, catalytic purifiers have little or no impact on lowering the CO emission levels of a forklift which is not tuned properly.

Acceptable air quality

- Maintain acceptable air quality when operating LPG forklifts in poorly ventilated places. Use a CO gas detector to check that CO levels in the breathing zone of employees do not exceed the exposure standard. The CO monitor should be set to alarm at 30 ppm. CO exposure may vary from person to person depending on the system of work. An assessment needs to be carried out to determine the number of CO monitors required. In some cases it may be necessary for each individual entering the cool store to be allocated or wear a CO monitor.

- Use mechanical ventilation if LPG forklifts have to be used for entry for extended periods, such as for continuous work.

Administrative controls

- Ensure electric or LPG forklifts to be used in poorly ventilated places are identified from those not to be used in these areas (e.g. signage, colour).

- Ensure the engine of the forklift is turned off when not in use to avoid unnecessary build-up of exhaust fumes.

- Put emergency procedures in place which include rescue and first aid

- Train employees working on tasks associated with the use of LPG forklifts in poorly ventilated places, including:
  - health effects and warning signs of exposure to CO
  - control measures in place (including documented safe work procedures)
  - use of atmospheric testing equipment
  - what to do if the alarm on the CO monitor activates
  - correct tuning techniques for LPG forklifts (for mechanics).
Appendix 4

Long-term fruit storage in controlled atmosphere rooms

Introduction
Controlled atmosphere (CA) storage is used to slow deterioration and maintain the quality of stone fruit for many months. The term CA storage means cooling to a low temperature and control of oxygen and carbon dioxide levels in a gas tight cool store.

The oxygen concentration in the air we breathe is normally about 21%. It is considered safe between 19.5% and 23.5%. Typically, controlled atmosphere rooms have very low levels of oxygen, with oxygen levels around 1 to 2% during operation. These reduced levels of oxygen will result in unconsciousness without warning after inhaling a single breath, and death within minutes. If the person survives then permanent brain and heart damage are likely. Rescuers spontaneously responding to the sight of the unconscious person could also become victims.

If entry and exit to an operating CA room is restricted (e.g. through a hole in ceiling) then the Confined Spaces Part of Occupational Health and Safety Regulations 2017 applies.

People may be at risk of exposure to an oxygen deficient atmosphere when operating in CA rooms or working nearby. Some examples of dangerous situations are:

- if a CA system is activated while a person is locked inside the room,
- entering an activated CA room (Never enter an operating CA room),
- when a person opens an activated CA room,
- entering into a CA room which has recently been opened and is being ventilated, and
- if a person is located in a poorly ventilated area next to a CA room which has been opened and is being ventilated.

Risk control measures
Entry should not be made to a CA room while it is operating.

Ensure that opening and closing of CA rooms is done by a person authorised by the employer who oversees the safe work procedures.

A documented safe work practice outlining the operation of the CA room needs to be developed and put into practice in consultation with health and safety representatives.

A documented safe work procedure should address the following points:

Closing a CA room
Ensure all people have left the CA room, close and lock the doors.

- Signpost the doors with clear and prominent signs that warn people not to enter the room (e.g. DANGER. Keep Out. Atmosphere deadly if inhaled).
- Activate the CA system.

Opening a CA room

- Ensure the opening of the CA room is closely supervised and observed by a second person who understands and follows the safe work procedures.
- Place a barricade made from cones, ropes or other portable barriers in a semi-circle at least three metres from the doorway to stop unauthorised access.
- Ensure people not involved with opening the doors are kept well away from the immediate vicinity. These persons need be instructed and trained.
- Place a prominent DANGER sign alongside the portable barriers (as described above).
- Record the time of opening on the sign.
- Provide adequate ventilation in areas adjacent to the door before opening the CA room. If these areas are poorly ventilated or enclosed they must be barricaded to stop unauthorised access.
- Unlock the door and open to its fullest extent. Ensure people opening the room reduce their risk of exposure to an oxygen deficient atmosphere by quickly moving away from the room to a pre-identified ventilated area while the doors are open.
- Ventilate the room with fresh air until the oxygen level is at least 19.5%.
Ventilation is usually carried out by opening the doors and turning on the refrigeration fans. The time taken to ventilate will vary depending on the room size, internal structure and the ventilation rate. It may assist to determine how long it takes to ventilate the CA room. This information will help to work out the time required to undertake future ventilation.

- Measure oxygen levels inside the room using an oxygen gas detector that is correctly calibrated and maintained as recommended by the manufacturer.
- Measurements should be taken by a competent person who is able to follow the manufacturer's instructions and correctly interpret the results. The tester should NOT enter the room while taking the measurements and the measurements should be taken by placing a probe into the room before the CA is activated. The probe should be connected to a recorder outside the room.
- Declare the room safe for entry only when the oxygen level is 19.5-21%.
- Record the atmospheric test results and the time the store was declared safe.
- Remove portable barriers and signs and start normal work activities again.

**Administrative controls**

- Prohibit entry to a CA room while it is in operation.
- Ensure the control system for the CA room is isolated so it cannot be operated while people are in the cool store.
- Put emergency procedures in place which include rescue and first aid.
- Training for employees should include:
  - health effects and warning signs of oxygen deficiency,
  - control measures in place, including documented safe work procedures,
  - the use of atmospheric testing equipment, and
  - emergency procedures.
Introduction

A cold environment is defined as an environment under which greater than normal heat losses are anticipated and compensatory thermoregulatory actions are required. That is, attention must be paid to the heat escaping our bodies and actions taken to do something about it. Cold stress is defined as the stress resulting from the net heat loss on the body or the net heat loss on a portion of the body such as feet, hands, limbs or head.

Exposure to cold environments may produce shivering, vasoconstriction, increased oxygen consumption, accelerated respiration and pulse rate, elevated blood pressure and a significant increase in cardiac output. Severe or prolonged exposure to cold may result in cerebral blood flow, effects on the central nervous system and may affect renal and liver function. In the event of abnormal reduction in core body temperature, hypothermia – a life threatening condition – may result. The range of acceptable deep core temperature variation for workers exposed to cold is very small with an allowable change of only + or .1 to .4° of the normal body temperature of 37.6°.

Recognising cold stress and hypothermia as a workplace health risk is important in establishing the required controls to prevent serious injury or illness.

Types of Cold Stress

- whole-body cooling
- local cooling, including extremity cooling, convective skin cooling (wind chill), conductive skin cooling (contact cooling) and cooling of respiratory tract.

Most likely, several if not all of these may be present at the same time.

### Classification of cold work

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Type of work</th>
<th>Type of cold stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>10° to 20°</td>
<td>Sedentary, light work, fine manual work</td>
<td>Whole-body cooling, extremity cooling</td>
</tr>
<tr>
<td>0° to 10°</td>
<td>Sedentary and stationary, light work</td>
<td>Whole-body cooling, extremity cooling</td>
</tr>
<tr>
<td>-10° to 0°</td>
<td>Light physical work, handling tools and materials</td>
<td>Whole-body cooling, extremity cooling, contact cooling</td>
</tr>
<tr>
<td>-20° to -10°</td>
<td>Moderate activity, handling metals and fluids (petrol, etc.), windy conditions</td>
<td>Whole-body cooling, extremity cooling, cooling of respiratory tract</td>
</tr>
<tr>
<td>Below -20°</td>
<td>All types of work</td>
<td>All types of cold stress</td>
</tr>
</tbody>
</table>
14. Appendices

**Risk management of cold stress**

The Occupational Health and Safety Act 2004 requires risks to health and safety be controlled so far as is reasonably practicable. This means that employers need to identify, assess and consider risk controls which eliminate the hazard at its source as the primary form of risk control. If the hazard is unable to be eliminated, engineered out or the hazardous task, object, substance, etc. substituted with something safer then, only then, can personal protective equipment be used as a form of risk control.

**Protective clothing and equipment as a risk control**

Protective clothing and equipment is a common risk control for employees exposed to cold environments. However, it is not a good idea to rely solely on protective clothing and equipment to control risk as it may not properly protect all employees from risks and at the same time can create new risks and work problems.

As far as reasonably practicable, controls other than the use of protective clothing and equipment should be used to manage risks arising from exposure to cold.

Personal protective clothing and equipment should be seen as a temporary measure or a last resort to be used only when other controls may not adequately control exposure, or are not reasonably practicable.

**Risks of using protective clothing and equipment**

Personal protective clothing and equipment is not a good risk control because it:

- does not eliminate or reduce the risks and dangers
- may not be cost effective - often the long term monetary and employee time costs of using protective clothing and equipment are not taken into account, such as the costs of:
  - selecting
  - storing
  - cleaning
  - fitting
  - medical examinations required before use
  - purchasing
  - replacing
  - maintaining
- training employees in use and maintenance
- monitoring of use and extra supervision.

- only provides limited protection
- will not protect employees if it is not properly selected, fitted, used, maintained and stored
- is often less effective if more than one type of personal protective clothing and equipment is used at the same time
- is not always used when it should because it:
  - interferes with doing the job
  - causes discomfort and/or pain
  - affects vision (e.g. safety goggles, full face respirators)
  - interferes with hearing and talking (e.g. hearing protection, respirators)
  - is not used by some employees for health, physical and psychological reasons
  - is difficult to use correctly if not properly supervised
  - interferes with employee concentration.

Protective clothing and equipment can increase manual handling risks by:

- making work harder that in turn may increase sweating and the risk of cold stress
- restricting postures and movements making the job harder to do and increasing the chance that protective clothing and equipment won't be properly used (e.g. gloves can prevent getting a good grip on tools, components and materials - this puts more physical stress on the hands, arms and shoulders).
Steps to follow before using protective clothing and equipment as a risk control

Step 1
A risk assessment should be completed prior to the selection and use of any protective clothing and equipment and should be undertaken in consultation with those employees and HSRs for whom the protective clothing and equipment will be provided.

Step 2
If the risk assessment shows that risk controls are needed, the following must be considered when consulting employees and the relevant HSRs who may be exposed to cold work environments:

- eliminating exposure to cold
- isolating employees from the cold
- engineering controls that reduce employee exposure to cold
- modifying or altering the systems of work to eliminate or reduce employee exposure to cold.

If these risk controls are not reasonably practicable in the short term then appropriate protective clothing and equipment may be suitable as a temporary risk control.
Step 3
This checklist will help determine if protective clothing and equipment is a suitable risk control. It identifies factors that may need to be addressed when using protective clothing and equipment as a risk control. Answers in a red box indicate protective clothing and equipment may not be a suitable primary risk control.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have employees exposed to cold and HSRs been consulted about the use of protective clothing and equipment?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there protective clothing and equipment that will effectively protect employees from the cold?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is this protective clothing and equipment readily available?</td>
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<tr>
<td>Will the protective clothing and equipment interfere with vision and communication?</td>
<td></td>
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<tr>
<td>Will any exposed employees be unable to use the protective clothing and equipment due to physical, psychological or medical factors?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will the protective clothing and equipment interfere with the job or task?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will using protective clothing and equipment create other risks, e.g. manual handling risks or heat stress?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 4
Take action to address any problems indicated by ticks in any of the red boxes as identified in Step 3.

Step 5
Implement an effective personal protective clothing and equipment program

When protective clothing and equipment is used as a temporary risk control a protective clothing and equipment program should be in place and reviewed regularly.

This checklist contains the essential requirements of an effective program and can be used to evaluate an existing program. Answers in a GREEN box indicate the requirement has been satisfied.

Are employees and supervisors (including labour hire and contractors) appropriately trained in:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the employer establish the program?</td>
<td></td>
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<tr>
<td>Did the employer consult employees and HSRs when establishing the program?</td>
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<tr>
<td>Are employees and HSRs active participants in the program, involved in its planning, implementation, monitoring and evaluation?</td>
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<tr>
<td>Is someone designated to be responsible for the program?</td>
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<tr>
<td>Does that person have the full support of employees and the employer?</td>
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<tr>
<td>Is there an effective procedure for dealing with situations where clothing and equipment are not being used as required?</td>
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<tr>
<td>Does the procedure for selecting protective clothing and equipment include consultation?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the following considerations met when selecting protective clothing and equipment?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Is it comfortable and a good fit?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• Does it interfere with the job?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• Does it provide employees with choice?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Does it cater for differences between employees?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Does it provide adequate levels of protection?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Can it be used together with other clothing and equipment?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there medical screening of each employee assigned to wear respirators?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Step 6

Protective clothing and equipment is a temporary measure, a last resort, only to be used when other risk controls do not control exposure or are not reasonably practicable and Steps 1-5 have been completed.

If protective clothing and equipment is being used for extended periods in a workplace, then alternative risk controls may not have been properly considered.

It is the employer’s responsibility to provide protective clothing and equipment for employees, including those from labour hire employees

Step 7

A continuous improvement approach is essential. This includes annual reviews of:

- changes in knowledge about the effects of cold on health
- existing, and any new, risks due to changes in work processes
- changes in technology and state of knowledge about risk control measures including elimination, substitution, engineering and changing systems of work or work practices
- changes in technology and state of knowledge about protective clothing and equipment
- the workplace’s protective clothing and equipment program.

The basis for these reviews can be steps 1, 2 and 3.

Factors to consider when selecting personal protective equipment:

Environmental factors to consider

In designing out risks posed by cold stress it is important to look at the work environment and identify the sources of cold, for example plant used, work processes and practices. In addition effects of cold on the body are influenced by environmental factors including:

- Air temperature – how hot or cold the surrounding air is
- Humidity – the moisture content in the air
- Air movement – including air/wind speed and air circulation.

Work related factors to consider

In addition to environmental factors which can increase the effect of cold on workers the following factors should be considered when identifying and assessing hazards associated with working in cold environments:
• Source of cold:
  − What working conditions expose employees to cold (e.g. high wind chill, wet workplaces, poor temperature control, frequently changing temperatures)?

• Nature of the work undertaken:
  − How does the work being done interact with or generate cold conditions (e.g. highly physical work increases sweating decreasing body temperature, vehicle operation increases wind chill, working in confined spaces)?

• Nature of materials being used in tasks:
  − The type of material being handled during a task will affect the risk of skin damage.

• Duration of exposure to cold:
  − Risks to health and safety will be increased by the length of time workers are exposed to cold (e.g. prolonged physical activity in cold or wet conditions).

Worker related factors to consider
While factors relevant to an individual worker need not exclude them from working in a cold environment they should be identified to ensure special consideration of a worker’s need when assessing risks associated with working in cold environments. This is also important to ensure the workplace is designed appropriately to accommodate any special considerations.

• Does the person have any physical or medical health conditions that make them more likely to be affected by cold?

• Are they affected by medication, drugs or alcohol which may make them more susceptible to cold?

• Are they experienced in and acclimatised to working in cold environments?

Specific factors to consider:

Clothing
The following features must be considered when choosing clothing for work in chillers and freezers.

1. Fit
   • Clothing needs to fit properly.
   • Clothing that is stretched tight does not insulate effectively.

   • Pay particular attention to knees and elbows – clothing should be looser over joints.
   • Inner layers need to be flexible and fit closely.
   • Outer layers must be large enough to be worn over the inner layers without stretching.
   • Clothing must be easily adjustable for size and with openings at the neck and wrists, under sleeves and down the front to adjust ventilation to cool down or warm up.
   • If separate jackets and trousers are worn, make sure there is enough overlap between the jacket and the trousers to prevent cold air getting in at the waist.

2. Visibility
   • Reflective and fluorescent colours are needed for visibility, particularly in high traffic areas.
   • Having reflective and fluorescent panels and strips as part of freezer gear is much better than separate vests, which can catch on equipment and cause slips, trips and falls.

3. Insulation
   • Clothing slows heat loss from the body, but it has to provide dry air next to the skin.
   • Insulation value of clothing is proportional to its thickness.
   • Layers provide greater insulation because they trap extra dry air between the layers.
   • Wearing layers allows you to cool down by removing layers as you get warm by doing physical activities.
   • Appropriate level of insulation will depend on the temperature in the freezer and work being done – the colder the environment, the greater the insulation needed from clothing.
   • Intensity of the work activity will also affect the level of insulation required particularly if a variety of different jobs are being done. Layers are the best arrangement. This means that workers can remove or add layers, depending on the work they are doing.
   • Clothing must be easy to put on and take off and fabrics chosen to reduce friction between layers.
   • Fabrics used between outer and inner layers should create air spaces to provide insulation. They should be lightweight and absorbent so they can trap water vapour away from the skin so that it can pass through the outer layer. They need to be resilient and able to ‘spring back’ when compressed (e.g. by bending over). Wool and other fibrous materials are suitable.
   • The clothing should be designed so that bending over does not cause too much compression of the layers and therefore loss of insulation.
4. Water resistance

- Clothing must remain dry for the insulation properties to continue to work, requiring changes of clothing during the work shift, particularly if moderate or heavy work is being done.
- Drying rooms must be conveniently located and be big enough so that workers can remove outer layers and dry them out.
- Inner fabrics should be able to wick or draw sweat away from the skin to be absorbed in the middle layer and breathed out through the outer layer. A number of new fabrics are now being used for close fitting undergarments suitable for wearing under freezer jackets.

5. Fasteners

- Buttons do not provide enough insulation, creating openings for cold air to get in.
- Zippers must be able to function in freezing temperatures and be used by cold and gloved hands.

6. Durability

- Clothing must be durable and strong enough to resist tears if caught on protrusions.
- Torn fabric does not insulate effectively.

7. Spares and cleaning

- Increasing fatigue and discomfort over a shift happens because frequent entry and exit from freezers and chillers makes clothing wet and cold.
- Water vapour is created by sweating while working in freezers and this turns into water in clothing when workers move into the warm humid air outside freezers.
- Increasing water in clothing reduces insulation and wet protective clothing can actually make people even colder as the clothing dries. Employees therefore need changes of clothing whenever they get wet, either from ice melting on the clothing or from sweat as a result of physical activity.
- Dirty clothing also has reduced insulation properties because it is less effective at trapping air.
- Regular laundering is critical and clothing must be easily washed. This means each employee needs at least three sets of protective gear: one set to wear, one set to have as spare in case clothing gets wet and one set being laundered.

Boots

Boots are very important – feet are one of the most likely parts of the body to be adversely affected by cold.

The following features of boots should be considered when choosing the right sort of protection.

1. Insulation

Boots can be lined with insulating materials such as fur or fabric or canvas or felt over-boots (to midcalf) can be used to increase insulation. Soles as well as uppers need to be well insulated. Cold will go through a thin sole to damage feet.

2. Size

Large enough so that you can wear several pairs of socks and use an insole to improve insulation.

3. Water resistance

Ability to repel water if there is any chance that ice or water will fall on the boot. Wet boots do not provide thermal insulation.

4. Ventilation

Well-ventilated to keep the surface next to the feet dry. If possible, boots should have a vapour barrier that wicks moisture away from the feet to help keep the inner surface dry.

If this is not possible, socks and insoles need to be replaced frequently and whenever they get wet. Boots must dry completely between shifts.

5. Flexibility

Soles must be flexible, particularly if you need to operate foot controls.

6. Anti-slip

Tread must be able to prevent slipping on wet or icy floors.

7. Impact resistance

Steel capped boots should only be used as a last resort as steel conducts the cold very well and makes feet even colder.

Caps made from carbon fibre or plastics that do not go brittle in severe cold may provide sufficient impact resistance without conducting cold to the toes.
8. Interaction with clothing

Boots must fit with trouser legs effectively so that cold air cannot get in through any gaps. Trouser legs can fit under or over boots but must seal properly.

Gloves

Like feet, hands are most likely to be affected by the cold. The types of materials being touched can increase the impact of cold on skin. The extremities, in particular fingers and toes, are susceptible to cooling. Unless sufficient heat input by warm blood can be maintained, tissue temperature progressively falls. Extremity blood flow is determined by energetic (required for muscles activity) as well as thermoregulatory needs. When whole-body thermal balance is challenged, peripheral vasoconstriction helps to reduce core heat losses at the expense of peripheral tissues. With high activity more heat is available and extremity blood flow can more easily be maintained.

The protection offered by hand wear and footwear in terms of reducing heat losses is limited. When heat input to the extremity is low (e.g. with resting or low activity), the insulation required to keep hands and feet warm is very large (van Dilla, Day and Siple, 1949). The protection offered by gloves and mittens only provides retardation of cooling rate and, correspondingly, longer times to reach a critical temperature. With higher activity levels, improved protection allows warm hands and feet at lower ambient temperatures.

The following features of gloves should be considered when choosing the right sort of protection.

1. Insulation

Mittens are better than gloves for keeping hands warm. Gloves should provide the warmth of a mitten with the manual dexterity allowed by a glove, and as such allow the wearer to perform multiple tasks without having to remove the gloves.

Good fit is essential with gloves so that work tasks can be completed. If mittens are being used, gloves may need to be worn underneath so that mittens can be removed for certain jobs (e.g. using RF equipment or operating controls on forklifts).

2. Interaction with clothing

Sleeves of jackets should fit, sealing over or under the cuff of the gloves or mittens to prevent cold air getting in. They should also be attached to jackets so that they do not get lost when removed.

Headgear

A lot of heat from your body is lost through your head making wearing headgear very important in freezers. The following factors should be taken into account when choosing headgear.

1. Protection

Headgear must protect ears and neck and be windproof. The combination of a knitted beanie with a hood from a freezer jacket can provide the necessary level of protection. It also lets you remove layers to cool down when doing harder work. Balaclavas that cover your face and pull down onto the neck completely may be necessary in extreme cold or when doing sedentary work.

2. Interaction with other gear

Headgear must not interfere with other types of protective gear, e.g. hearing protection, safety glasses.
### Appendix 6 – Checklist: Anhydrous ammonia refrigerating systems

<table>
<thead>
<tr>
<th>Guidance</th>
<th>Questions</th>
<th>YES or NO</th>
<th>Item</th>
<th>Regulation, Act</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a.</strong></td>
<td>Safety Data Sheet (SDS)</td>
<td></td>
<td></td>
<td></td>
<td>Is a current SDS for anhydrous ammonia readily accessible to employees and contractors on site? (Has it been reviewed within the past five years?)</td>
</tr>
<tr>
<td><strong>b.</strong></td>
<td>Notification of WorkSafe Victoria of dangerous goods on site</td>
<td></td>
<td></td>
<td>Dangerous Goods (Storage &amp; Handling) Regulations 2012, Regulation 19 (SDS)</td>
<td>Determine quantity of anhydrous ammonia held in the refrigeration system. If 500 litres or more of anhydrous ammonia has WorkSafe Victoria been notified of the presence of these dangerous goods?</td>
</tr>
<tr>
<td><strong>c.</strong></td>
<td>Planning for emergencies</td>
<td></td>
<td></td>
<td>Dangerous Goods (Storage &amp; Handling) Regulations 2012, Regulation 55 - Planning for emergencies</td>
<td>If 500 litres or more of anhydrous ammonia held on site, there needs to be a written emergency management plan developed in consultation with relevant fire services. If no written plan and the quantity is less than 500 litres, there should be an emergency plan as required under the general provisions of Dangerous Goods (Storage &amp; Handling) Regulations 2012, Regulation 444.</td>
</tr>
<tr>
<td><strong>d.</strong></td>
<td>Fire protection system</td>
<td></td>
<td></td>
<td></td>
<td>If quantity of ammonia is 2000L or more, has the occupier installed a fire protection system that is fully operation and been developed in consultation with the relevant fire services?</td>
</tr>
</tbody>
</table>

---

**Guidance:** Occuper should have a written plan for dealing with an anhydrous ammonia leak:
- Wind directional devices, windsocks? (To assist in evacuating the site);
- Manifest and Emergency Plan available to emergency services in event of an incident;
- shutdown procedure for the refrigeration system in the event of an incident;
- plan or system that readily identifies the function and location of valves so that any leak or incident involving the refrigeration system can be isolated.

**Main isolation valves clearly labelled.**

**Guidance:** Documented plan or procedure for dealing with an anhydrous ammonia leak:
- wind directional devices, windsocks? (To assist in evacuating the site);
- manifest and Emergency Plan available to emergency services in event of an incident;
- shutdown procedure for the refrigeration system in the event of an incident;
- plan or system that readily identifies the function and location of valves so that any leak or incident involving the refrigeration system can be isolated.

**Main isolation valves clearly labelled.**

**Guidance:** Verify a fire protection report has been issued by the Fire Service and the occupier has complied with the requirements outlined within the report. (Compliance with the report can be demonstrated when the occupier is able to produce a formal letter of compliance issued by the Fire Service).
<table>
<thead>
<tr>
<th>Item</th>
<th>Regulation, Act</th>
<th>Questions</th>
<th>YES or NO</th>
<th>Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>d.</strong></td>
<td>Dangerous Goods Act 1985, Section 32</td>
<td>Would an anhydrous ammonia leak be reported to police or relevant fire authority as required under Dangerous Goods Act 1985?</td>
<td></td>
<td><strong>Guidance:</strong> Occupier should have formal procedures outlined within the emergency plan to meet this reporting requirement</td>
</tr>
<tr>
<td></td>
<td>Occupational Health and Safety Act 2004, Section 38</td>
<td>Would the employer notify WorkSafe in the event of an ammonia leak that results in injury to any person that requires medical treatment as defined in Section 38 of the Occupational Health and Safety Act 2004</td>
<td></td>
<td><strong>Guidance:</strong> Occupier should have formal procedures outlined within the emergency plan to meet this reporting requirement</td>
</tr>
<tr>
<td><strong>e.</strong></td>
<td>Dangerous Goods (Storage &amp; Handling) Regulations 2012, Reg. 27 - General duty to control risk</td>
<td>Has the occupier implemented adequate risk-control measures associated with the safe storage and handling of anhydrous ammonia within the refrigeration system?</td>
<td></td>
<td><strong>Guidance:</strong> Occupier is required to demonstrate that there are adequate risk controls in place. This can be achieved by conducting a formal self-assessment against AS 1677 Refrigeration systems. Refrigeration systems. Part 1: Refrigerant classifications Refrigeration systems. Part 2: Safety requirements for fixed applications Note: If other codes or standards are used they need to demonstrate compliance to an equivalent level of AS 1677</td>
</tr>
</tbody>
</table>
| | Dangerous Goods (Storage & Handling) Regulations 2012, Reg. 37 - Structure and plant – condition and repair | Is there a formal and effective preventative maintenance system or program in place for the anhydrous ammonia refrigeration plant and equipment? | | **Guidance:** Occupier is required to demonstrate that there is an effective maintenance system in place which is formally recorded within a register, and clearly lists and identifies safety items that are critical to the safe operation of the refrigeration system such as:  
  - safety relief valves  
  - ventilation systems  
  - detectors (if provided)  
  - critical operating valves  
  - sensors fitted to level indicators  
  - high and low level alarms  
  - pressure vessel inspected. Refer: AS3788:2006 Pressure Equipment – In Service Inspection  
  - intrinsically safe electrical equipment and wiring (where detectors are not provided refer: AS1677 Part 2 clause 4.7.6)  
  Occupier should be able to demonstrate that the appropriate maintenance regime is being provided on all items identified in the register. |
<table>
<thead>
<tr>
<th>Item</th>
<th>Regulation, Act</th>
<th>Questions</th>
<th>YES or NO</th>
<th>Guidance</th>
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<td>Is the anhydrous ammonia refrigeration plant and the preventative maintenance system operated in-house or by external contractors or combination of both?</td>
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<td><strong>Guidance:</strong> Occupier has formal records which confirm employees and/or contractors responsible for the operation and maintenance of the anhydrous ammonia refrigeration plant and equipment at the workplace have received appropriate training.</td>
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<td>Are those responsible for the maintenance and operation of the anhydrous ammonia refrigeration plant and equipment suitably trained?</td>
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<td><strong>Guidance:</strong> The Occupier has a copy of the operating and maintenance manual as required under the provisions of Dangerous Goods (Storage &amp; Handling) Regulations 2012, Reg. 25. Formal safe work procedures:  - identify and control the risks associated with the safe operation and maintenance of the anhydrous ammonia plant and equipment  - require that a Safe Work Method (SWM) is undertaken prior to any maintenance work  - have one or more permit systems in place for maintenance work (e.g. hot work, confined space entry).</td>
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<td>Is there a copy of the operating and maintenance manual for the refrigeration plant and equipment on site and readily accessible? (Refer: AS 1677 Refrigeration systems Part 2 Safety requirements for fixed applications Clause 6.2.1)</td>
<td></td>
<td><strong>Guidance:</strong> There must be outer warning placarding &quot;HAZCHEM&quot; provided at every road vehicle entry where the quantity of anhydrous ammonia on site is 500 litres or more. Refer: Dangerous Goods (Storage &amp; Handling) Regulations 2000, Reg. 47. Where capacity of the bulk container (receiver) is greater than 500 litres, appropriate placarding must be provided on the vessel. Refer: Dangerous Goods (Storage and Handling) Regulations 2000, Reg. 48.</td>
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<td>Are premises and vessels adequately placarded?</td>
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<td><strong>Guidance:</strong> Hazards and risks associated within the storage and any handling of corrosive materials such as anhydrous ammonia must be identified and appropriately controlled. The level of exposure to corrosive materials such as anhydrous ammonia during charging of and maintenance to the refrigeration plant and equipment will determine what risk control measures, such as emergency and medical equipment, may be required (e.g. eye wash, safety shower, first aid facilities). Refer: Dangerous Goods (Storage and Handling) Regulations 2012, (Reg. 27)</td>
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<td>Is there adequate first aid facilities and emergency equipment such as safety shower/eye wash station close to the refrigeration plant room?</td>
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<td><strong>Guidance:</strong></td>
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<td>f.</td>
<td>Dangerous Goods (Storage &amp; Handling) Regulations 2012, Reg. 44 - Ventilation and atmospheric emissions</td>
<td>If the refrigeration plant and equipment is located within a room/building, appropriate natural or mechanical ventilation will be required?</td>
<td>Guidance: Refrigeration plant and equipment located indoors needs to be either naturally or mechanically ventilated. (For specific ventilation rates refer to Table 4.1 AS 1677 Refrigeration systems Part 2: Safety requirements for fixed applications).</td>
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<td>g.</td>
<td>Hazardous zones</td>
<td>If the system is located in the open, are there any potential ignition sources within 1.5 metres of the refrigeration plant and equipment?</td>
<td>Guidance: If there are ignition sources within 1.5 metres of the refrigeration plant then a hazardous zone risk assessment needs to be conducted as per AS 2430. Classification of hazardous areas.</td>
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<td>h.</td>
<td>Site and installation of refrigeration system</td>
<td>Is the system is located in a room or space?</td>
<td>Guidance: Then all electrics in that room or spaced should be suitable to operate in a zoned hazardous area. AS 2430. Classification of hazardous areas.</td>
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<td>Is pipe-work appropriately marked according to AS1345?</td>
<td>Guidance: Liquid and vapour pipe lines must be capable of being readily identified and marked or colour coded in the appropriate colours as per AS 1345. Colours as defined in AS 1345: Background: Yellow-ochre (Straw, Sand, sandstone, Raffia, Biscuit) Writing: Black Directional arrow showing flow direction</td>
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<td>If the refrigeration system is located within an enclosed room or space where people may enter and work is there an audible and visible evacuation alarm system?</td>
<td>Guidance: Where persons are required to work near evaporators (containing anhydrous ammonia) the occupier should have one or more gas detectors installed in the work area to provide early warning in the event of a refrigerant leak and before persons are exposed to dangerous concentrations of the refrigerant anhydrous ammonia. Note: There are potential health risks for asphyxiation to occur where there is a leakage of gas. Refer: AS Refrigerating systems 1677 Part2: Safety requirements for fixed applications, Clause 4.8.1.</td>
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|      |                | • Is personal protective equipment (PPE) provided?  
• Is the PPE maintained? (Breathing apparatus (BA) set if required)  
• Is PPE readily available?  
• Is there PPE appropriately stored?  
• Are there appropriate records to verify maintenance of PPE?  
Are relevant people trained and currently competent in the use of the PPE? (BA set) |  | Guidance: For anhydrous ammonia amounts;  
• ≤ 225kg 1 respirator required  
• > 225kg’s 2 respirator required  
• 900kg’s 1 self-contained BA with effective life of 25mins + PPE to AS2022 required including maintenance of equipment  
Guidance: Suitable training must be provided to those who may be required to use a BA set and emergency drills should be conducted to review and ensure emergency procedures are adequate.  
Guidance: Occupier must ensure employees and contractors involved in the operation and maintenance of the refrigeration plant and equipment have received appropriate information, instruction and training. Records verifying induction or any other hazard or competency based training has been provided should be maintained with records of safety and tool box meetings. |
WorkSafe Victoria

WorkSafe Agents
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