

A guide to

Handling large, bulky or awkward items

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The information presented in this guide is intended for general use only. It should not be viewed as a definitive guide to the law and should be read in conjunction with the Occupational Health and Safety Act 2004.

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The cover image was photographed under supervised conditions. Forklifts should never be left unattended whilst a load is on the tynes.

INTRODUCTION

Around 340 claims for injuries resulting from handling large, bulky or awkward items occur in the wholesale and retail sectors in Victoria each year, at a cost of \$6 million. And that's just the recorded claims – these figures do not include self-employed people, labour hire staff, or employees of self-insurers, so the total figures are likely to be much higher.

This Guide sets out practical ways to eliminate or reduce these injuries. While it is primarily written for employers, it also provides information for other workplace duty holders, WorkSafe inspectors and other interested parties.

Information contained in this Guide is derived from the results of a Solutions Workshop held in April 2005. This workshop brought together a range of people from the wholesale and retail sectors – including representatives from industry associations, employers, employees and employee organisations, suppliers, safety inspectors, ergonomists and health and safety representatives – to share ideas for addressing the risks in handling large, bulky or awkward items.

The Guide considers design and packaging, equipment selection, work practices, and environmental considerations that will assist workplaces to comply with WorkSafe Victoria's requirements.

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SAFER HANDLING OF LARGE, BULKY OR AWKWARD ITEMS

MECHANICAL HANDLING HAS TONNES OF ADVANTAGES!

When implementing risk controls at your workplace, you must look at your hazards, assess the risk, and determine whether the risk can be eliminated or reduced as far as reasonably practicable. The *Occupational Health and Safety (OHS) Act 2004* (s. 35) from 1 January, 2006, will place a duty on employers to consult with employees, so far as is reasonably practicable, in this process. Your health and safety representatives (HSRs) and employees will often be the best source of information and ideas on workplace design, layout, work methods and new technology when looking at ways to manage risks arising from handling large, bulky or awkward items. They will also be able to identify whether the proposed solutions will lead to the introduction of other risks.

You should also consider involving people such as designers, consultants, suppliers and purchasing officers, particularly when looking at ways to influence what occurs in the supply chain upstream and downstream of your workplace.

The criteria for 'large, bulky or awkward' items used in this Guide are items weighing 25kg or more and having one dimension 500mm or more. However, you may find the principles in this Guide will help make your work safer, even if the items you handle do not fit these criteria.

In looking at ways to eliminate or reduce the risk in consultation with your employees, you should consider the three elements below.

Bear in mind that these are not necessarily discrete steps, and that the most practicable method to control risks in your situation may involve a combination of redesigning or repackaging, using mechanical aids, and/or team lifts. It is expected that in most cases, team lifting would be the least preferred or a short-term solution, or used to supplement the handling of items where other, non-manual handling methods have been investigated and applied where reasonably practicable.

The information contained in this Guide is indicative and will not necessarily cover every workplace situation. Consideration must always be given to the Occupational Health and Safety (*Manual Handling*) Regulations 1999 (*'Manual Handling Regulations 1999'*), when ascertaining the most practicable risk controls for your particular situation.

1. Redesign or repackage

- Ask yourself, 'Do we actually need to handle these items at all?' and 'Can we get rid of the problem by reducing package size and weight?'
- Handling of large, bulky, awkward items could be eliminated altogether if you investigate ways to repackage the items to be handled to reduce their weight, or make design changes in your workplace which mean items can be handled by powered mechanical aids.
- Another option is to repackage the items to increase their size and weight so that mechanical aids become the only practicable way of handling these items.
- In many cases you will may find that any need to handle large, bulky, awkward items is eliminated or significantly reduced.

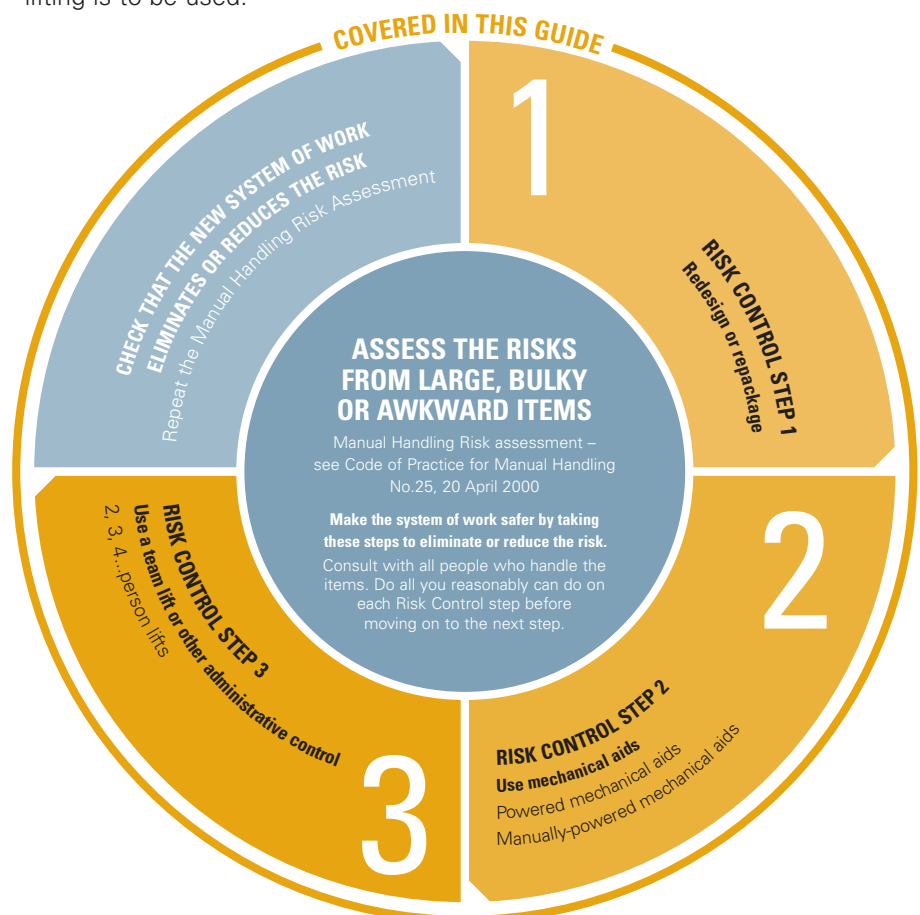
SAFER HANDLING OF LARGE, BULKY OR AWKWARD ITEMS

2. Use mechanical aids

- Eliminate or minimise risk through redesigning or repackaging before you proceed to use mechanical aids to handle large, bulky, awkward items.
- The first preference is to eliminate the need for manual handling by using powered mechanical aids such as forklifts or powered pallet movers.
- Where it is not possible to use powered mechanical aids, consider using other mechanical aids such as trolleys or hand pallet jacks to reduce exposure to manual handling risk.
- Issues such as package design, weight and size, frequency of handling, ease of access to the item to be moved, obstacles along the path of movement, work at height, storage/picking location, item stability, and the distance the item is to be moved will determine the most appropriate aids.
- The effectiveness of any solution involving mechanical aids depends on selecting the correct equipment for the application, maintaining it in a condition fit for its purpose, and ensuring that workers who will be using the equipment receive the necessary training and supervision.

3. Use a team lift or other administrative control

- Team lifting and other administrative controls are the **least** preferred option when handling large, bulky or awkward items.
- Team lifting and other administrative controls should only be used in circumstances where options for redesign or using mechanical aids have been investigated and are not practicable, although there may be situations where team lifting and/or other administrative controls may be used to supplement other control measures.
- Cartons should be appropriately labelled with weights, centre of gravity etc. to provide as much information as possible to prepare for a team lift.
- Specific training in manual handling techniques should be provided if team lifting is to be used.



SAFER HANDLING OF LARGE, BULKY OR AWKWARD ITEMS

KEY PRINCIPLES FOR HANDLING LARGE, BULKY OR AWKWARD ITEMS

- Ensure you consider the hierarchy of control when working out ways to handle large, bulky or awkward items:
 - Redesign the workplace to allow for the use of powered mechanical aids
 - Eliminate manual handling of these items by the use of mechanical aids
 - Redesign the item or its packaging to allow handling by powered mechanical aid, eg. pallet, skid or tyne pockets, lifting lugs, forklift clamp, tow ball for connection to powered tug
 - Redesign the item to a lightweight, compact load
 - Redesign the item or its packaging so it has access for hand trolley movement
 - Redesign the item or its packaging with handles or hand holds to allow for team lifting
 - Provide signage on packaging indicating weight and required handling technique.
- Handling of large, bulky or awkward items should be done predominantly by powered mechanical means.
- Physical changes to workplace design, layout and plant are more effective than administrative controls to make the workplace safer.
- Adequate access to items should be provided to allow for their handling by mechanical means.
- Selection of the appropriate mechanical aid to handle specific items should take into account the following:
 - Size and weight of the item
 - Item surfaces that could rub, cause abrasions, punctures or cuts or are likely to catch clothing
 - Item surfaces likely to be exposed to gusts of wind
 - Type of adequate handles or gripping surface
 - Liability to swing
 - Obstruction of vision
 - Contents of the package (toxins, acids, hot fluids, etc.)
 - Stability of the item during handling
 - Distance to be handled
 - Route (gradient, uneven or slippery floors, stairs) over which the item is to be handled.
- Wherever mechanical aids are to be used, you should put in place a system to ensure they are maintained in a suitable condition, and that employees receive the appropriate training and supervision to enable them to use the equipment correctly and safely.
- Where employees work at height, the equipment used to raise them should provide close access to the items at height and help ensure protection against the risk of falls.
- When looking at ways to eliminate or reduce risk when handling these items, make sure that any improvements made at one point do not worsen the risk at another point in the process.
- Don't allow improvements to the way these items are handled at your workplace to be stifled by upstream or downstream constraints.
- Retrieval of large, bulky or awkward items should occur within the 'best working zone' – between shoulders and knees – wherever possible.
- Manual lifting and carrying of items should be replaced by sliding and trolleying.

SAFER HANDLING OF LARGE, BULKY OR AWKWARD ITEMS

TAKE A SUPPLY CHAIN APPROACH

Handling large, bulky or awkward items occurs throughout the supply chain, and changes to one part of the system of work often affect other parties in the chain. Therefore the consequences of changing the system of work should be considered. The people affected include customers and suppliers.

The level of risk to your employees or contractors could be affected by activities occurring outside the immediate working environment of your warehouse or retail premises. And at the other end of the spectrum, employees, contractors or customers further along the chain may be exposed to risk as a result of the way in which you do your work.

The *OHS Act 2004* and the *Manual Handling Regulations 1999* set out the legal duty of employers to all employees, direct or indirect, to eliminate, or reduce, so far as is reasonably practicable, risks to health and safety.

WorkSafe encourages workplace parties to consider all the steps in the supply chain, and how these impact on workers being able to do a job safely.

Influencing your suppliers

You should consider negotiating with your suppliers to alter packaging size/weight, setting requirements for consignors to use slip sheets for containerised items, etc. This ties in closely with requirements and expectations of your customers, so that influencing their requirements could give you leverage when addressing upstream supply issues.

Influencing your customers

Not only are your own employees exposed to risk when they are required to handle large, bulky or awkward items, but workers and customers are also impacted through undertaking activities such as loading items into vehicles, or hiring 3rd party couriers to make deliveries to domestic or other premises. These parties should also be considered when looking at ways to address risks in handling large, bulky or awkward items. You should consider ways to influence your customers so that the requirement to supply such items is reduced or eliminated – if customers stop asking for these types of items, multiple risks to parties in the supply chain (including the customers themselves) will be addressed. Even a sign 'We supply goods in this size for YOUR safety' can help influence your customers.

SAFER HANDLING OF LARGE, BULKY OR AWKWARD ITEMS

LOOK AT EVERY STEP IN YOUR SYSTEM OF WORK

Within your own workplace, employees may be exposed to risk at numerous points in the course of handling items. You should consider breaking your work processes down into discrete steps and identifying the hazards, assessing the risk, and working out suitable controls for the risk at each step, in consultation with your employees.

You should also consider the possible introduction of other risks into the system of work when implementing measures to control risks at your workplace. For example:

- Introducing a forklift will require implementation of a traffic management plan to segregate pedestrians from forklifts.
- Appropriate Certificates of Competency should be obtained for operators of specialised equipment, e.g. forklifts, cranes.
- When using cranes to handle items, ensure loads are carried within the capacity of the Safe Working Load (SWL), and implement a program to monitor damage to slings, chains, etc.
- Where racking is installed, a planned maintenance program may need to be implemented and safe load capacity signage displayed.
- Changes to racking loads may affect racking performance and forklift activities.
- Work at height when retrieving goods from elevated locations may require specialised fall protection equipment.

HOW TO USE THIS GUIDE

The Green, Amber and Red format helps you to identify high risk practices and assess your workplace to implement safer work practices. The rationale is simple. To reduce injury rates and compensation claims, high risk situations must be addressed. Companies whose work practices fall into the Red, high risk area are likely to be in breach of legislation but, more importantly, they are placing the health and safety of their workers in jeopardy.

If high risk practices are used in your workplace, you should immediately determine whether you can implement the practices in the Green, low risk column straight away. If that isn't practicable, you should put in place the comparable practices in the Amber, medium risk column. Generally these will only provide an interim solution, as in most instances the Green solutions reflect good practice. If, however, you are able to demonstrate that an appropriate risk assessment process has been undertaken, and you are able to verify that the 'reasonably practicable' test has been applied to the controls you implement, then control measures falling within the Amber range may be practicable for some items.

RED (HIGH RISK)	AMBER (MEDIUM RISK)	GREEN (LOW RISK)
The practices in the red column should not be used in workplaces; an employer who allows these practices to be used is likely to be in breach of OHS legislation.	The practices in the amber column are less effective in reducing risk, as compared to the green column, and would generally be treated as interim solutions.	The practices in the green column should be regarded as the target for all workplaces

SAFER HANDLING OF LARGE, BULKY OR AWKWARD ITEMS

PRACTICABLE CONTROL MEASURES

What does 'reasonably practicable' mean?

The *OHS Act 2004* explains what you must take into account when deciding if something is 'reasonably practicable'. In general terms, the factors to be taken into account are:

- the likelihood of the hazard or risk eventuating
- the degree of harm that would result if the hazard or risk eventuated
- what you know, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk
- the availability and suitability of ways to eliminate or reduce the hazard or risk
- the cost of eliminating or reducing the hazard or risk

This Guide has persuasive status on what you know, or ought reasonably to know, and therefore what you should reasonably do. It is expected that employers, employees and WorkSafe inspectors will use the Guide to form an opinion about suitable health and safety risk controls, under the test of 'reasonably practicable'.

FURTHER INFORMATION

In the Appendices to this Guide, you will find a range of information covering:

- Handling aid selection
- Trolley design guidelines
- Team lifting guidelines
- Mechanical aids

Other items of interest to help you in choosing appropriate risk controls for your situation can be found on the WorkSafe website at www.workcover.vic.gov.au.

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COMPARATIVE CHARTS

GENERAL INFORMATION

The Comparative Charts in this Part provide a summary of common work practices and categorise these according to the level of risk that is likely to exist if that practice is undertaken at your workplace. They reflect the real life experiences of the industry representatives, unions, employers, WorkSafe inspectors and others who participated in a Solutions Workshop held in April 2005.

The Charts cover the following types of items:

- Furniture
- Whitegoods, audio-visual and office equipment
- Oversize, overweight cartons
- Long items
- Machine parts

Solutions may involve any or all of the following:

- Redesigning the workplace to allow for the use of powered mechanical aids
- Redesigning the item or its packaging with wheels, handholds, or providing it on skids/pallets for handling by mechanical aids
- Using powered mechanical aids to handle items
- Using suitable mechanical aids to move and raise items
- Using team lifting for suitable items

If your workplace situation is shown

The solutions shown in the Green, low risk column cover a wide range of controls (in order of preference) from "Redesign or Repackage" to "Team Lifting".

The risk controls you put in place should be selected according to the three elements in the order set out on pages 4-5 of this Guide. That is, select from the "Redesign or Repackage" section first, and only if this is not reasonably practicable should you proceed to choose solutions from the "Mechanical Aids" section. Only if that is not reasonably practicable should you then proceed to the "Team Lift or Other Administrative Control" section.

Often a combination of solutions from two or more of these categories may be needed to reduce the risk so far as is practicable in your situation.

If your workplace situation is not shown

Consider the requirements for risk assessment and control as stipulated in the *Manual Handling Regulations 1999*, and support your risk assessment with insights gained from the principles in this document.



STORAGE AND RETRIEVAL OF FURNITURE ITEMS

Furniture that has one dimension 500mm or more, and weighs 25kg or more, including bed bases and mattresses, lounge suites, dining tables, entertainment units, wall units, wardrobes, chests of drawers, pianos, etc.


Commonly, furniture items are handled from or into a storage location in a walk-in pallet racking bay at ground level, or stored directly on the ground. Very often this is done by either two people manually, or by one person using a hand trolley.

The item is carried from one location to another manually by two people, or by one person using a hand trolley, hand pallet truck, electric pallet mover or a forklift.

Alternatively, the item is picked from an elevated storage location by one or two persons using an order picking forklift and transported to another location using this equipment.

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
<p>Furniture</p> <p>Redesign or Repackage</p>	<p>Very likely to cause injury</p> <ul style="list-style-type: none"> Storage and layout only allows for the manual handling of furniture Working at height without fall protection system Working at height with fall restraint system that does not protect persons from the pendulum effect should they fall while at height Furniture crammed into storage or containers so that high force is required to remove or replace them Furniture design or packaging that does not allow access for hand trolleys 	<p>Some risk of injury – short term controls/additional controls required</p> <ul style="list-style-type: none"> Storage layout and design allows for the use of hand pallet jacks and trolleys to handle furniture Order picking forklift fitted with appropriately designed platform used to manually retrieve and replace lightweight furniture items from storage racking <i>Note: A fall protection system must be used for all persons working at height</i> Sufficient access is available in storage bays to enable persons handling furniture to maintain reasonable posture while removing item Furniture design allows for easy access for hand trolleys 	<p>Less likely to result in injury – recommended controls</p> <ul style="list-style-type: none"> Storage layout and design allows for the use of powered mechanical aids to handle furniture Storage in stillages or cradles, or on pallets, and lifting and movement by use of powered mobile equipment which eliminates the need to manually handle items at height Storage bays with roll-out shelves to assist access by powered mobile equipment Roll-out pallets in containers Slip sheets for container unloading Furniture design allows stacking and moving items with trolley, using minimal manual handling

COMPARATIVE CHARTS

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
Mechanical Aids	<ul style="list-style-type: none"> • Handling items on trolleys whose weight exceeds the rated load of the trolley • Floor storage areas have uneven, damaged, or inadequate floor surfaces for the safe handling of items • No appropriate equipment to access items at height • Use of heavily loaded hand trolley in unsuitable circumstances, e.g. up or down flights of stairs • Handling items weighing 200kg or more using two-wheel hand trolley • Racking that has uneven, damaged flooring/decking that requires furniture to be lifted over instead of slid across. 	<ul style="list-style-type: none"> • Specific manual handling aids such as: <ul style="list-style-type: none"> • Attaching webbing or other handles to furniture • Roll-out racking which can present lightweight furniture close to the operator • Four wheel trolley with tall sides for moving mattresses • Furniture straps to maintain good posture while handling items • Floor and racking surfaces regularly treated to allow for easy sliding of furniture • Use of a standard two-wheel hand trolley to transfer furniture weighing no more than 100kg over a distance of not more than 100m on a flat, continuous surface. • Racking designed with smooth flooring/decking to enable sliding of furniture rather than lifting and carrying 	<ul style="list-style-type: none"> • Specifically designed powered mechanical aids such as: <ul style="list-style-type: none"> • Fork spreader attachment for handling wide items • Grab attachment for forklift to handle mattresses • Air freight rollers used to manually move heavy furniture placed on flat skids • Suitable mechanical aid to access items at height • Ergonomically designed hand trolleys to lift and move furniture items not more than 35m  <ul style="list-style-type: none"> • Hand pallet jack with long tynes to lift and move furniture on legs from racking
Team Lift or Other Administrative Controls	<ul style="list-style-type: none"> • Team lifting where each person is required to lift more than 25kg • Using pinch grip or open hand grip to lift and carry heavy plastic wrapped furniture • No indications as to the weight of heavy or unstable items 	<ul style="list-style-type: none"> • Team lifting restricted so that each person in the team only lifts a maximum of 20kg, i.e. two-person team restricted to 40kg item, three-person team – 60kg, four-person team – 80kg • Furniture is labelled with weight and has identified grip points 	<ul style="list-style-type: none"> • Team lifting is by trained persons who are matched in skill, experience, strength and size and each person in the team only lifts a maximum of 20kg and the load is only carried one to two metres • Furniture is labelled with weight, the centre of gravity and any other relevant issues such as grab force limitations, tyne access, etc




STORAGE AND RETRIEVAL OF WHITEGOODS, AUDIO-VISUAL OR OFFICE EQUIPMENT ITEMS.


Whitegoods, audiovisual equipment and office equipment items have one dimension 500mm or longer and weigh 25kg or more. Include refrigerators, upright and chest freezers, top and front loading washing machines, driers, dishwashers, kitchen appliances, air-conditioning units, large screen televisions, rear projection systems, speaker systems, desks, filing cabinets, whiteboards, photocopiers, printers, monitors, cabinets, faxes, scanners and other office equipment.


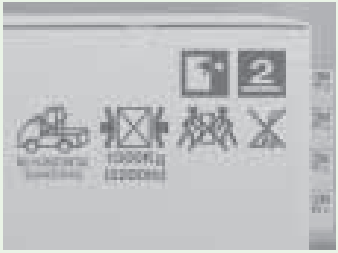
It is common for whitegoods to be stored at a location in a walk-in pallet rack at ground level, or directly on the ground. Items are stacked one, two or three high on pallets and are manually picked by two persons or stacks are picked by one person using a hand trolley. The item is moved from one location to another manually by two persons or by one person using a hand trolley, hand pallet truck, an electric pallet mover or a forklift. Alternatively, the item is picked from an elevated storage location by one or two persons using an order picking forklift and transported to another location using this equipment.

Office items are stored at a location in a walk-in pallet rack at ground level, or stored directly on the ground. Items are stacked one, two or three high on pallets. Items are picked from a storage pallet in a two- or three-level pallet rack. Items on second or third level may be out of the person's reach and so a mechanical aid such as a safety step, platform ladder or elevated work platform must be used to reach the items. Items are manually picked by two persons or stacks are picked by one person using a hand trolley. The item is moved from one location to another manually by two persons or by one person using a hand trolley, hand pallet truck, an electric pallet mover or a forklift. Alternatively, the item is picked from an elevated storage location by one or two persons using an order picking forklift and transported to another location using this equipment.

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
<p>Whitegoods, AV units, office equipment</p> <p>Redesign or Repackage</p>	<p>Very likely to cause injury</p> <ul style="list-style-type: none"> Warehouse design that does not segregate pedestrians from powered mobile plant Stacking arrangements do not allow for the use of mechanical aids to pick and retrieve items 	<p>Some risk of injury – short term controls/additional controls required</p> <ul style="list-style-type: none"> Use of powered mobile plant is scheduled to occur when pedestrian traffic is minimal Stacking arrangements allow for the use of mechanical aids such as hand pallet trucks, table lifters and hand trolleys to pick and retrieve items 	<p>Less likely to result in injury – recommended controls</p> <ul style="list-style-type: none"> Good warehouse design that allows powered mobile plant to be with appropriate pedestrian segregation. Stacking arrangements allow for use of powered mechanical aids to pick and retrieve items. 

COMPARATIVE CHARTS

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
Redesign or Repackage	<ul style="list-style-type: none"> Working at height without fall restraint system Working at height with fall restraint system that does not protect persons from the pendulum effect should they fall while at height Two-person picking of items using the same narrow platform ladder Design of item or its packaging does not allow for handling by mechanical aids or by appropriate team handling Packaging that makes items unstable Packaging that makes items difficult to grasp if required to be handled manually 	<ul style="list-style-type: none"> Order picking forklift fitted with appropriately designed platform used to manually retrieve and replace lightweight items from storage racking Occasional one-person picking and retrieval of small items using platform ladder with winch. Transfer of items onto their own standard pallet before stored and moved within the workplace by powered mobile plant Design of the items or its packaging incorporates handles, hand holds, pockets or other such attachment points for non-powered mechanical aids Cut-out handles as part of packaging design Handling by packaging straps Specifically designed non-slip handles <p><i>Note: A fall restraint system must be used for all persons working at height.</i></p>	<ul style="list-style-type: none"> Storage in stillages and lifting and movement using powered mobile equipment which eliminates the need to manually handle the items at height Ordering items in multiples of pallet loads so that powered mobile plant can be used to handle items Design of the items or its packaging incorporates lifting lugs, forklift pockets or other such attachment points for powered mechanical aids Relevant packaging information displayed on all sides Specific handling instructions in appropriate positions, i.e. handle by trolley – this side only: clamp pressure and direction Symbols and signs on packaging follow universal labelling guidelines.
Mechanical Aids	<ul style="list-style-type: none"> Work at height requiring access to rear of pallet in a racking bay that is not fully decked 	<ul style="list-style-type: none"> Design of warehouse to include bulk storage of items on pallets in racking and separate picking location where suitable mechanical aids are available to transfer items to and from pallets Racking design to allow access to rear of pallet in separate picking location. 	<ul style="list-style-type: none"> Mechanical aid transfer of items onto pallet designed specifically for that type of item and then handled solely by powered mobile plant 

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
<p>Mechanical Aids</p>	<ul style="list-style-type: none"> • Use of heavily loaded hand trolley in inappropriate circumstances, e.g. up flights of stairs • Handling items weighing 200kg or more using two-wheel hand trolley • Team lifting is used to transfer heavy items, and the number of people is inadequate 	<ul style="list-style-type: none"> • Use of a standard two-wheel hand trolley to transfer items weighing no more than 100kg not more than 100m. <p><i>Note: Hand trolley design criteria are detailed later in this Guide.</i></p> <ul style="list-style-type: none"> • Non-powered mechanical aids used to lift and transfer items, e.g. <ul style="list-style-type: none"> • Hand pallet jack • Hand winch • Hand trolley • Levers • Rollers 	<ul style="list-style-type: none"> • Ergonomically designed hand trolleys to lift and move light items over a distance of not more than 35m • Powered mechanical aids used to lift and transfer items, e.g. <ul style="list-style-type: none"> • Forklift with grab attachment • Items on slip-sheet/pallets and moved with forklift or powered pallet mover • Vacuum lifter • Air freight rollers • Cranes • Powered conveyors • Gravity conveyor • Trolley systems – All items are stored on a trolley and moved via rails by powered tug to and from storage locations
<p>Team Lift or other Administrative Controls</p>	<ul style="list-style-type: none"> • Hand trolley or pallet jack use over steep gradients • Handling items on trolleys whose weight exceeds the rated load of the trolley • No indication of weight or safe handling procedure on packaging 	<ul style="list-style-type: none"> • Powered mobile plant used for all handling items over floor surfaces with gradients • Weight range of items marked on packaging, e.g. red diamond – must use a two-person lift to handle items 	<ul style="list-style-type: none"> • Floor surfaces designed and maintained in flat, undamaged condition with good slip resistance • Weights and characteristics of items attached to them, e.g. weight + which is heavy/light end/side; whether fragile; whether it cannot be handled on its side or upside down, etc. 

COMPARATIVE CHARTS

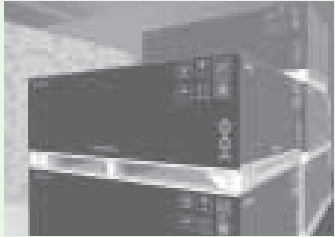


STORAGE AND RETRIEVAL OF OVERSIZE, OVERWEIGHT CARTONS

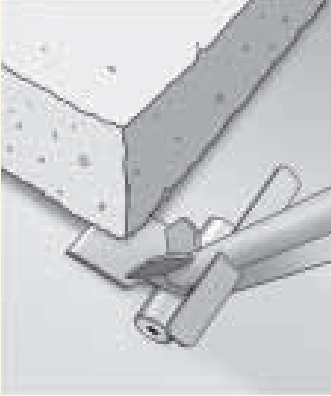
These cartons are 25kg or more and have at least one dimension 500mm or larger and include: vegetable bins, parts stillages, flat pack furniture, etc.

Large cartons are likely to be stored on pallets in a walk-in pallet rack at ground level, or stored directly on the ground. Cartons are stacked one, two or three high on pallets that may be stored in high-bay racking. Cartons can be picked by a forklift directly or by a picker who is raised to the level of the bay by an order picking forklift. The picker, wearing a harness and lanyard, slides the cartons and places them onto the picking pallet. Items on second or third level may be out of the person's reach and so a mechanical aid such as a safety step, platform ladder or elevated work platform must be used to reach the cartons.

Alternatively, cartons are manually picked by two persons or stacks are picked by one person using a hand trolley. The carton is moved from one location to another manually by two persons or by one person using a hand trolley, hand pallet truck, an electric pallet mover or a forklift.

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
Oversize / Overweight Cartons	Very likely to cause injury	Some risk of injury – short term controls/additional controls required	Less likely to result in injury – recommended controls
Redesign or Repackage	<ul style="list-style-type: none"> Oversize/overweight items in their outer carton are lifted manually 	<ul style="list-style-type: none"> Oversize/overweight items have outer carton removed and the smaller compact inner cartons handled 	<ul style="list-style-type: none"> Oversize/overweight cartons designed around a skid or pallet to allow handling by powered mobile plant 
Mechanical Aids	<ul style="list-style-type: none"> No access for powered mobile plant to retrieve or place items in racking No access to specialised mechanical aids to pick or replace items from stillages 	<ul style="list-style-type: none"> Cartons in stillages transferred by powered mechanical aid to a specific area where cranes, vacuum lifters or other specialised mechanical aids can be used to pick or replace items from stillages 	<ul style="list-style-type: none"> Storage location has easy access for mobile plant Cartons handled by specific mechanical aid stored in close proximity to cartons

COMPARATIVE CHARTS

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
Mechanical Aids	<ul style="list-style-type: none"> • Team lifting only used to lift and transfer heavy items • Team lifting of cartons that are damaged and may collapse during handling • Team lifting up or down flights of stairs 	<ul style="list-style-type: none"> • Non-powered mechanical aids used to lift and transfer items, e.g. <ul style="list-style-type: none"> • Hand pallet jack • Hand winch • Hand trolley • Levers • Rollers 	<ul style="list-style-type: none"> • Powered mechanical aids used to lift and transfer cartons, e.g. <ul style="list-style-type: none"> • Forklift with grab attachment • Cartons on slip-sheet or pallets and handled with forklift or powered pallet mover • Vacuum lifter • Air freight rollers • Cranes • Powered conveyors • Gravity conveyors
Team Lift or Other Administrative Controls	<ul style="list-style-type: none"> • Packaging that makes items unstable • Packaging that makes items difficult to grasp if required to be handled manually • No indication of weight or safe handling procedure on packaging • Hand trolley or pallet jack use over steep gradients • Hand trolley use up or down warehouse stairs • Handling items on trolleys whose weight exceeds the rated load of the trolley 	<ul style="list-style-type: none"> • Cut-out handles as part of packaging design • Handling by packaging straps • Specifically designed non-slip handles • Oversize/overweight cartons designed without protrusion and with smooth outer layer so that they can be handled by sliding rather than lifting • Weight range of items marked on packaging, e.g. red diamond – must use a two-person lift to handle items • Powered mobile plant used for all handling of items over floor surfaces with gradients 	<ul style="list-style-type: none"> • Relevant packaging information displayed on all sides • Specific handling instructions in appropriate positions, i.e. handle by trolley – this side only: clamp pressure and direction • Symbols and signs on packaging follow universal labelling guidelines • Weights and characteristics of cartons printed on them, e.g. weight, which is heavy/light end/side; whether fragile; whether it cannot be handled on its side or upside down, etc • Floor surfaces designed and maintained in flat, undamaged condition with good slip resistance

COMPARATIVE CHARTS




STORAGE AND RETRIEVAL OF LONG ITEMS

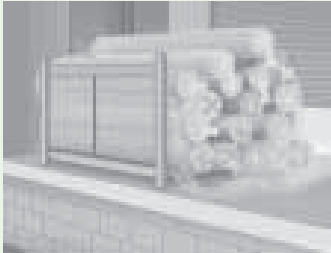
These items have one dimension that is 2m or longer and include: long building materials; flat pack furniture (some items 58kg); over-length pipe and flat steel; large whiteboards up to 4m long; plumbing supplies – pipes (e.g. copper, PVC, concrete, etc. up to 6m long); hot water services; aluminium extrusion products; weather boards; rubber belting; bumper bars, exhaust systems; textile rolls.

Long items could be stored in a pallet rack at ground level, or directly on the ground. Items are stacked directly in racking or in stillages in low-and high-bay racking. They may also be in high-bay racking and are picked by a forklift with a prong attachment or by a picker who is raised to the level of the bay by an order picking forklift. The picker then slides the items into a stillage.

Items in low bay racking on the second or third level may be out of the person's reach and so a mechanical aid such as a safety step, platform ladder or elevated work platform must be used to reach the items. Items may also be manually picked by pulling the item from the racking or stillage onto a trolley. The item is moved from one location to another manually by two persons or by one person using a trolley, hand pallet truck, electric pallet mover or a forklift.

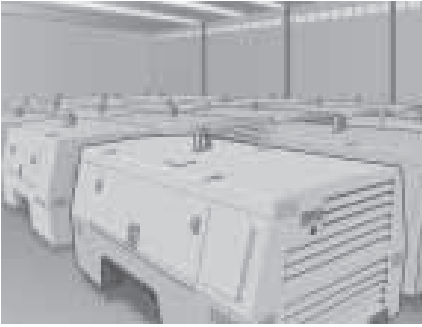
PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
<p>Long items</p> <p>Mechanical Aids</p>	<p>Very likely to cause injury</p> <ul style="list-style-type: none"> One-person carrying of long rigid item weighing 20kg over a distance of 20m or more One-person handling of large sheet weighing 13kg or more One-person handling of large sheet weighing 10kg or more in a windy environment One-person repetitive carrying of long rigid loads weighing 9kg or more, a distance of 9m at a rate greater than five times per minute for two hours, e.g. more than 600 carries of 9kg long items in one session One-person repetitive carrying of long rigid loads weighing 10kg or more, a distance of 9m at a rate greater than once per minute for a two hours, e.g. more than 120 carries of 10kg long items in one session 	<p>Some risk of injury – short term controls/additional controls required</p> <ul style="list-style-type: none"> Occasional two-person lifting and carrying of long rigid items weighing no more than 20kg not more than 15 m Occasional one-person handling of large sheets (such as whiteboards) weighing less than 10kg using a handling aid (which allows a power grip) in a non-windy environment no more than 9m Repetitive one-person carrying of long rigid loads weighing no more than 9kg not more than 9m less than five times per minute for a maximum of two hours, e.g. no more than 600 short carries of long rigid items in one shift Frequent one-person carrying of long rigid loads weighing no more than 10kg not more than 9m between once per minute and once per 30 minutes for a maximum of two hours, e.g. no more than 120 carries of long rigid items in one shift 	<p>Less likely to result in injury – recommended controls</p> <ul style="list-style-type: none"> Moving long items over distance of 15m using powered mechanical aids such as forklifts or electric pallet movers Use of powered mechanical aid such as a forklift or crane to move large sheets secured in stillages Use of powered mechanical aid such as a forklift or crane to move long items secured in stillages Use of appropriate powered mechanical aid 

COMPARATIVE CHARTS

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
Mechanical Aids	<ul style="list-style-type: none"> One-person carrying of long rigid item weighing 10 kg more than 100 m Understaffing of multi-person handling so that one or more persons are exposed to handling of 20kg or more 	<ul style="list-style-type: none"> Occasional two-person lifting and carrying of long rigid item weighing no more than 10kg not more than 90m Occasional multi-person handling of long rigid loads provided that all persons in the team support less than 10kg in weight and are matched for skill, strength and height and that they have been trained to use appropriate techniques and that they are supervised to ensure that these techniques are used 	<ul style="list-style-type: none"> Use of an appropriate hand trolley to transfer long items not more than 15m. Mechanical aids used to eliminate the need for team lifting 
Team Lift or other Administrative Controls	<ul style="list-style-type: none"> One-person carrying of long rigid item weighing 25kg or more Two-person carrying of long rigid item weighing 40kg or more One-person transfer of loads with poor handholds, shifting or uneven loads or loads that put a high force per unit area on the hands (e.g. Metal sheets, wire handles) over distances that take more than 10 seconds to travel Frequent two-person handling of long rigid loads weighing 10kg or more and persons in the team not trained to use appropriate techniques 	<ul style="list-style-type: none"> Occasional one-person lifting and carrying of long rigid items weighing no more than 10kg not more than 15m Occasional two-person transfer of loads with poor handholds, shifting or uneven loads or loads that put a high force per unit area on the hands (e.g. metal sheets, wire handles) providing the distances take no more than 10 seconds to travel Occasional two-person handling of long rigid loads weighing 10kg or less provided that both persons are trained to use appropriate techniques and that they are supervised to ensure that these techniques are used. 	<ul style="list-style-type: none"> One off, one-person lift and carry of long rigid items weighing no more than 7kg, not more than 15m Use of appropriate hand trolley to transfer loads with poor handholds, shifting or uneven loads or loads that put a high force per unit area on the hands (e.g. metal sheets, wire handles) Occasional two-person handling of long rigid loads weighing 10kg or less provided that both persons in the team are matched for skill, strength and height and that they have been trained to use appropriate techniques and that they are supervised to ensure that these techniques are used

COMPARATIVE CHARTS

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
<p>Team Lift or other Administrative Controls</p>	<ul style="list-style-type: none"> • One person manually handling any load 6m or more in length in one dimension • No weight or characteristics of long loads available • Handling items on trolleys whose weight exceeds the rated load of the trolley • No initial or refresher training 	<ul style="list-style-type: none"> • Weights indicated on loads • Regular refresher training for persons involved in handling long items • Training includes the replacement of lifting and carrying techniques by pushing, pulling and lowering techniques 	<ul style="list-style-type: none"> • Weights and characteristics of long loads attached to the loads, including centre of gravity, appropriate handholds and tyne pockets, etc. to provide info. when undertaking team lift • Regular refresher training for persons and their supervisors involved in handling long items



STORAGE AND RETRIEVAL OF MACHINE PARTS

This includes machine parts that have one dimension 500mm or more and weigh 25kg or more, such as forklift parts, earthmoving equipment parts, truck and bus parts, etc. Many parts weigh considerably more than 25kg.

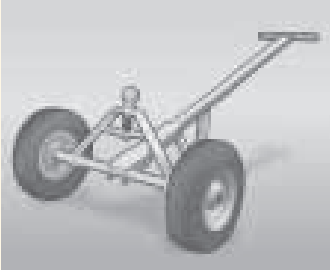
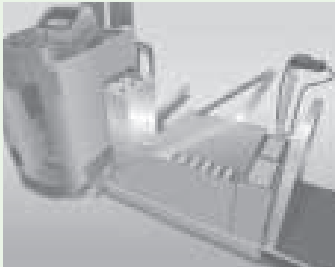
Team lifting of parts of this type would be physically untenable in all but rare situations.

Machine parts are stored on a pallet or in a stillage at a location in low-bay or high-bay racking. Parts are removed from the storage pallet or stillage and placed onto a picking pallet with other items. Alternatively, there is one part per pallet or stillage and the entire pallet is selected using a forklift. Parts on second or third level may be out of the person's reach and so a mechanical aid such as a safety step, platform ladder or elevated work platform must be used to reach the items.

Items are manually picked by two persons or they are moved by forklift to a location where a mechanical aid can transfer them from the storage to the picking pallet. The picking pallet is moved using a hand trolley, hand pallet truck, an electric pallet mover or a forklift. Alternatively, the item is picked from an elevated storage location by one or two persons using an order picking forklift and transported to another location using this equipment.

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
<p>Machine parts</p> <p>Redesign or Repackage</p>	<p>Very likely to cause injury</p> <ul style="list-style-type: none"> No access for powered mobile plant to retrieve or place items in racking No access to specialised mechanical aids to pick or replace items from stillages No established Safe Working Load (SWL) for storage racking Racking design not fit for purpose Damaged or unserviceable stillages or pallets used to store machine parts Stillages with insufficient SWL used to store machine parts Lifting stillages by crane without specifically designed lifting lugs No control measures to separate pedestrians from powered mobile plant 	<p>Some risk of injury – short term controls/additional controls required</p> <ul style="list-style-type: none"> Parts in stillages transferred by powered mechanical aid to a specific area where cranes, vacuum lifters or other specialised mechanical aids can be used to pick or replace parts from stillages SWL posted on racking Standard stillage designed with SWL and with appropriate fork tyne pockets and/or lifting lugs 	<p>Less likely to result in injury – recommended controls</p> <ul style="list-style-type: none"> Storage location designed for easy access for mobile plant Mechanical aid stored in close proximity to parts to be handled Adequate storage space available in racking with sufficient SWL Stillages designed specifically for the weight, shape and stability of the machine parts to be stored within them and lifted and moved by the appropriate mechanical aid, i.e. fork tynes pockets or lifting lugs Traffic management plan in place to control the risk associated with the operation of powered mobile plant to handle machine parts

COMPARATIVE CHARTS

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
Mechanical Aids	<ul style="list-style-type: none"> • Slinging using webbing over unprotected sharp edges • Truck loading or unloading involves work at height from the rear of the vehicle • Persons loading or unloading are in close proximity to powered mobile plant or a slung load • No adequate manual handling aids available 	<ul style="list-style-type: none"> • Specific manual handling aids such as: <ul style="list-style-type: none"> • Cantilever wheel attachment for moving trailers  <ul style="list-style-type: none"> • Roll-out racking which can present lightweight parts close to the operator • Height-adjustable reach conveyor with operator platform for manual loading and unloading of shipping containers 	<ul style="list-style-type: none"> • Design of the machine part or its packaging incorporates lifting lugs, forklift pockets or other such attachment points for powered mechanical aids • Specifically designed and engineered slings for unevenly shaped parts or parts with off-set centre of gravity • Machine parts loaded or unloaded from vehicles using powered mechanical aids from a position where any person loading or unloading is protected from being struck by the load or from a fall from height in accordance with a documented • Specifically designed powered mechanical aids such as: <ul style="list-style-type: none"> • Powered forklift battery remover 
Team Lift or other Administrative Controls	<ul style="list-style-type: none"> • Lack of maintenance on storage racking • No indication of weight of load • Handling items on trolleys whose weight exceeds the rated load of the trolley • No procedures in place for handling machine parts 	<ul style="list-style-type: none"> • Advice sought on appropriate racking • Indication of weight of machine displayed on racking bay • Undocumented procedures in place for handling machine parts and these procedures are strictly supervised 	<ul style="list-style-type: none"> • Regular inspections and damage reporting and maintenance system in place for all storage racking • Weight of machine parts displayed prominently on part or on carton • Documented procedures in place detailing how machine parts to be handled

COMPARATIVE CHARTS

PREFERRED SOLUTION	HIGH RISK	MEDIUM RISK	LOW RISK
<p>Team Lift or other Administrative Controls</p>	<ul style="list-style-type: none"> Powered mechanical aids operated without supervision by person not holding an appropriate Certificate of Competency Operators not provided with training following the introduction of new powered mechanical aids into the workplace No maintenance of mechanical aids Slings, chains and other such mechanical aids not marked with SWL or in poor condition Damaged or unserviceable cranes used to lift parts Use of cranes by untrained operators In-house forklift attachments without design computations Damaged or unserviceable mobile plant Handling loads by mobile plant in excess of forklift SWL or attachment SWL Lifting equipment made in-house without design computations or SWL Lifting equipment not fit for purpose Use of slings, chains or other such lifting aids without knowledge of their SWL Use of damaged or poorly maintained lifting aids Untrained persons slinging machine parts No training 	<ul style="list-style-type: none"> Employer ensures that operator has an appropriate Certificate of Competency before using powered mechanical aid Regular off-site refresher training conducted on the use of specific powered mechanical aids Employer ensures that operator has an appropriate Certificate of Competency before slinging machine parts Competency-based training on undocumented procedures 	<ul style="list-style-type: none"> Employer has system to certify that operators hold the appropriate Certificate of Competency and are competent to operate specific powered mechanical aids Regular on-site refresher training conducted on the use of specific powered mechanical aids Training conducted for operators on all new powered mechanical aids introduced into the workplace Forklifts, stock pickers, pallet lifters, cranes, vacuum lifters, chains, slings and other such mechanical aids are suitably maintained, identified with SWL and fit for purpose in the handling of machine parts Pedestal, overhead travelling, or mobile crane used to handle machine parts in accordance with documented safe work procedure by competent operators Only approved attachments used with forklifts, stock pickers and other mobile plant All lifting equipment has designs approved by a suitably qualified person Records of design and maintenance of lifting equipment retained Slings, chains and other such lifting aids properly designed with marked SWL Lifting aids used are fit for the purpose Regular inspection and maintenance system for all lifting aids Employer has system to certify that operators hold the appropriate Certificate of Competency and are competent to sling machine parts using the equipment available Competency-based training conducted on documented procedures

APPENDICES

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APPENDIX 1 : HANDLING AID SELECTION GRAPHS

Description of application

The following graphs have been designed to assist you in selecting the most appropriate means of handling a large, bulky or awkward item. They provide a range of options for handling items over various distances (15m, 35m and 50m) and at high frequency (200 times per day).

The handling options provided in the graphs include powered mechanical aids, trolleys, and team lifting. As stated in this Guide, powered mechanical aids should always be the first option, with team lifts the least preferred option. In selecting a handling aid, you must always consider the requirement to eliminate the risk of injury as far as reasonably practicable, or if the risk cannot be eliminated, then it must be reduced as far as is reasonably practicable. The principles of the hierarchy of control always need to be considered in making the decision to select a particular handling method.

The information contained in the graphs assumes that handling occurs over flat, level ground along wide, uncluttered aiseways. Where the item is to be handled through cluttered areas or over uneven or sloping pathways, this will need to be factored into the choice of handling aid, i.e. a more sophisticated aid will need to be used, or more people will be required to assist with the move.

EXAMPLE

You are required to move a refrigerator weighing 140kg over a distance of 25m along a level, 2m-wide aisleway.

Factors to consider in deciding on type of aid to be used:

1. Distance to be travelled
2. Weight of item
3. Any obstacles or hindrances in the physical area through which the item will be moved

Given that the distance to be travelled is 25m, you should refer to the graph 'Handling aid selection – for distances up to 35m' (go to the table covering a distance greater than that over which you will be moving). We know the item weighs 140kg – refer to the category '160 kg' on the X-axis (you should round up when the item weight falls between two weight categories).

The columns in the 160kg weight category suggest various options for moving the refrigerator. Each option provides a minimum number of people required to assist with the move. So in this case the range of equipment and the number of people required to move the refrigerator are:

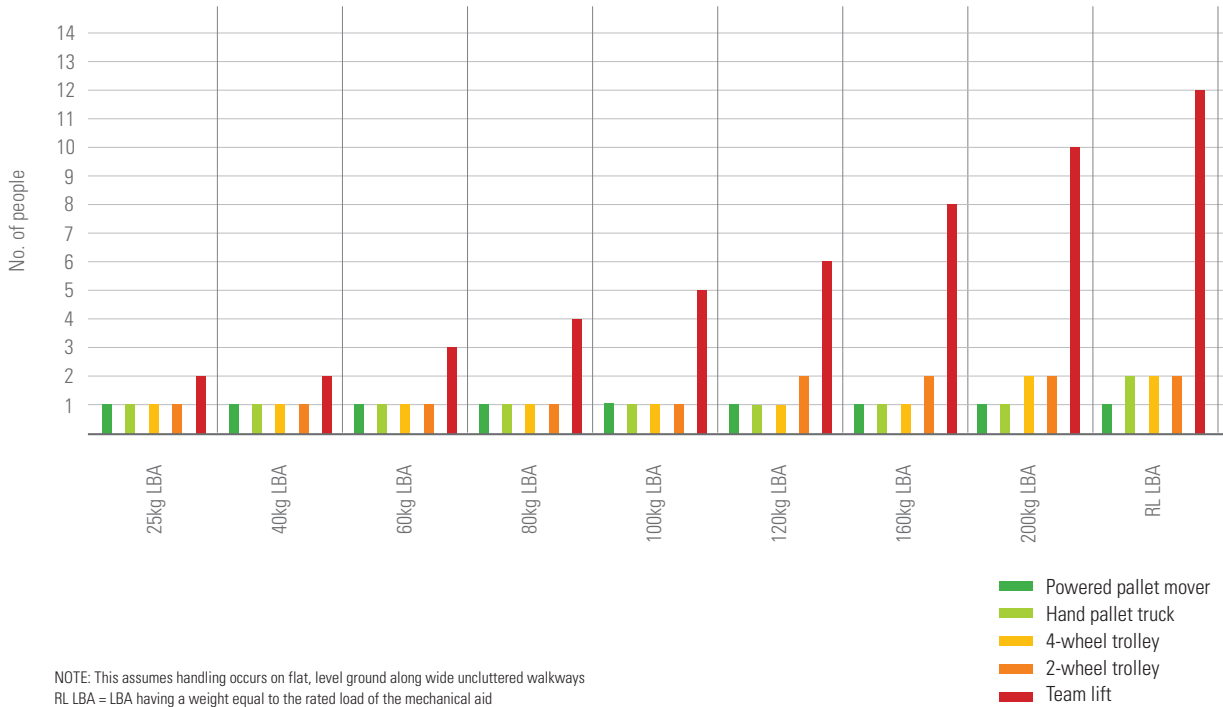
- Powered pallet mover: one person
- Hand pallet truck: one person
- Four-wheel trolley: one person
- Two-wheel trolley: two people
- Team lift: eight people

It is clear from this example that a team lift is unlikely to be suitable to move the refrigerator. If you selected this option, you would need to demonstrate that this reduces the risk of injury as far as is reasonably practicable. You should refer to the Comparative Charts for information on selecting the most practicable control for your situation.

APPENDIX 1

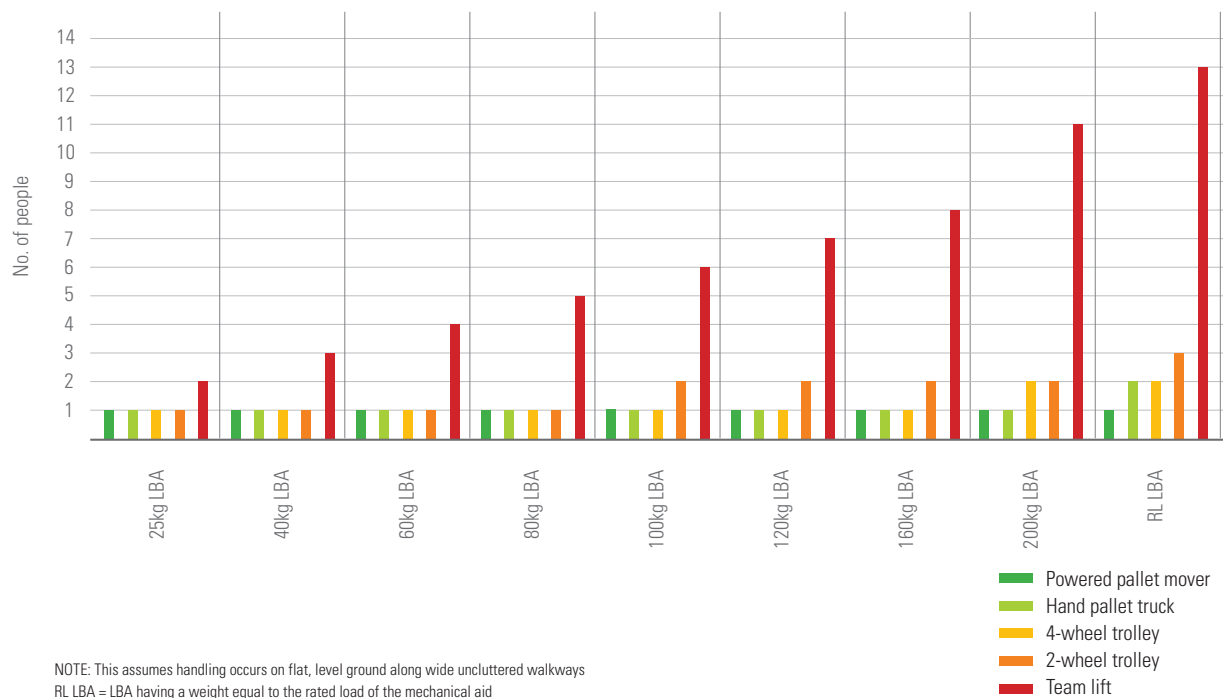
HANDLING AID SELECTION - FOR DISTANCES UP TO 15M

Large bulky or awkward items



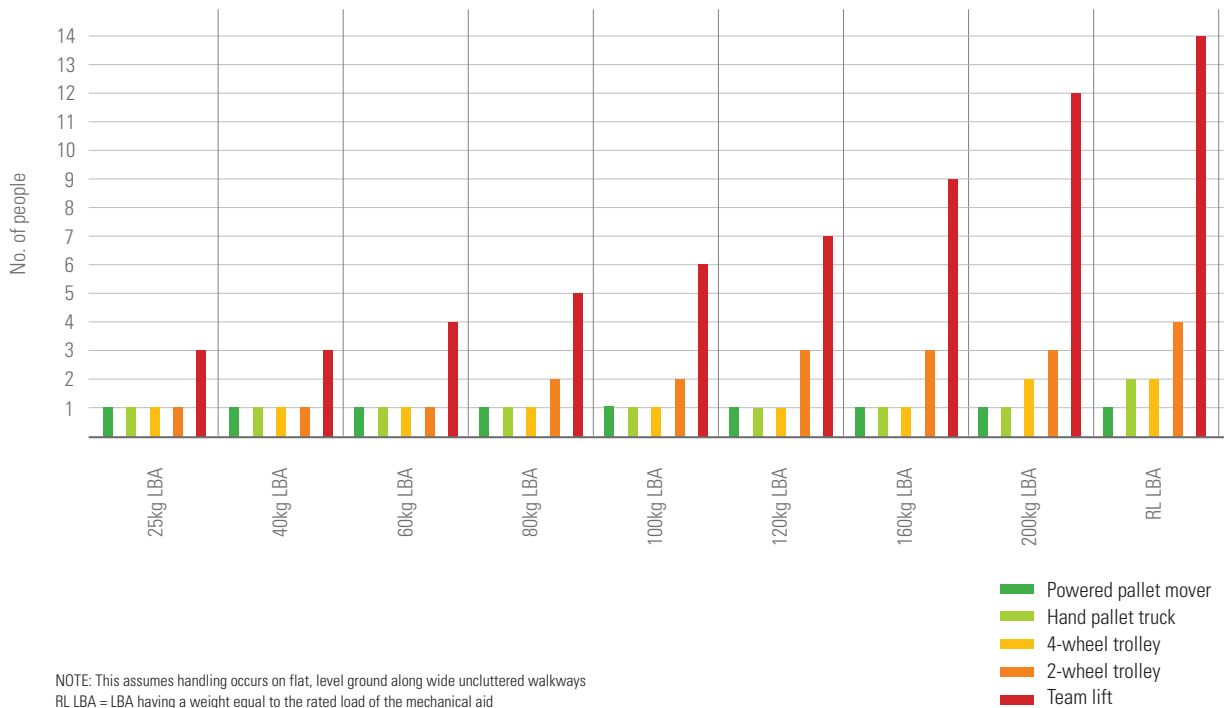
HANDLING AID SELECTION - FOR DISTANCES UP TO 30M

Large bulky or awkward items



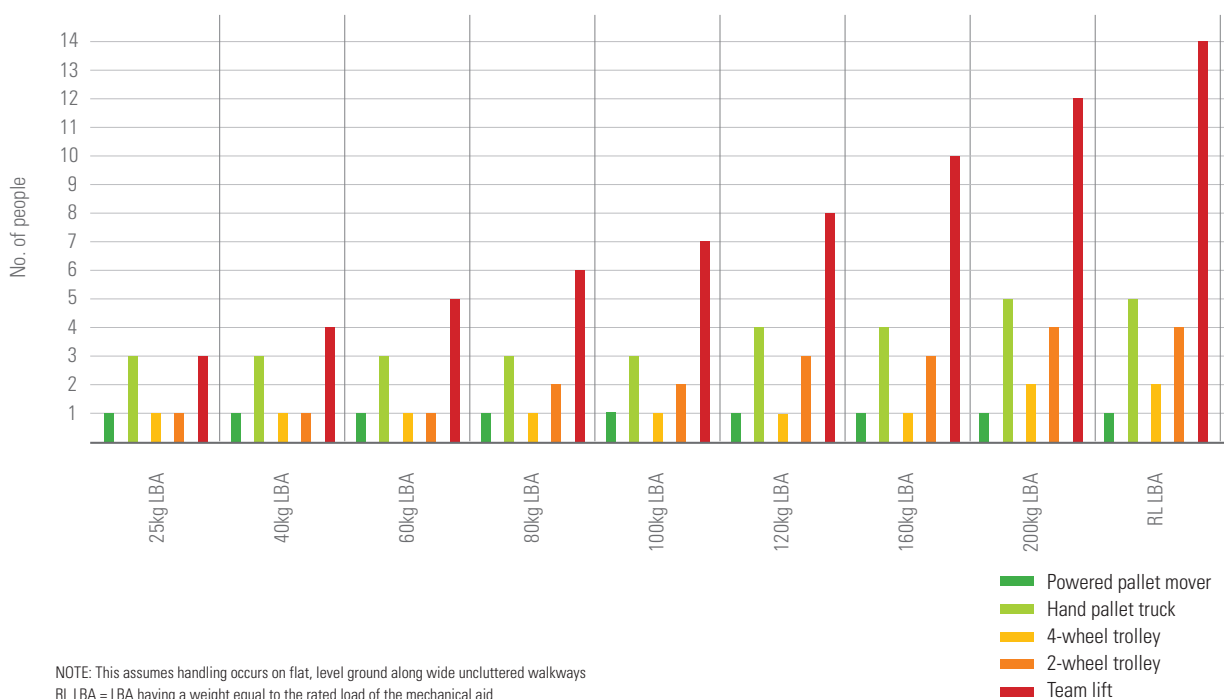
HANDLING AID SELECTION - FOR DISTANCES UP TO 50M

Large bulky or awkward items



HANDLING AID SELECTION - FOR 200 TIMES PER DAY

Large bulky or awkward items



APPENDIX 2 : TROLLEY DESIGN GUIDELINES

TROLLEY DESIGN GUIDELINES

The use of a hand truck, hand trolley or hand pallet jack for handling large, bulky or awkward items is not without risk. While these mechanical aids reduce the risk of a musculoskeletal injury arising from lifting and carrying these items, there is still a manual handling risk associated with pushing and pulling activities. There continues to be a high risk of a musculoskeletal injury if the mechanical aid is used on stairs or steep gradients, particularly if the item overbalances during handling. A risk exists of crushing the fingers and hands being caught between the mechanical aid and the item or other fixtures and items. There is also a risk to the toes, feet and lower legs of being hit or crushed by the mechanical aid.

Researchers have identified a number of key factors that must be considered when designing manual pushing and pulling tasks. Surprisingly, the weight of the load or equipment, though significant, is not as important as most people think. It is the horizontal push force that matters most, and with the right castor selection and job design, thousands of kilograms can be moved safely and efficiently.

Pushing is preferable to pulling for several reasons. You may, from your own experience, recall that your feet are often 'run over' by the equipment when pulling. If a person pulls while facing in the direction of travel, the arm is stretched behind the body, placing the shoulder and back in a mechanically awkward posture, increasing the likelihood of painful, debilitating, and costly injury. Alternatively, pulling while walking backwards is a recipe for an incident, as the person is unable to view the path of travel. Further, research demonstrates that people can usually exert higher push forces than pull forces. In some situations pulling may be the only viable means of movement, but such situations should be avoided wherever possible, and minimised when pulling is necessary.

To better understand the forces in a typical pushing/pulling task, imagine moving a trolley some distance, turning it around a corner, and then stopping and positioning it at the end of the route. There are four phases in this task:

- Starting or initial force
- Rolling or sustained force
- Turning force
- Stopping or positioning force

Starting or initial force

To start the motion, the operator must overcome inertial forces, friction forces, and any other mechanical/physical forces that may be due to such factors as flat spots on the wheel, debris or irregularities on the floor. If a castor is turned, additional resistance must be overcome until it aligns in the direction of travel. Under typical conditions, the force to initiate movement (the starting or initial force) is always higher than the force to sustain movement.

Rolling or sustained force

Once movement has started, the operator usually does not need to apply much, if any, acceleration. The inertial forces either go to zero or become low once moving at a relatively constant velocity. (Note: Any change in speed or direction means acceleration, so, if the operator tries to speed up, slow down, or turn, inertial forces will occur.) Once in motion, at a relatively constant speed and direction, the forces resisting movement are restricted to friction and physical interference from wheel or floor irregularities, and momentum tends to keep the equipment in motion.

Turning force

Two primary forces combine when the trolley is turned: inertia due to acceleration in a new direction and friction in the swivel housing and between the floor and the wheel. The trolley's momentum, which is related to its mass (weight), wants to carry it in the direction it was travelling, so the operator must overcome that by applying higher forces in the new direction. A well-designed and maintained castor will have low frictional resistance to turning at the bearings in the castor housing, so the real friction concern is related to any pivoting at the wheel-ground interface. Swivel castors are designed with an offset for this very purpose. Depending on the weight of the trolley, the speed at which it is turned, and the friction at the castors, the turning forces can be significant. The result is that an operator will need to apply new forces in new directions, often with awkward body postures and with high force exertions, which can increase the likelihood of injury.

Stopping or positioning force

If, at the end of the travel route, the operator can simply release the trolley and let it roll to a stop on its own, there is no need to apply any force. However, if it must be stopped or positioned in a specific place, the forces can be significant and in many directions in the case of positioning. Such forces can expose the operator to potentially hazardous postures and muscle exertions. Stopping, in terms of inertial forces, is the same as starting, but additional force is applied to decelerate, rather than accelerate. Positioning is a series of starting, stopping and turning forces, which are typically the highest force conditions required in a pushing task, and these are compounded if the space to position the trolley is restricted.

The following sites refer to Ergonomic Guidelines for Designing Trolleys:

Fallshaw – Designing Trolleys

www.fallshaw.com.au/designing_trolleys/designing_trolleys_index.htm

Darcor – The Ergonomics of Manual Material Handling – Pushing and Pulling Tasks

www.darcor.com/whitepaper/whitepaper.htm

The selection of an appropriate, well-designed mechanical aid to handle large, bulky and awkward items should take into account:

- Load characteristics (size, shape, weight, centre of gravity)
- Frequency of use
- Distances to be travelled
- Workplace layout (aisle width, type of flooring, gradient, floor condition)

A risk assessment of each mechanical aid will determine these factors. Consult with employees to find out what the problems are with the existing way the task is done and provide information about some of the options available.

APPENDIX 2

If a risk assessment has not been conducted then these general guidelines may assist in the selection of an appropriate mechanical (non-powered) aid for the large, bulky or awkward item:

HAND TRUCK (2-WHEEL TROLLEY)

- Load weight should be within the Rated Load (RL) of the particular trolley.
- Load should be stable and have a centre of gravity not higher than handle height.
- Keep the centre of gravity low by placing heavier items below the lighter ones.
- Load height should be such that the operator has clear visibility in the direction of travel.
- Place the load so that it will not slip, shift or fall, and secure it with straps if they are provided.
- Always wear safety footwear when using this equipment to move items.
- Distance to be travelled should not be greater than 35m without a break.
- Total distance travelled with a load should not exceed 100m.
- Path should be free of obstacles and be at least 1m wide.
- Load weight of one-person handling should not exceed 100kg so that for a load weighing 100 to 200 kg, two persons should handle the 2-wheel trolley.
- Push the load so that the weight will be carried by the axle and not the handle.
- Tip the load slightly forward so that the tongue of the hand truck goes under the load and then push the tongue of the hand truck all the way under the load.
- Do not walk backward with a hand truck unless going up stairs or ramps.
- When going down an incline, keep the hand truck in front of you so it can be controlled at all times.
- Move hand trucks at a walking pace.
- Hand truck should not be used by an employee more than 200 times per day.
- Store hand trucks with the tongue under a pallet, shelf or table.

HAND TROLLEY (3-, 4-, 5-, 6- WHEEL TROLLEY)

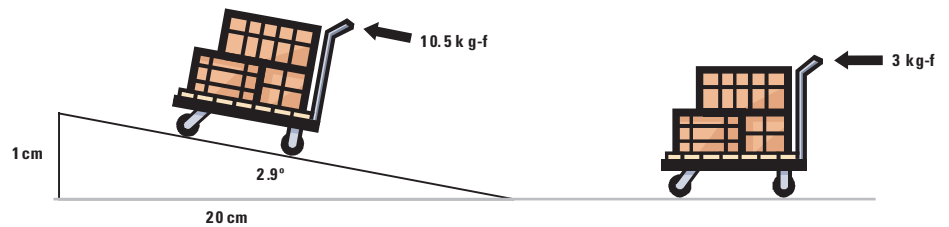
- Load weight should be within the RL of the particular trolley.
- Use a trolley that is designed in accordance with ergonomic guidelines.
- For 3-wheel trolleys, the load should be stable and have a centre of gravity not higher than handle height.
- Place the load so that it will not slip, shift or fall, and secure it with straps if they are provided.
- Always wear safety footwear when using this equipment to move items.
- Load height should be such that the operator has clear visibility in the direction of travel—if the view is obstructed, get a second person to assist.
- Load length should be such that the trolley and load are easily manoeuvrable, and can be readily stopped. Consider the use of two persons to handle trolley loads longer than 4m to minimise the risk of injury from the high force required to stop the load suddenly and maintain its stability should it come into contact with other persons, or fixtures or items.
- Total distance travelled with a load should not exceed 400m.
- Path should be free of obstacles and have good clearance for the trolley.
- Do not walk backward with a hand trolley unless going up ramps.
- When going down an incline, keep the trolley in front of you so it can be controlled at all times.
- Use a trolley fitted with brakes if required to stop on a ramp or regularly use a ramp.
- Move hand trolleys at a walking pace.
- Hand trolleys should not be used by an employee more than 200 times per day.
- Keep the starting forces below the range 17–21kg-force (kg-f).
- Ensure the rolling force does not exceed 12kg-f if the trolley is pushed more than 3m.
- Emergency stopping forces of more than 36kg-f should not be needed to bring the trolley to a stop within 1m.
- If trolleys are pushed up a slope, the load should be reduced so that the recommended rolling force limit is not exceeded. Table 1 shows calculated pushing force increases per 100kg of laden trolley weight on various slopes. These must be added to the pushing force needed on a level surface.

Table 1 – Increase in pushing force on various slopes

SLOPE GRADIENT	PUSH FORCE INCREASE PER 100 KG OF LADEN TROLLEY WEIGHT
1 in 10 (5.7°)	10.0 kg-force (kg-f)
1 in 15 (3.8°)	6.7 kg-f
1 in 20 (2.9°)	5.0 kg-f
1 in 30 (1.9°)	3.3 kg-f
1 in 50 (1.1°)	2.0 kg-f

APPENDIX 2

Example: If a trolley with a laden weight of 150kg requires a pushing force of 3kg-f on a level surface, it will require a force of 10.5kg-f ($3 + 5(150/100)$) to push it up a gradient of 1 in 20.



HAND PALLET JACK

- Load weight should be within the RL of the particular hand pallet jack.
- Load height should be such that the operator has clear visibility in the direction of travel. If the view is obstructed, get a second person to assist.
- Secure the load on a pallet or place it in a stillage so that it will not slip, shift or fall.
- Distance to be travelled should not be greater than 35m.
- Path should be free of obstacles and be at least 1.3m wide.
- If a T-handle is used, it should be long enough to protect the employee's feet from being struck by the pallet during pulling activities.
- If hand pallet jacks are pushed up a slope, the load should be reduced so that the recommended rolling force limit is not exceeded. Table 1 shows calculated pushing force increases per 100kg of laden trolley weight on various slopes. These must be added to the pushing force needed on a level surface.
- Do not walk backward with a hand pallet jack unless going up ramps.
- When going down an incline, keep the pallet jack in front of you so it can be controlled at all times.
- Use a hand pallet jack fitted with brakes if required to stop on a ramp or regularly use a ramp.
- Move hand pallet jacks at a walking pace.
- Start and stop the pallet jack gradually to prevent the load from slipping.
- Hand pallet jack should not be used by an employee more than 200 times per day.
- Keep the starting forces to the range 17-21kg-f or less.
- Ensure the rolling force does not exceed 12kg-f if the jack is pushed more than 3m.
- Emergency stopping forces of more than 36kg-f should not be needed to bring the hand pallet jack to a stop within 1m.
- Due to the wheel design, do not use hand pallet jack on gravel, damaged, or uneven surfaces.
- Always wear safety footwear when using this equipment to move these items.
- Never ride on hand pallet jacks.

Table 2: Trolley Selection Guide

An ergonomically designed trolley loaded to its RL will have a starting force not exceeding 21kg-f, a rolling force not exceeding 12kg-f, and an emergency stopping force not exceeding 36kg-f on a flat level surface.

TYPE OF ERGONOMICALLY DESIGNED TROLLEY	MAXIMUM LBA LOAD (KG)	MAXIMUM TRANSPORT DISTANCE (M)	MAXIMUM FREQUENCY OF USE IN 8H SHIFT	NUMBER OF PERSONS TO HANDLE TROLLEY
Two – Wheel hand truck	100	100	200	1 2 if poor visibility
Two – Wheel hand truck	200	35	50	2
Three – Wheel hand truck	RL	400	200	1 2 if poor visibility
Four – Wheel hand trolley or Five – Wheel hand trolley or Six – Wheel hand trolley	RL	400	200	1 2 if poor visibility 2 if long item
Hand pallet jack		35	200	1 2 if poor visibility
Electric pallet jack	RL	100	400	1
Electric walkie stacker	RL	100	400	1
Forklift	RL	400	400	1
Powered ride-on pallet mover	RL	400	400	1

APPENDIX 2

Force measurement

Force measurement can be easily done using a set of calibrated scales or a tension/compression measuring device (force gauge). The force can be measured by attaching a spring scale or force gauge to the trolley around waist height and pulling the trolley along a flat, level floor surface that is representative of the floor surface normally used. This area should be free of cracks or holes, as these may affect the readings and the wheels or castors should be positioned in the direction of travel.

The scales are pulled and two recordings are taken. The first is the force to start the trolley moving (starting force) and the second is the force to keep the trolley moving at a slow walking pace (rolling force). These measurements are repeated at least three times.

Alternatively, bathroom scales or force gauge can be used to push the trolley as described above and the readings taken.

References

Canadian Centre for Occupational Health and Safety – Ergonomics – Pushing and Pulling Handcarts

www.ccohs.ca/oshanswers/ergonomics/push2.html

WorkCover NSW – Guidelines for design and selection of trolleys

www.dir.qld.gov.au/design4health/pdfs/nsw_trolleys.pdf

Fallshaw – Designing Trolleys

www.fallshaw.com.au/designing_trolleys/designing_trolleys_index.htm

Darcor – The Ergonomics of Manual Material Handling – Pushing and Pulling Tasks

www.darcor.com/whitepaper/whitepaper.htm

The Eastman Kodak Company, Kodak's Ergonomic Design for People at Work, 2nd edn, John Wiley & Sons, Inc, New Jersey, 2004.

Kroemer, K.H.E. & Grandjean, E, Fitting the Task to the Human, 5th edn, Taylor & Francis, London, 2001.

Design features to improve safety and productivity

Incorporating height adjustability in the design of a trolley can have additional safety, ergonomic and productivity benefits.

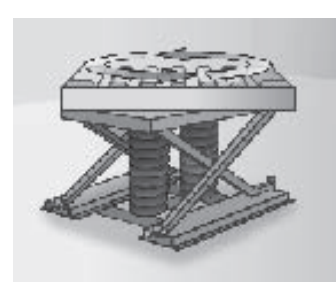
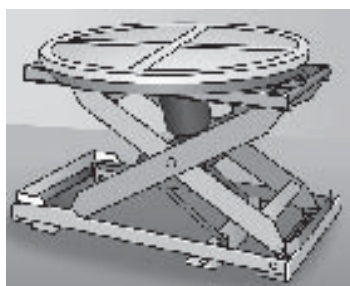
Lift tables, scissor lifts, trolley lifters, walkie stackers etc. incorporate height adjustability and allow items to be moved while close to the ground, thereby lowering the centre of gravity and so maximising stability. Height adjustability also allows items to be raised to comfortable ergonomic work heights.

Raising items using the trolley may eliminate the need to lift and place them as they could be more easily slid into position on a conveyor, bench or shelf, into the rear of a vehicle.

Tilting devices can be added so loads can be positioned both vertically and angularly. These trolleys can also include devices to assist horizontal movement, such as conveyors or ball transfers.

Lift tables, etc. may also be adapted by choosing from different power options. For example, lifts can be operated with electric or air-powered hydraulic pump units, pneumatic lift systems or full mechanical lift systems.

The design may also allow for numerous attachments and accessories to transport and position special work loads such as barrels, coils, rolls, etc.



APPENDIX 3 : TEAM LIFTING GUIDELINES

Team lifting

The capacity of the team in a team lift is less than the sum of the individual capacities of the members of the team.

In most circumstances, the capacity of a team during a lift is reduced by between 10 and 20 per cent for a two-person lift and by more than that for a team of three or more.

e.g. two-person lift with each person lifting 25kg in ideal conditions would mean that a total of 40kg load could be safely lifted.

Three-person lift..... 60kg load

Four-person lift..... 80kg load

(Reference: Code of Practice for Manual Handling No. 25, 20 April 2000)

Team lifting occurs when more than one person is involved during the lift.

- Use team lifting and carrying where other solutions are inappropriate.
- Remember that the combined strength of the team is less than the sum of individual strengths.
- Select team members of similar height and strength.
- Assign a leader to the team.
- Determine a set of commands to be used such as lift, walk, stop, down. Make sure that everyone knows what to do when they hear the command.
- Follow the commands given by the team leader.
- Practise team lifting and carrying together before attempting the task.

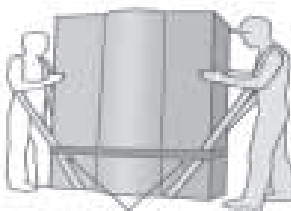
What should be done when lifting and carrying long items as a team?

- Use a shoulder pad to reduce compression.
- Carry load on the same shoulder.
- Walk in step.



What should be done when lifting and moving furniture as a team?

- Use straps.
- Adjust the length of the straps according to your height.
- Use webbing around straps to prevent them from slipping off.



Webbing to secure straps

What should be done when trolleying items as a team?

- Obtain assistance while loading a heavy item on to the hand truck.
- Use your body weight to tilt the item.
- Place the lip of the hand truck under the item.



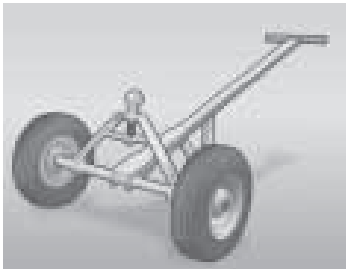
Tip the hand truck back with assistance.



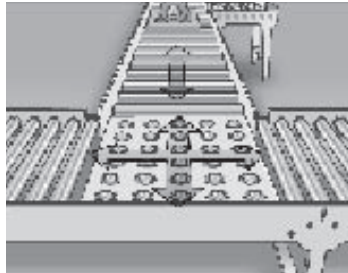
Move off. The assisting person directs the movement.



APPENDIX 4 : MECHANICAL AIDS



1. Trailer trolley (with towball)



2. Roller table



3. 4-wheel trolley



4. Heavy load (adjustable) trolley



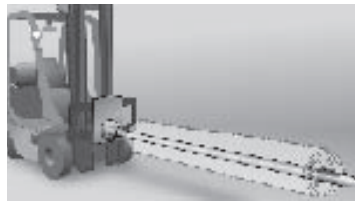
5. Fork spreader attachment



6. Carpet roll trolley



7. Leverage bar with rollers



8. Forklift with carpet prong attachment



9. Plasterboard stillage



10. Heavy load trolleys (with load)



11. 3-wheel hand trolley



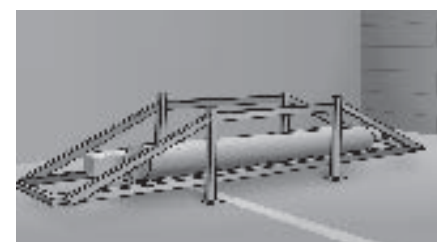
12. Hand trolley (3-or 2-wheel adjustable)



13. Customised furniture trolley



14. Magnetic lifter



15. Long item stillage



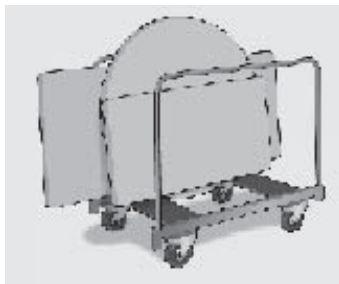
16. Forklift with grab attachment



17. 5-wheel trolley



18. Chair trolley



19. Customised furniture trolley



20. Portable load elevator



21. Chair trolley



22. Forklift layer picker (clamp)



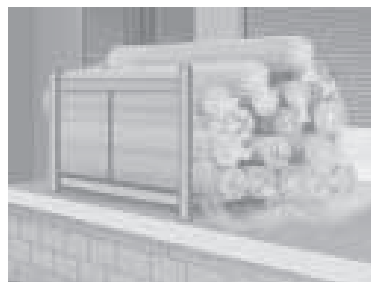
23. Order picking forklift with platform



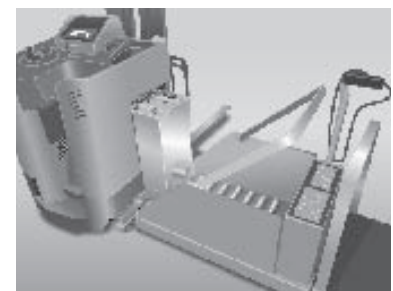
24. Forklift layer picker (vacuum)



25. Order picking forklift with height adjustable stillage



26. Stillage (with long items)



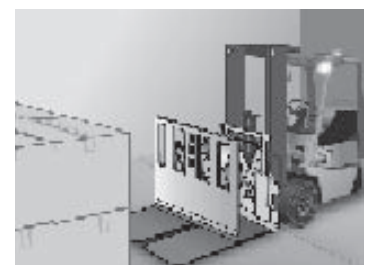
27. Forklift battery charger



28. Forklift with bale clamp



29. Magnetic 3-wheel trolley



30. Forklift with push/pull attachment

FURTHER INFORMATION

Acts and Regulations

Occupational Health and Safety Act 2004

Occupational Health and Safety (Manual Handling) Regulations 1999

Occupational Health and Safety (Prevention of Falls) Regulations 2003

Acts and Regulations are available from Information Victoria on 1300 366 356 or order online at www.bookshop.vic.gov.au. To view the legislation see www.dms.dpc.vic.gov.au, click on Victorian Law Today and scroll down to the Search window.

WorkSafe Victoria

As tasks and hazards will vary depending on the circumstances in your workplace, this Guide cannot and does not replace the requirement for conducting risk assessment and risk control under the *Occupational Health and Safety (Manual Handling) Regulations 1999*.

WorkSafe Victoria provides a range of supplementary information to help you in choosing appropriate risk controls for your situation.

Contact the WorkCover Advisory Service on 1800 136 089 or visit www.workcover.vic.gov.au

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WorkSafe Victoria

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Agent contact details are all available at worksafe.vic.gov.au/agents

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