

Racking & Warehouse Storage Guide



LINK51

The UK's
largest
manufacturer
of Pallet Racking,
Shelving and Lockers

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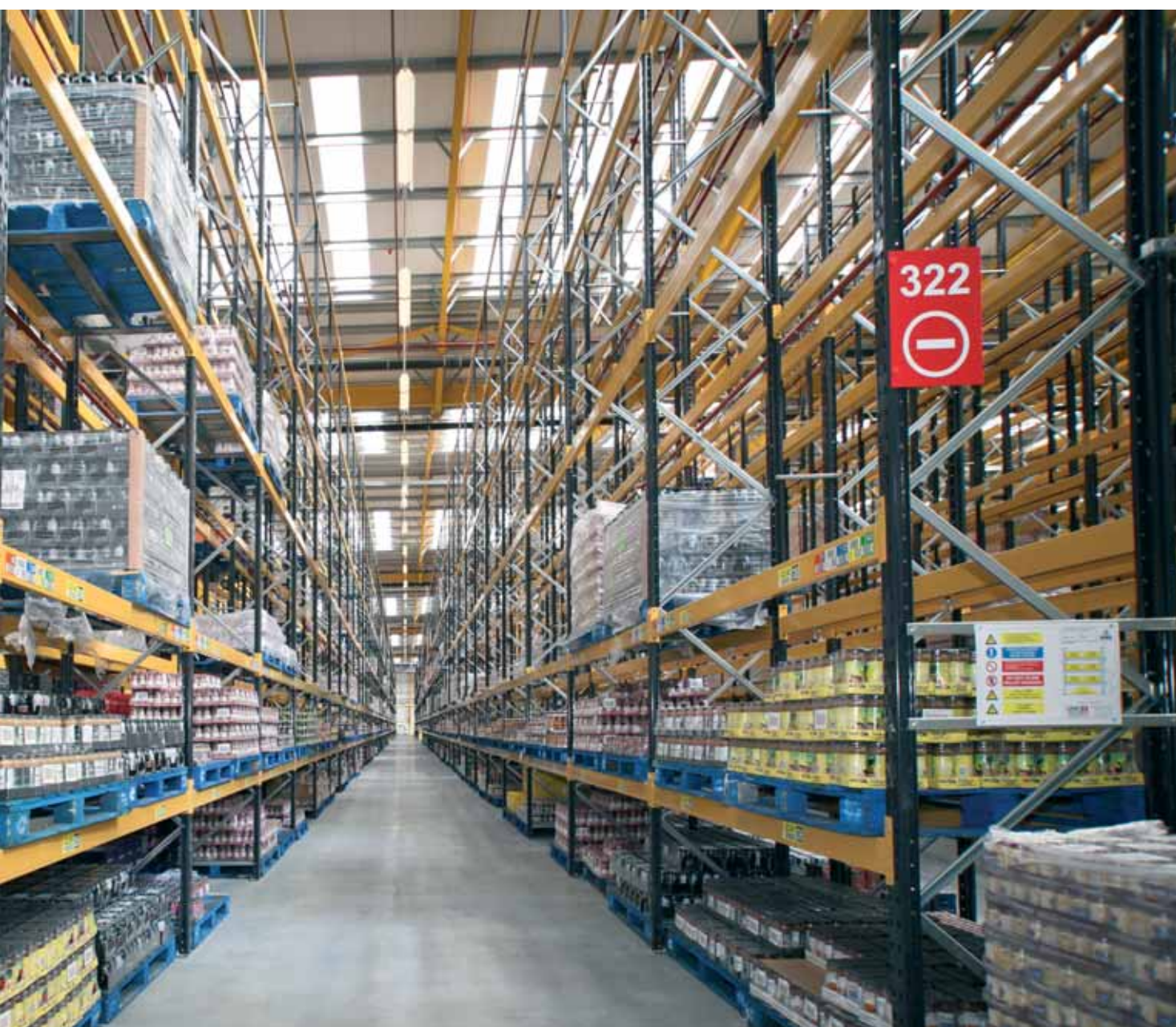
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**Creating the
perfect
storage
environment**



The efficient, safe design and use of pallet racking storage systems, pallets and materials handling equipment depends on a number of factors.

This guide is intended to give an indication of best practice and advice to anyone involved in the planning of a new warehouse or storage facility.

It is of equal value to the warehouse manager / operator for information on operation, maintenance and health and safety matters for those who may not be a specialist with regard to this type of equipment or in the detail design related to the storage facility.

Covering Industry and Technical Standards and relevant storage and warehouse legislation this guide is a handy reference tool for any personnel working within a warehousing/operations environment.

Warehouse and Storage Planning



Warehouse Planning Do's and Don'ts

Design from the inside, out

Warehousing is all about *efficient space utilisation and cost-effective materials handling*. These essentials must be considered first, *before* the building structure

- The roof is only there to keep out the weather!
- It is more economic to build upwards than outwards (per cubic metre of space)
- Think building volume, not floor area, in storage zones
- Think of the amount of activity that is to take place and ensure that adequate movement space is also provided
- Building related costs are often quite high, largely "fixed" and can literally become a "millstone around your neck" if you get your planning wrong!

Unitise and Standardise

Whether handling small parts, palletised goods, or large loads, make sure that you:-

- "Unitise" goods for ease of handling and storage
- Use industry-standard pallets and containers to eliminate double-handling, minimise the risk of product damage and make best use of space
- Minimise the number of different standard sizes and loaded weights of the unit load devices that you use in order to maximise flexibility
- Instruct your suppliers to use only those standard-sized units, in order to minimise transport and handling costs
- Work with your customers to deliver in standard unit load quantities and lot sizes, in order to minimise handling and delivery costs

Plan for Good Space Utilisation

Space costs money Use it wisely

- Use Pareto (A,B,C) analysis to categorise products according to their storage, handling and throughput characteristics
- Use the available building height to maximum advantage
- Select storage systems which offer
 - good space utilisation
 - good selectivity
 - stock rotation
- Select handling equipment which complements the storage systems and also facilitates good space utilisation (i.e. which will allow you to work with the narrowest practicable aisles)
- Remember, handling and storage equipment usually accounts for only a relatively small proportion of total warehousing costs. Investment in the right equipment can save a great deal more, both in terms of building costs, and labour costs

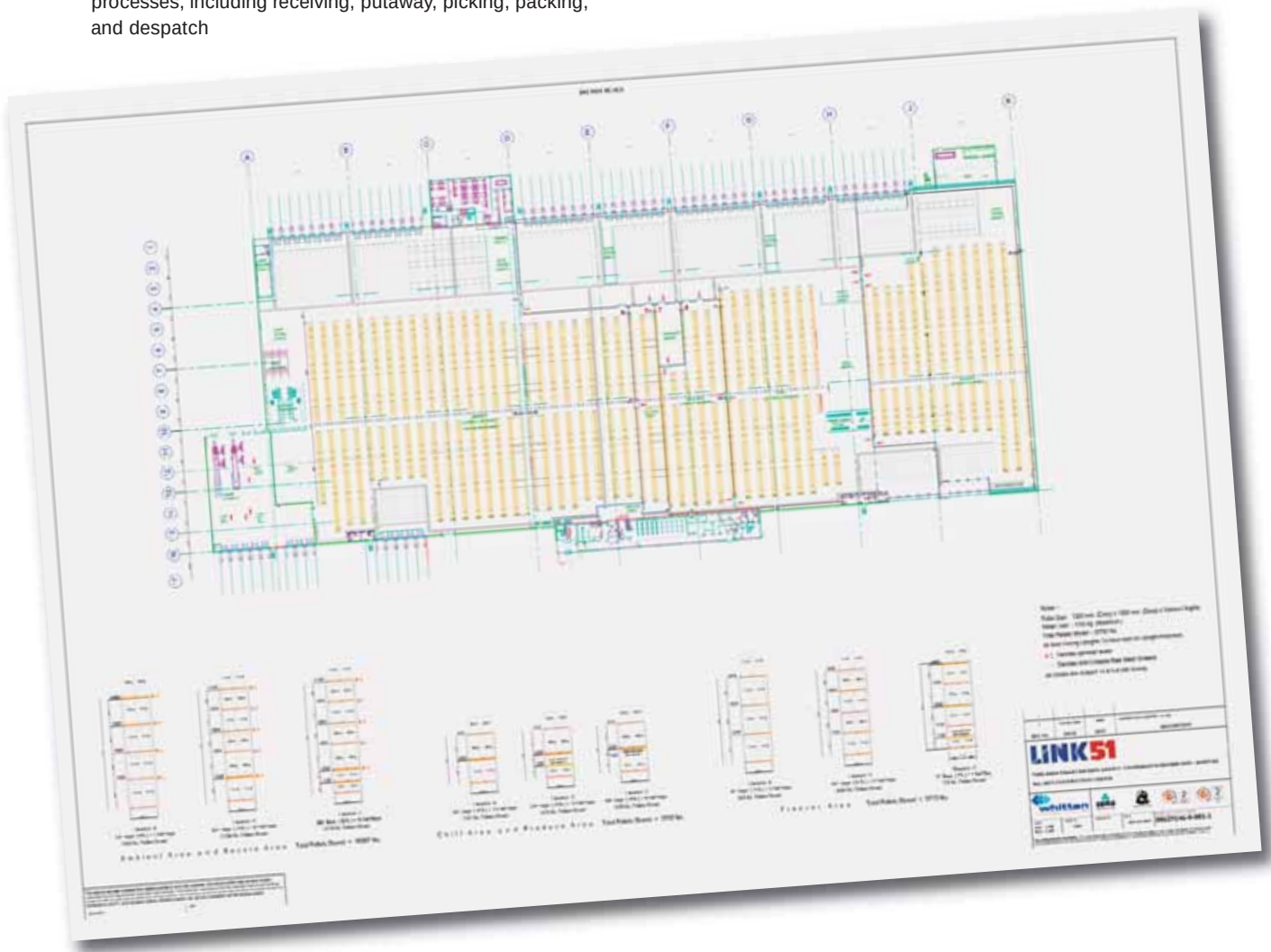
Plan for Efficient Materials Handling Flow

- Why meander when you can travel in straight lines?
 - Through-flow or 'U' flow?
- Plan flow-efficient layouts in terms of:-
 - stock layout (by product popularity or other appropriate grouping)
 - processes, including receiving, putaway, picking, packing, and despatch

- Select appropriate types of handling equipment according to:-
 - the types of load to be moved
 - the rates of movement
 - travel distances

Plan for Productivity

- Labour costs are usually controllable; therefore minimise them
- Benchmark your performance against "best in class"
- Focus on Order Picking – it can account for half or more of labour costs. Identify picking methods which:-
 - reduce picker travel distances
 - maximise accuracy
 - eliminate paper
 - encourage high productivity, or
 - bring the goods to the picker
- Introduce performance standards
- Monitor individual and group KPI's and performance
- Train staff
- Reward good performance



Specify the Umbrella

Prepare the building performance specification only after planning the storage and handling systems and internal layout.

Key items to specify, include:-

- Dimensions of the structural column grid
- Clear operating height from floor to top of the very top load
- Floor loadings, flatness and finishes
- Loading dock arrangements
- Mezzanine floors; heights, types and loadings
- Lighting levels, heating and environmental needs
- Fire protection and compartmentalisation
- Offices and employee amenities



Think outside the box – avoid congestion

At large D.C.'s over 60% of site area can be allocated to roadways, parking, and external activities. Make sure that:-

- The site has a secure perimeter
- Employee car parking is secure and separated from the main site
- Proper routes are defined and marked for commercial vehicles
- Adequate parking is provided for commercial vehicles and private cars
- All access and egress is controlled, security-wise
- Pallets, cages and waste are stored in properly designated, enclosed areas
- Pedestrian routes are safe and properly defined
- Plan to avoid congestion: Don't over-develop the site !!

Future Proof the Design

Business is Dynamic. Future-proof your investment, in terms of:-

- Process flexibility
- Process reliability
- Process resilience
- Reverse logistics
- Allowing for future changes in
 - business needs
 - product ranges
 - stockholding policy
 - customer demands
- Changes in handling and storage technology and Information Technology
- Ultimate property disposal



Planning your Racking & Storage

Matching business needs with the appropriate pallet racking system is critical and entails asking the right questions as well as providing flexibility in solutions that can accommodate variables such as capital resources, anticipated growth and variable product lines.

Choosing the right storage system involves a solution process, and that begins with considering the flow of merchandise. That will dictate your density requirements – how “tightly” the merchandise should be stored. From that key decision follows a series of specifications: the material and type of racking, pick systems, ancillary material handling etc.

Warehousing with high density storage solutions usually have large or complete turnover of inventories during specific intervals or seasons. Merchandise could be stored in large bays with a few access aisles to maximise floor space.

Conversely, lower density warehousing is appropriate for parts or retail distribution centres where customer orders are picked continuously to fulfil Just In Time (JIT) requirements.

Storage Analysis & Planning

The data collection stage of the design process defines data requirements and results in the development of two “Planning Bases”.

1. Today's picture of flows and quantity movements.
2. Tomorrow's requirements, which may show the transitional steps at specific time-points where significant events are expected to take place e.g. new product launches or new contracts expected / lost.

In almost all circumstances it is important to gain an understanding of the following;

- How are the goods received and in what volume? How are they expected to be received and to be stored and put away – and at what rates and volumes?
- Which product lines are expected to be held as stock – together with the physical characteristics for each stock keeping unit (SKU) passing through the warehouse?
- What volume of goods needs storing in each of the family or sub groups?
- What are the typical order profiles (analysed by division and family groups or sub groups)? Must orders be checked and/or repacked? What is the work content and physical volume to be handled in each task area?
- Must goods be staged if they cannot be direct-loaded? What is the quantity of inbound and outbound vehicles the facility will need to provide for within the warehouse area (for undercover loading) and within the yard, including any stand trailers or containers? What additional yard space should be allocated to product handling equipment, such as pallets, and should these be of a consistent size for ease of operating the warehouse?

What effect do days of the week or month or other seasonal factors have on the throughputs and inventory levels?

There are two basic data collection tasks that almost always apply:

- Storage Analysis and;
- Movement Analysis

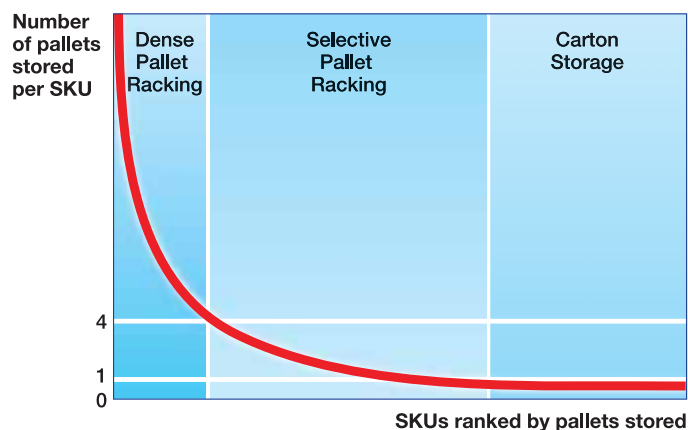


Figure 1.1 Storage Analysis Graph

Storage Analysis

Defining the right balance between the conflicting objectives of efficient storage and frequent order accessories (picking slot visits) is a key part of the decision process. This balance can only be achieved after proper analysis of product lines to be stored and the rates at which they have to move through the warehouse. In this regard compilation of ranked product storage and ranked product movement rate data is invaluable.

To demonstrate this in graphical form, the storage analysis graph in Figure 1.1 shows the number of pallets to be stored for each line. This information combined with the total quantity of pallets or units to be stored, provides a very good guide in the selection of storage systems.

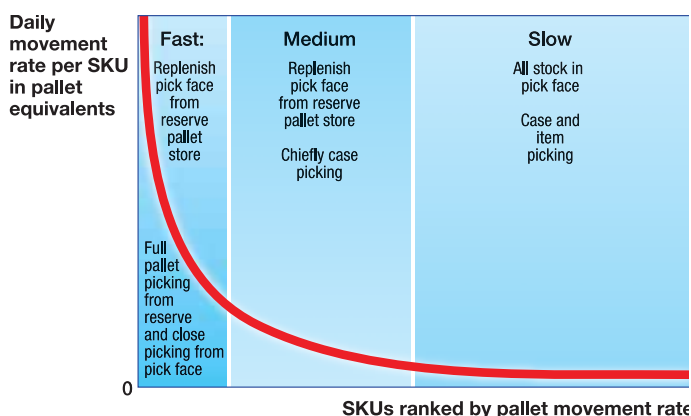


Figure 1.2 Typical product movement graph

Movement Analysis

A movement graph, as illustrated in Figure 1.2 shows the rate at which each product line moves through the warehouse with indications of whether it moves out in pallet or carton quantities. This provides further guidance to the selection of storage system and the most appropriate handling equipment and, in particular, the order picking system.

In a small operation this information may be observed manually. As the size and complexity of the warehousing requirement grows, the only practical way to define requirements is to collect data in electronic form and develop a database, allowing the data to be manipulated as required. Typical measures would include number of pallets per day, (e.g. number of picks or order lines per day), based on known ratios or validated assumptions.

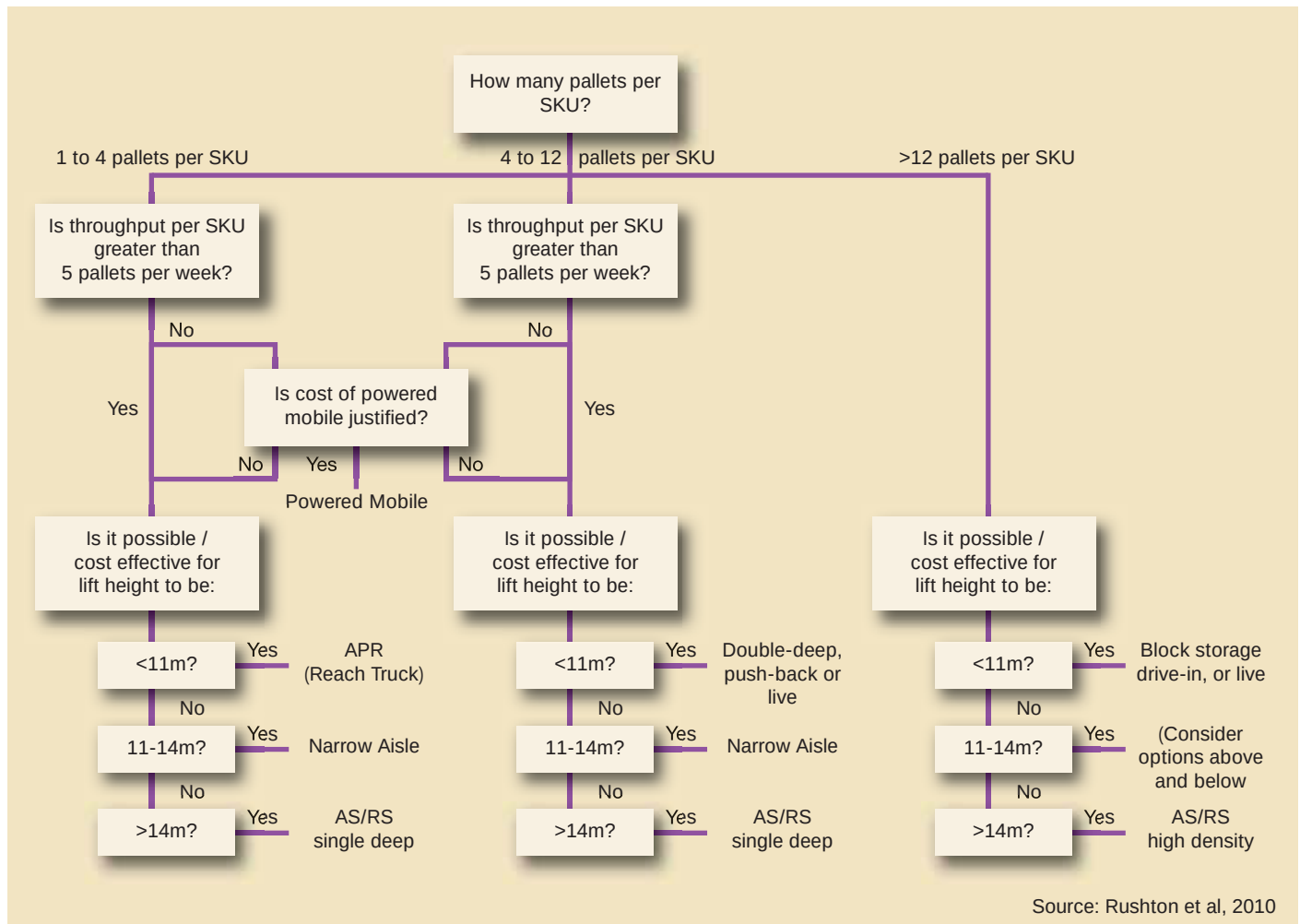
Planning the building footprint & layout

Critical components of a building footprint as it relates to pallet racking are;

- Building column layout
- Building clear height (usable vertical space below the roof or ceiling)
- Overall square footage
- Permanent and semi-permanent obstructions (offices, sprinklers, lighting etc.)
- Simplicity of building layout (a rectangular building is typically more conducive to efficient storage design than one that has large square footage through multiple build outs)
- Dock door placement
- Safety requirements (egress paths, forklift aisles etc.)

Decision Tree

Decision tree below describes the key influencing factors to enable focus on decision areas.



Storage Capacity and Racking Applications

Storage Capacity Calculator

This guide is to give an indication of the number of pallet positions available in a given space depending on the type of pallet racking storage system used.

The two charts give an estimate of the number of pallets that can be stored in a warehouse space for the 2 most popular pallet sizes, 1200 entry x 1000 and 1200 x 800 entry pallet.

How does it work?

Example

For 1200 entry x 1000 pallets in a 3,000m² warehouse using Standard Aisle Pallet Racking

Find 3,000 on the bottom of the chart, then follow the vertical line up to the point where it meets the diagonal line for Standard Aisle Pallet Racking.

At this point follow the horizontal line back to the left hand side; this will be the number of pallets per level. So, for Standard Aisle Pallet Racking in a 3,000m² warehouse there will be 750 pallet positions per level.

Further guidance

How many levels will there be?

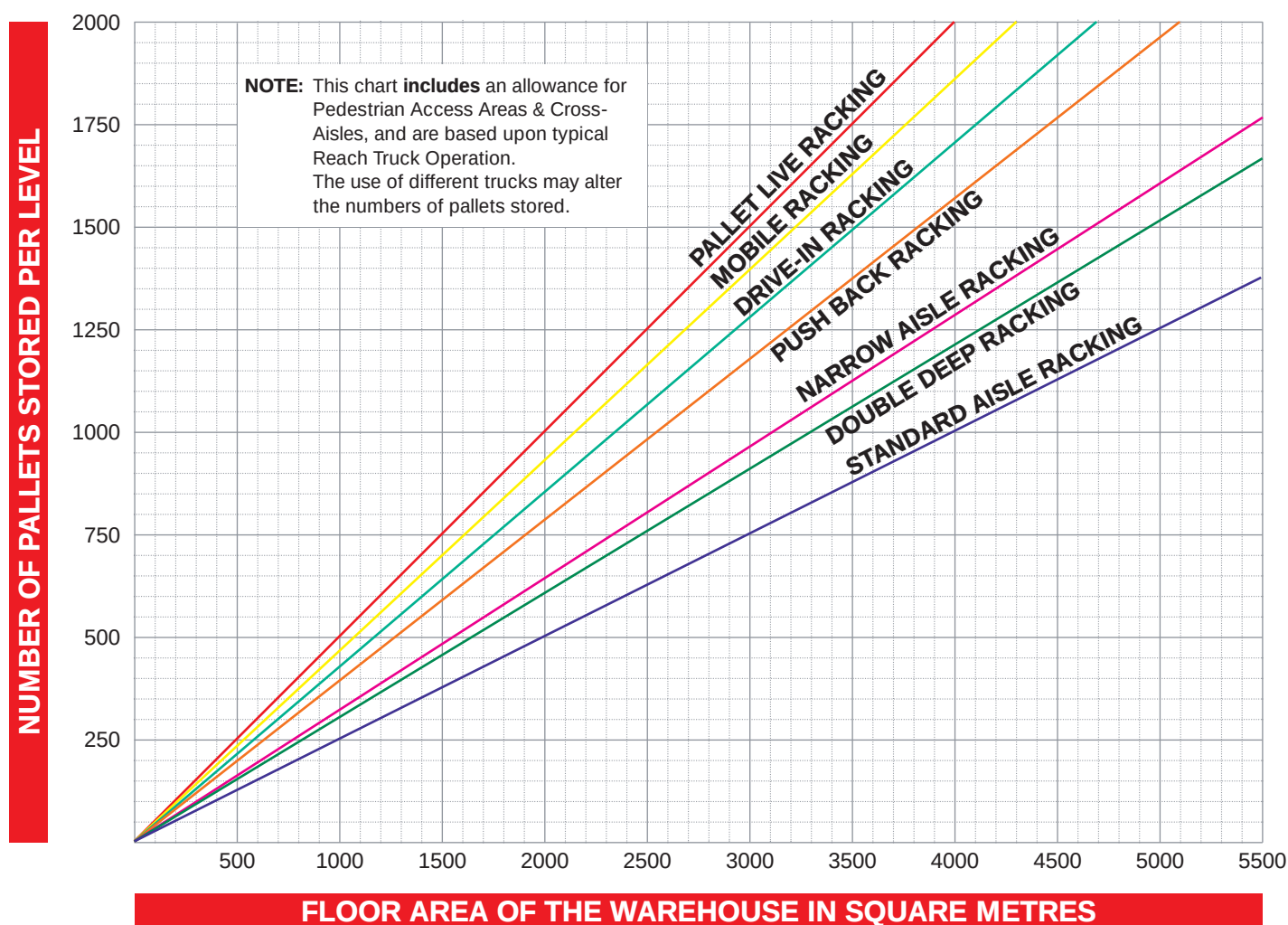
- The following details will help to determine the number of pallet levels: -

The height of the pallet

The height of the building

The lift height/capability of the fork lift truck

Pallet Size 1200 x 1000mm



How will the warehouse operate?

The throughput of the pallets should also be considered. For example some of the higher density systems may limit access to stored pallets.

General guide

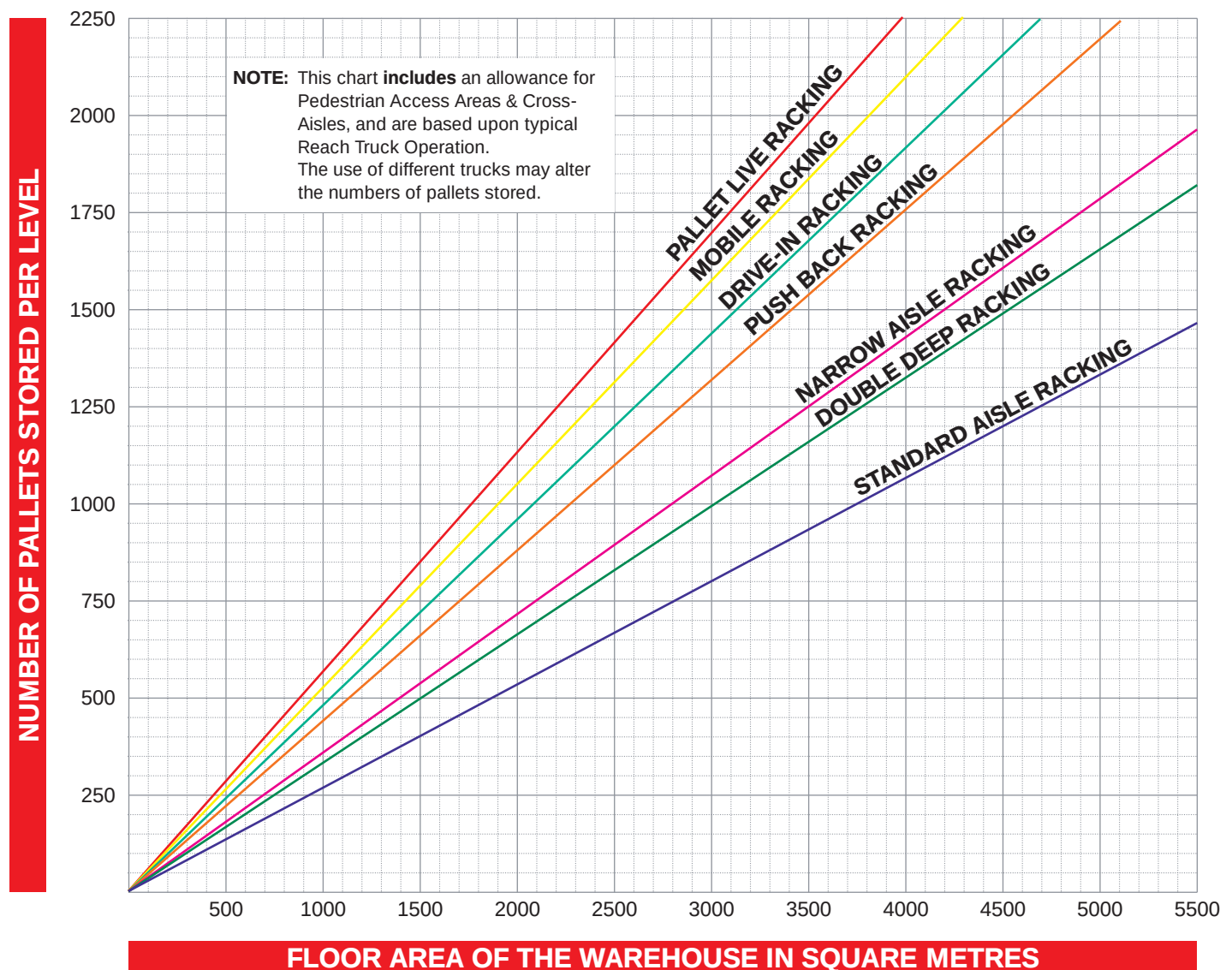
● Standard Aisle Pallet Racking	100% access to every pallet
● Standard Aisle Double Deep	FILO (First In Last Out)
● Narrow Aisle Pallet Racking	100% access to every pallet
● Push Back	FILO (First In Last Out)
● Drive In	FILO (First In Last Out)
● Mobile	100% access to every pallet
● Pallet Live	FILO (First In Last Out)

For larger schemes a combination of pallet racking systems may offer the optimum solution. The charts are for general initial guidance only. A full review of the storage requirements should be carried out with the storage supplier for the best results.

Full details of all applications are highlighted on pages 11 to 38.



Pallet Size 1200 x 800mm



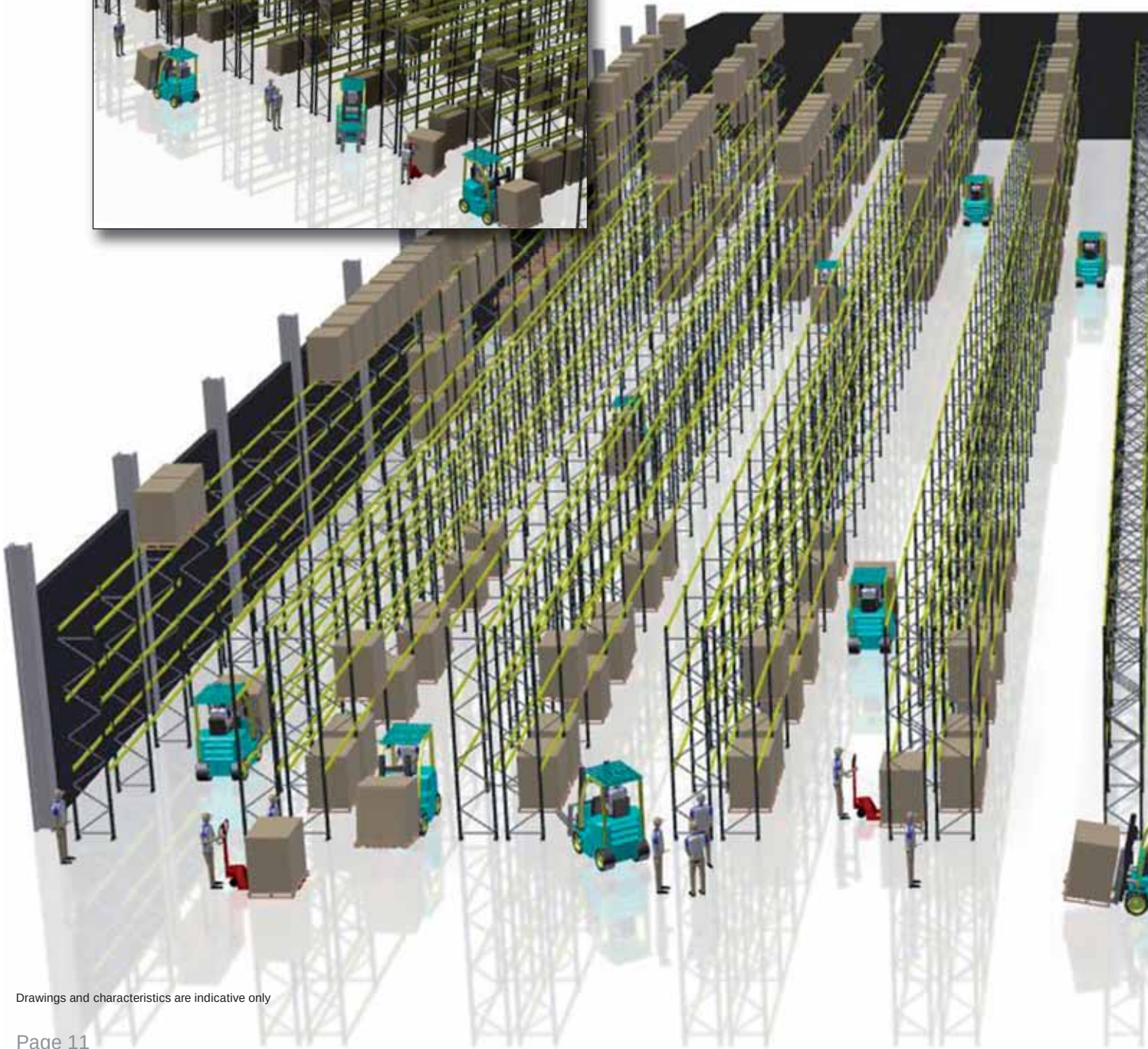
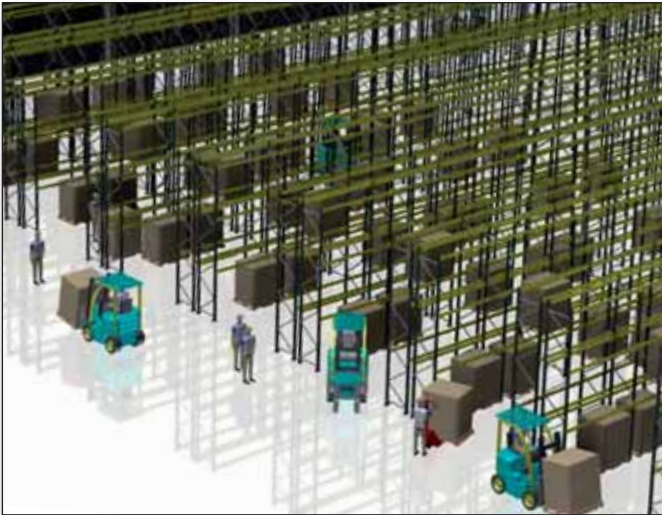
Adjustable Pallet Racking

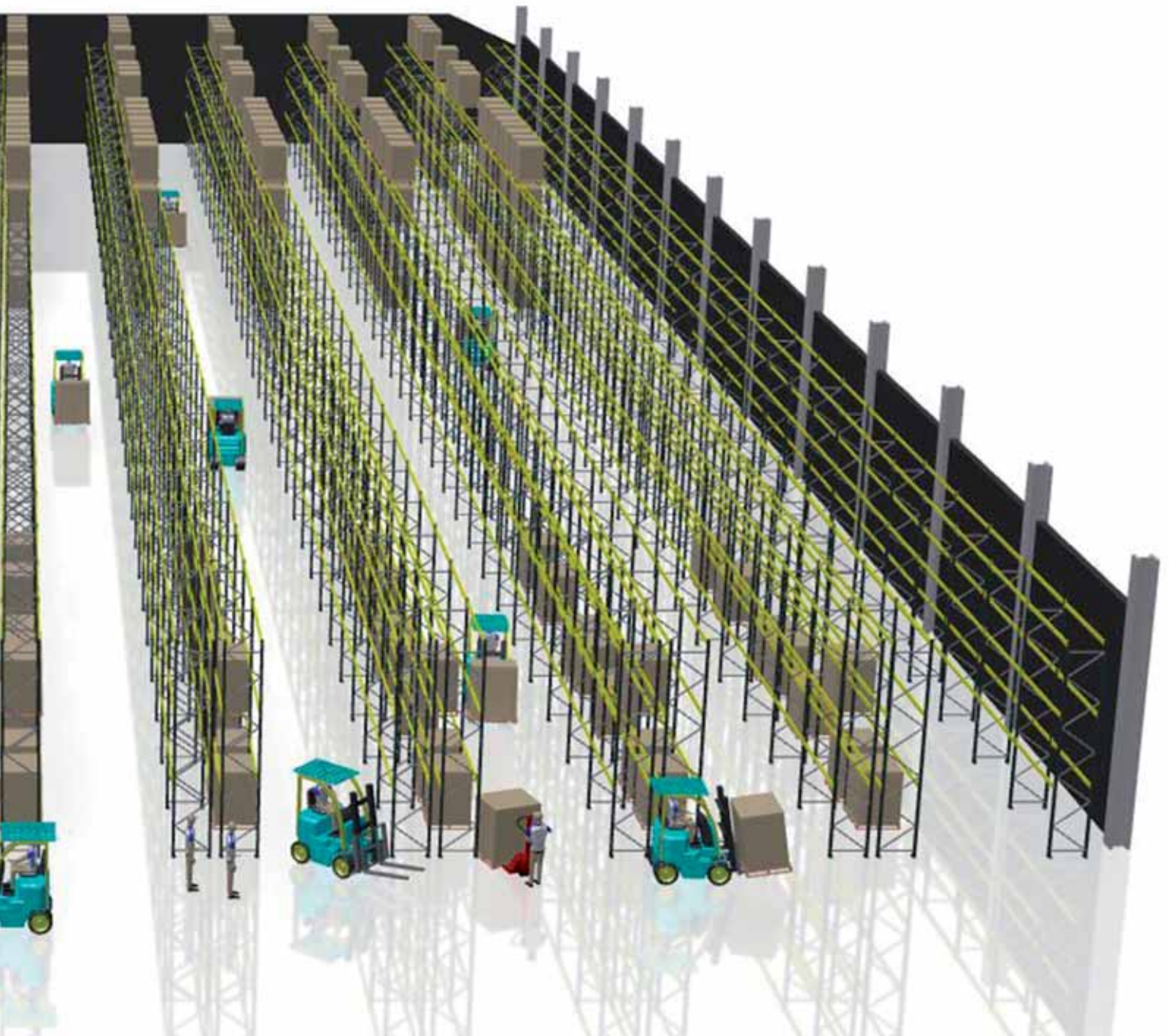
Easily installed, cost effective and versatile, adjustable beam racking is the most widely used of pallet storage systems and allows 100% direct access to each pallet stored.

With adjustable beams, racking can be re-configured to accommodate changes in the type of goods stored and wide aisles allow access by all types of truck, making specialised handling equipment unnecessary. Although racking is adjustable, once the beams are slotted into position in the frame uprights, an inter-locking structure of great strength and rigidity is maintained.

Features check list

Space utilisation of floor area	✓✓✓
Utilisation of cubic storage space	✓✓✓
Access to individual pallet loads	✓✓✓✓✓
Speed of access & throughput	✓✓✓
Efficiency in stock rotation	✓✓✓
Efficiency in stock control	✓✓✓✓
Specialised handling equipment	None required
Ease of re-location	✓✓✓✓✓
Ease & speed of installation	✓✓✓✓✓
Adjustability of beam positions	✓✓✓✓✓







Case Study

Tesco Distribution Centre - Middlesbrough

Standard aisle pallet racking installation for non-food products.

- 56,000 pallet positions – sufficient to accommodate 10,000 individual electrical, home ware and cook shop lines
- Top beam height of 12.5 metres
- The layout has also been configured to ensure that movement of the 32 forklift trucks and 128 order pickers is as efficient as possible around the site
- Aisle widths of 3.2 metres have thus been specified to allow 2 trucks to pass
- Site operates 24 hours per day, 7 days per week and receives some 60% of its incoming loads on container from the adjacent docks



Double - Deep Pallet Racking

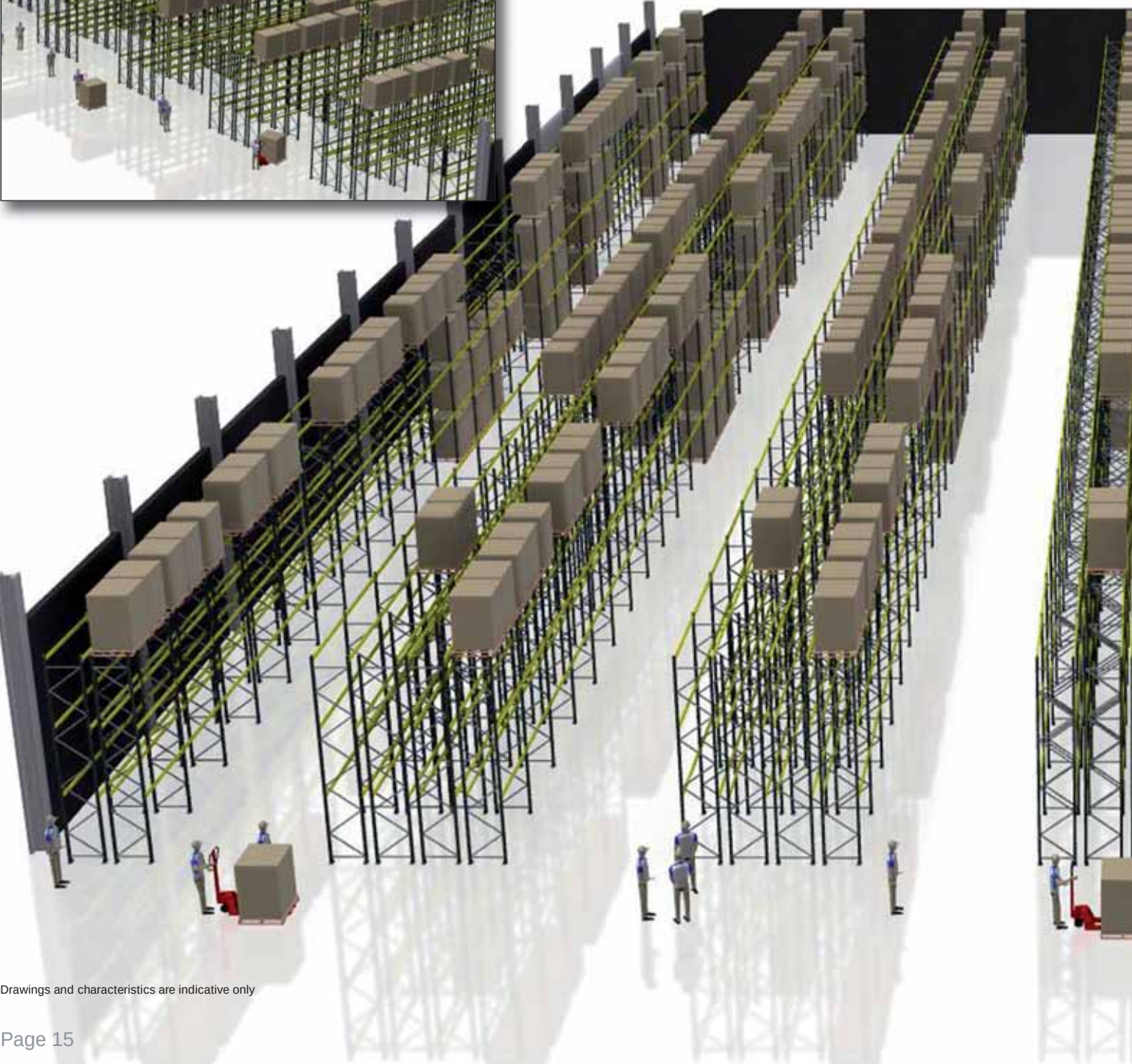
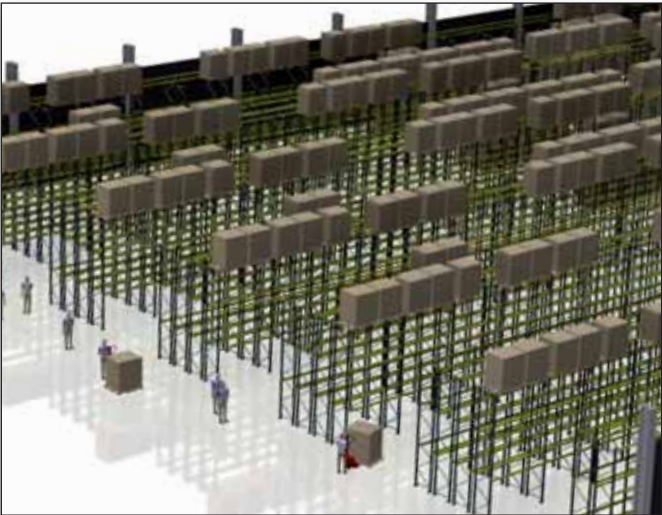
A variant on standard adjustable beam racking, Double-deep pallet racking, as the name implies, allows pallets to be stored two deep but still accessible from the same aisle.

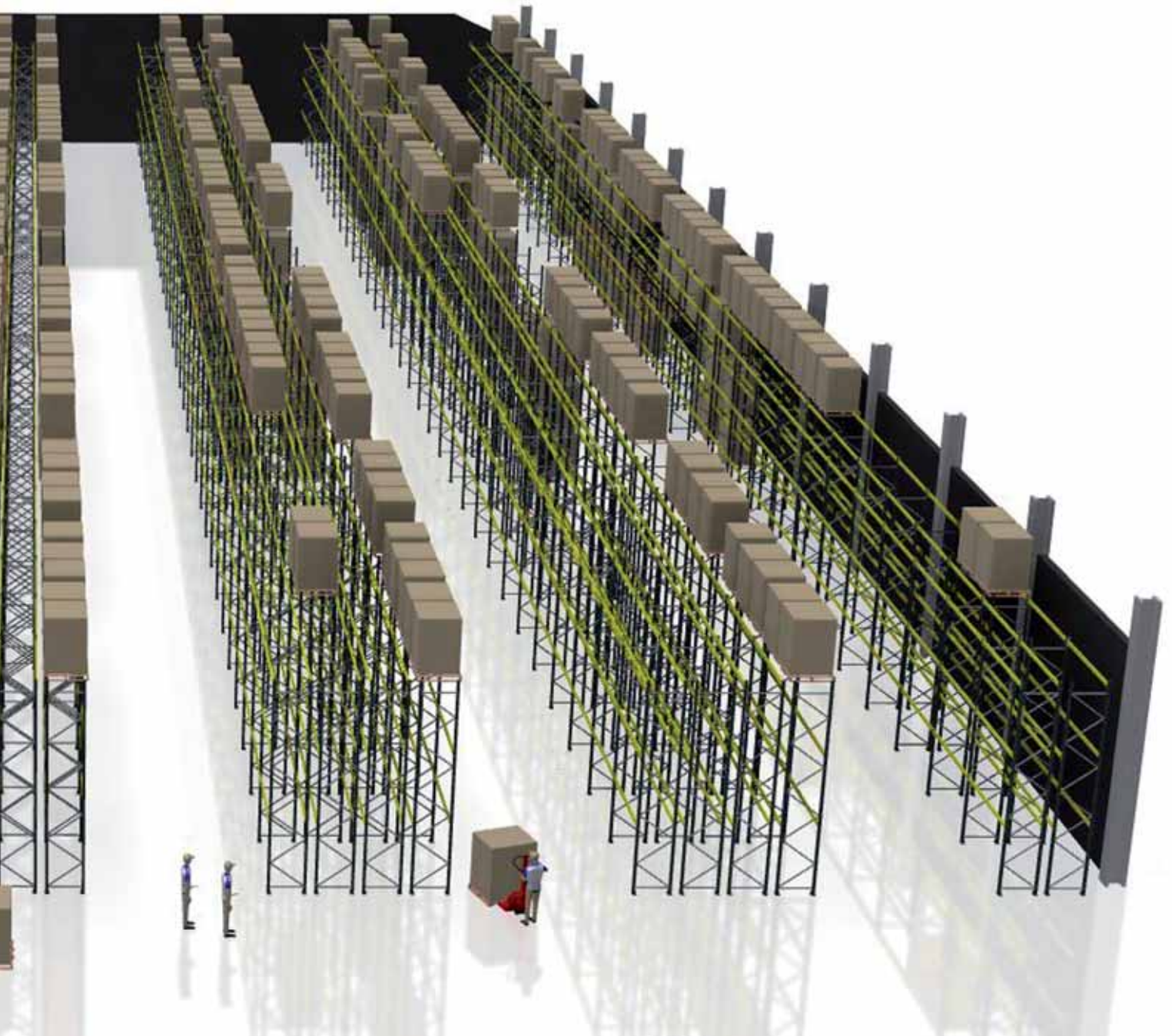
By reducing the number of access aisles and using the space saved to accommodate additional racking, a Double-deep configuration provides a highly space-efficient storage system.

Although the speed of access to all of the pallet positions is restricted, with an efficient stock management system this can easily be compensated for to take advantage of the benefits of more storage space.

Features check list

Space utilisation of floor area	✓✓✓✓
Utilisation of cubic storage space	✓✓✓✓
Access to individual pallet loads	✓✓✓
Speed of access & throughput	✓✓✓
Efficiency in stock rotation	✓✓✓
Efficiency in stock control	✓✓✓
Specialised handling equipment	Required
Ease of re-location	✓✓✓
Ease & speed of installation	✓✓✓✓
Adjustability of beam positions	✓✓✓✓





Case Study

TDG Distribution - Manchester

Double-deep bulk storage and push-back picking facility for cereal manufacture and distribution.

- Bulk storage of finish cereals and raw foods
- Finish cereals are stored as shrink wrapped double stacked pallets
- Configuration of the racking allows for the double height pallets
- Raw foods such as apple sauce are held in bulk ready for call-off into the factory
- The site handles 50 containers a day through 28 loading docks
- Racking system supports the fire sprinkler system





Narrow Aisle Pallet Racking

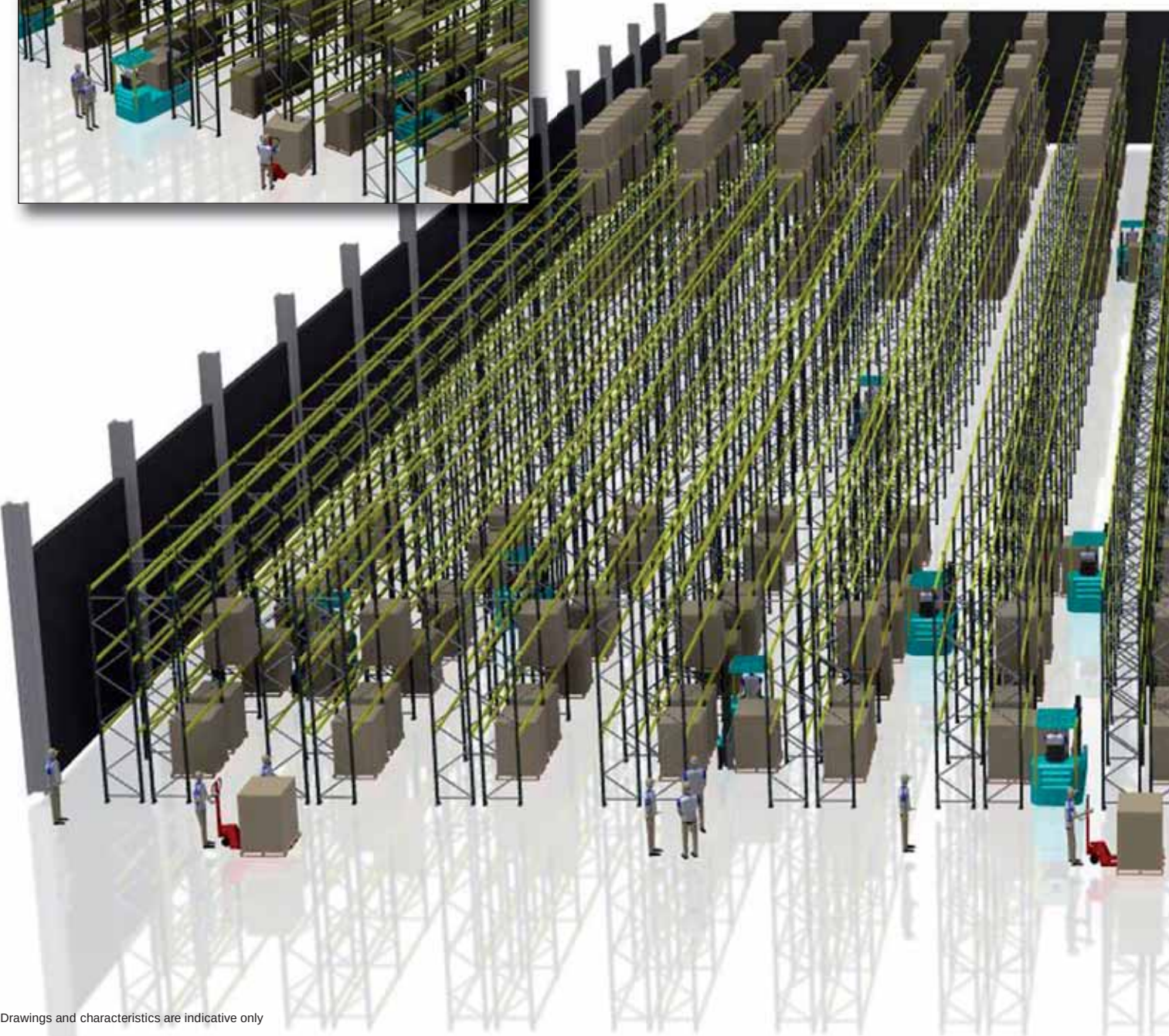
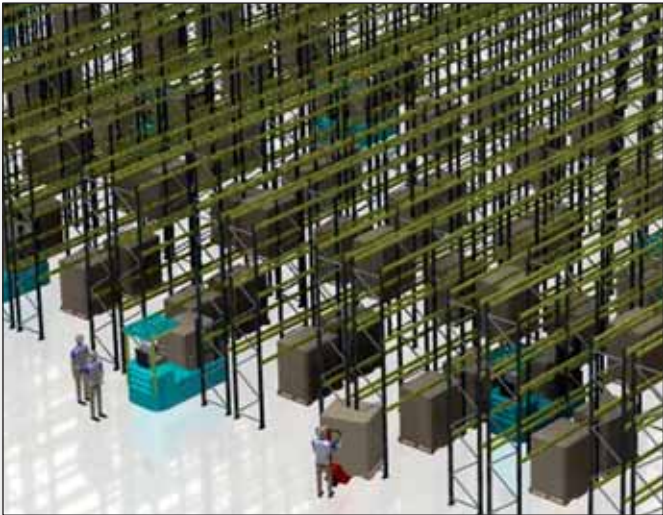
By allowing fork lift trucks to operate in aisles of up to half the width required in conventional adjustable beam pallet racking,

Narrow aisle racking makes excellent use of floor space and maximizes the height at which goods can be stacked. Using specialised lift trucks in either ' man-down' or ' man-up' variants, narrow aisle racking is precision designed for safe, efficient load handling within the tight confines of these space-efficient aisles.

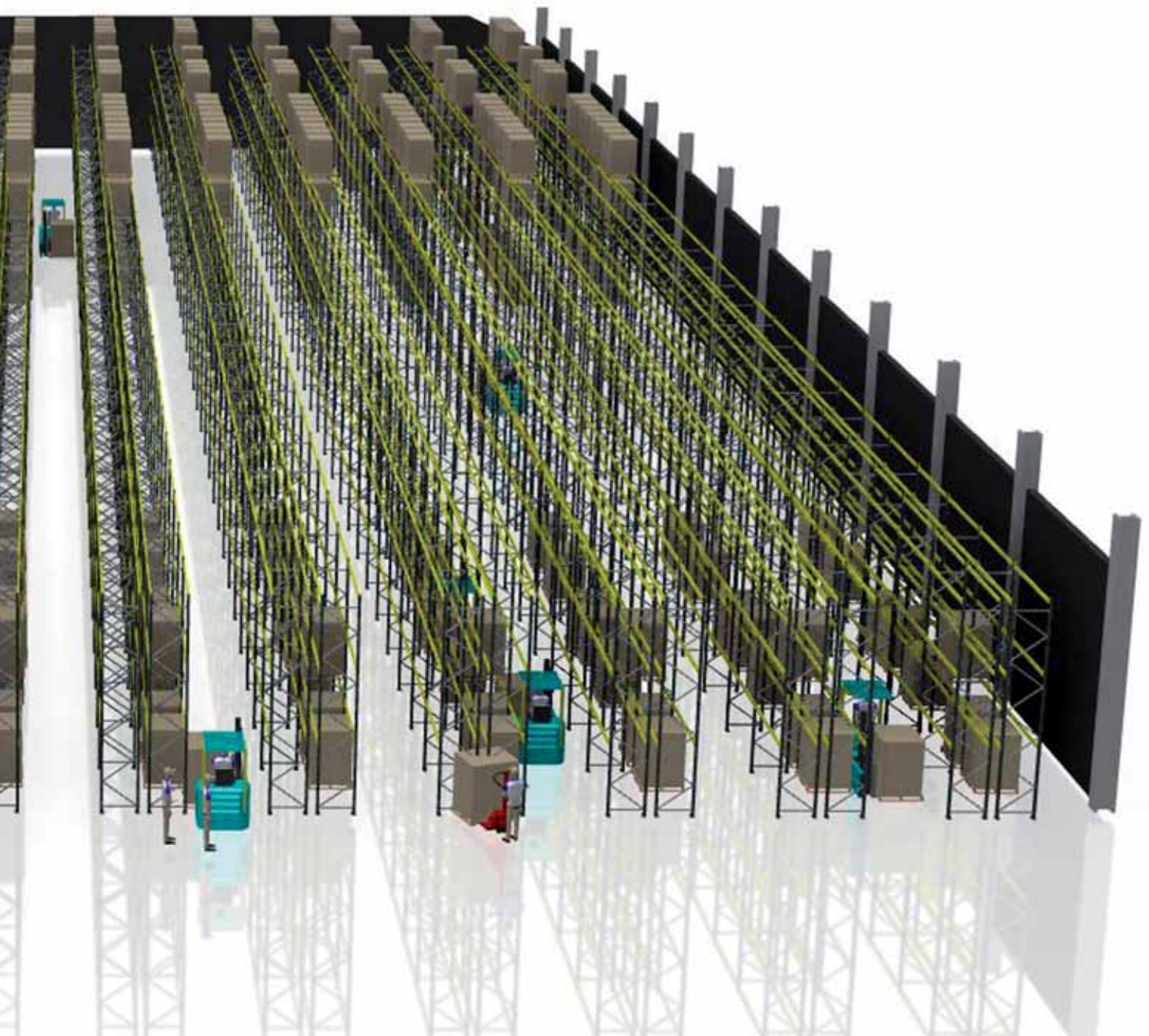
Fitted with guidance rails or wires at floor level, trucks are precisely guided into position, thereby improving safety, whilst minimising the incidence of accidental damage to racking and improving the speed and accuracy of load handling.

Features check list

Space utilisation of floor area	✓✓✓✓✓
Utilisation of cubic storage space	✓✓✓✓✓
Access to individual pallet loads	✓✓✓✓✓
Speed of access & throughput	✓✓✓✓✓
Efficiency in stock rotation	✓✓✓✓✓
Efficiency in stock control	✓✓✓✓✓
Specialised handling equipment	Dedicated trucks
Ease of re-location	✓✓✓
Ease & speed of installation	✓✓✓
Adjustability of beam positions	✓✓✓



Drawings and characteristics are indicative only







Case Study **Triumph Motorcycles - Hinckley**

Narrow aisle centralised storage facility for finished products.

- Racks provide storage for 7300 finished units as well as manufacturing components such as wheels and tyres
- Bays accommodate 2 Euro pallets or a single finished motorcycle on 7 levels high
- Pallet racking utilises specially designed skids to allow tyre stillages to be positioned directly into the racks
- Site operates wire guided man-up order picker and counter balance trucks



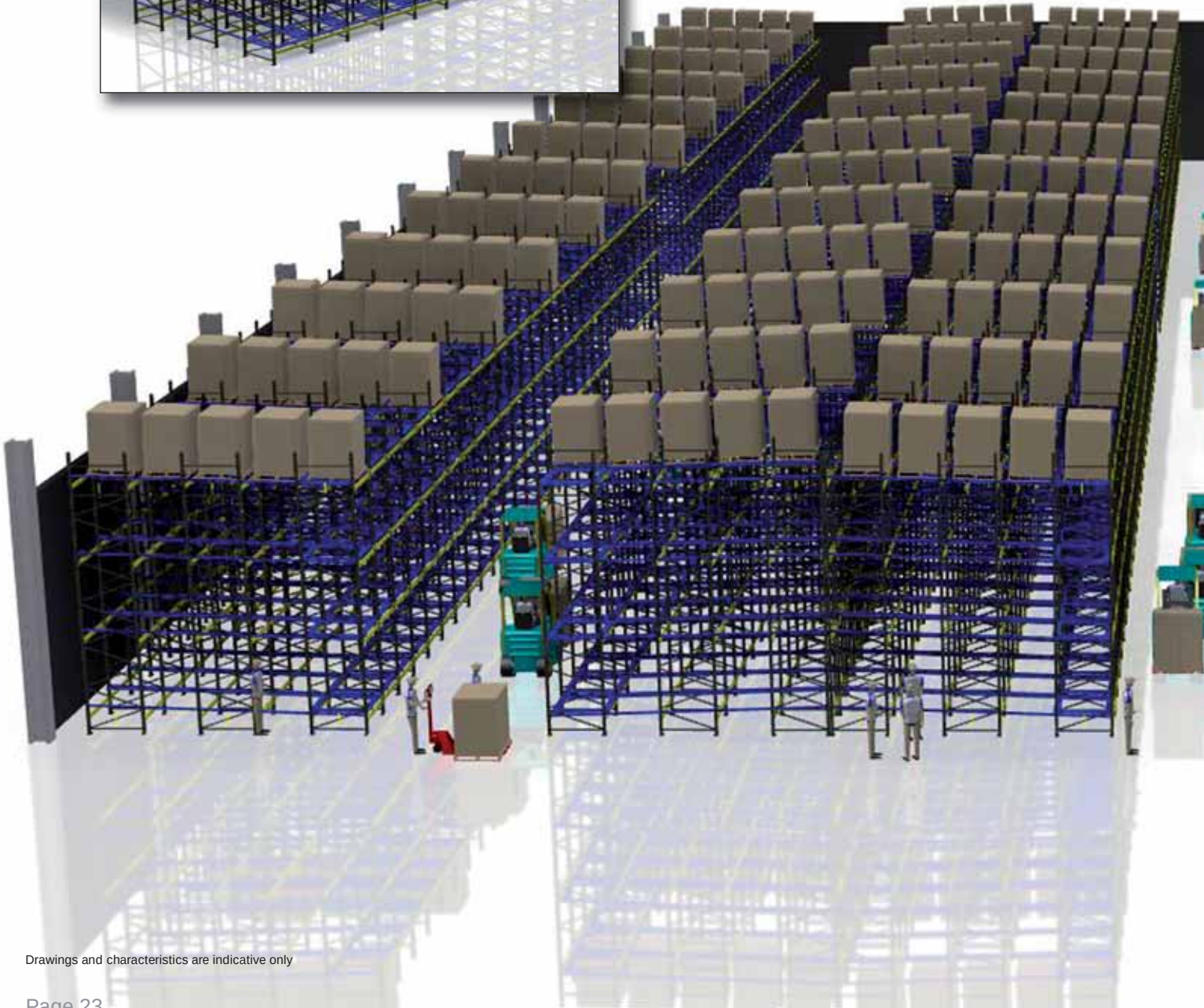
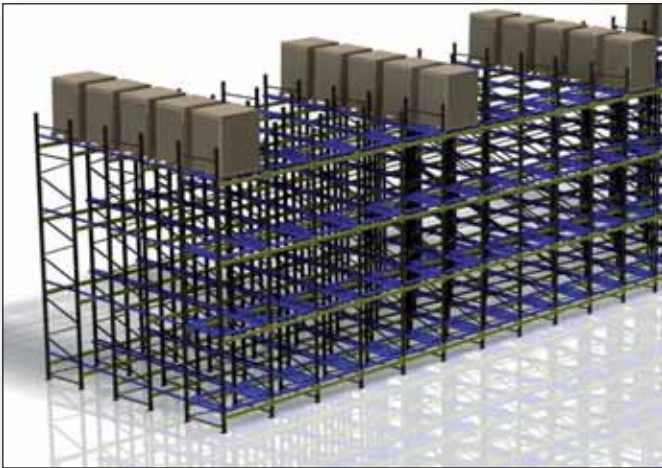
Push-Back Pallet Racking

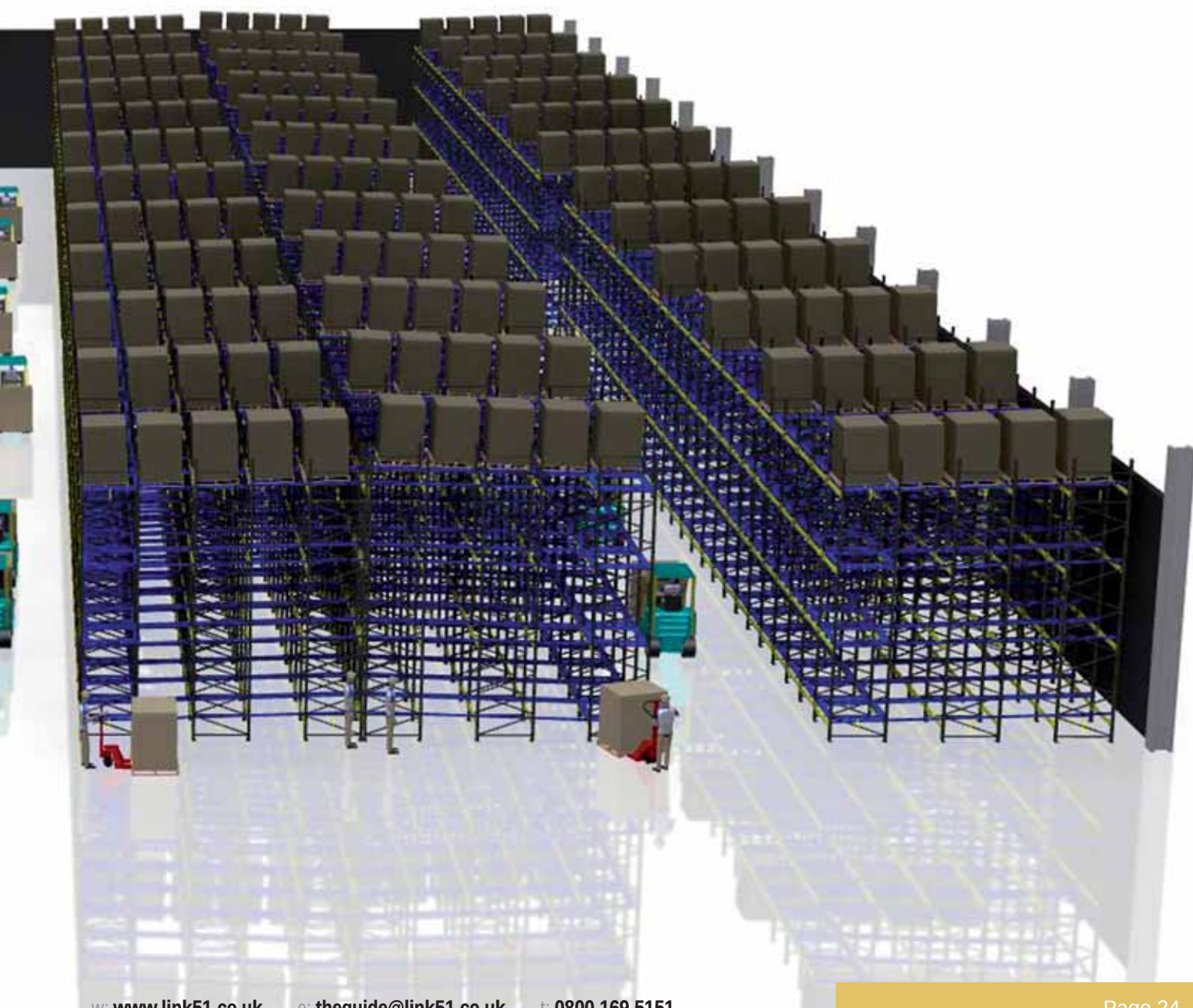
Push-back racking is amongst the most space and time efficient pallet storage systems available.

Pallets are loaded in sequence onto wheeled carts or rollers and are pushed back along inclined beds. Pallets can be stored up to 10 deep and when a load is retrieved the remaining pallets roll forward into position at the picking face. Selectivity is “ First in, Last out” and with each product having a dedicated lane, dynamic push back racking is particularly useful in marshalling areas and for bulk storage and handling.

Features check list

Space utilisation of floor area	✓✓✓✓✓✓
Utilisation of cubic storage space	✓✓✓✓✓✓
Access to individual pallet loads	✓✓✓✓
Speed of access & throughput	✓✓
Efficiency in stock rotation	✓✓✓✓
Efficiency in stock control	✓✓
Specialised handling equipment	None required
Ease of re-location	✓
Ease & speed of installation	✓✓
Adjustability of beam positions	Not required





Case Study

Diageo - Glasgow

Push-back racking provides high-density storage and maximum protection for packaging materials.

- 720 pallet positions within 2 banks of push-back cart storage
- Pallets were originally block stacked but new packaging materials are not as robust
- New system had to fit within the footprint of the block stacked products
- Forklifts deliver pallets direct to 8 automated bottling lines
- A fire sprinkler system is incorporated with in the racking
- Wire mesh guard is fitted to the rear of each bank of racking to protect personnel





Drive-In Pallet Racking

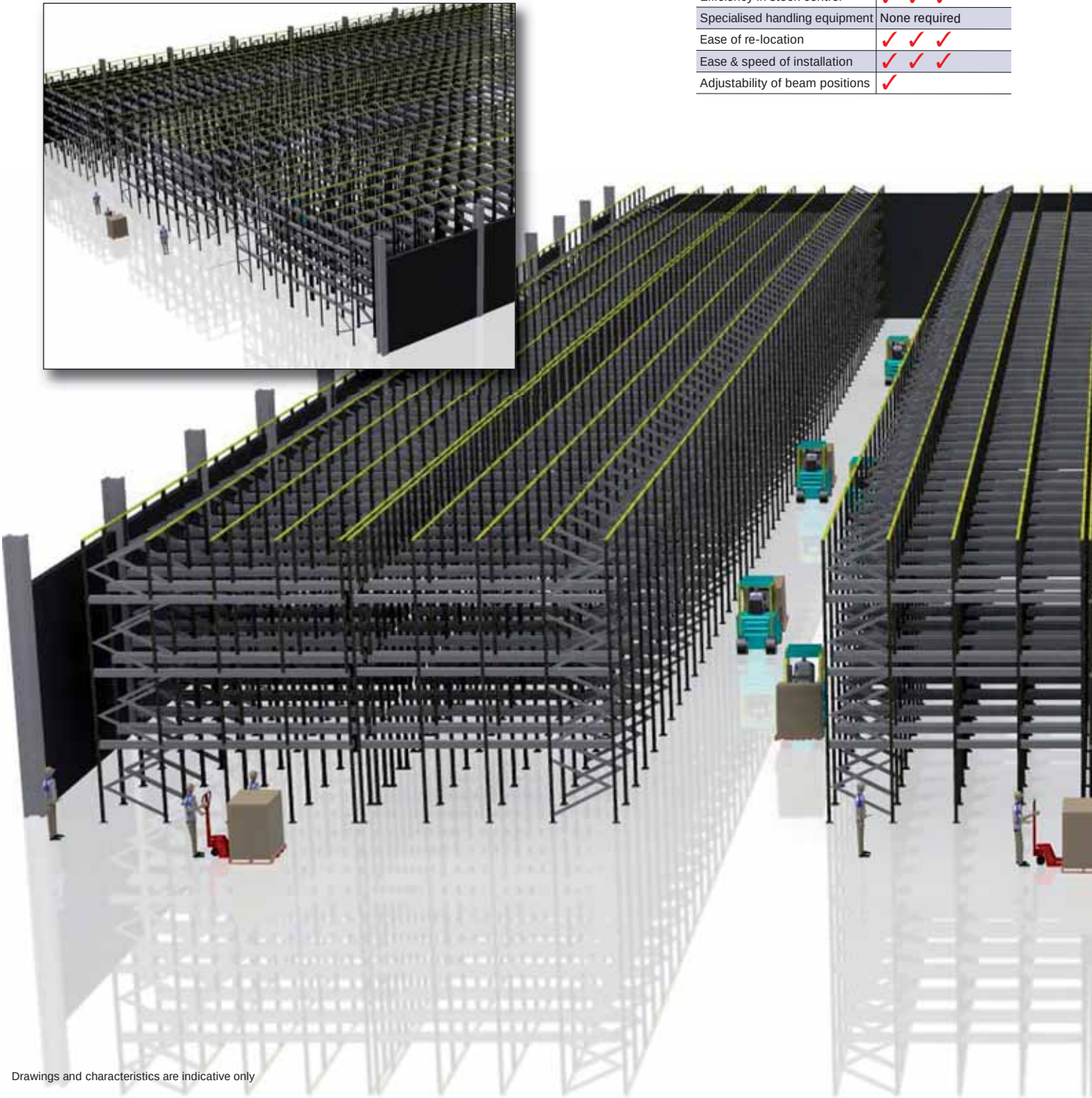
Using minimal space for access aisles and lanes, Drive-in racking provides a high-density and very space-efficient bulk storage system.

With the first pallet into a lane being the last out, stock selectivity is restricted, but when loads are delivered and dispatched in batches, this is not a difficulty. Pallets are stored on runners in the depth of the racking and trucks enter to deposit or retrieve loads.

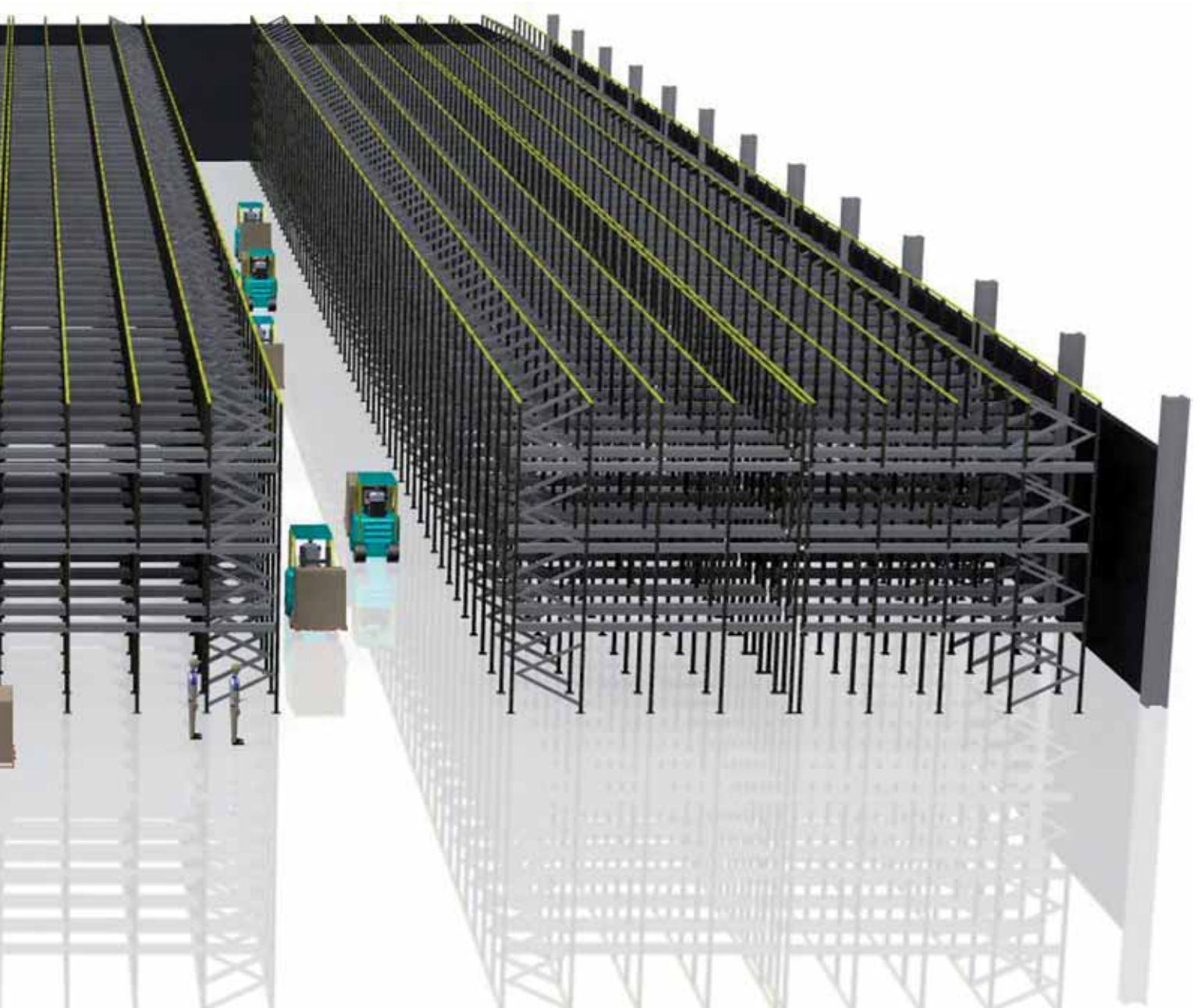
For maximum utilisation of both cubic and floor space by providing pallet storage at up to 11 metres, Drive-in system has unsurpassed structural strength and stability, with single-section uprights and rails and double bolt rail fixing into each upright.

Features check list

Space utilisation of floor area	✓✓✓✓✓✓
Utilisation of cubic storage space	✓✓✓✓✓✓
Access to individual pallet loads	✓
Speed of access & throughput	✓✓
Efficiency in stock rotation	✓✓
Efficiency in stock control	✓✓✓
Specialised handling equipment	None required
Ease of re-location	✓✓✓
Ease & speed of installation	✓✓✓
Adjustability of beam positions	✓



Drawings and characteristics are indicative only





Case Study

Britvic - Tamworth

Combination of drive-in and standard pallet racking offers bulk storage and order picking locations.

- Installation offers some 10,000 pallet positions
- 8,500 drive-in pallet positions
- Pallets are stored to 4 levels
- Additional 1,500 pallets of standard racking
- Standard pallet racking is used for the storage of refrigeration and vending which is stored on slatted shelves





Mobile Pallet Racking

Pallet Racking can be easily configured for space-saving mobile storage. With the racking mounted on mobile chassis which move along guide tracks set into the floor, the floor space for only one 'moving' operating aisle is required to access all pallet locations.

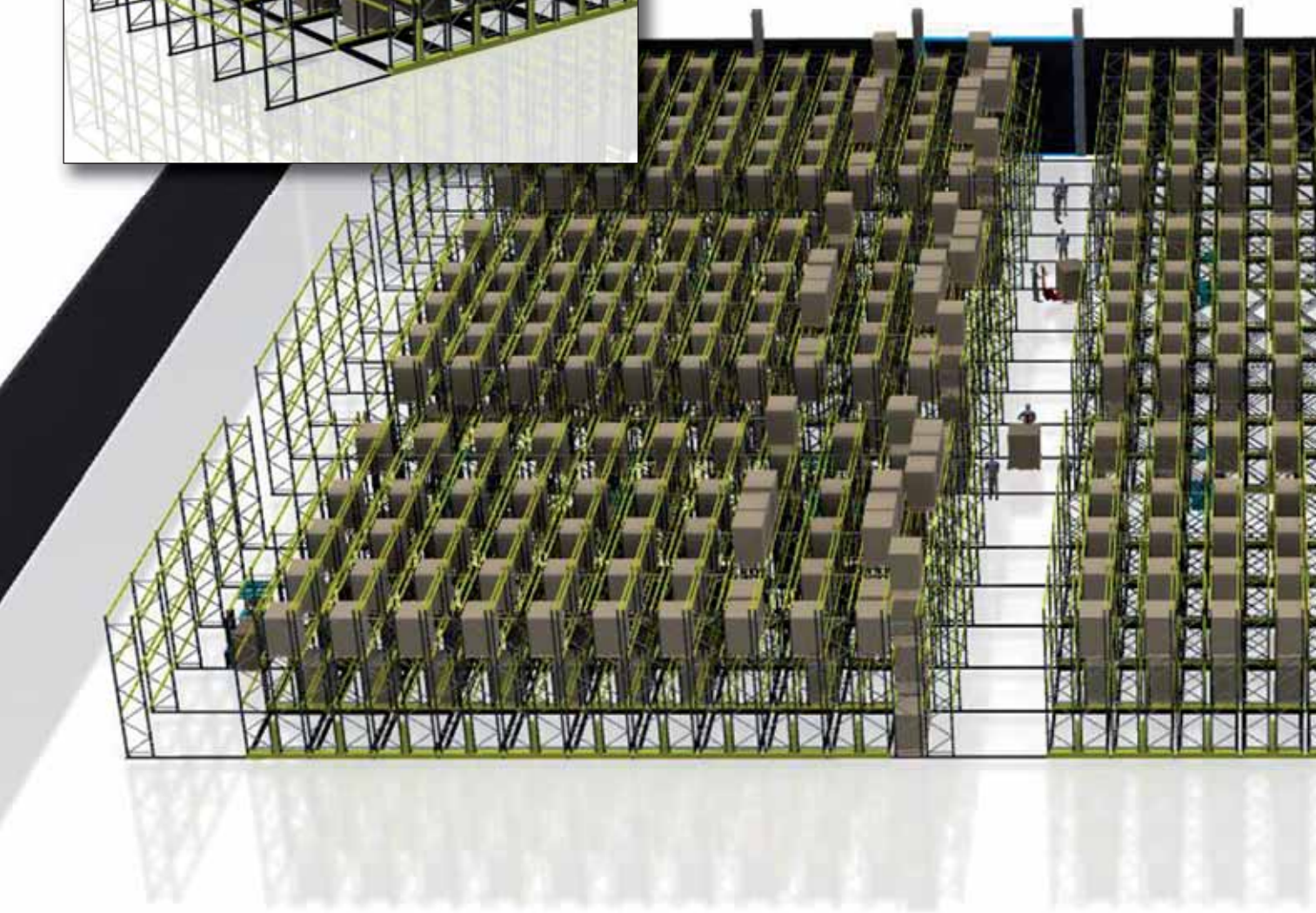
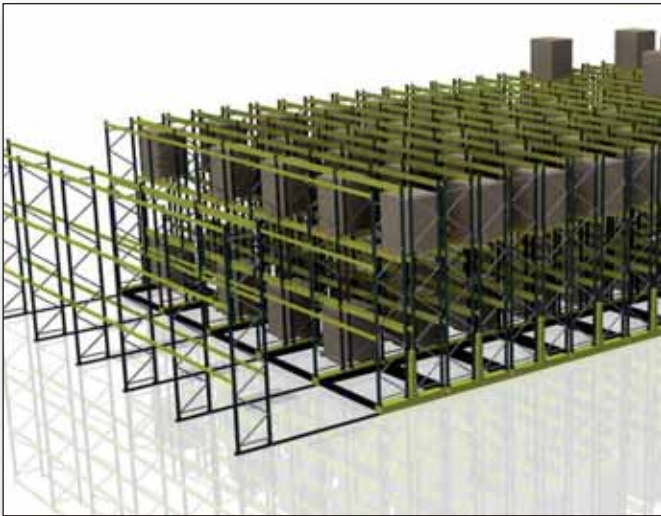
This space-saving design makes mobile pallet racking particularly suited to cold stores, as the maximum amount of space can be utilised for storage.

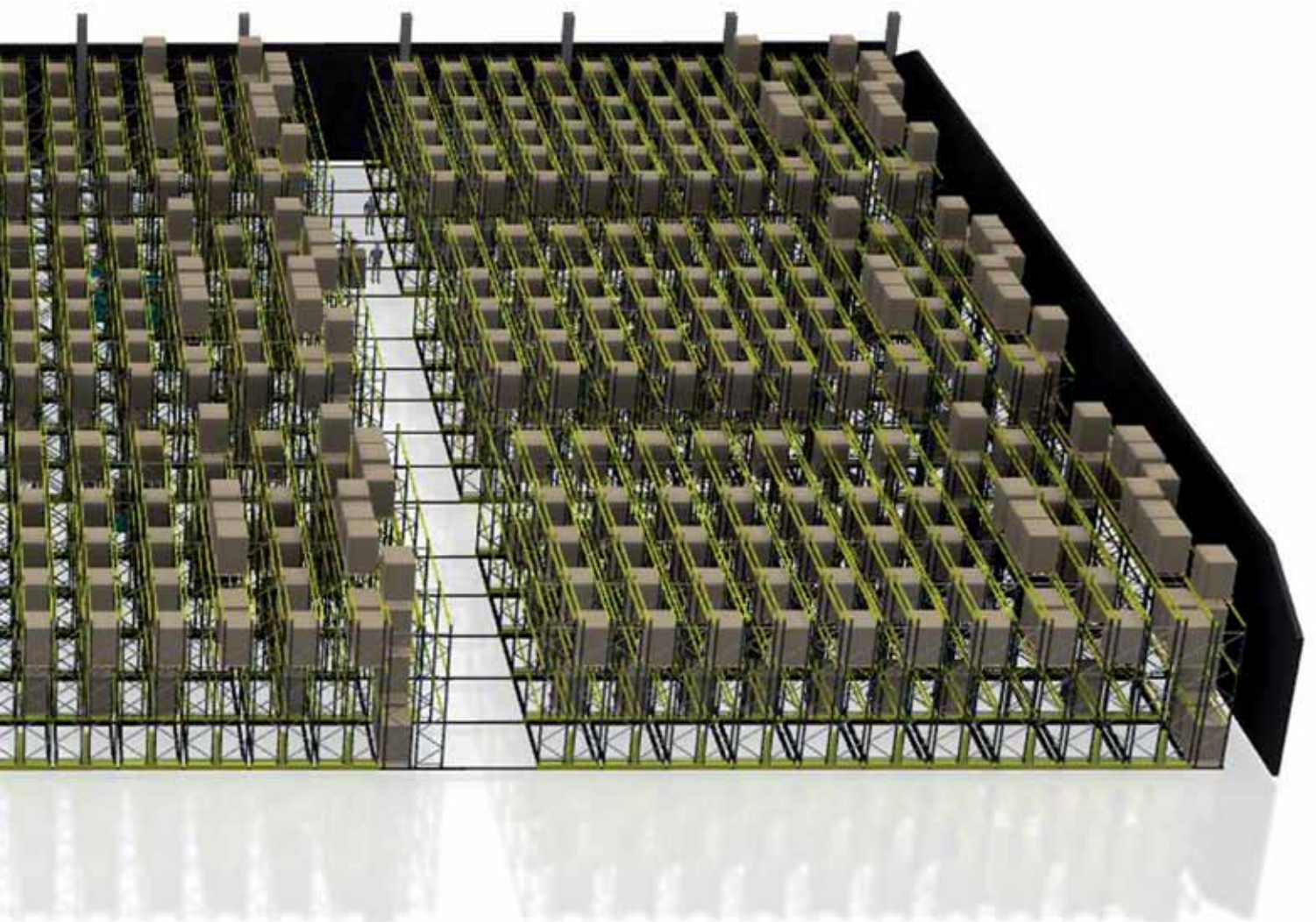
Operation is simple with chassis moving in a cascade sequence until the selected aisle is opened, all from a single push of a button.

The system application is powered by efficient, industry standard, electric motors for maximum reliability.

Features check list

Space utilisation of floor area	✓✓✓✓✓✓
Utilisation of cubic storage space	✓✓✓✓✓✓
Access to individual pallet loads	✓✓✓✓✓✓
Speed of access & throughput	✓
Efficiency in stock rotation	✓✓
Efficiency in stock control	✓✓✓✓
Specialised handling equipment	None required
Ease of re-location	✓✓
Ease & speed of installation	✓✓✓
Adjustability of beam positions	✓✓✓



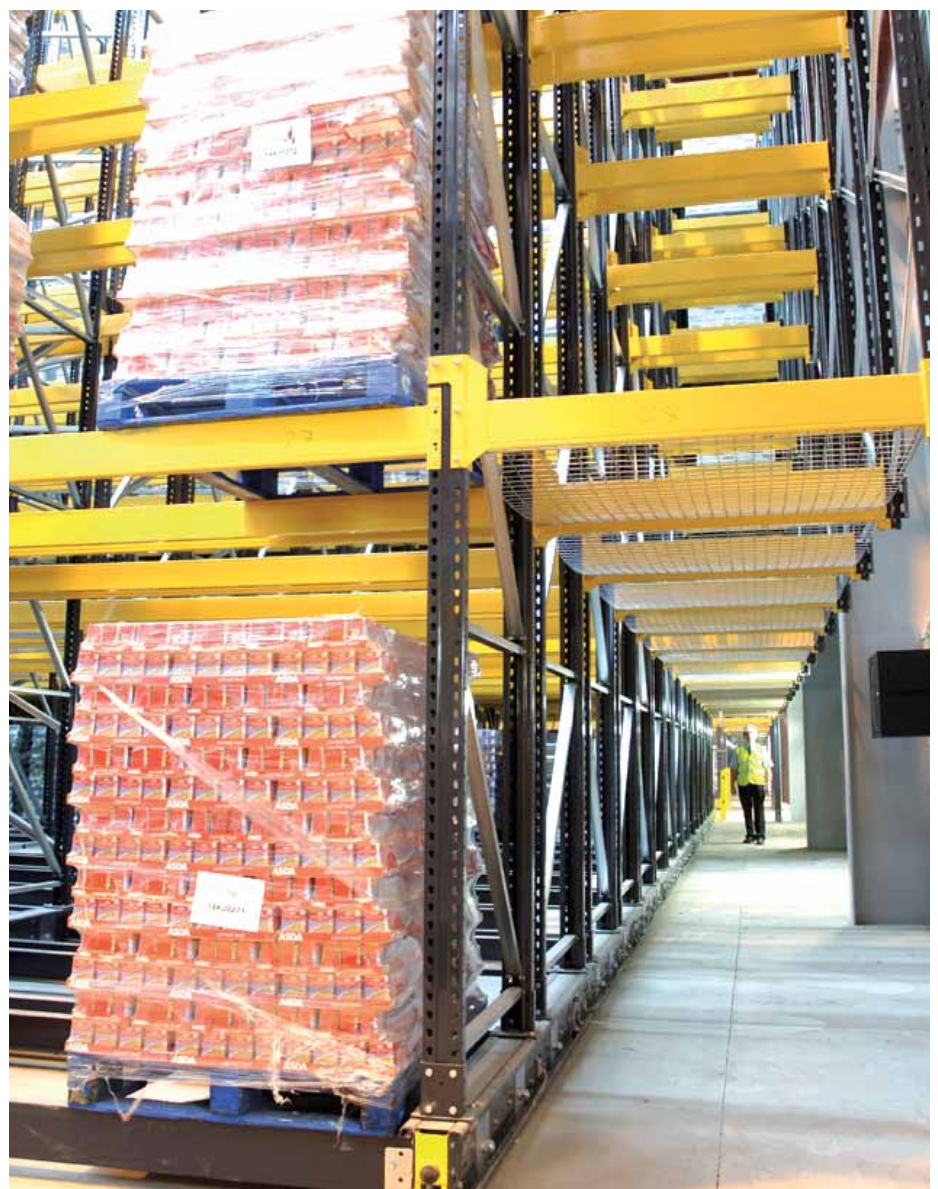


Case Study

Boughey Distribution - Nantwich

Mobile and standard pallet racking increase storage for food distribution service.

- 13,500 pallet positions within the 90,000 square feet facility
- Optimum aisle width to accommodate both reach trucks and powered pedestrian trucks
- Utilises the full height of 11 metres beneath the eaves
- Accommodates some 8,000 pallet movements per week
- 20 access aisles within the pallet racking and 6 storage levels in the height
- Mobile layout incorporates escape routes along the length of the warehouses with pallet storage above





Pallet Live Storage

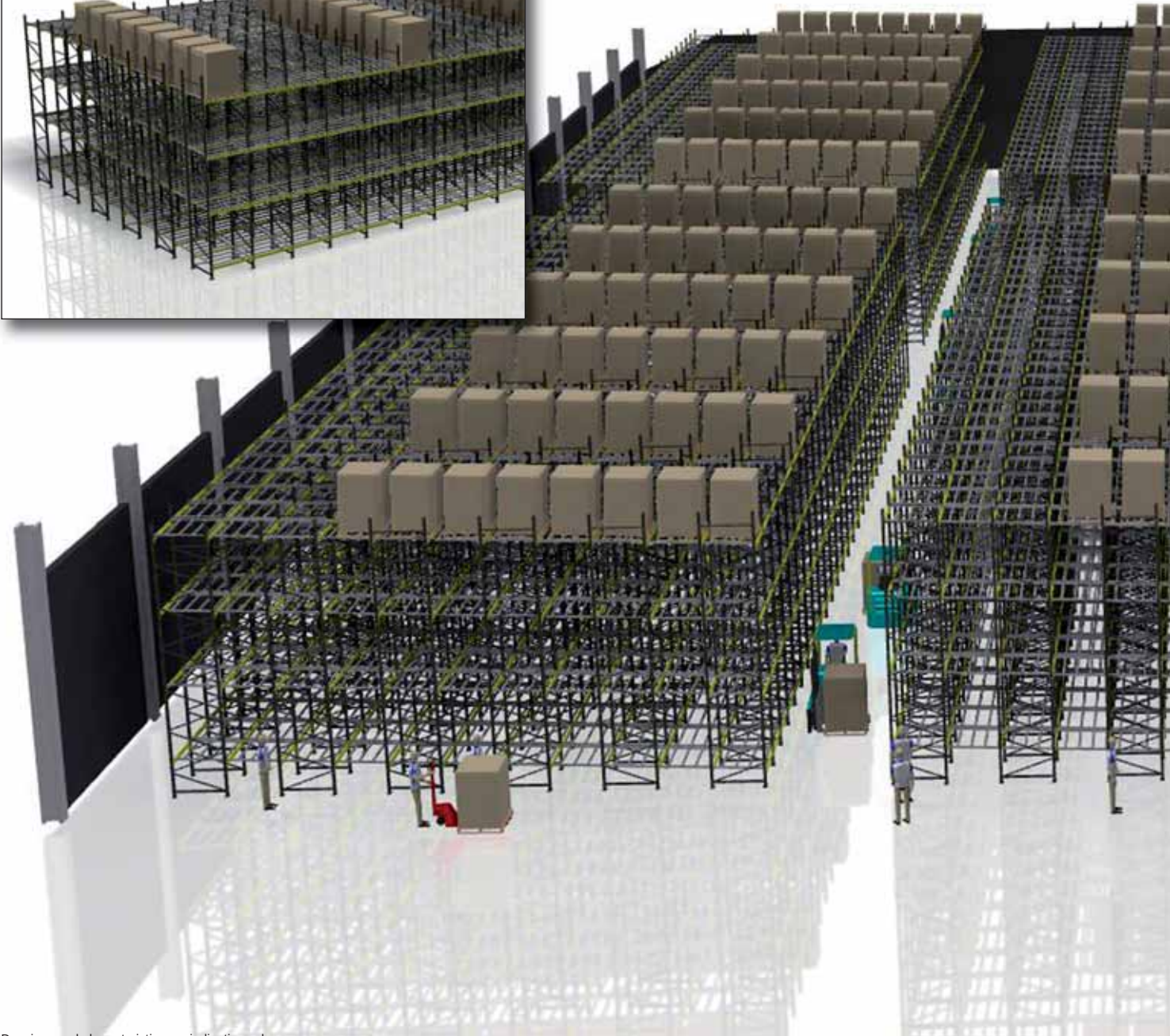
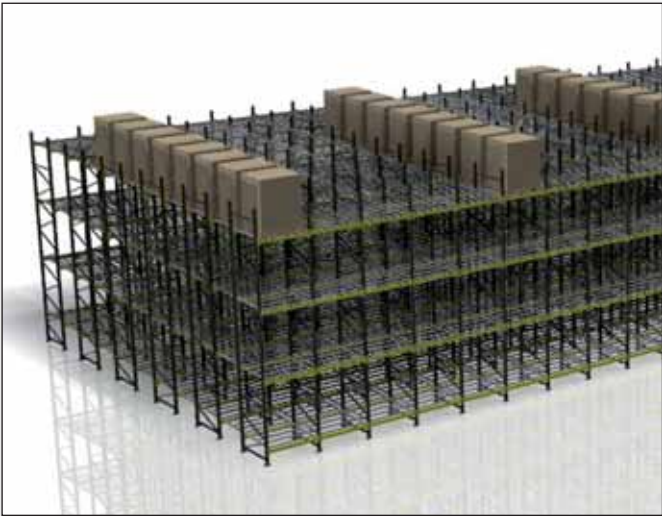
Pallets are loaded onto dedicated lanes of inclined gravity rollers which are set at a fixed gradient. When a load is taken from the picking face, the next pallet rolls onto position, with replenishment stock loaded at the opposite upper end of the lane.

Pallet movement is regulated by brakes and speed controllers fitted within the roller tracks.

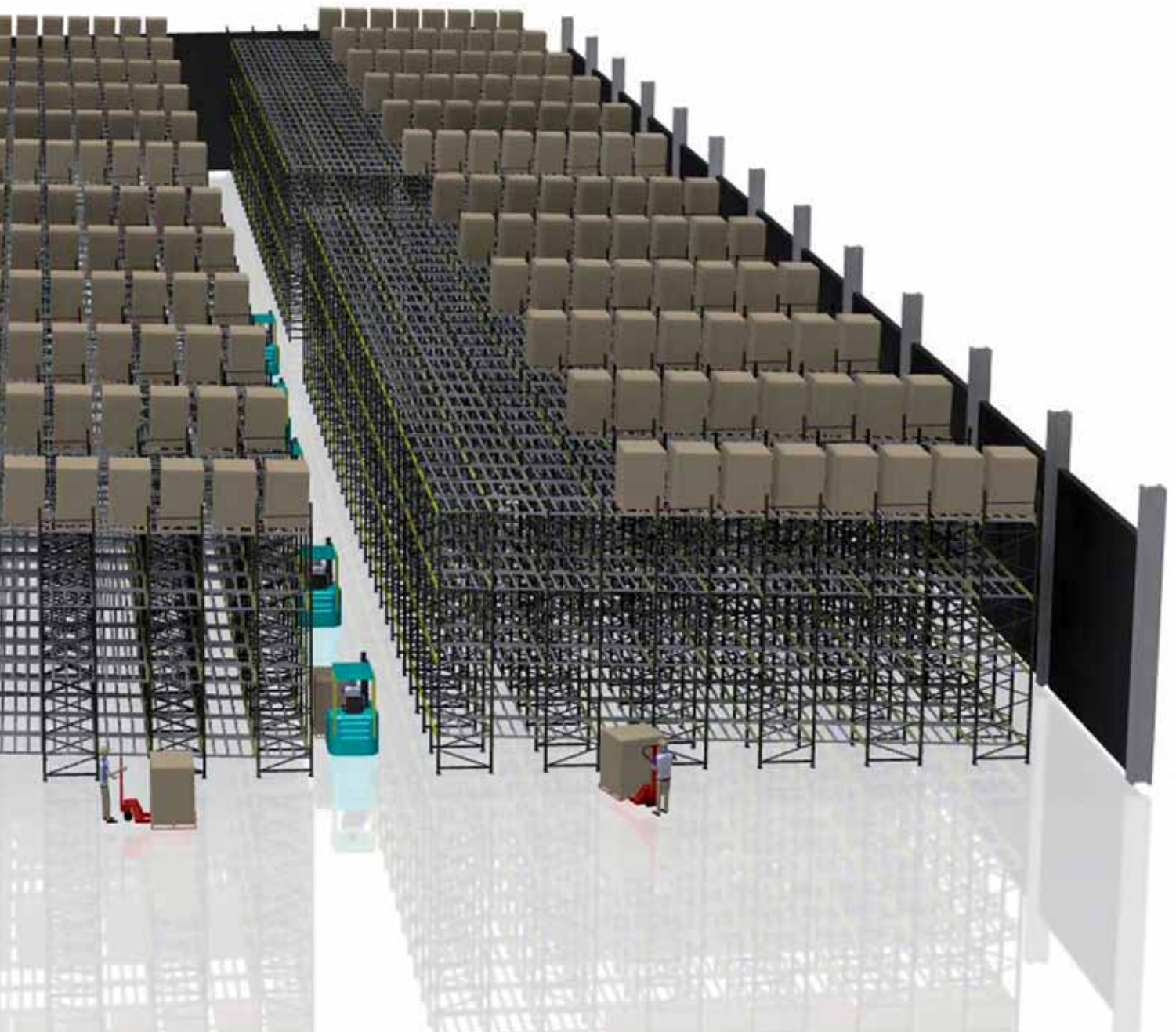
Working on a first in, first out basis dynamic live storage racking provides extremely high levels of density in a given area, and provides automatic stock rotation, with the minimum of fork lift truck movements required to handle the flow of goods.

Features check list

Space utilisation of floor area	✓✓✓✓✓✓
Utilisation of cubic storage space	✓✓✓✓✓✓
Access to individual pallet loads	✓✓✓✓✓✓
Speed of access & throughput	✓✓✓✓✓✓
Efficiency in stock rotation	✓✓✓✓✓✓
Efficiency in stock control	✓✓✓✓✓✓
Specialised handling equipment	None required
Ease of re-location	✓
Ease & speed of installation	✓
Adjustability of beam positions	Not required



Drawings and characteristics are indicative only







Case Study

Gilbertson and Page - Welwyn Garden City

UK's largest independent producer of dog biscuits consolidates production storage with pallet live solution.

- Two blocks of storage, 10 lanes wide and 2 levels high
- Each lane can accommodate 20 pallets
- Each pallet carries 65 1.5kg bags, shrink wrapped for forward delivery
- System interfaces with the production area
- First in, first out operation ensures food is despatched in use-by sequence



Operation and Maintenance of Racking

Information

The user should be provided with information regarding the technical limitation of the racking in terms of load carrying capacity and warnings of the dangers of re-arranging the configuration of the racking without the manufacturer's technical appraisal.

Signage will display the safe working load criteria for defined areas of the racking. It will warn of specific dangers that may be encountered in operating the system and it will provide advice on the essential maintenance requirements of the system.

Adjustable Pallet Racking Operation

Generally, the safe working loads of adjustable pallet racking are declared on the load notices attached to the rack and are normally quoted in terms of a maximum bay load. It is important that the loads applied to the beam are uniformly distributed loads and that both beams are loaded equally.

The bay load is governed by many factors with the height to the first beam level, the height between beam levels and the number of floor fixings per upright being of prime importance. Beams must not be removed or re-positioned without reference to the supplier.

During loading, the pallet should be carefully lowered to ensure that it is supported equally by the beams. During unloading, the load should be lifted, taking care not to intrude on the level above, and to ensure that it is clear of the beams before it is manoeuvred. The load should never be pushed or slid into position across the beam.

For more information on Load Notices see Section 4.

Access

Pallet racking is not designed as access equipment and personnel should not be permitted to climb racks. If access is required to the upper levels of a racking installation, then appropriate equipment should be used.

The following non-exhaustive list contain the minimum requirements expected of warehouse operators:-

- Good truck/rack interface.
- Correct placement of pallets.
- Clear aisles.
- Adequate clearance around loads.
- Pallets in good condition.
- Good driver skills.
- Regular maintenance.
- Report all damage and repairs.



Inspection and Maintenance

A regime of regular inspection for the pallet racking installation should be carried out at a series of levels of competence.

Warehouse staff and fork lift truck operators should be encouraged to report all damage immediately as it occurs to ensure appropriate action is taken to protect the safety of operatives and others. This will, however, require a diplomatic approach to disciplinary procedures for careless drivers.

Regular formal inspections of all racking should be undertaken by warehouse supervisors at weekly and monthly intervals to identify and act upon any damage not yet reported. This should typically include removal of product from random bays to provide more detailed inspection access.

Yearly or half-yearly formal inspections should be carried out by a technically competent individual (preferably SARI registered), fully experienced in the identification and categorisation of racking damage. This individual might be a fully trained member of the management, a rack manufacturer's technical expert or an independent consultant.

The frequency of each level of inspection must be adjusted with due regard to the throughput of the warehouse. High usage stores require a more regular inspection. Cold store conditions are more arduous for materials and staff and must be taken into account in determining the necessary frequency of inspection and the skill level of the inspector.

For further information and advice see SEMA Guideline 6 Guide to the Conduct of Pallet Racking and Shelving Surveys.

All surveys must be conducted, and in particular documented in the maintenance log, in a systematic and clear manner. The survey will classify damage according to severity and corrective action necessary.

Generally, three degrees of damage will exist; Green, Orange and Red Alert Levels.

Red alerts are items which are severely damaged well beyond the limitations of the SEMA code. In such circumstances, the racking should be immediately off-loaded and isolated from future use until repair work is carried out. Such repair work would normally be the replacement of the damaged item. For items identified as Designation Red, a written procedure must be adopted by the Inspection Engineer in order to inform the user of the seriousness of the situation.

Orange alerts are items that are damaged beyond the limitations of the SEMA code, but not sufficiently serious to warrant immediate off-loading of the rack. A procedure should be in place to ensure that once the rack is off loaded, it is not re-used until repairs have been carried out. In the event that the location is still occupied 4 weeks after initial identification, the rack should be off-loaded for repair without further delay.

Green alerts are items which are damaged but are within the limitation of the SEMA code. Such items would be recorded as being suitable for use but be identified for future reference and monitoring.

Damage Requiring Replacement

Anything which significantly changes the original cross section profile or deforms the straightness of any load bearing member or which significantly weakens jointed members due to failed welds or loose bolts, requires replacement.

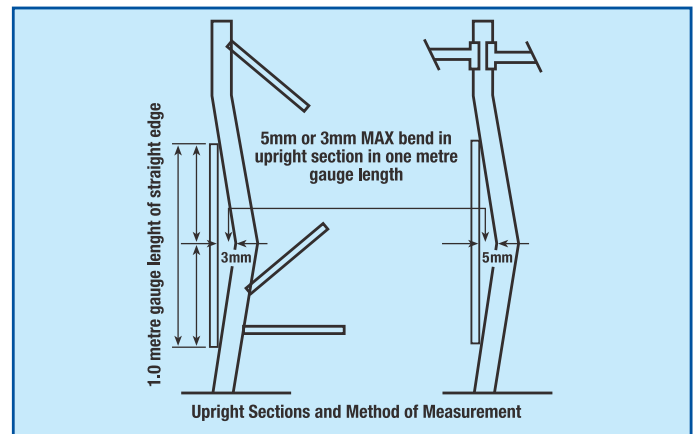
Damage to racking

Any damage to a rack upright will reduce its load carrying capacity. The greater the damage the greater will be the reduction in its strength until the upright collapses at its normal working load.

Damage to bracing sections will reduce the capacity of racking frames to withstand accidental frontal impacts and may also reduce the axial load carrying capability of frame uprights.

Assessment of Damage to Uprights and Bracing Members

A steel straight edge 1.0 metre long is placed in contact with a flat surface on the concave side of the damaged member such that the damaged area lies central as near as possible to the length of the straight edge.



For an upright bent in the direction of the rack, beam spans the maximum gap between the upright and straight edge should not exceed 5.0mm.

For an upright bent in the plane of the frame, bracing the maximum gap between the upright and straight edge should not exceed 3.0mm.

For bracing members bent in either plane, the gap between straight edge and bracing member should not exceed 10mm.

These rules apply only to damage which produces an overall bend in a member. They do not apply to highly localised damage such as dents, buckles, tears, splits. Members subjected to these defects should be replaced. Localised bends over a length of less than one metre, may be judged pro-rata to the 1.0 metre limits e.g. over a half metre length half of the prescribed limits apply. Dents, buckles, tears and splits should be replaced.

Assessment of Damage to Beams

Beams will naturally deflect under normal loading conditions to a maximum permissible of span/200. This deflection should disappear when beams are unloaded and should not be confused with permanent deformation caused by overloading or impact damage.

Damage should be measured against the following criteria:

- Beam and connectors which show any clearly visible deformation should be unloaded and expert advice sought from the equipment supplier.
- Welded connections between beam section and end connector should show no signs of cracking.

Load Notices for Racking

The design and layout of pallet racking load notices has been developed by SEMA (Storage Equipment Manufacturers Association) in consultation with regulatory bodies including the Health and Safety Executive. Use of specific colours and symbols in accordance with the Health and Safety (Safety Signs and Signals) Regulations 1996 which in turn implement European Council Directive 92/58/EEC on minimum requirements for the provision of safety signs at work (see also BS5499-5:2002).

Use of SEMA logo

The SEMA logo should be placed in a prominent position on the load notice. It should only be used when the notice is supplied by a SEMA member, and when this is placed on a product or system which conforms to the SEMA Quality System.

SEMA Quality System

The SEMA Quality System ensures that the storage equipment is designed, manufactured and installed in accordance with industry standards. Where a product or system is installed by a company other than a SEMA member the said company should utilise SEIRS registered installers.

Training

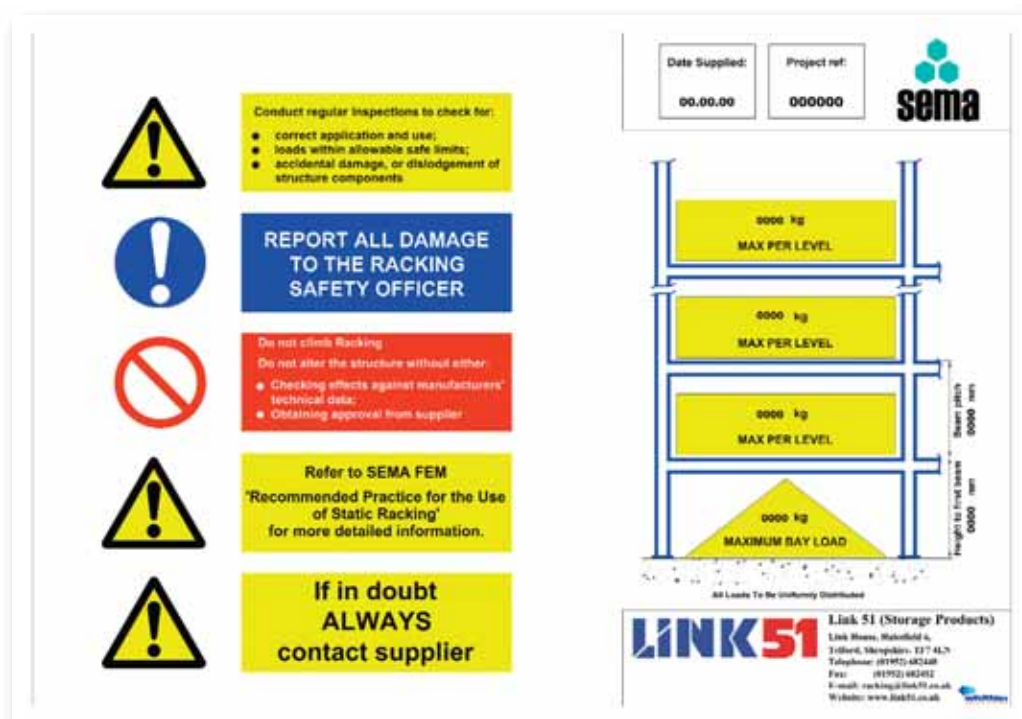
Load notices provide important information for the safe use of the equipment. However, they are operational signs and as such the information on the actual sign has been kept to a minimum for clarity. Users of storage equipment should always consult the manufacturer of the product to establish safe operational practice and should adequately train all persons who will use the equipment.

Display

Load notices should be placed in a prominent location on, or adjacent to the equipment so that they are clearly visible.

Checking Load Notice Information

Always refer to the supplier if you are unsure about load notice information.



Example of a load notice for Pallet Racking.

Equipment Inspections

As part of the regular inspection routine users should ensure that load notices are in place and are clearly visible. SEMA approved inspectors will check for this when called upon to perform an inspection.

Sizes

Recommended sizes for the load notices are as follows:

Product Equipment	Load Notice Size
Adjustable Pallet & Mobile Racking	A3 Landscape
Cantilever Racking	A4 portrait (A5 if necessary to fit the upright)
Shelving	A4 Landscape
Mezzanine Floors	A3/A4 Landscape



Product and Industry Standards

Who are S.E.M.A?

Storage Equipment Manufacturer's Association

Aims and Objectives of S.E.M.A

- Consider everything relevant to the Storage Equipment Industry.
- Benefit the industry through the distribution of technical advice and information on trading opportunities.
- Establish and publish technical standards for all types of storage equipment.
- Represent the Storage Equipment Industry in discussions with UK Government departments and Local Authorities. SEMA is a Member of the British Materials Handling Federation (BMHF) and actively influences the Federation Europeene De La Manutention (FEM Section X, the European Handling Industries Federation which seeks to establish common policies, particularly technical, amongst national storage equipment associations.
- Ensure that standards adopted by public and professional bodies are in accordance with the interests of the Industry.

Why use S.E.M.A accredited storage companies?

Benefits to the customer are:

- Quality storage equipment products and systems that meet customers' requirements.
- Products designed and tested to recognised and approved standards.
- Consistent level of product quality and supply.
- Storage products designed, manufactured and installed in accordance with recognised safety standards.
- Products designed, manufactured and installed in accordance with a system that is subject to a third party assessment.
- Increased customer/operator confidence in products/systems supplied.

Technical Standards

SEMA is proactive in the development of standards for the Storage Industry in the UK. They develop and influence both National and European Codes of Practice and guidelines for the design, supply and installation of all types of storage equipment.

SEMA represents the UK's national interests in Europe and constitutes the UK National Committee of FEM Section X, the European Federation of Storage Equipment Associations. European Codes are also monitored and administered by SEMA in the UK.

sema



S.E.I.R.S (Storage Equipment Installer's Registration Scheme)

SEMA has been proactive in the development of standards in Industry for many years. The **SEIRS** initiative is a continuation of this business ethic to improve safety standards in an environment where product design, manufacture and installation take place under the influence of increased legislation.

Components of SEIRS

SEIRS is based upon 3 key components:

- An installation Guideline/Code of Practice
- Storage Industry - specific safety training courses
- An ID Card and registration system

Benefits of SEIRS

SEIRS has many benefits to the Storage Equipment Supplier, the Installer and the End-User/Customer.

End User / Inspectors / Officials

Customer beneficiaries of SEIRS include end-users, inspectors and other officials involved with the installation process. Benefits include:-

- Installation by professionals
- A means of verifying qualifications
- Adherence to SEMA Guidelines and Codes of practice

Supplier

SEIRS offers benefits to the supplier of storage equipment whether this is the manufacturer, the distributor or the system supplier, including:

- Reassurance
- Supply chain professionalism
- Customer satisfaction

Installer

Individual installers and their employing companies can benefit from SEIRS in numerous ways, e.g.

- Recognised qualifications
- Health and safety updates
- Preferred Installer status

Approved Installation Companies

It is generally recommended that the installation of shelving, racking and storage equipment is only undertaken by experienced and trained personnel and preferably by installers who are SEIRS (Storage Equipment Installers Registration Scheme) registered. SEIRS is a qualification for individual installers who themselves undergo industry-specific training in best practice, legislation and safe working practice.

Installation companies will be able to apply to become a SEMA Approved Installation Company (SAIC) to demonstrate their professionalism and dedication to safe working practices. All SEMA Approved Installation Companies must follow the SEIRS programme.

SEMA comments.....

Chris Humphreys, SEMA President, states, "SEMA is constantly seeing to improve standards in all sectors of the storage industry. The SAIC initiative is a natural progression of our activities and has been introduced to recognise those installation companies who are committed to 'raising the bar'".

"As you can expect," continues Chris Humphreys, "companies applying for SAIC status must meet the criteria and these criteria have their foundations in safe working practice".

The SEMA President goes on to say, "installation companies will understand that they have a duty to their employees, their customers and indeed themselves. The industry has changed dramatically in the last 10 years. Many installation companies are now smaller, independent organisations. They are no longer tied to a particular manufacturer. They typically employ a core installation team or teams and many utilise temporary staff to supplement their teams for work which is essentially labour intensive".

"Accordingly regulation is a necessity. This helps to ensure that standards are being met and also helps to meet the requirements of customers who are becoming increasingly demanding, particularly where safety is concerned".

"The SAIC initiative 'ticks all the boxes' in this regard without being over bureaucratic as far as the company is concerned. It greatly assists in looking after the interests of employers, the employing company and their customers helping all to meet their duties".

Health and Safety

The SEIRS initiative is supported by the Health and Safety Executive. This includes the SEIRS Safety Training, which is based on an Installation Guideline developed by SEMA and the SEIRS ID Card and registration system.

Policing Storage Safety on Construction Sites

The latest step designed to maximise health and safety performance during installation of its products involves a joint initiative between SEMA, the Storage Equipment Manufacturers Association and the CSCS, the Construction Skills Certification Scheme, focussing on improving safety standards on major construction sites.

Under this joint initiative, installers of storage equipment who need to carry out work on sites controlled by the MCG (Major Contractors Group), will have to demonstrate that they are operating to the Storage Equipment Industry Codes and Guidelines, in addition to a knowledge of general site Health and Safety

This now means that installation team members will need to be in possession of a valid SEIRS qualification prior to applying for the relevant CSCS ID card.

"The SEIRS ID card, which must be renewed every three years, demonstrates a level of knowledge and a commitment on behalf of individuals operating in this labour intensive sector. SEIRS is both a training and an individual installers' registration scheme which was first introduced in 2000 at the request of and in consultation with, the HSE, and has been developing and improving ever since".

The training involves providing a clear understanding and the importance of working to industry best practice including safe system of work which are based on the SEMA Codes of Practice. These deal with the array of applicable legislation such as the **Work at Height Regulations** and correct use of appropriate PPE, but specifically focused on the installation of storage equipment. "Essentially", continues Mike Tucker, "SEIRS is now a very comprehensive programme".

In parallel the CSCS have developed a system for the construction

industry whereby site workers must be qualified in traditional construction industry skills.

However, when contractors from other industries work on construction sites they must now demonstrate relevant industry specific qualifications related to their own industry to supplement the general health and safety requirements of the CSCS in order to ensure that safety levels are maximised on site.

"Accordingly", comments Gordon Jenkins of the CSCS, "it is now a pre-requisite that installers of storage equipment seeking to work on an MCG site must be in possession of a valid SEIRS ID card".

Gordon Jenkins, goes on to say, "we are delighted to be working with SEMA and the SEIRS initiative to promote safe practice on our construction sites where storage equipment is being installed. SEMA is the organisation representing the interests of the UK storage equipment industry and, as a safety initiative regulating the installation process, all installers must now be in possession of a valid SEIRS ID card before being allowed to work on a MCG Site".

"This system will be policed on MCG sites thus ensuring that subcontractors to the construction industry are appropriately qualified".

The HSE has stated that:

"The Health and Safety Executive welcomes SEIRS and the initiative taken by the Storage Equipment Manufacturers Association (SEMA) to improve safety standards. It demonstrates that SEMA is committed raising both standards and awareness of Health and Safety issues associated with Storage Equipment.

The CSCS card lists the holder's qualifications and is valid for either three or five years. It also demonstrates that they have health and safety awareness as all cardholders have to pass the appropriate CITB-Construction Skills Health and Safety Test.

Installer Progress

SEIRS exists to ensure that proper safety skills and knowledge are acquired by individual installers in various aspects of the installation process, from ground workers through to site supervisors and managers.

This is achieved by undertaking specialised SEIRS safety courses tailored to the storage industry, the techniques for which may differ significantly from other industries including the Construction Industry.

SEIRS offers recognised installer progression as described through safety skills courses, advanced, supervisory and safety management. The SEIRS management team is also providing other career development options including NVQ's based on the SEMA guidelines.



CDM 2007 Regulations



Storage Equipment projects fall under the definition of construction work as defined by the CDM Regulations. This includes the dismantling of racking schemes.

The 'Principal Contractor's' role is pivotal on any project and it is essential that the Client recognises the difference between being a 'Principal Contractor' and straightforward 'Contractor' on a job. Failure to do so can have serious implications.

It is crucial that at the tender stage of a project, the racking supplier's role is clearly defined, so that should the racking company be awarded the contract, the potential for last minute confusion is minimised.

There is plenty of anecdotal evidence of instances where racking suppliers have arrived on site, having assumed that a Principal Contractor has been appointed and because the Client has made the assumption that the Principal Contractor's role will be taken on by the racking supplier, chaos ensues.

Such scenarios can lead to (often very expensive) consultants being brought in at the eleventh hour to take on the 'Principal Contractor' role. For racking installation projects, the degree of detail as well as the time and effort required to comply with the legal duties imposed by CDM regulations will be in proportion to the nature, size and level of health and safety risks involved in the project. Therefore for small projects with minimal accident potential, companies are only required to take relatively simple, straightforward steps and few, if any, specialist skills will be needed.

However when it comes to larger racking projects that may involve several different Contractors – lighting engineers, sprinkler fitters as well as the racking installers – being on site at the same time, it is particularly essential that careful consideration is given to the CDM regulations from the outset of the project.



For more information on CDM request a copy of our guide.



Case Study

Client

- A major Children's clothing retailer

Project Duration

- 10 weeks

Product

- Baby / Infant Goods

Ideal Scenario

This extensive pallet racking project involved Link 51 as the Principal Contractor. Link 51 were asked to carry out the role as they proved to have the relevant expertise and resources for such a large project. This was an extremely busy existing operational working environment and involved working closely with the Client, their project team and their operatives.

It was identified at design stage that the rack build could be completed using the "finger build method" which under the New Working at Height Regulations eliminates the requirement for harness work and to climb in rack. A detailed risk assessment was provided as part of the Construction Phase Plan for all working at height and was provided at the request of the Client to their Health and Safety Manager.

Health and safety inspections were carried out twice weekly and the Link 51 health and safety consultant provided briefings to the Client's operatives and attended regular site meetings with the CDM Co-ordinator.

This project provides an excellent example of health and safety management under the Principal Contractor's role.

The risks of failing to demonstrate CDM competence can, in the event of an accident, have serious ramifications. From the design stage to the completion of a project, Clients, Designers and Contractors must be aware of their CDM responsibilities. Results of a recent Health and Safety Executive (HSE) survey revealed that many Designers involved with construction projects are unaware of their duties under CDM regulations.

The Design Phase

In the racking industry, even less scheme Designers are aware of CDM regulations. Certainly a significant number of companies routinely fail to consider the practical detail of how the structures they design can be safely built.

Of course, when it comes to the erection of high bay racking/shelving schemes, it is inevitable that workers will have to work at height.

For some Designers and Contractors a safety harness is seen as a panacea for protection against all work at height risks while the use of work platforms is rarely considered.

Falls from height continue to be the most significant cause of serious accidents on construction sites in the UK and designers have legal duties to avoid foreseeable risks to workers during construction and significantly, the ongoing maintenance of the finished structure.

Under CDM, the Client has to be sure that the key health and safety issues have been considered at the design phase.

Sub-contractors and the Client

For any major racking installation project it is essential to use experienced sub-Contractors who are competent and aware of their health and safety responsibilities. On site health and safety inductions must be carried out and workers informed of hazards and risks.

It is critically important that the Client is aware of his responsibilities when commencing any new project and it is incumbent upon the Principal Contractor to ensure that the Client knows this. In the event of an accident ignorance of the law will be no defence.



Health and Safety

Warehousing and storage cover a wide range of activities that can result in various hazards and risks. Effective health and safety management involves you, the employer, looking at the risks that arise in the workplace and then putting sensible health and safety measures in place to control them. By doing this you can protect your most valuable asset, your employees, as well as members of the public from harm. You will also help protect your premises, goods, equipment and reputation.

Accidents, injuries and ill health are reported to the health and safety enforcing authorities under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR).

Major injuries

Around a quarter of major injuries (broken bones, injuries requiring hospitalisation for more than 24 hours etc) in the warehousing industry are caused by workers slipping or tripping. In the past, a slip or trip accident may not have been viewed as seriously as an accident involving a fork-lift truck. However, it is clear from the pattern of major injuries that workers who slip or trip are sustaining serious injuries from the fall or from impact with objects or structures.

Manual handling, being hit by moving or falling objects and falls from height also cause a significant number of major injuries. See Figure 1.

Over-3-day absence

The manual handling of loads is the main cause of reported over-3-day injuries. As well as being the prime cause of major injuries, slips and trips are also a significant cause of over-3-day injuries. See Figure 2.

Health and safety policy

A health and safety policy statement is a starting point to managing health and safety in the workplace. It sets out how health and safety will be managed in your organisation – it shows who does what, and when and how they do it. If you have five or more employees, you will need to have a written health and safety policy statement.

The main cause of injuries in warehousing

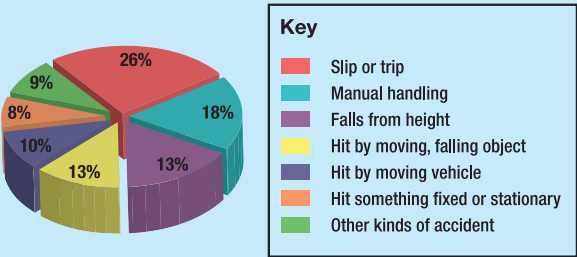


Figure 1
Causes of major injuries in storage and warehousing (2005/6)

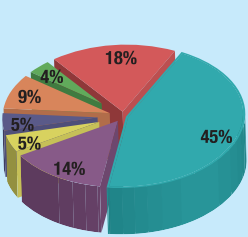


Figure 2
Causes of over 3-day absence injuries in storage and warehousing (2005/6)

Managing Health and Safety

Warehousing is a complex industry that can expose workers to a multitude of risks; health and safety should be proactively managed just like any other part of the business.

The Management of Health and Safety at Work Regulations 1991 require employers to put in place appropriate health and safety arrangements. This means having an effective health and safety management system. The complexity of this system should reflect the organisation's activities.

Steps to successful health and safety management include:

- Identifying the key health and safety priorities within a business;
- Concentrating efforts on these priorities;
- Assessing the risks to employees and others;
- Eliminating risks where possible. Where risks can't be eliminated, they should be reduced to an acceptable level;
- Using safe systems of work;
- Providing the workforce with adequate information and training;
- Involving the workforce and health and safety representatives in decision making on health and safety issues; and
- Regularly reviewing performance.

Successful health and safety management 'HSG652' gives more information on health and safety management systems.

Risk assessment

The first step in managing health and safety is to identify the priorities – i.e. to carry out a risk assessment. It is also important to consider additional hazards specific to a site that may also need attention.

Risk assessment is an important step in protecting your workers and your business, as well as complying with the law. It helps you focus on the risks that really matter – the ones with the potential to cause real harm. You are legally required to assess the risk in your workplace so that you can put in place a plan to control them.

A risk assessment is simply a careful examination of what in your work could cause harm to people, so that you can weigh up whether you have taken enough precautions or should do more to prevent harm. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures.

The law does not expect you to eliminate all risk, but you are required to protect people 'so far as is reasonably practicable'.

When thinking about your risk assessment, remember:

- A hazard is anything that may cause harm, such as chemicals, electricity, working from ladders, an open drawer etc;
- The risk is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.

Risk assessment can be broken down into five steps:

Step 1 Identify the hazards

Step 2 Decide who might be harmed and how

Step 3 Evaluate the risks and decide on precautions

Step 4 Record your findings and implement them; and

Step 5 Review your risk assessment and update if necessary

If you employ five or more people you must keep a record of the significant findings of your assessment. The record should be fit for purpose – paperwork is a means to an end rather than an end in itself.



Examples of risk assessments are published on the risk pages of HSE's website; these help you identify what is expected in practice.

Many risks in a warehouse may already be well controlled, e.g. the correct industrial trucks may be used and the drivers correctly trained, but you should also consider other issues such as supervision, monitoring and maintenance.

Workers should be actively involved in the risk assessment process.

Investigating accidents and incidents

Check what happened:

- Find out about the circumstances leading up to the accident/incident
- Identify the hazards that contributed to the accident/incident, e.g. plant, equipment, tools or substances in use;— work environment (such as floor surface, lighting, temperature)
- The way the work is organised (who is doing what and when); and
- Training and skills of those involved

Prevent the accident/incident happening again:

- Identify what has already been done to minimise the risk
- Decide on additional precautions required to prevent similar accidents/incidents
- Ensure the additional precautions are implemented
- Review the new precautions to ensure they remain effective
- Keep records of any investigations you carry out

Storage Risk Assessments

Your storage risk assessment must identify hazards caused by your storage of goods, analyse the likelihood of their occurring and determine who and what might be at risk.

You then need to take steps to implement any precautions needed to ensure all risks are minimised.

You'll also need to record your findings and remember to review your assessment regularly.

Types of possible hazard you'll need to consider include:

- Goods falling from shelving or racking
- Someone falling when climbing on shelving
- Stock or materials blocking fire exit routes
- Accumulations of used packaging
- Poor storage causing increased manual-handling risks, e.g. putting bulky items above head height
- Spillages of goods causing environmental damage or increasing the risk of slips and trips occurring
- Exposure to badly stored hazardous substances
- Contamination or danger caused by storing inappropriate materials together
- The use of mechanical-handling equipment, e.g. loads falling from forklift trucks
- Vandalism, theft and arson causing pollution
- Flammable substances

Health and Safety with Pallet Racking

The safe and efficient use of pallet racking storage systems depends on a number of factors. This guide is intended to give an indication of good practice and advice to the warehouse operator who may not be a specialist in technical matters or in the detail design related to the storage facility. If the users should be left in any doubt about a particular situation then more specialist advice must be sought from the supplier of the equipment.

In general, storage systems using pallets, pallet racking and mechanical handling equipment are safe when well designed and used within the designed parameters.

Specification

Some racking installation problems are caused by the user not supplying a complete specification of their storage requirements.

The racking manufacturer or supplier will generally strive to establish the proposed use of the storage systems so as to provide the most cost efficient design solution. Lack of information in the initial specification may result in an incorrect design or one that is less flexible for future changes of use. In order to determine a safe design of the storage equipment to be supplied, the information provided by the user must include details of the following storage environment:-

- Building structure and properties of the floor
- The type and quality of pallet to be used, the goods required to be stored and how they are packed
- The handling equipment to be employed
- The location of rack sprinklers and any information about planned future changes



Clearances

Racking systems should be designed to provide adequate clearances both laterally between adjacent pallets/loads, between pallet loads/uprights, and also vertically between the top of a load and the bottom of the above beam. Adequate clearances should also be provided between handling equipment and racking. It should be noted that changes in the handling equipment or the product stored on the pallets can materially affect the clearances originally designed and care should be taken to ensure that these remain adequate. Failure to provide adequate clearances can only increase the likelihood of damage (see clearance diagrams for further guidance).

Precautions

To reduce the risk of goods falling from racks, where there is a risk of injury to personnel, effective preventative measures should be taken. This is particularly important along passageways and order picking areas adjacent to racking or shelving.

Protection

The careless use of mechanical handling equipment can damage the storage equipment components and impair its safety.

Minor impact damage to uprights can severely reduce the safe carrying capacity of an upright.

Where impacts on the storage equipment are likely to occur, upright protectors should be specified.

Storage layouts should be designed to ensure aisles of adequate width are provided. In determining the minimum aisle widths and gangways, consideration must also be given to the provision of upright protectors. Generally, these should be sited on uprights at the corners of aisles and gangways or the entry face of drive-in racking. They should be made conspicuous by a highly visible colour.

Floor mounted column protectors are the most popular and are fixed to the floor immediately in front of the rack frame. Alternatively, structural steel barriers can be installed to provide maximum protection for exposed rack ends.

Flooring

With a new warehouse facility, the floor should be designed to support the imposed loads from the storage equipment and to be suitable to accommodate the floor fixings to be used.

With an existing warehouse floor it will be necessary to obtain sufficient information to confirm that the imposed loads from the racking or shelving can be safely supported without causing deformation of the floor. This may cause the rack to move out of plumb or create problems for truck traffic operating in the area. Equally, the existing floor level conditions should be confirmed suitable prior to installation of racking or selection of specialised handling equipment.

Installation

The correct assembly of the storage equipment is of equal importance to the provision of a safe structural design. The persons carrying out the assembly and installation should be trained and experienced in the work to be done and be properly supervised and controlled to ensure that the health and safety of the workers are safeguarded. It is highly recommended that the installers are SEIRS registered (The Storage Equipment Installers Registration Scheme). The Health and Safety Executive welcomes SEIRS and the initiatives taken by SEMA (the Storage Equipment Manufacturers' Association) to improve safety standards. SEIRS installers are fully trained in essential installation techniques, health and safety requirements and applicable legislation.

The quality and accuracy of the installation work can have a profound influence on the performance of the storage equipment.

2 WAY ENTRY typical dimensions (mm)

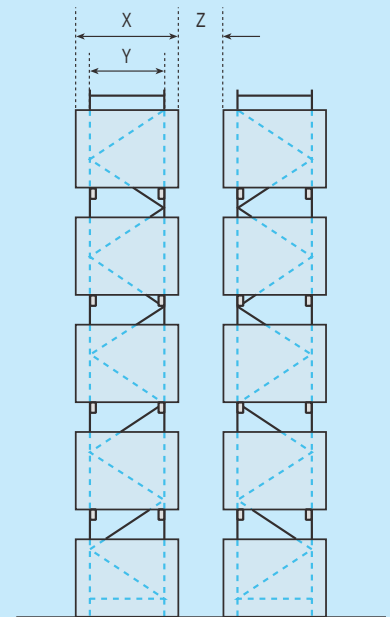
x	y	z
750	600	100
900	700	100
1000	750	150
1200	900	150

4 WAY ENTRY typical dimensions (mm)

x	y	z
750	700	75
900	800	75
1000	900	100
1200	1100	100

(all dimensions in mm)

x = overall depth of pallet
y = dimension over outside of beams
z = clearance between back to back pallets or loads



Typical dimensions

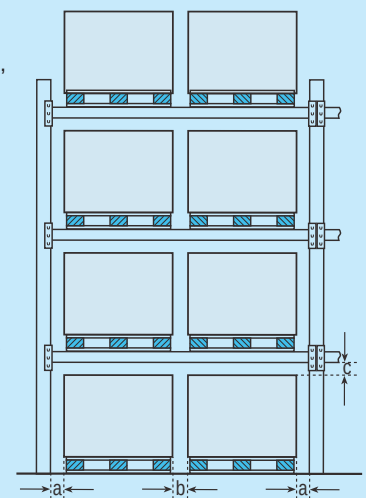
Beam Height	a	b	c
Up to 3000	75	75	75
3001-6000	75	75	100
6001-9000	100*	100*	125*
9001-12000	100*	100*	150*

(all dimensions in mm)

* These dimensions may be reduced in certain circumstances, such as for trucks with an elevating driving position.

Beam Height is the dimension from floor to top of beam in mm.

a = clearance between pallet or load and upright
b = clearance between adjacent pallets or loads
c = clearance between underside of beam and top of load or pallet where no automatic height section is used



Source: SEMA, Code of Practice for the use of static pallet racking.

For more information on safe Installation please refer to Section 5 on Product and Industry Standards.

Pallet Design and Safe Use

One of the major factors to be considered in the design of a Pallet Racking System is the type of pallet used to carry the loads to be stored.

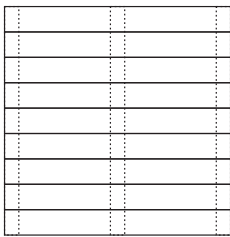
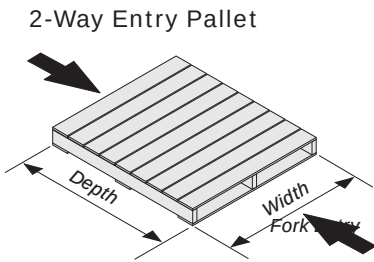
The two most commonly used pallet types - 2-Way Entry and 4-Way Entry - are shown here.

There are numerous variations on these designs - see the following pages for identification of pallet types.

Note the fork entry positions.

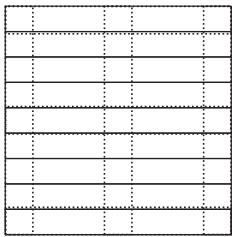
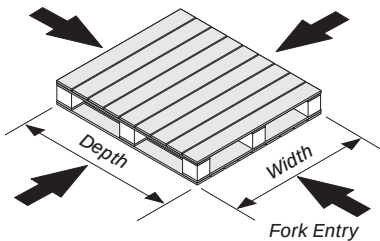
Both types of pallet are usually nonreversible - i.e. they must only be used with the close boarded side uppermost.

Note: When designing pallet racking, always take careful consideration of the type and size of pallets to be stored.



Plan view, 2-Way Entry Pallet

4-Way Entry Pallet



Plan view, 4-Way Entry Pallet

Key



Beams (or Drive-In Rails) must give support to the pallet at positions shown by the arrow.

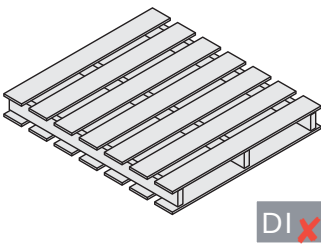


Pallet not suitable for use with Drive-In or Drive-Through Racking.

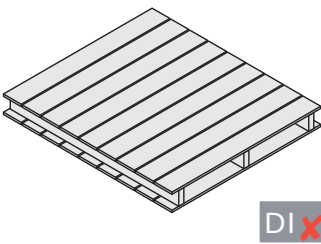


Pallet suitable for use with Drive-In Racking, when forks enter in the direction shown by arrow.

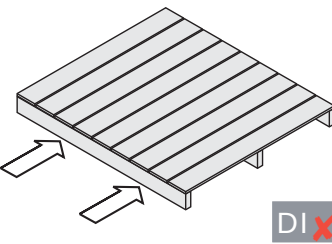
Types of Two-Way Entry Pallet



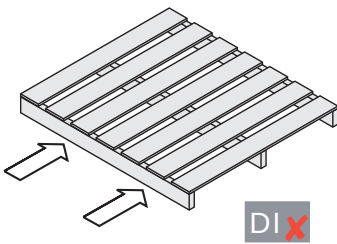
Two-Way Entry Pallet, Reversible, Open Boarded, Deck-Wing.



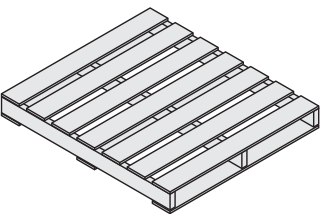
Two-Way Entry Pallet, Reversible, Close Boarded, Deck-Wing.



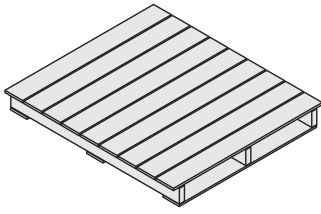
Two-Way Entry Pallet, Single Sided, Close Boarded Deck.



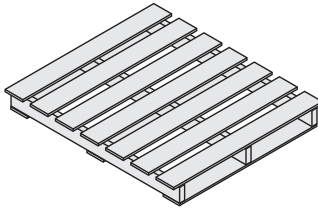
Two-Way Entry Pallet, Single Sided, Open Boarded Deck.



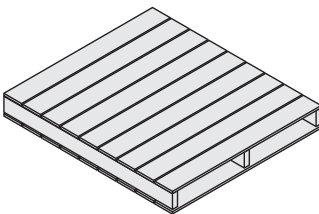
Two-Way Entry Pallet, Non Reversible, Open Boarded Deck.



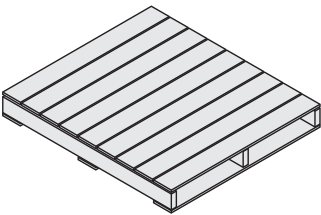
Two-Way Entry Pallet, Non Reversible, Close Boarded, Deck-Wing.



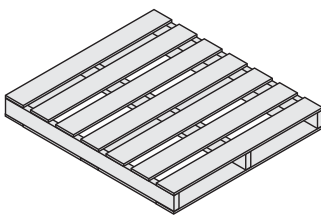
Two-Way Entry Pallet, Non Reversible, Open Boarded, Deck-Wing.



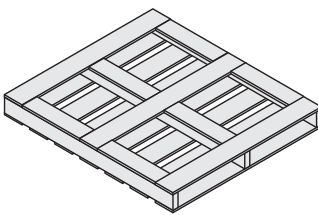
Two-Way Entry Pallet, Reversible, Close Boarded Deck.



Two-Way Entry Pallet, Non Reversible, Close Boarded Deck.

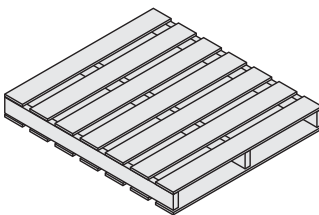


Two-Way Entry Pallet, Non Reversible, Open Boarded, Deck-Perimeter Base.



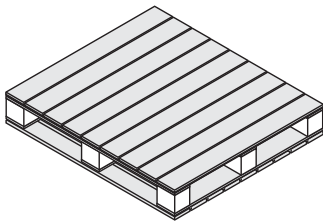
Underside view shown

Two-Way Entry Pallet, Non Reversible, Close Boarded, Deck-Perimeter Base.

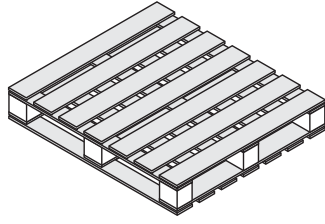


Two-Way Entry Pallet, Reversible, Open Boarded Deck.

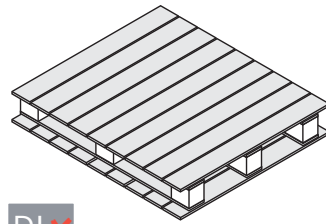
Types of Four-Way Entry Pallet



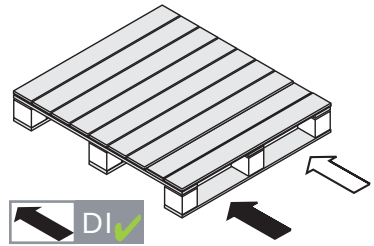
Four-Way Entry Pallet, Reversible, Close Boarded Deck.



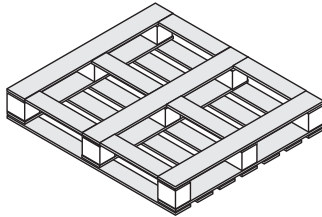
Four-Way Entry Pallet, Reversible, Close Boarded Deck.



Four-Way Entry Pallet, Non Reversible, Close Boarded, Deck-Wing.

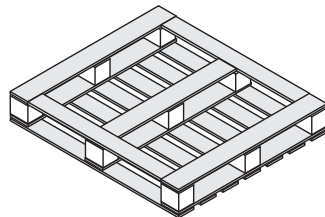


Four-Way Entry Pallet, Non Reversible, Close Boarded Deck.



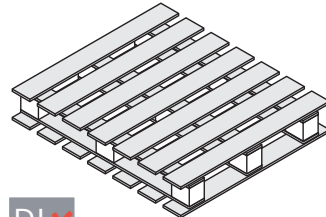
Underside view shown

Four-Way Entry Pallet, Non Reversible, Open or Close Boarded Deck, Cruciform Perimeter Base..

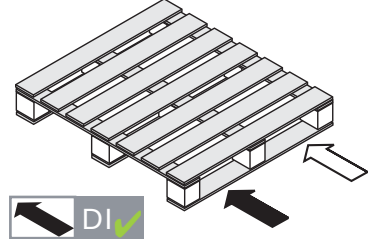


Underside view shown

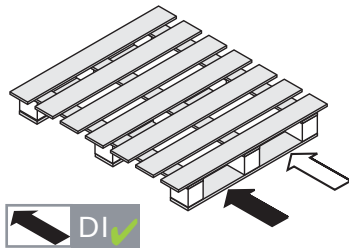
Four-Way Entry Pallet, Non Reversible, Open or Close Boarded, Deck-Perimeter Base.



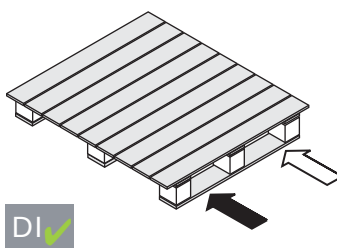
Four-Way Entry Pallet, Reversible, Open Boarded, Deck-Wing.



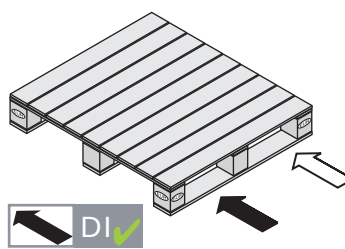
Four-Way Entry Pallet, Non Reversible, Open Boarded.



Four-Way Entry Pallet, Non Reversible, Close Boarded, Deck-Wing.

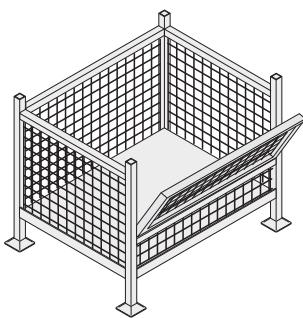


Four-Way Entry Pallet, Non Reversible, Close Boarded, Deck-Wing.

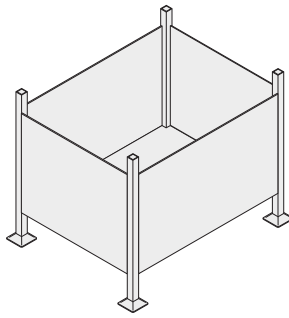


'Euro Pallet', 1200 x 800, Four-Way Entry, Non Reversible. Marked 'EUR' on corner blocks.

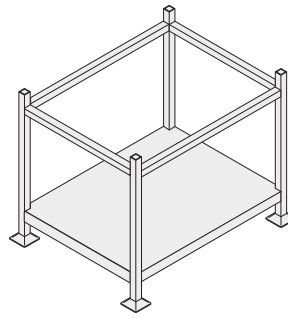
Types of Post Pallet



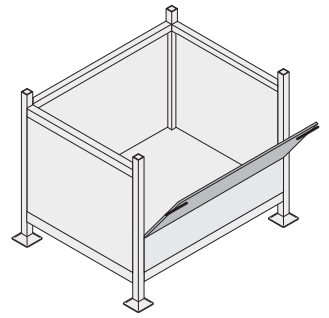
Mesh Box Pallet, With Drop Side.



Solid Side Post Pallet.



Fixed Post Pallet, with Tie Bar.



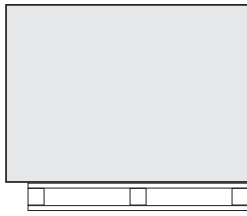
Solid Side Post Pallet, with One Half Drop Side.

Note: All Post Pallets must be located using Pallet Foot Supports.

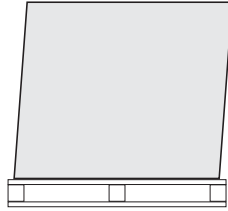
Pallet Loads

In addition to the weight, the actual dimensions of a pallet load are critical.

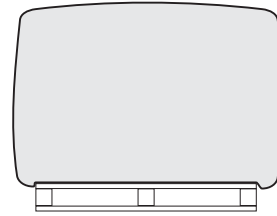
Take note of all possible factors such as pallet overhang, misplacement, and load stability, which could effect the configuration of the racking and its operating clearances etc.



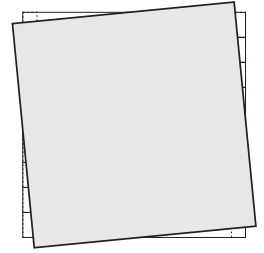
Front elevation showing load overhang



Front elevation showing load instability.



View showing Load settling.
e.g. Sand, Aggregate.



Plan view showing load misplacement.

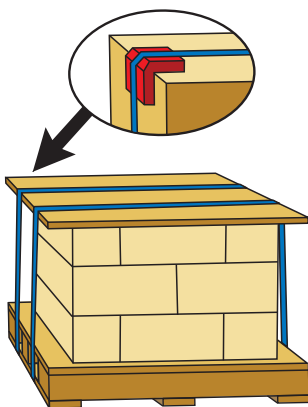
Using flat pallets

Flat timber pallets form an essential part of many mechanical handling system in warehouses. Accidents directly attributable to these pallets usually arise from six main sources:

- Poor design
- Poor construction
- The use of a pallet which is unsuitable for a particular load
- The continued use of a damaged pallet
- Bad handling
- The use of a pallet which is unsuitable for a particular racking system

The majority of pallets are designed for carriage of a particular class or type of goods and to be handled or stored by a particular method, e.g. a pallet intended for the carriage of boxed cereals, handled by a lift truck and stored singly in racking, will not usually be suitable for goods such as cans of paint, lifting by bar sling or for stacking four high. A pallet designed specifically to carry evenly distributed loads, such as boxed cereals, may not be strong enough to carry concentrated loads, such as an electric motor of the same weight.

Where mixed racking systems are installed within a single warehouse, the use of pallets which require a different orientation for each racking system, e.g. a four-way entry pallet without base members 'x', are not to be regarded as suitable. Use a pallet design that is suitable for all your racking systems, regardless of orientation.



Dunnage and other methods can improve load packaging.

Loading pallets

Pallets should be loaded to an established pattern designed to achieve maximum stability and safety within the rated load. Loads should be applied gradually, and unless the pallet has been specifically designed for point loading, should, as far as possible, be uniformly distributed over the deck area. As a general guide, the load height should not exceed the longest base dimension of the pallet.

Shrink or stretch wrapping the load usually provides greater security, minimising the possibility of movement of goods – it may be possible, in certain circumstances, to safely transport loads taller than the largest base dimension of the pallet, e.g. palletised loads approximately to the internal height of closed vehicles. This should only be done where you have carefully assessed the stability of the load components, the load configuration and any special features such as wrapping, strapping etc

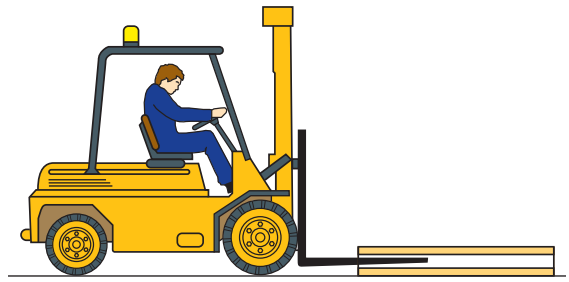
Safe pallet use

Consider the following for safe use of pallets:

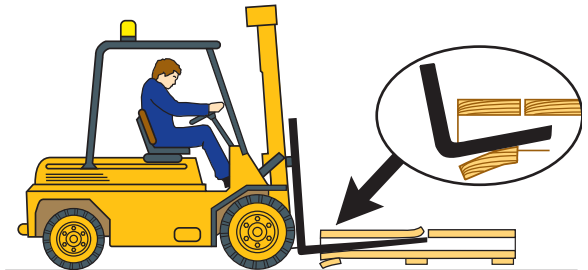
- You should have an effective system for pallet inspection. Damaged pallets should be removed from use
- All pallets should be inspected each time before use, to ensure that they are in a safe condition. Withdraw damaged pallets for suitable repair or destruction
- Empty pallets should be carefully handled and not dragged or thrown about. They should not be handled by methods likely to loosen deck boards. Wedging the platform of a sack barrow between top and bottom deck boards can cause damage
- Hand-pallet truck forks of unsuitable length can cause base board damage and be dangerous to workers
- If hand-pallet trucks are used, take care to ensure that the small finger wheels (also known as trail or guide wheels) do not damage the base boards. Chamfered edges to the bottom deck boards will assist entry of the pallet truck fork arms
- Expendable pallets, i.e. pallets designed for one delivery only, should be clearly marked to this effect and are not normally suitable for storing on racking. They should not be reused
- Take care when using strapping to secure loads to pallets, as deck boards can be pulled from the bearers
- To avoid damage to pallets and to lift palletised loads safely, the forks of a handling device should extend into the pallet to at least 3/4 of the pallet depth

The forks should not extend beyond the pallet, as protruding forks could:

- Make contact with or lift an adjacent load(s), causing it to overturn or collapse; or
- Find their way underneath a fixed structure (e.g. racking) during lifting, causing overloading of the truck and/or serious damage to the racking structure



Mast should be absolutely vertical



Mast should not be tilted backwards until forks have fully entered and lifted the pallet Warehousing and storage

Instruct operators on the correct method of handling pallets, emphasising:

- The mast should be in the vertical position when entering and leaving the pallet, forks should be level with the pallet boards
- The pallet should be positioned against the heel of the forks
- The forks should enter the pallet squarely
- The forks should be correctly spaced for the pallet load being lifted
- Pallets should not be pulled or pushed along the ground
- Loads should be carefully and gently placed on the stack below
- Pallets should be lowered onto racking beams, and never slid across or along the top surface of such beams



Turntable pallet stretch-wrap machines

These machines are commonly used in warehouse premises to wrap a pallet load in a sheet of plastic film to provide stability, weatherproofing and protection to the load during storage or distribution. The pallet load is usually placed onto the machine turntable using a lift truck or pallet truck; the plastic film is then attached to the pallet load manually, e.g. by tying to the pallet, and wrapping is carried out by rotating the load on the turntable while the film reel is carried vertically up and down on a column. Some machines are fitted with a top clamp, which descends to steady the pallet load while the wrapping cycle is carried out.

Common hazards associated with the use of turntable pallet stretch-wrap machines include:

- Trapping a person's body between the moving pallet load and the fixed structure
- Trapping a person's body between the moving pallet load and fixed parts of the machine
- Trapping a hand by moving parts, e.g. drive mechanisms, chain and sprockets
- Trapping a foot between the power-driven turntable and its surround
- Trapping a foot between the underside of the film reel carriage and floor or framework of the machine
- Trapping a hand or arm between the top clamp and the load

The following safeguards should be adopted when turntable pallet stretch-wrap machines are used:

- Ensure that the area around the turntable to a minimum distance of 500 mm (1000 mm is recommended) from the turntable edge is level and marked with fluorescent orange-red or 'safety colour' yellow and black lines (see BS 5499 Part 5). This area should be clear of obstructions to allow safe access for trucks to load and unload. Adopt a suitable system of work to avoid the danger of overhang, e.g. by ensuring correct positioning of the pallet and ensuring that the pallet is of the appropriate size
- There should be a minimum horizontal clearance of 500 mm between the turntable edge and any fixed parts of the machine or film reel carriage
- The turntable drive mechanism should be completely encased
- Provide suitable fixed guards for chains and sprockets in the film reel carriage column. Guarding may not be necessary where the film reel carriage is moved by means of a collar driven by a protected lead screw
- The turntable should be circular to minimise the risk of foot trapping, and any gap between the turntable and its surrounds should not exceed 5 mm
- To prevent trapping a foot between the underside of the film reel carriage and the floor or other fixed framework of the machine, a clearance of at least 100 mm should be maintained. Where this is not possible, provide a suitable trip device that will stop the motion of the film reel carriage. The film reel carriage should not restart automatically if stopped by a trip device; positive restart action, e.g. the

operation of a 'start' button, should be necessary after the obstruction is removed. Similar protection is required between the film feed carriage and the top clamp support at the other end of the carriage travel, unless safe by position

- To prevent entrapment between the top clamp and load, the underside of the clamp should be covered with suitable resilient material at least 25 mm thick. This should be renewed if its resilience deteriorates. The top clamp pressure should be limited to prevent or reduce the risk of injury if a person's arm comes between the top of the pallet load and underside of the top clamp
- To allow for uneven loading, the diagonal measurement of the largest pallet load should be at least 100 mm less than the diameter of the turntable, e.g. for a standard 1200 mm by 1000 mm pallet, the turntable size should be 1690 mm diameter
- Controls and switches should be grouped and mounted in one panel, clearly marked to indicate their function and mode of operation, and situated to allow the operative to occupy a safe position with full view of the load
- Provide easily accessible emergency stop buttons that are of the palm or mushroom type, and coloured red. Once operated, the stop buttons should remain in operation until reset
- As an alternative to safeguarding the hazards individually, locate the turntable column and film reel within an interlocked enclosure

In some specialised warehousing situations, pallet wrappers or strappers that are conveyor-fed and operate automatically (including those where the pallet remains stationary while the reel passes round it on a rotating arm) may be found. Such machines generally require a higher standard of guarding, and as a minimum, should be provided within interlocked enclosures.



Pallet inverters

These mechanically operated machines are designed so that a defective pallet at the bottom of a palletised load can be easily removed and replaced with a sound pallet, without the need to de-stack the load by hand. They may also be used to change from one type of pallet to another. Pallet inverters should only be used where a pallet carries non-crushable materials stacked in a manner that allows inversion. The basic operation is as follows:

- 1 Palletised load with defective pallet placed onto the machine platform by lift truck or pallet truck
- 2 Load clamped between platform and top plate
- 3 Load inverted by machine
- 4 Clamping mechanism released
- 5 Pallet removed and replaced as required
- 6 Palletised load re-clamped
- 7 Load inverted back
- 8 Platform descends with palletised load to original position

Hazards at pallet inverters are known to include:

- The trapping points between the dangerous moving parts of the pallet inverter
- The trapping points between the moving parts of the pallet inverter and its fixed structure
- The trapping points between moving parts of the pallet inverter and the fixed structure of the building or structures surrounding the pallet inverter
- The trapping points between the moving platform and the palletised load and
- The trapping points between the moving platform and the ground or loading bay during descent



After assessing the risks associated with the use of pallet inverters, you should adopt the following precautions:

- The pallet inverter should only be used by trained and authorised personnel. It should be located in a suitable part of the warehouse where unauthorised employees can be excluded from its area of operation
- Provide interlocked enclosure guards. The enclosure guards should be designed, installed and adjusted so that;
 - until the guard is closed, the interlock prevents the machinery from operating by interrupting the power
 - either the guard remains locked closed until the risk of injury from the hazard has passed, or opening the guard causes the hazard to be eliminated before access is possible (i.e. the machine comes to rest before access is possible)
- Operators should be trained, instructed and competent in the correct method of using the machine and be made aware of the potential dangers



Pallet converters

A pallet converter is a frame (usually metal) that fits onto a wooden pallet to enable crushable or unevenly shaped loads to be stacked. The pallet converter should be rigid even without a load or with a part load, and you should not rely on a full load to ensure rigidity.

Locking pins or other devices used to locate and lock the converter onto the pallet should be in good working order and free from defects. To ensure the pallet converters are in a condition to be stacked safely, there should be an effective system of control over pallets and component parts of converters that ensures all the component parts are compatible with each other. Damaged or defective pallet converters should not be used.

Materials Handling Equipment

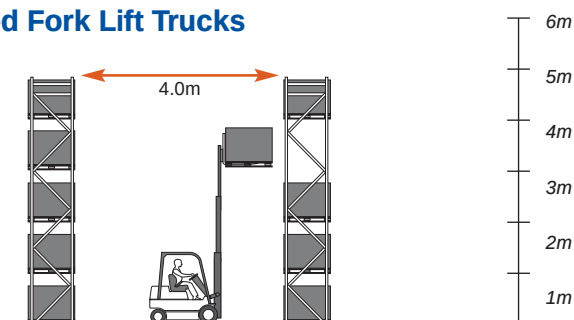
The success of any storage installation will be dependent upon the compatibility of the interface between the storage equipment and the vehicles handling the loads to be stored and retrieved.

Careful consideration must be given to balancing the volume storage requirement against the throughput of goods, critical factors which will influence the specification of both the storage racking and the type/s of handling equipment.

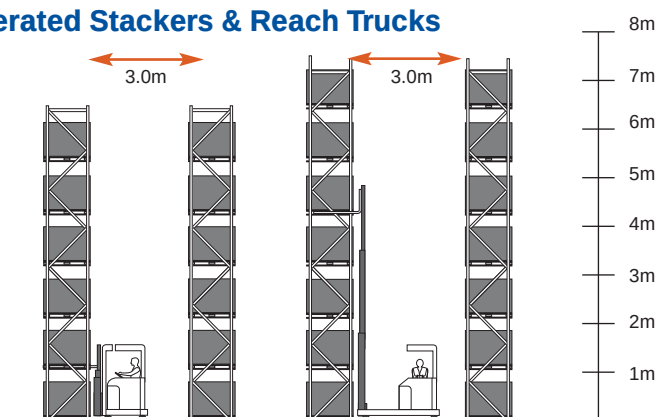
When planning a storage & handling scheme, reference to the guidelines published by S.E.M.A. (the UK Storage Equipment Manufacturers Association) and B.I.T.A (British Industrial Truck Association) is recommended.

The illustrations below offer a general comparison of the working aisle widths and lift heights of the main types of pallet handling vehicle, relative to the pallet racking system.

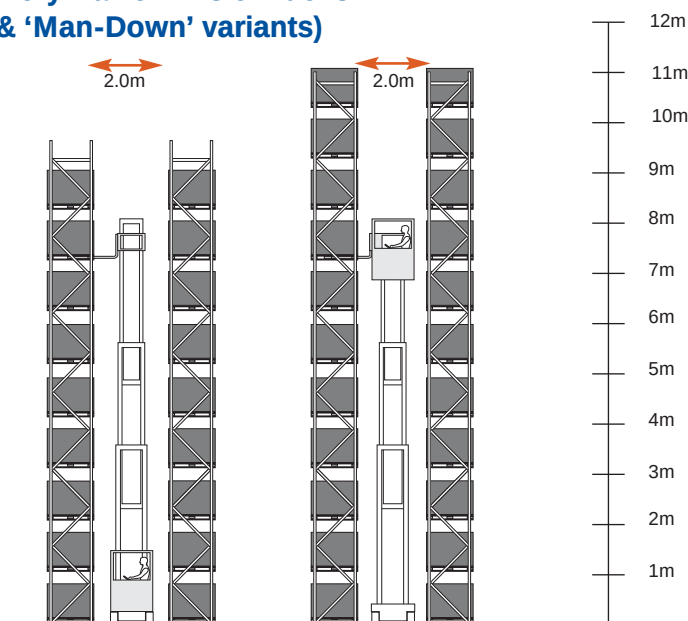
Counterbalanced Fork Lift Trucks



Power Operated Stackers & Reach Trucks



Narrow & Very Narrow Aisle Trucks ('Man-up' & 'Man-Down' variants)



All aisle dimensions are indicative only and will always be dependant on the pallet or load being handled, type of fork lift truck, operating environment and any special customer requirements such as attachments etc.

Check with truck manufacturers for exact dimensions.



Stacking and Low Level Order Picking Trucks

These combine the function of a pallet transporter and a fork lift truck and provide a high degree of versatility and mobility.

Such trucks are ideal for varied load moving tasks, short journeys and order picking duties.

A wide range of variants is available including basic pallet trucks, lifters, stackers and order picking types.

Manually Operated Lifters/Stackers.

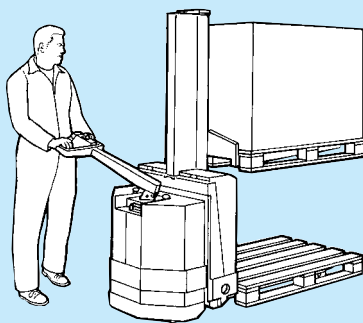
This elementary type of load transporter incorporates a hydraulically operated lift, but requiring manual shift.

Used for moving loads a short distance around warehouses, stores or manufacturing facilities. Restricted lift height.

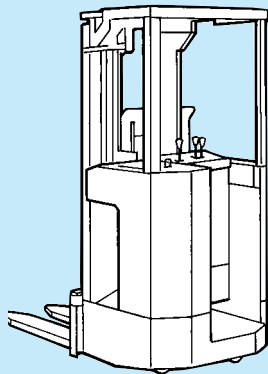
The straddle legs may need space for access under the bottom beam at floor level.

Capacity: Approx. 1000kg.

Lift height: Approx. 1.5 - 2.0m.



Pedestrian Stacker.



'Rider' Stacker.

Power Operated Stackers.

More robust and sophisticated units than the manually operated lifters, these are widely used for lifting and internal transport.

Pedestrian Controlled or Rider Operated variants are available, to suit a wide range of handling requirements.

Capacity: Approx. 1000 - 2000kg.

Lift height: Approx. 1.5 - 6.0m.

Low Level Order Pickers.

Powered ride-on units, for picking orders from low level storage locations.

Some have initial lift for travel and order picking purposes, but they cannot pick or place pallets into racks.

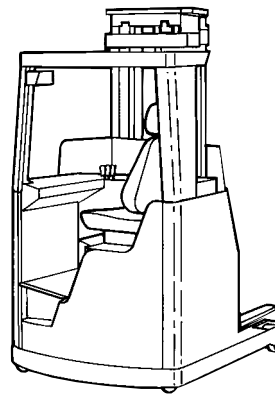


Reach Trucks

In widespread use, the electrically powered Reach Truck has replaced the traditional counter balance truck for many internal pallet handling applications.

Reach trucks are designed so that the load is retracted within the wheel base. This dramatically reduces the overall length and turning circle of the vehicle, allowing the truck to operate in aisles of reduced width - thus significantly saving space.

Substantially increased lift heights, exceeding 10.5 metres, can be achieved.



Reach Truck.

Widely used, and available in numerous versions for different loads, lift heights and intensity of usage.

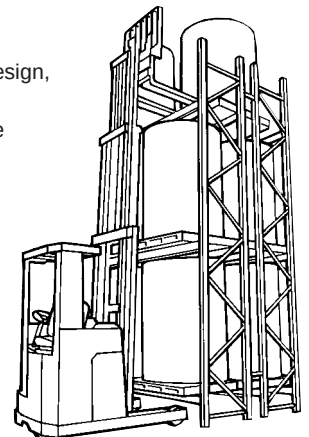
Numerous versions in use, including trucks with fully enclosed heated cabs for working in cold stores, whilst others are available with a rotating and tiltable driver's seat/cab for improved ergonomic performance.

Capacity: Approx. 1200 - 2500kg.

Lift height: Approx 7 to 10m.

Double-Deep Reach Truck.

A variant of the standard reach truck design, equipped with telescopic forks to allow pallets to be stored two deep within the racking.



Possible extra 300mm clearance required at 1st beam level when using a reach truck



Counterbalanced Fork Lift Trucks

Very robust, battery, petrol, diesel or gas powered trucks which carry their load at the front of the vehicle.

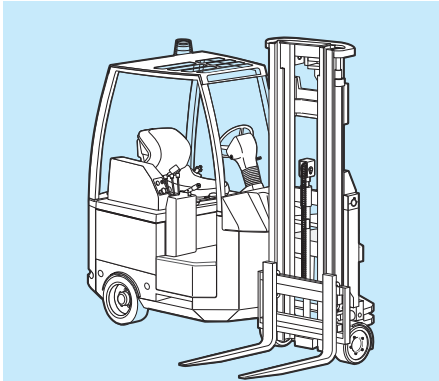
The name for this type of truck is derived from the fact that loads placed on the forks are counterbalanced by the weight of the vehicle over the rear wheels.

These trucks are available in a wide range of variants, to meet the multitude of handling tasks and working environments encountered.

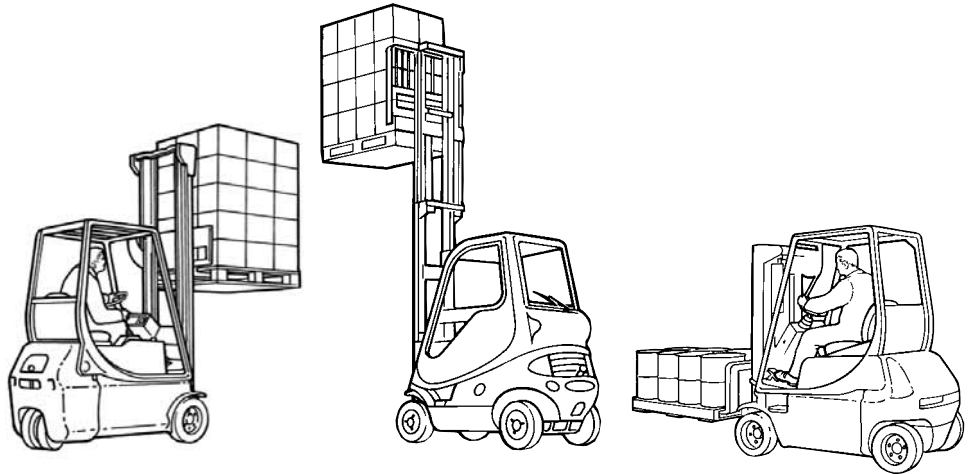
Most heights and fork lengths vary according to the application and most designs are typically 2 or 3 stage according to closed height requirements.

Capacity: Up to 3000kg.

Lift height: Up to approx. 10m.



Articulated trucks can operate in a similar aisle sizes to VNA trucks, saving space, they can also perform the loading tasks of reach and counterbalance trucks. Special rack layout considerations do need to be made and truck drivers will need to be competent when working in narrow aisles.



Counterbalanced Trucks can be 3 or 4 wheel configuration, depending on the lift capacity and the turning radius required.

Note: Pay attention to the tyres specified or used: Most warehouse trucks run on cushion or solid pneumatic profile tyres; 'Yard trucks' run on standard pneumatic tyres, which are not as stable for racking applications.



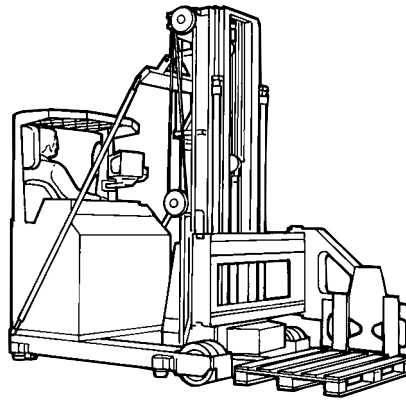


Narrow & Very Narrow Aisle Trucks

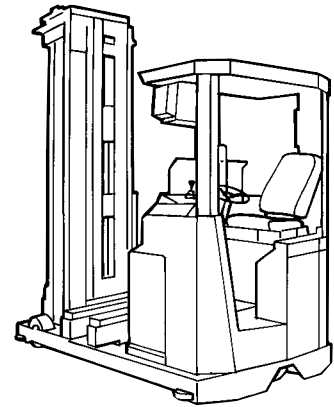
Designed to operate within the minimal aisle widths and maximised storage heights of Narrow Aisle Racking installations.

A Narrow Aisle (NA) Truck can be classified as one whose base does not have to turn within the working aisle because the load is moved sideways into or out of the racking. In this way the aisle width is kept to a minimum.

'Fixed-Path' NA trucks usually operate only within the racking aisle, using rail or wire guidance for precision movement, whilst 'Free-Path' NA trucks are also able to work outside the NA store.



With rotating or 'L' head fork attachment

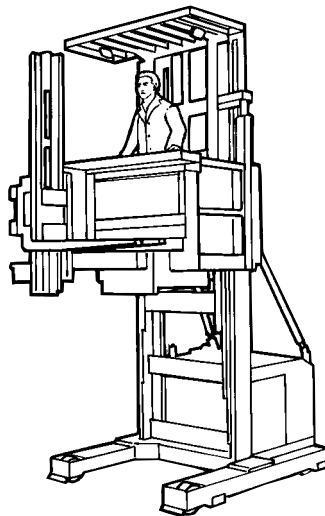


Side-loading telescopic forks

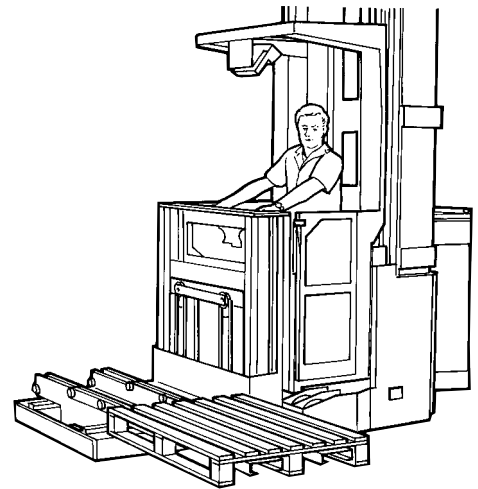
NA/VNA Trucks, 'Man-Down'.

Standard version, where the operator remains at ground level.

Also known as a 'Turret Truck'.



With rotating or 'L' head fork attachment



Side-loading telescopic forks

NA/VNA Trucks, 'Man-Up'.

Also known as 'Rising Cab' trucks, where the operator's cab is elevated with the forks, providing much improved visibility. Very popular for picking and stacking applications. Many are fitted with radio data terminals (RDT's) to control picking operations.

Also known as 'Combination Trucks' or 'Lateral Aisle Stacking Trucks'.

Medium/High Level Narrow Aisle Order Picking Trucks.

The function of an Order Picking Truck is to provide the facility for an operator to hand pick items at, and above, the manual picking height - *see also Low-Level Order Pickers*.

Many different designs are available but in the main the units are derivatives of conventional Narrow Aisle Trucks, with a cage framework, working platform or roller platform added to or substituted for the lift forks.

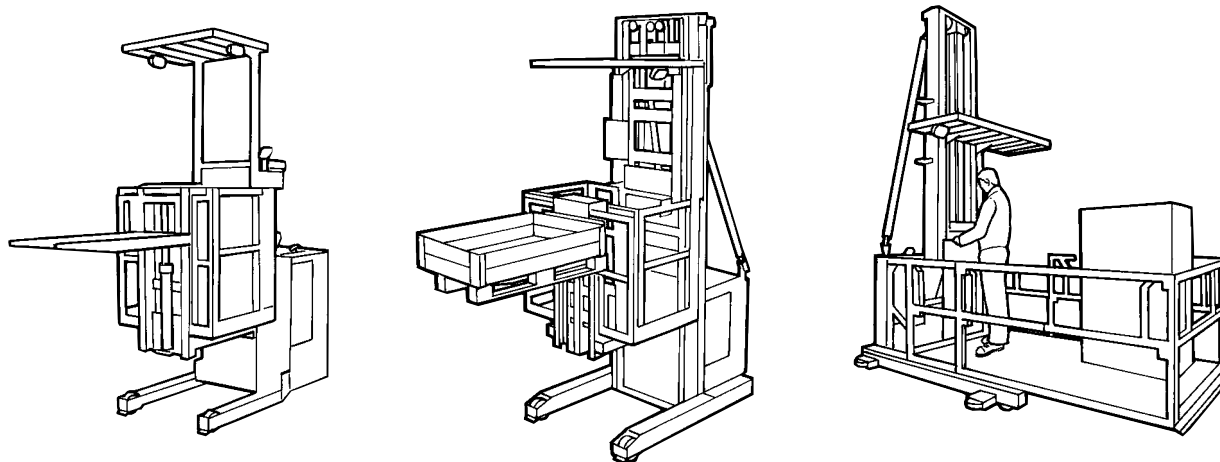
These machines work in aisles, little wider than the base of the truck and are thus highly efficient in their utilisation of space.

Capacity: Typically 700 - 1000kg.

Picking height: Approx 9m.

VNA Order Picking Trucks.

Like VNA 'Man-Up' or 'Rising Cab' trucks, these are used for pallet/order picking and are often custom-designed to meet specific load/application requirements.



Operation of lift trucks

Although no substitute for proper training, the following simple rules are set out for the benefit of lift truck operators and their supervisors, and should always be followed.

Do's and Don'ts

Do:

- Issue keys or other activating devices for lift trucks to authorised operators only, who should retain them until the end of the work period
- On completion of work, park the lift truck in the designated parking area with the fork arms lowered to the ground and clear of walkways, with the parking brake applied and engine switched off. Shut off the power on battery-powered trucks. Turn off the gas on gas-powered lift trucks. Return keys or other activating devices to their place of safe keeping



- Be particularly careful when operating where there are pedestrians. Observe the site rules and take all precautions to avoid pedestrians. Pedestrians and vehicles should be separated wherever possible
 - As a general rule, when operating, keep to the left. However, when driving between rows of machines or racks it may be safer (if a clear view can be obtained) to keep to the centre of the gangway or aisle
 - Sound the horn in short sharp blasts at every potential danger spot. Remember, the horn does not give automatic right of way
 - Stop before doorways. Sound the horn and proceed slowly if clear to do so
 - Avoid violent braking or sudden change of direction which may cause the load to fall off or the lift truck to tip
 - Where possible, travel with the fork arms lowered to within 150 mm (6") of level ground and mast tilted slightly back. With some attachments, for example barrel clamps, the load should be kept level. Always follow the instructions for use of the attachment
 - Always look in the direction of travel. When loaded, travel down or up slopes with the fork arms facing uphill. When unloaded, travel up or down slopes with fork arms facing downhill. It may be necessary to raise the fork arms slightly at the bottom of slopes to avoid grounding the load or fork arms. Where it is impossible or hazardous to turn the lift truck to comply with the above, for example when loading containers using a portable ramp, operate with the fork arms facing uphill for both directions of travel. In this case keep the lift truck in line with the incline and do not attempt to turn until on a level surface. Do not turn on or travel across a ramp or incline
 - Travel slowly when descending slopes
 - When leaving the lift truck, even for a few seconds, apply the parking brake, make sure the controls are in neutral and the fork arms are tilted forward and lowered to the ground. If the lift truck is to be out of sight or remote, shut off the power and remove the key or other activating device
- When mounting or dismounting from the lift truck use the steps and handholds provided for the purpose. Before dismounting, check that it is safe to do so and that the lift truck is parked safely
 - Before raising a load ensure there is sufficient clearance overhead to do so and that objects which could fall and injure people nearby will not be dislodged

Don't:

- Lift a person on the forks unless a safe working platform is fitted
- Operate controls from outside the cab
- Stand on or near the controls to reach the load or anything outside the cab
- Allow operators to consume alcohol while at work. Even small quantities of alcohol can impair judgement and put the safety of the operator and others at risk
- Allow an employee who appears unfit through drink or drugs to operate a lift truck (a person who would be unfit to drive a vehicle on the public road should be considered unfit to operate a lift truck)
- Pick up a load if someone is standing close to it
- Allow people to walk underneath the load
- Move a load that appears unsuitable, including one which is on a damaged pallet. Mark it as such and report its condition to the supervisor. Do not attempt to lift a load where the weight of the load is not known and it is believed that it may be approaching the maximum weight
- Leave a lift truck unattended/parked on a gradient except in an emergency, in which case chock the wheels to ensure that the truck cannot roll down the gradient. This should be done even if the truck will only be parked for a very short time and the operator remains in the vicinity (for example to attend to a problem with a load)
- Carry passengers unless the lift truck is designed and equipped to do so
- Run over cables or flexible pipes etc that are on the floor unless they are suitably protected
- Travel with the load raised, because of the risk of overturning, except at creep speed as part of a stacking or de-stacking manoeuvre
- Carry a load that blocks forward visibility. If it is absolutely necessary to carry a bulky load which blocks visibility, then the lift truck should be driven in reverse. If this is not possible, for example when travelling up a slope, a responsible person should be appointed to be a banksman who, having a clear view of the path of the load, can give clear instructions to the operator. The banksman should be in a safe position and be in view or able to communicate effectively with the operator. If the banksman is unable to maintain a clear view of the path of the load then assistants who can do so will be necessary. Assistants also need to be in a safe position and either be in view of, or otherwise be able to communicate effectively with, the responsible person. Everyone involved in such exercises needs to use the same reliable means of effective communication (see Safety signs and signals or BS 6736 Code of practice for hand signalling for use in agricultural operations)



Stacking and de-stacking

General principles which apply are:

- Lift trucks can become unstable when the mast is being raised or lowered because its centre of gravity is changing, whether loaded or not. Therefore, before the mast/arm is raised/lowered or extended, the truck should be stationary with the parking/hand brake applied and transmission disengaged before the hydraulics are used. However, on some rough-terrain machines it may be necessary to make minor adjustments while in motion to allow for uneven ground;
- Stacking and de-stacking should not be attempted on inclines since the lift truck could overturn as the load is lifted, and the stack itself may be unstable;
- If the fork tips extend beyond the load make sure they do not contact other loads in the rack etc;
- Loads should be against the vertical face of the fork arms or load back-rest extension;
- Adjust the fork spread to suit the load.

The above refers to stacking and de-stacking with lift trucks equipped with fork arms. Similar procedures should be followed when loading or unloading lorries, trailers etc and when using attachments, except that with some attachments the mast should remain vertical at all times. The instructions of the manufacturer or authorised supplier should be followed.

Stacking with counterbalance lift trucks

The procedure for stacking with counterbalance lift trucks is as follows:

- Before lifting, assess the weight of the load and its centre of gravity to ensure that the load does not exceed the capacity of the lift truck;

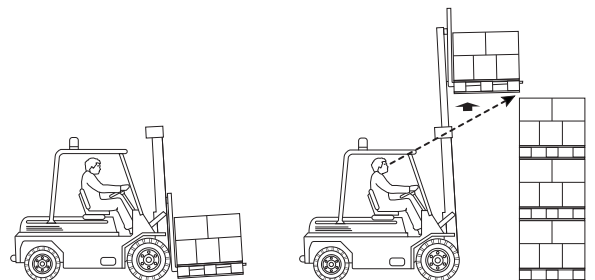


Figure 1

Figure 2

- Approach the stack with the load low and tilted backwards. Slow down and stop at the face of the stack, apply the parking brake, select neutral if applicable, and reduce the backward tilt to an amount just sufficient to stabilise the load (Figure 1);
- Look up and check for obstructions then raise the load to the desired stacking height (Figure 2);

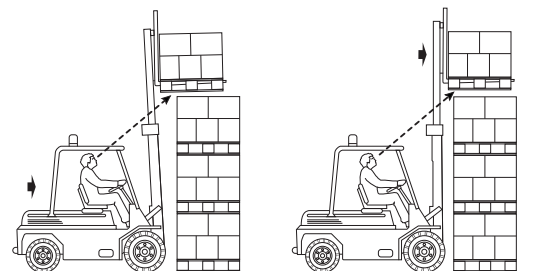


Figure 3

Figure 4

- Move slowly forwards, taking care not to dislodge loads in adjacent stacks (Figure 3);
- When the load is over the stack, stop, apply the parking brake and select neutral if applicable. Reduce the backtilt until the load is level, then slowly and smoothly lower the load onto the stack (Figure 4);

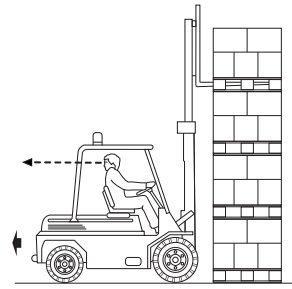


Figure 5

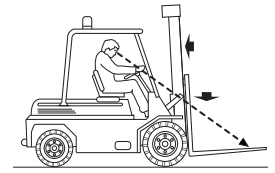


Figure 6

- When the load is securely stacked, lower the fork arms until free of the pallet or dunnage strips. After ensuring the way is clear, withdraw by reversing the lift truck, keeping a continuous lookout front and rear. Great care must be taken to ensure that the forks do not bind on withdrawal. If necessary adjust the tilt to clear (Figure 5);
- When clear of the stack, apply the parking brake and select neutral if applicable. Lower the fork arms to just above ground level, apply a slight backtilt, and check that the way is clear before moving off (Figure 6).

De-stacking with counterbalance lift trucks

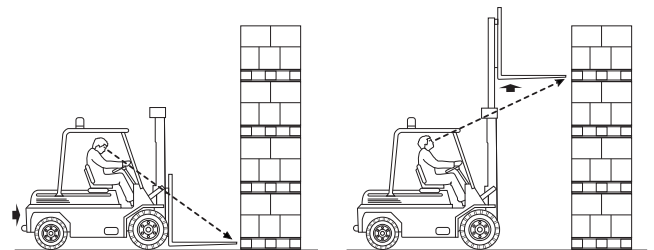


Figure 7

Figure 8

The procedure for de-stacking is as follows:

- Halt at the face of the stack and apply the parking brake, selecting neutral if applicable. Bring the mast to the vertical position. If necessary, adjust the fork spread to suit the width of the load and ensure that the weight of the load is within the capacity of the lift truck (Figure 7);
- Look upwards, raise the fork arms to a position permitting clear entry into the pallet or dunnage strips (Figure 8);
- Fully insert the fork arms by slowly driving forward until the heels of the forks gently touch the load or pallet base, and apply the parking brake, selecting neutral if applicable (Figure 9);
- Lift the load clear of the stack and carefully apply a backward tilt, just sufficient to stabilise the load (Figure 10);

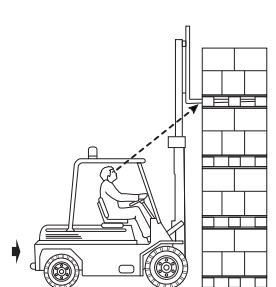


Figure 9

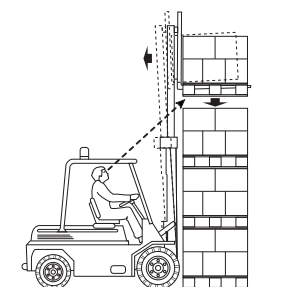


Figure 10

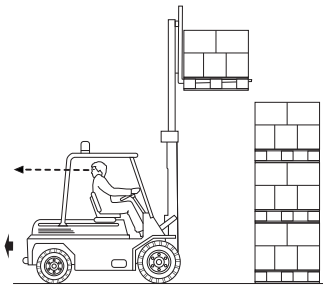


Figure 11

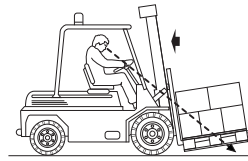


Figure 12

- (e) check that the way is clear, then move slowly backwards until the load and fork arms are clear of the face of the stack, taking care not to dislodge loads in adjacent stacks and apply the parking brake, selecting neutral if applicable (Figure 11);
- (f) lower the load carefully and smoothly to the correct travelling position, applying a further backward tilt. Check to see the way is clear before moving off (Figure 12).

Reach trucks

Reach trucks should not be driven, whether loaded or not, with the reach mechanism extended except when inching at the face of the load, stack or rack. The parking brake should be applied before operating the reach mechanism. No one should step over the reach legs or put any part of their body between the mast and power unit if the reach truck is capable of being operated. The reach movement should not be used for pushing or dragging loads and the load should be carried on the fork arms and not resting on the reach legs unless the reach truck is specifically designed for the purpose.



Stacking with reach trucks

Operators of reach trucks should observe the following basic stacking rules:

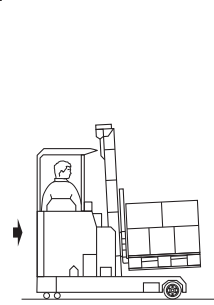


Figure 13

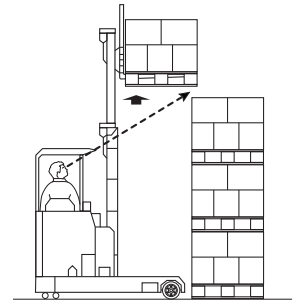


Figure 14

- (a) Approach the stack with the load low, reached in and tilted slightly backwards (Figure 13);
- (b) Slow down and stop at the face of the stack, apply the parking brake, select neutral if applicable, and reduce the backward tilt to an amount just sufficient to maintain the load stability. Look up and check for obstructions, then raise the load to the desired stacking height (Figure 14);

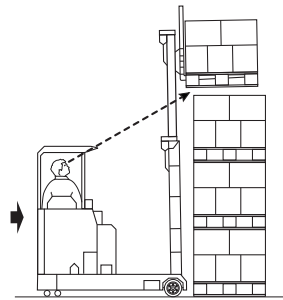


Figure 15

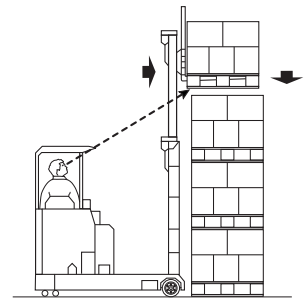


Figure 16

- (c) Move forward if necessary, to bring the reach truck close to the stack, and reapply the parking brake, selecting neutral if applicable. Reach out smoothly, taking care not to dislodge loads in adjacent stacks (Figure 15);
- (d) When the load is squarely over the stack, level the load and lower it onto the stack gently and smoothly (Figure 16);

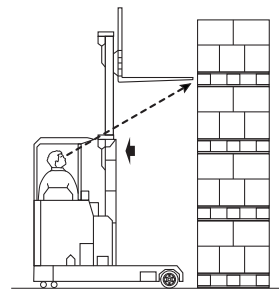


Figure 17

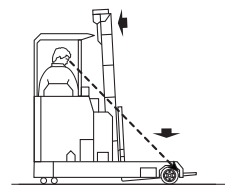


Figure 18

- (e) When the load is securely stacked, lower the fork arms until free of the pallet or dunnage strips and reach in. When freeing the fork arms, great care must be taken to ensure the forks do not bind on withdrawal. Adjust the tilt as necessary. (If the fork arms are not fully clear of the stack, the reach truck should be moved back a short distance, after ensuring the way is clear.) (Figure 17);
- (f) When the fork arms are clear of the stack, reapply the parking brake if the reach truck has been moved, selecting neutral if applicable. Lower the fork arms to just above ground level, apply a slight backtilt, and check the way is clear before moving off (Figure 18).

De-stacking with reach trucks

Operators of reach trucks should observe the following basic de-stacking rules:

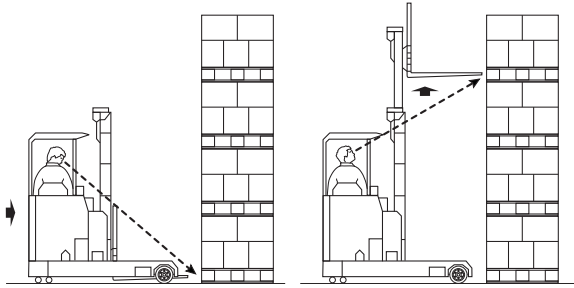


Figure 19

Figure 20

- (a) Halt at the face of the stack and apply the parking brake, selecting neutral if applicable. Bring the mast to the vertical position. If necessary, adjust the fork arm spread to suit the width of the load and ensure that the weight of the load is within the capacity of the reach truck (Figure 19);
- (b) Look up and check for obstructions, then raise the fork arms to a position permitting clear entry into the pallet or dunnage strips (Figure 20);

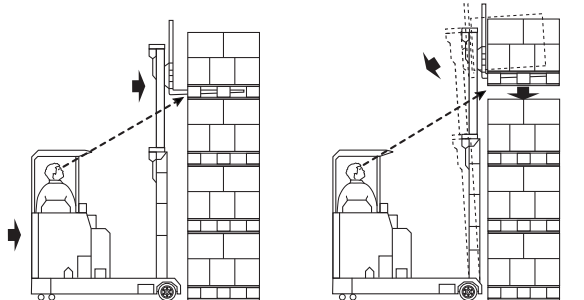


Figure 21

Figure 22

- (c) Move forward if necessary, to bring the reach truck close to the stack and re-apply the parking brake, selecting neutral if applicable. Fully insert the fork arms by reaching out until the heels of the forks gently touch the load or pallet base (Figure 21);
- (d) Lift the load until it is clear of the stack and carefully apply a backward tilt just sufficient to stabilise the load and reach in (Figure 22);

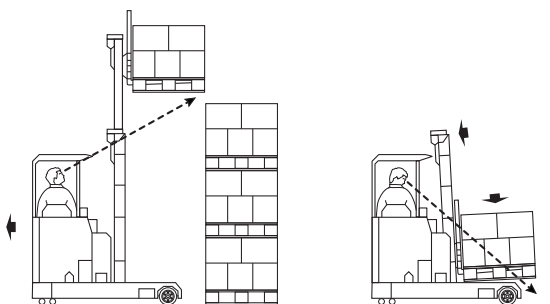


Figure 23

Figure 24

- (e) If necessary, move the reach truck slightly backwards away from the stack, ensuring that the way is clear and taking care not to dislodge loads in adjacent stacks. Re-apply the parking brake, selecting neutral if applicable, if the reach truck has been moved (Figure 23);
- (f) Lower the load carefully and smoothly to the correct travelling position, applying the requisite backtilt before checking the way is clear and moving off (Figure 24).



Working platforms

People should never be lifted on the fork arms or a pallet balanced on the fork arms of a lift truck because they can easily fall off. However, although equipment such as lift trucks and telescopic materials handlers are primarily designed for the purpose of handling materials, when fitted with a suitably designed working platform they can provide a safer alternative to other means of access (such as a ladder). This arrangement will not provide the same level of safety as purpose-built equipment such as a mobile elevated work platform (MEWP). Where it is reasonably practicable to obtain and use purpose-built equipment for lifting people, particularly for regular and/or routine operations then such equipment should be used. Regulation 9 of the Lifting Operations and Lifting Equipment Regulations 1998 requires lifting equipment (including lift trucks and working platforms) used for lifting people to be thoroughly examined by a competent person at least once every six months or in accordance with an examination scheme, and each time that exceptional circumstances which are liable to jeopardise the safety of the lifting equipment have occurred.

Masted rough-terrain counterbalance lift trucks

The basic principles of lift truck operation apply to these machines but there are some additional factors that need to be considered in their operation.

To control a lift truck on rough terrain it is important to ensure adequate traction between the tyres and the ground. Traction is affected by several factors including:

- (a) the nature of the terrain. Travel routes should be chosen or prepared to avoid steep inclines, slippery gradients, and unstable or uncompacted ground. Loss of control may also occur as a result of bouncing when crossing rough ground;
- (b) the weight over the drive wheels. An increase in the weight over the drive wheels will increase traction. So, for example, a loaded lift truck may be able to climb a slope safely but not be able to descend the same slope if unladen. Loss of control is more likely to occur with two-wheel drive lift trucks than four-wheel drives, but generally lift trucks can obtain sufficient grip to climb inclines steeper than those they descend safely. The manufacturer's data should be consulted when assessing whether a particular lift truck is suitable for its proposed use.

On some machines the parking brake cannot hold the machine on the steep inclines which it is able to climb. Operators should be made aware of the limitations of their lift truck which should be included in the manufacturers' performance data contained in their instruction manual. Work areas should be arranged in such a way that lift trucks do not have to stack or de-stack on an incline.

Stacking to high levels should only be carried out on reasonably level, well-drained ground that is well consolidated and is away from any excavation or wall.

When raising a load

When travelling, the fork arms should always be lowered but should be clear of the ground and any obstructions, and the mast should be tilted slightly backwards. When raising a load, care must be taken to ensure that there are no overhead obstructions. A load should never be lifted where there is a possibility of contact with or arcing from overhead power lines.

If a lift truck is to be driven unladen on public roads, the fork arms should be removed, folded or protected in some way to avoid presenting a hazard to other road users. The lift truck should be cleaned of any material likely to fall on the road and cause danger to other road users.



Telescopic materials handlers

The same basic principles of operation apply to these lift trucks as to all others, including rough terrain, but with a number of important additions. The range of types available is large. They may be two-wheel or four-wheel drive, and have two-wheel, four-wheel, crab steer or articulated steering.

The ability of telescopic materials handlers to raise loads to greater heights than conventional lift trucks increases the hazards of operation, particularly that of overturning. To counteract this latter hazard some types are equipped with stabilisers or chassis levelling devices.

The telescopic action of the boom presents an additional instability problem which operators need to understand. Although tipping sideways is recognised as a significant hazard, operators should also be aware of the danger of tipping forwards. Extension of the boom is a major factor which can cause this to happen and therefore the boom should be fully retracted for travelling, except at creep speed.

Stabilising jacks

If the truck is fitted with stabilising jacks, the operator should be aware of the lifting capacity with and without the jacks down. If used, the jacks should be on firm, level ground. The operator should also be familiar with limitations concerning the use of axle locks and lateral levelling.

The load capacity of the truck will vary according to the extension of the boom and its degree of elevation. The manufacturer's specifications should be observed at all times. Many telescopic materials handlers are used with a variety of attachments which may affect the stability of the machines. The manufacturer's or authorised supplier's recommendations for fitting and using attachments should be followed.

Operators and supervisors should be aware that attachments will alter the rated lift capacity and centre of gravity of the machine.





Machines should normally be fitted with Rated Capacity Indicators (RCI), often known as Load Moment Indicators. These give warning of approaching overload and should always be switched on during load handling operations. RCIs must be maintained and tested according to the manufacturer's or authorised supplier's instructions as part of the inspection regime required under PUWER. Operators should be made aware that it is an offence to interfere intentionally with the proper working of such a device (Section 8 of the HSW Act).

Lift trucks fitted with RCIs should not be used if it is suspected that the RCI is not working or is defective. The RCI is provided as an additional safety device and should not be used solely as an indicator of the limits of the machine.

For stacking or loading with a telescopic materials handler a firm, level site should be selected. Items should be transported with the boom as low as is practicable. On many machines the visibility to the right-hand side can be completely obscured if the boom is raised to certain positions. Because of this limitation particular care needs to be taken in areas where there may be pedestrians. It may be necessary to fit visibility aids or employ a banksman. Banksmen should be in a safe place and visible to the operator at all times.

When travelling up or down slopes with a load, the boom should face uphill. As far as possible avoid travelling across slopes.

Public Roads

When travelling on public roads, attachments and loads should be carried in such a way that they do not present a hazard to other road users. The boom should be in the lowest practicable position.

Before loads are raised, a check should be made for overhead obstructions. Loads should not be raised where there is a possibility of contact with or arcing from overhead power lines.

Restraining systems, such as seat belts should be worn whenever there is a risk of injury due to overturning. Doors should be kept shut to prevent the operator being ejected and crushed in the event of an overturn.

Side-loading lift trucks

The mast should be in when travelling unless the side-loader is specifically designed to allow travelling with the mast out. The load should be raised clear of the deck before the mast is traversed in, unless palletised or similar loads are being handled in the truck well. The truck should travel with the load securely on the deck and the fork arms just clear. The capacities of the truck, both with its stabilising jacks in use and without them, should be clearly marked and visible to the operator. When stabilising jacks are in use they should be hard down on firm ground, or suitable packing should be used.



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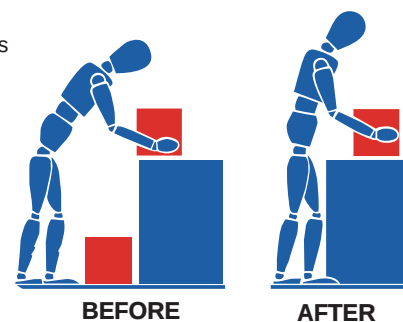
Manual Picking

Avoiding an obstructed lift...

Organise the workplace so that the handler can get as close to the load as possible.

When lifting of loads at or near floor level is unavoidable, handling techniques which allow the use of relatively strong leg muscles rather than those of the back are preferable, provided the load is small enough to be held close to the trunk.

The handler should also be able to address the load squarely; preferably facing in the direction of intended movement.



Use of midway stage to change grip

If the task includes lifting to shoulder height, an intermediate step to allow the handler to change grip will help to reduce the risk.

Good handling technique for lifting

Think before lifting/handling.

Plan the lift. Can handling aids be used? Where is the load going to be placed? Will help be needed with the load? Remove obstructions such as discarded wrapping materials. For a long lift, consider resting the load midway on a table or bench to change grip.



Keep the load close to the waist.

Keep the load close to the body for as long as possible while lifting. Keep the heaviest side of the load next to the body. If a close approach to the load is not possible, try to slide it towards the body before attempting to lift it.

Adopt a stable position.

The feet should be apart with one leg slightly forward to maintain balance (alongside the load, if it is on the ground). The worker should be prepared to move their feet during the lift to maintain their stability. Avoid tight clothing or unsuitable footwear, which may make this difficult.



Get a good hold.

Where possible the load should be hugged as close as possible to the body. This may be better than gripping it tightly with hands only.

Start in a good posture.

At the start of the lift, slight bending of the back, hips and knees is preferable to fully flexing the back (stooping) or fully flexing the hips and knees (squatting).

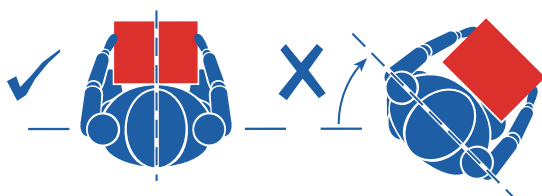
Don't flex the back any further while lifting.

This can happen if the legs begin to straighten before starting to raise the load.



Avoid twisting.

Avoid twisting the back or leaning sideways, especially while the back is bent. Shoulders should be kept level and facing in the same direction as the hips. Turning by moving the feet is better than twisting and lifting at the same time.

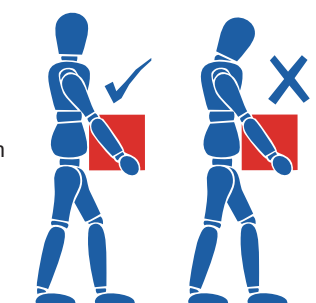


Keep the head up when handling.

Look ahead, not down at the load, once it has been held securely.

Move smoothly.

The load should not be jerked or snatched as this can make it harder to keep control and can increase the risk of injury.



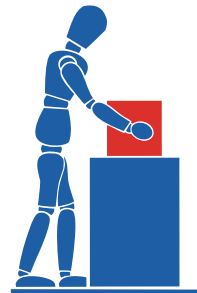


Don't lift or handle more than can be easily managed.

There is a difference between what people can lift and what they can safely lift. If in doubt, seek advice or get help.

Put down, then adjust.

If precise positioning of the load is necessary, put it down first, then slide it into the desired position.

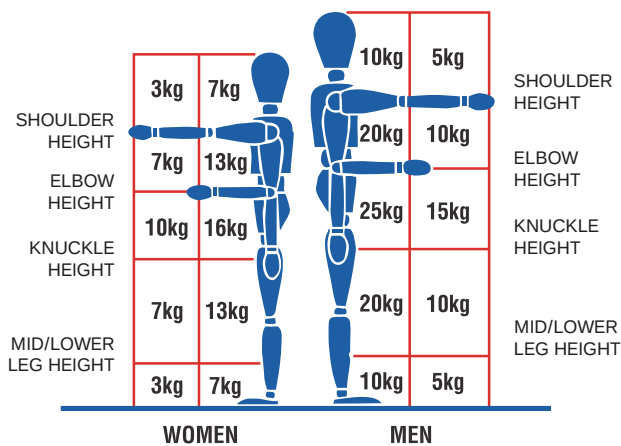


Guidelines for lifting and loading...

These basic guideline figures for lifting and lowering are for relatively infrequent operations - up to approximately 30 operations per hour.

Load at arm's length...

These figures will have to be reduced if the operation is repeated more often. As a rough guide the figures should be reduced by 30% where the operation is repeated once or twice per minute, by 50% where the operation is repeated around five to eight times per minute and by 80% where the operation is repeated more than about 12 times per minute.



Guidelines for risk assessment only, not safe lifting weight limits

Detailed assessment...

When a load is held at arm's length or the hands pass above shoulder height, the capability to lift or lower is reduced significantly. If the handler's hands enter more than one of the box zones during the operation, the smallest weight figures apply. Where lifting or lowering with the hands beyond the box zones is unavoidable, a more detailed assessment should always be made.

Even if the above conditions are satisfied, a more detailed risk assessment should be made where:

- the worker does not control the pace of work.
- pauses for rest are inadequate or there is no change of activity providing an opportunity to use different muscles.
- the handler must support the load for any length of time.

Summary...

Stand as close as possible to the object to be lifted

Bend the knees as much as possible - or brace yourself by putting the knees against a solid object - and use an arm supporting strut if this helps

Bend the hips keeping the head and back in a straight line;

and

Lift gradually using leg and stomach muscles

Link 51 (Storage Products)

About Us

Link 51 (Storage Products) is the UK steel storage equipment market leader. It specialises in the design, manufacture and installation of a wide range of versatile storage equipment, from adjustable beam pallet racking and heavy duty shelving, through to 'live storage' and fully integrated 'turnkey' warehouse schemes.

Link 51 are a World Class Manufacturer and are able to demonstrate industry best practice across all operational disciplines. Having UK based manufacturing allows Link 51 the benefits of being close to market for location (reducing transport costs and carbon emissions) and understanding customers' needs.

All Link 51 UK production facilities are fully accredited to ISO 9001, ISO 14001 and operate in line with ISO 18001.

Link 51's strength also lies in its people, and highly experienced design, technical, manufacturing and administrative personnel aim to ensure the success of every storage & handling project.

Link 51 is part of Whittan Storage Systems, which manufactures an extensive range of pallet racking, shelving, lockers, cupboards and other storage equipment, for clients around the world.



Link 51 Project Management

The implementation of a new warehouse storage scheme is a significant commitment for any business, but one that will bring immediate benefits.

It consequently pays to appoint a supplier who will handle your project with great care, and will resolve any concerns you may have along the way.

Link 51 provide market-leading storage solutions as part of a fully-managed project solution.

We will answer all of your questions and apply the expert knowledge and industry best practice necessary to carry a project through from conception to commissioning and beyond.

Link 51's project team takes a hands-on approach: guiding clients through the initial briefing and site surveys; checking detailed design proposals; meeting manufacturing schedules; completing installation on time; ensuring successful completion and hand-over.

This commitment to every installation project will deliver :

- Experienced people
- Working to the industry standards set by SEMA
- Link 51's own proven techniques and procedures
- Adhering to critical Health and Safety standards
- Applying detailed knowledge of CDM Regulations
- Professional rack maintenance and inspection advice

Our particular commitment to health and safety in design and construction means Link 51 works in partnership with a growing number of clients, who consider Link 51 their added insurance policy – particularly when it comes to the implementation of large-scale or technically complex storage and handling schemes.

www.link51.co.uk

Associated Organisations

British Industrial Truck Association (BITA)

www.bita.org.uk

British Materials Handling Federation (BMHF)

www.bmhf.org.uk

British Safety Council (BSC)

www.britsafe.org

British Safety Industry Federation (BSIF)

www.bsif.co.uk

British Standards Institution (BSI)

www.bsigroup.co.uk

The Chartered Institute of Logistics and Transport (UK) (CILT (UK))

www.ciltuk.org.uk

European Federation of Materials Handling (FEM)

www.fem-eur.com

Food Storage and Distribution Federation (FSDF)

www.fsdf.org.uk

Fork Lift Truck Association (FLTA)

www.fork-truck.org.uk

Health and Safety Executive (HSE)

www.hse.gov.uk

International Federation of Warehousing and Logistics Associations (IFWLA)

www.ifwla.com

Link 51 (Storage Products)

www.link51.co.uk

Storage Equipment Manufacturers Association (SEMA)

www.sema.org.uk

United Kingdom Warehousing Association (UKWA)

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