

Pallet Racking Selection Guide

Range Overview

Dexion pallet handling systems comparison chart.

Conceptual layout	Storage capacity (pallet positions)	Pallets high	Floor area (m x m)	Total area (sqm)	Average floor area by pallet position (sqm)	Storage product area	Area	Height	Cube	% of floor space covered by storage	Ceiling height (m)	Building volume (cbm)	Average building volume/ pallet positions (cbm)	% of building cube that is product	Average locations used in operations	% of pallets immediately accessible	Stock rotation	Price relationship guide (storage only)
Selective racking	2000	5	62.9 x 27.0	1698	0.85	53.9 x 11.9	641.4	7.45	4778.5	38%	8	13586	6.79	35%	95%	100%	Good	1
Double deep racking	2040	5	52.2 x 23.5	1227	0.60	43.1 x 14.4	619.5	7.75	4801.1	51%	9	11040	5.41	43%	88%	50%	Fair	1
Drive-in racking	2080	5	50.3 x 23.3	1169	0.56	44.9 x 17.5	785.5	8.00	6283.9	67%	8.2	9590	4.61	66%	75%	6%	Fair	2
Narrow aisle racking	2176	8	55.8 x 17.0	949	0.44	45.8 x 9.5	435.4	12.35	5377.0	46%	13	12338	5.67	44%	95%	100%	Good	1
Push back racking	2120	5	48.7 x 23.0	1119	0.53	X	484.0	8.80	4259.2	43%	9	10071	4.75	42%	80%	28%	Fair	3
Pallet flow racking	2080	5	44.1 x 29.0	1279	0.61	35.1 x 20.0	702.0	8.75	6142.5	55%	9.5	12150	5.84	51%	90%	13%	Fair	4
Mobile racking	2000	5	67.0 x 16.1	1079	0.54	54.0 x 12.5	675.0	7.80	5265.0	63%	8	8630	4.31	61%	98%	100%	Good	5
ASS open face single deep	2048	16	54.0 x 8.9	481	0.23	46.3 x 4.8	222.4	27.20	6048.8	46%	28	13457	6.57	45%	98%	100%	Good	3
ASS open face double deep	2048	16	54.0 x 7.0	378	0.18	46.3 x 4.8	222.4	27.20	6048.8	59%	28	10584	5.17	57%	95%	50%	Fair	3
ASS closed faced double deep	2048	16	54.0 x 6.9	373	0.18	43.1 x 4.8	205.3	29.20	5994.7	55%	30	11178	5.46	54%	95%	50%	Fair	3
ASS curve crane	2080	16	57.5 x 8.9	512	0.25	46.3 x 4.8	222.4	27.20	6048.8	43%	28	14329	6.89	42%	98%	100%	Good	3
Manual satellite system	2000	5	37.0 x 38.0	1406	0.70	28.3 x 24.4	690.0	9.00	6209.6	49%	9.5	13357	6.68	46%	80%	10%	Poor	6
Block stacking	2052	3	47.0 x 35.6	1673	0.82	X	910.0	4.05	3685.5	54%	4.5	7529	3.67	49%	70%	9%	Poor	0
Stackable containers	2016	4	62.0 x 32.5	2015	1.00	X	1129.0	6.80	7676.9	56%	7	14105	7.00	54%	75%	6%	Poor	1.5

Note: The data above is set as a guide only and may vary greatly from actual application.

Dexion Keylock pallet handling systems.

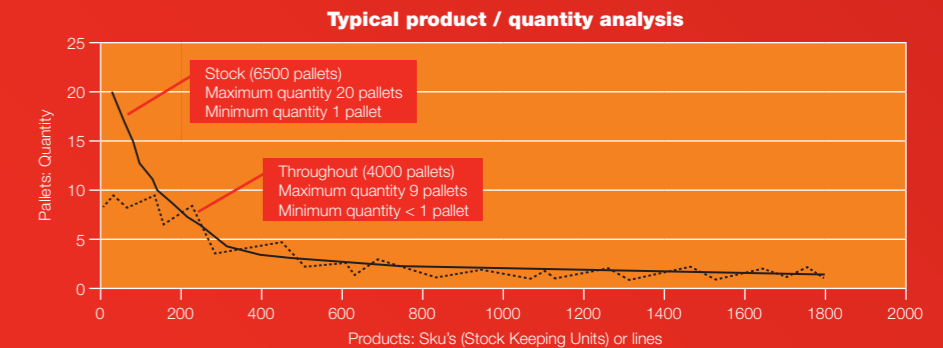
Dexion Keylock operates in conjunction with several key components. These are:

- **Products – your boxes, packages, sacks, bottles, containers etc.**
- **People – your fork lift truck drivers, pickers, packers, operators, managers.**
- **Places – your warehouse, floor, walls, columns, lighting, sprinklers etc.**
- **Prime Movers – fork lift trucks, cranes, handling devices and attachments.**
- **Pallets – wooden, plastic, cardboard in every shape and size.**
- **Procedures – the storage, handling, picking, despatch processes.**

All of these variable key components impact the environment where pallet storage systems form part or the whole of a storage solution. The storage and handling systems that are available are only limited by the imagination of the systems designer.

The table opposite compares the handling, space and density of each pallet storage system. The full range of Dexion Keylock systems are detailed in this book. Your Dexion representative will help assess your needs and work with you to develop a solution that will meet your specific requirements.

Key operating needs must be compared to the product profile that exists today within your business. The quickest and most time efficient method to review your products is to use a P-Q (Product/Quantity) Graph. Today's data will change in the future and this management tool enables you to prepare for this.

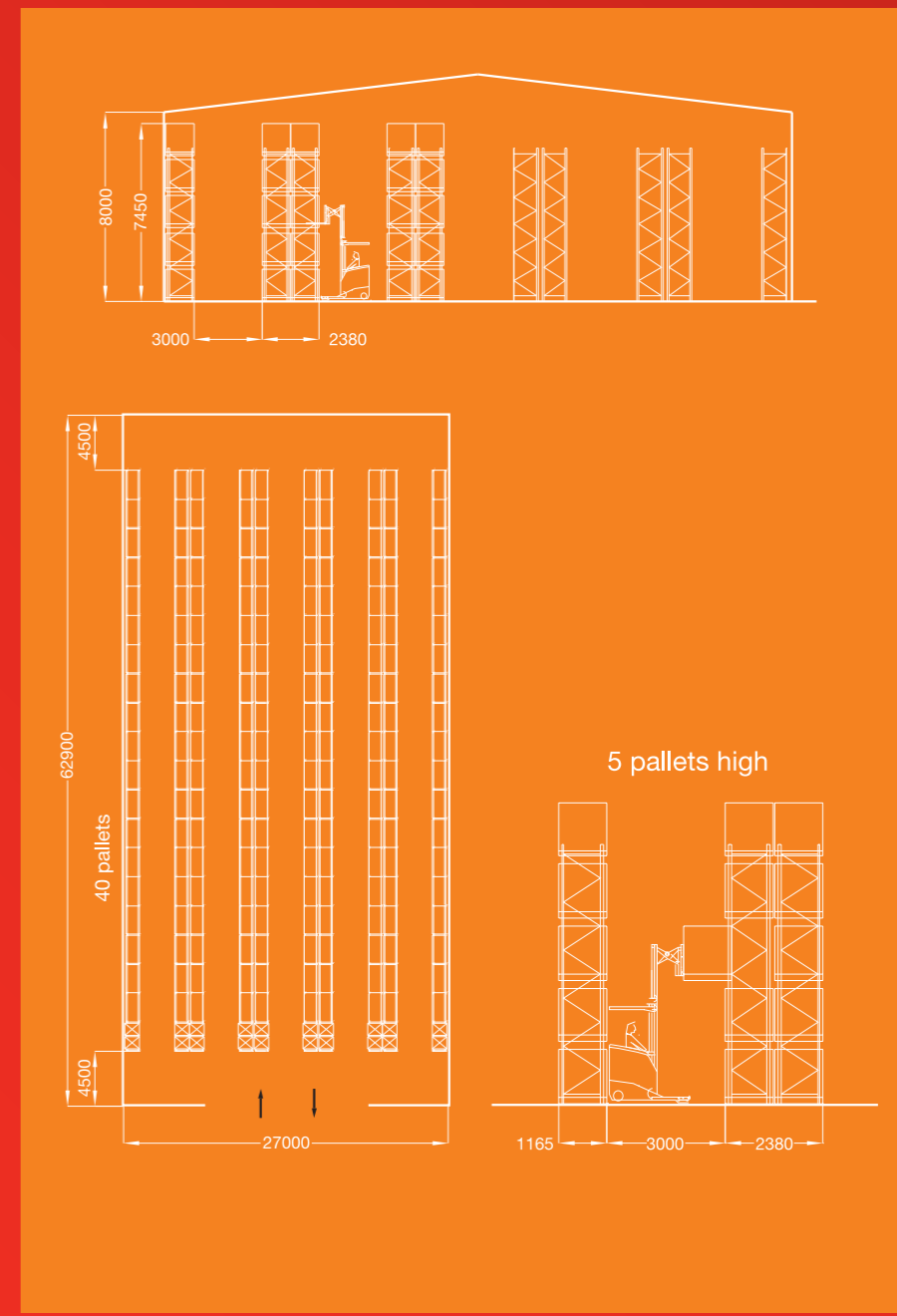




High volumes
many skus.

Selective racking.

The simplest of all pallet rack storage systems provides access to every pallet. Low cost equipment can be used offering simple adjustability and adaptability. Storage density is low with only 35% floor space used and only 25% cubic space used.



- Advantages.**
- Individual access to all pallets to full height of warehouse.
 - Simple stock rotation achieved.
 - Easy beam adjustment accommodates variable pallet heights.
 - Compatible with many handling equipment styles.
 - Conventional tolerance for floors when used to 10m high.
 - Lower level pallets can be located on the floor (picking pallets).
 - Accessories available can accommodate every unit load type.
 - Economical shelving beams can be added for low level picking.
 - High average locations used 95%, for 100% accessibility, good stock rotation.

Selective pallet racking example for 2000 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area: 62.9m x 27m = 1698 sqm

Total building volume:
13584 cbm (8m high)

Average floor area/
pallet position:
1698 sqm/2000 pallets = 0.85 sqm/pallet position

Average building volume/
pallet position:
13584 cbm/2000 pallets = 6.79 cbm/pallet



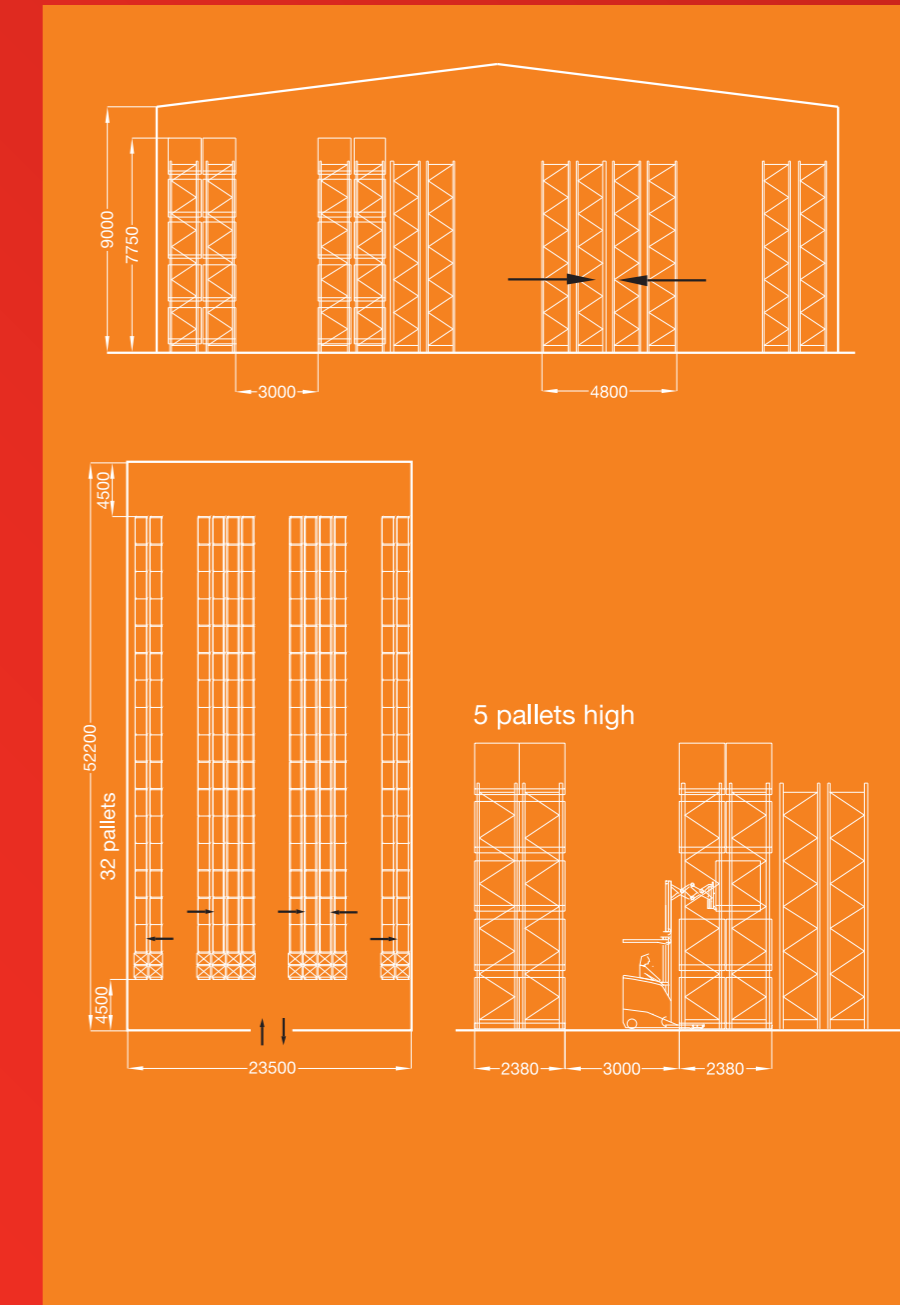
Double deep racking.

Double deep racking stores two pallets deep in a single entry rack or four pallets deep in a double entry rack. This system requires the use of a special reach fork lift truck with either dual pantograph or sliding fork attachments.

Double deep racking improves storage density with fewer aisles and more storage locations. This reduces the aisle to rack ratio but also reduces selectivity (FIFO). Truck lift heights are limited by load, to about 9 metres.

The upper levels can be fitted with front to back guide rails to assist the operator to locate and place a pallet at height. The bottom beam must be sufficiently clear of the ground to allow the reach trucks legs to pass under it.

High volumes few skus.



- Advantages.**
- Storage density increased as rack aisle ratio changes from selective racking.
 - 50% immediate accessibility with reasonable stock rotation.
 - Good use of all available locations, typically above 90%.
 - Safe and secure handling with the bottom pallet usually off ground.
 - Ability to use double deep handling equipment for other tasks.
 - Best used when each SKU has several pallets.

- Double deep example for 2040 pallets.**
- Pallet and load size: 1165mm (entry) x 1165mm x 1350mm (H)
 - Floor area: 52.2m x 23.5m = 1225 sqm
 - Total building volume: 11028 cbm (9m high)
 - Average floor area/pallet position: 1225 sqm/2040 pallets = 0.60 sqm/pallet position
 - Average building volume/pallet position: 11028 cbm/2040 pallets = 5.41 cbm/pallet



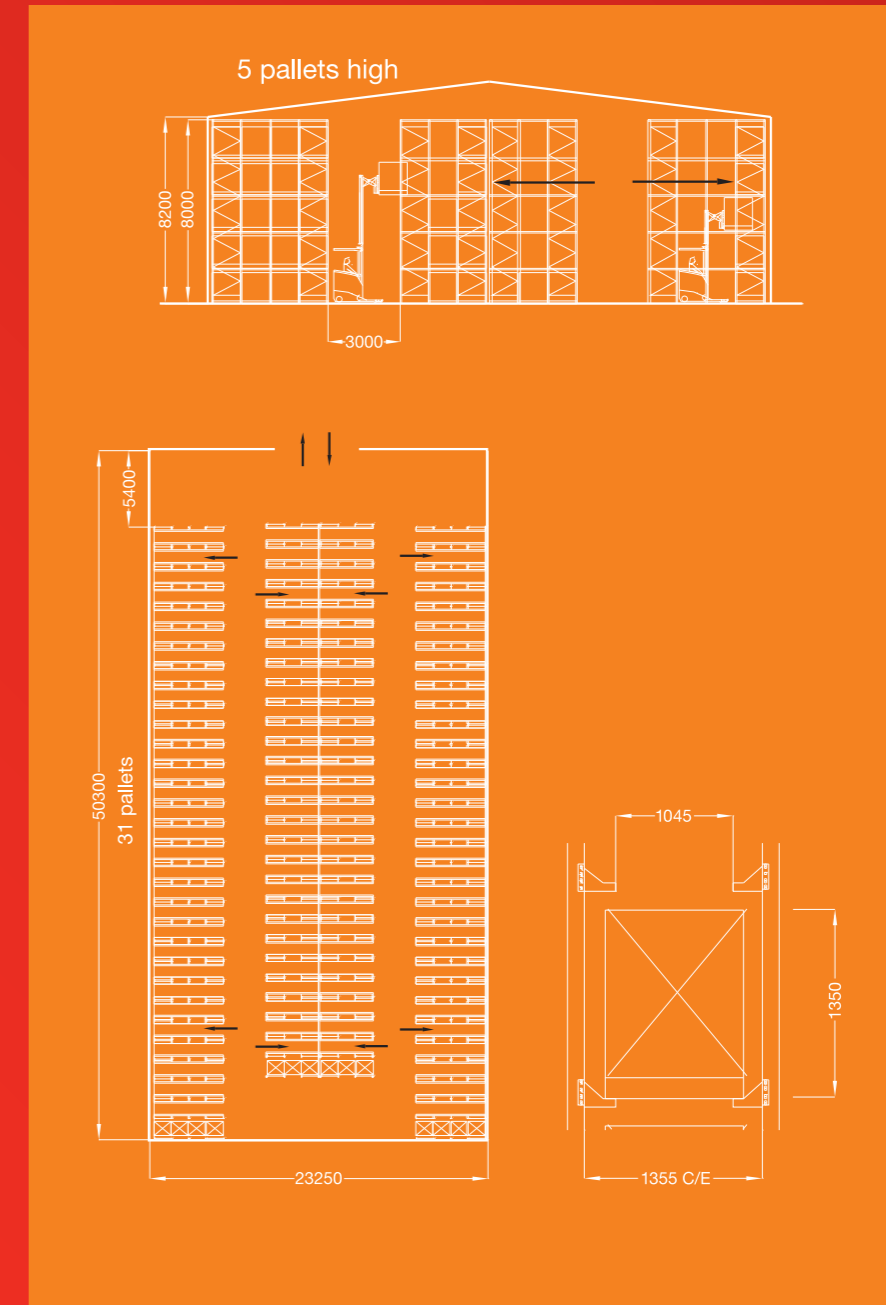
High density
low capital.

Drive-in racking.

Forklift trucks drive into lanes on racking specially built to provide support to the pallet along the pallet sides. Stacking often to 10 metres high and 4 or 5 but occasionally even 10 pallets deep.

This system can provide very dense storage capacity, often low in access and rotation of products. As the truck enters the racking, special precautions apply to ensure the compatibility of design between the truck, pallet and load and the racking. Flat floors are advantageous.

Usually the rack design incorporates a stability structure at the rear of the rack and therefore drive in indicates single access from one side. Drive thru requires this same stability to be provided by a variation in design.



Advantages.

- Very dense storage, ideal for few SKU's with high pallet quantities.
- Prevents product crushing, and offers damage free storage.
- Floor single or double stacked pallets always accessible.
- Low capital costs using conventional handling equipment.

Drive-in racking example for 2080 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area:
50.3m x 23.25m = 1170 sqm

Total building volume:
9590 cbm (8m high)

Average floor area/
pallet position:
1170 sqm/2080 pallets =
0.56 sqm/pallet position

Average building volume/
pallet position:
9590 cbm/2080 pallets =
4.61 cbm/pallet



Full access high density.

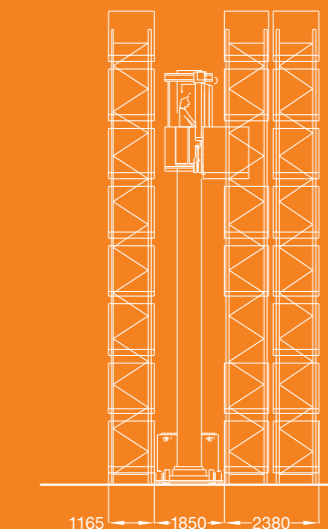
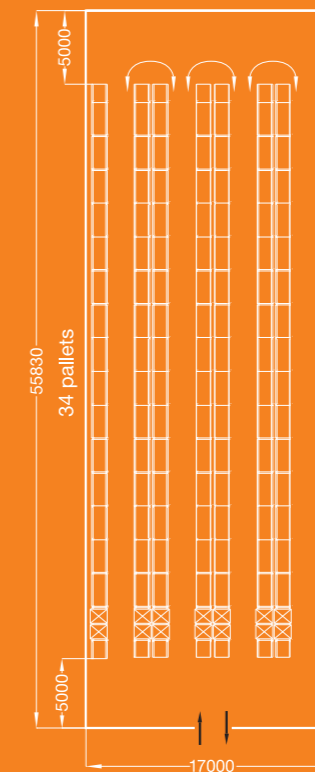
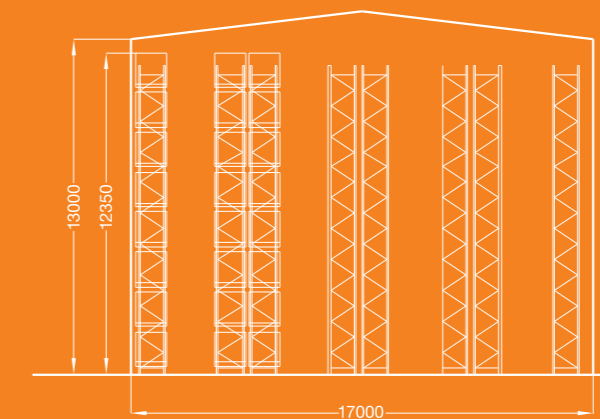
Narrow aisle racking.

The system is served by a specialised fork lift. The mast of the fork head rotates either left or right as required.

The system can also be serviced by fork lifts with elevating operator cabins where the operator hand picks.

Very flat floors, close tolerance racking, carefully located pallets of uniform size and stock location systems are all prerequisites for successful narrow aisle systems.

Floor guidance in the aisles is mandatory and the design interface between every aspect of their system is needed.



Advantages.

- Floor mounted free roaming trucks are flexible in multi-aisles.
- High speed through put with specialised equipment.
- Controlled materials handling provides safe and damage free environment.
- Fire suppression and seismic need consideration. Hard wearing and very flat floor designed for heavy static/ live loads are normal.
- High average locations used 95%, for 100% accessibility, good stock rotation and 50% floor utilisation with high cube available.

Narrow aisle racking example for 2176 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area:
55.83m x 17m = 950 sqm

Total building volume:
12338 cbm (13m high)

Average floor area/
pallet position:
950 sqm/2176 pallets =
0.437 sqm/pallet position

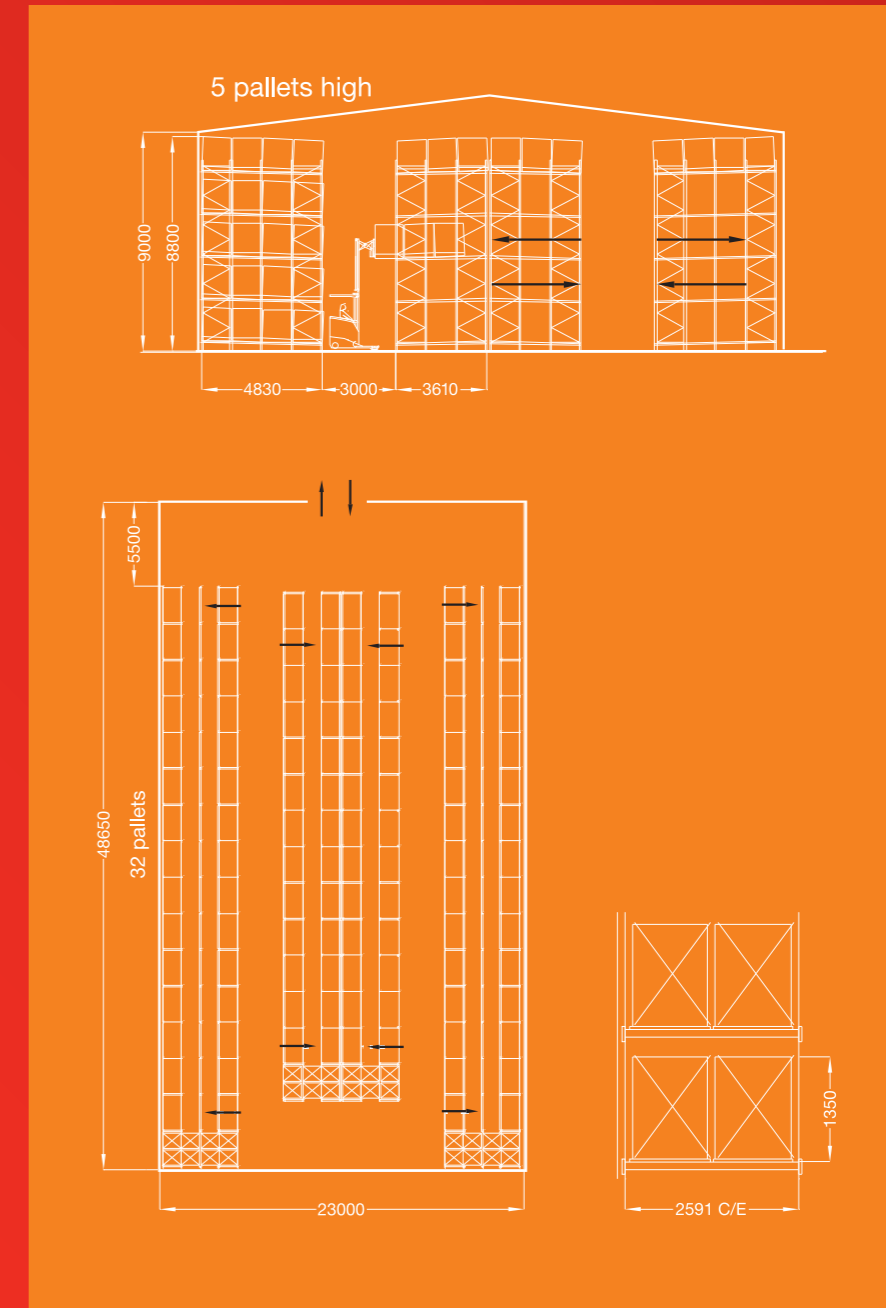
Average building volume/
pallet position:
12338 cbm/2176 pallets =
5.67 cbm/pallet



Push back racking.

Conventional fork lift trucks load pallets into inclined magazines for storage. Once loaded, the pallets return automatically to the front of the rack by gravity. By retrieving from the front of the rack, pallets are stored on a FILO basis.

The system offers safe and dense storage for 2, 3 and 4 deep pallet storage. Typically up to 5 pallets high, the safety and relatively fast accessing of the products is achieved as the FLT does not enter the racking.



- Advantages.**
- Pick face remains constantly full.
 - A low damage environment, with truck outside racking always.
 - High storage density with speedy accessibility, but FILO.
 - Conventional handling equipment can be used.
 - Pallet quality may not be so critical as carts or cradles are always used.

Push back rack example for 2120 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area:
48.65m x 23m = 1119 sqm

Total building volume:
10071 cbm (9m high)

Average floor area/pallet position:
1119 sqm/2120 pallets = 0.53 sqm/pallet position

Average building volume/pallet position:
10071 cbm/2120 pallets = 4.75 cbm/pallet

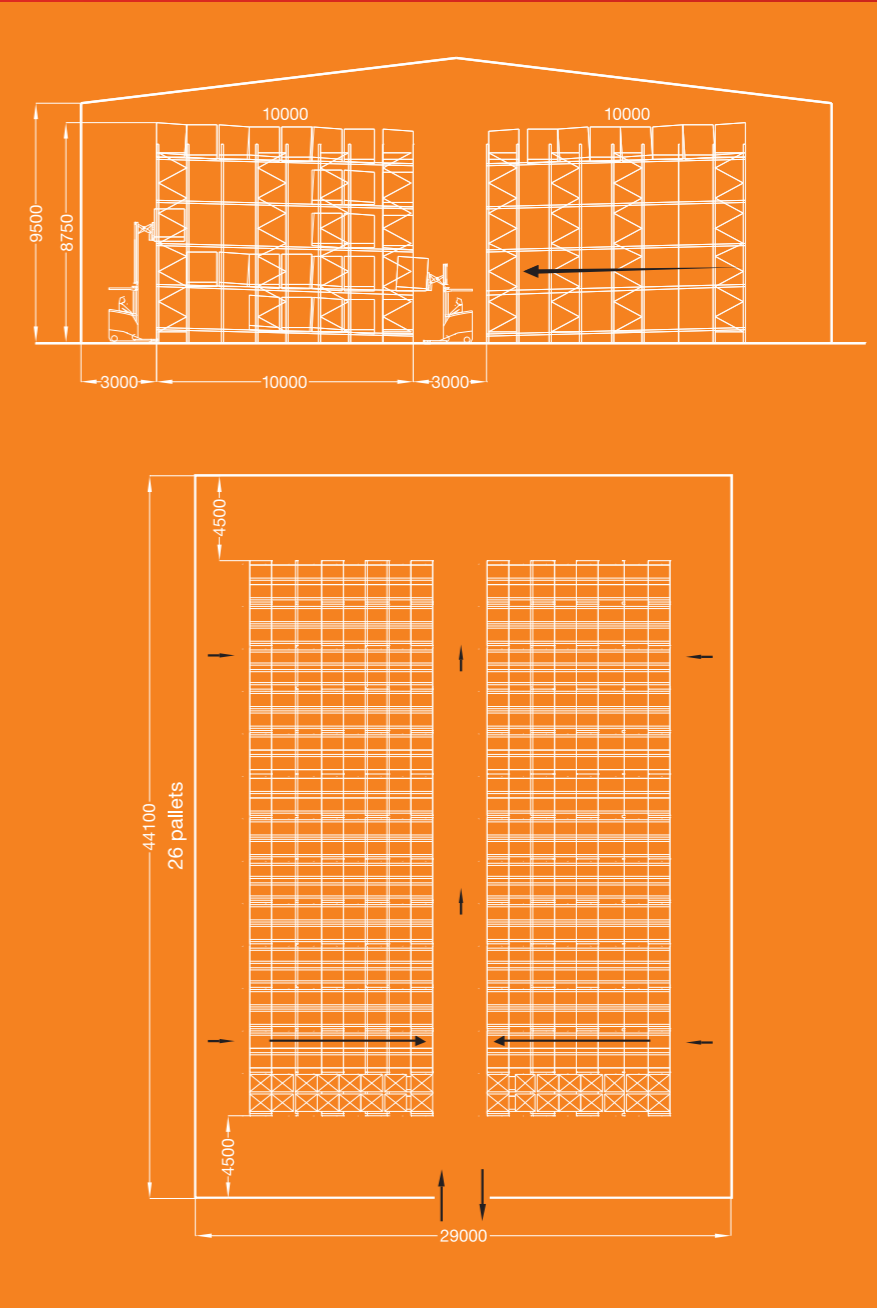
First in first out.



Pallet flow through.

Specially constructed lanes of gravity inclined tracks stacked side by side and on top of each other within a pallet rack framework form a solid block of storage that is fed in from one end and unloaded at the other.

Consistent loads are stored in each lane, for the same SKU. Automatic rotation is provided. Rack utilisation is often at 90%.



Advantages.

- Very dense storage achieved especially when few SKU's and high number of pallets.
- FIFO guaranteed, ideal for products with shelf life or absolute rotation.
- Secure and safe handling as the pallet truck does not enter the rack.
- Stable loads and constant, high quantity pallet mandatory.
- Wide range of pallets can be accommodated at the design stage.

Flow thru rack example for 2080 pallets.

Pallet and load size: 1165mm (entry) x 1165mm x 1350mm (H)

Floor area: 44.1m x 29m = 1279 sqm

Total building volume: 12150 cbm (9.5m high)

Average floor area/pallet position: 1279 sqm/2080 pallets = 0.615 sqm/pallet position

Average building volume/pallet position: 12150 cbm/2080 pallets = 5.84 cbm/pallet



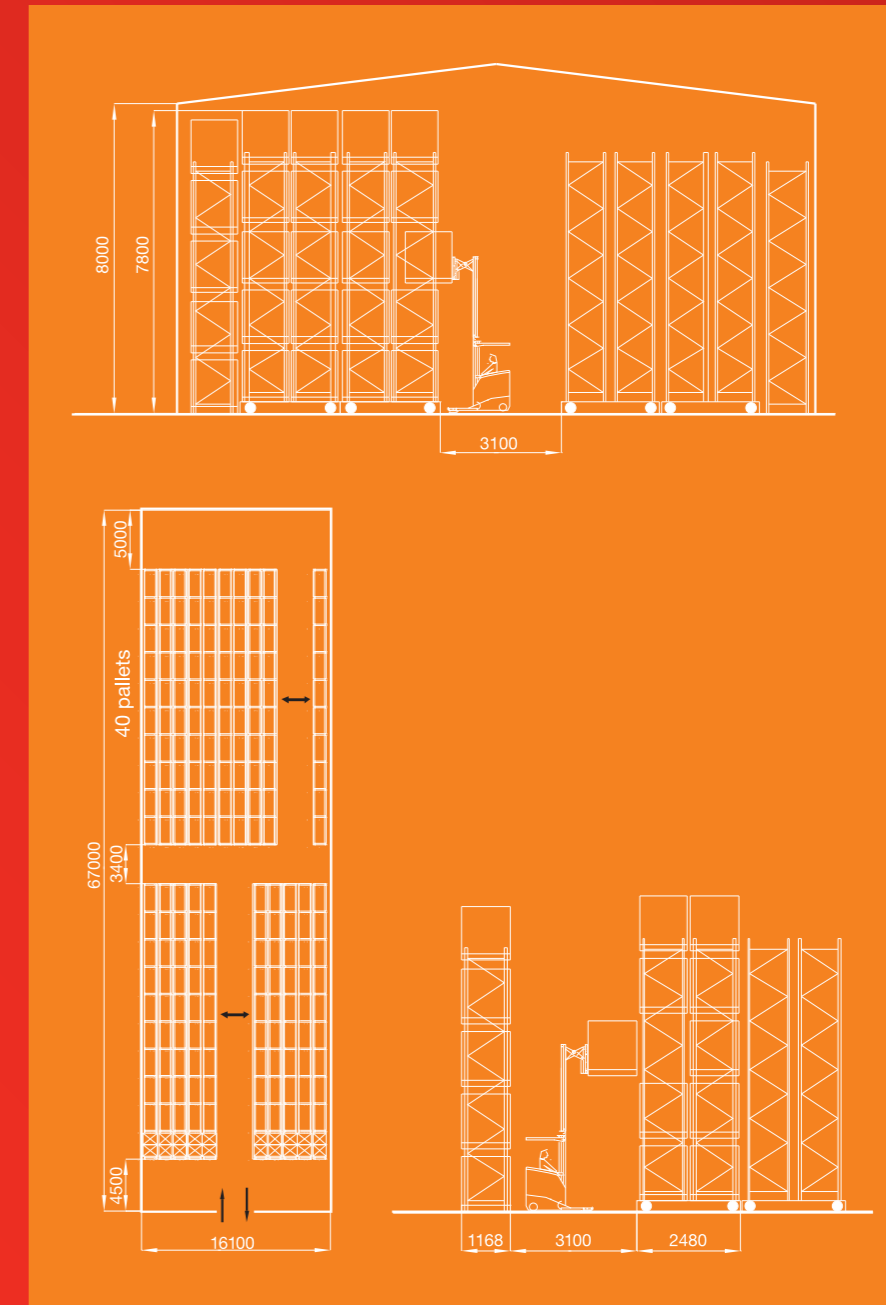
High density
maximum
mobility.

Selective mobile racking.

Standard racking is mounted on powered mobile bases to form banks of mobile racks that can be operated by only one aisle. The racks are electronically powered and moved to enable a FLT to access every aisle when needed. Remote control panels can assist by linking FLT movements to throughputs.

Specially constructed floors with running and guide rails are needed. Powered mobile is usually conceived at the planning stage and is used extensively in cold storage applications.

High capacity and high usage close to 100% is common.



Advantages.

- Very dense storage with individual selectivity still available.
- Product security and safety provided (possible to lock the system).
- Accessibility needs to be planned, especially using a remote control.
- Safety systems of the scheme well established and exceed all international standards.
- Materials handling equipment can be conventional.

Selective mobile racking example for 2000 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area:
67m x 16.1m = 1078 sqm

Total building volume:
8630 cbm (8m high)

Average floor area/
pallet position:
1079 sqm/2000 pallets =
0.54 sqm/pallet position

Average building volume/
pallet position:
8630 cbm/2000 pallets =
4.315 cbm/pallet



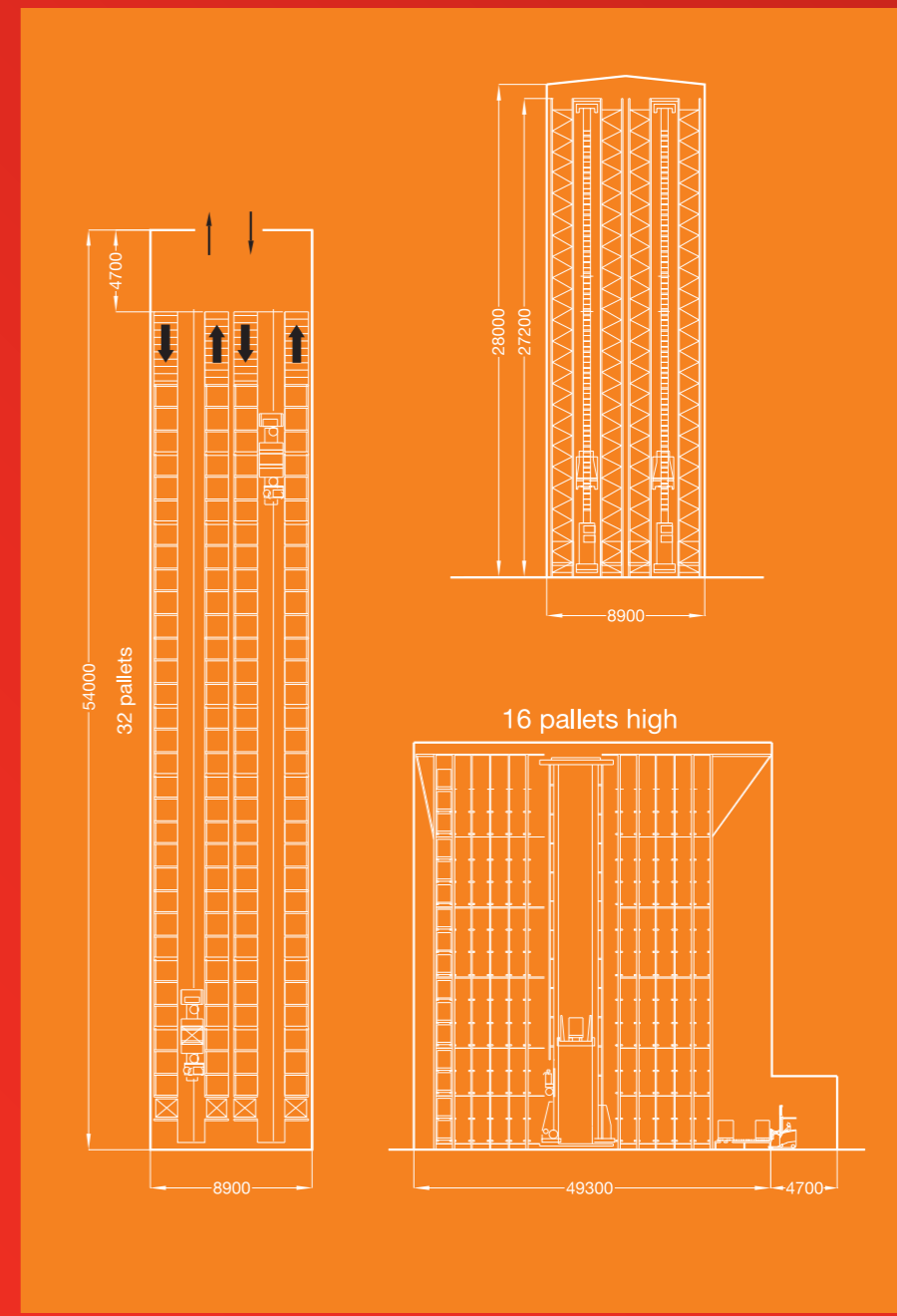
High volume
high throughput.

Automatic satellite systems, Open face single deep.

Stacker cranes usually floor mounted and rack guided overhead, store and retrieve pallets up to 40 metres. Typically these are automatically controlled units with many adaptations available which include double pallet handling, man-up capability, manual and semi-automatic modes.

Special consideration in AS/RS include infeed and outfeed systems, automatic fire protection, very high tolerance racking, closely controlled load sizing and weight checking.

Specialised building and installation techniques, offering seismic and rack supported buildings can be considered.



- Advantages.**
- High storage density with minimal building footprint.
 - Purpose built facilities ensure built for purpose features.
 - Low running costs associated with automation.
 - Highly efficient warehouse management is normal.
 - Fast and accurate operations in man free environment.

Open face single deep AS/RS example for 2048 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area:
54m x 8.9m = 480.6 sqm

Total building volume:
13457 cbm (28m high)

Average floor area/
pallet position:
480.6 sqm/2048 pallets =
0.235 sqm/pallet position

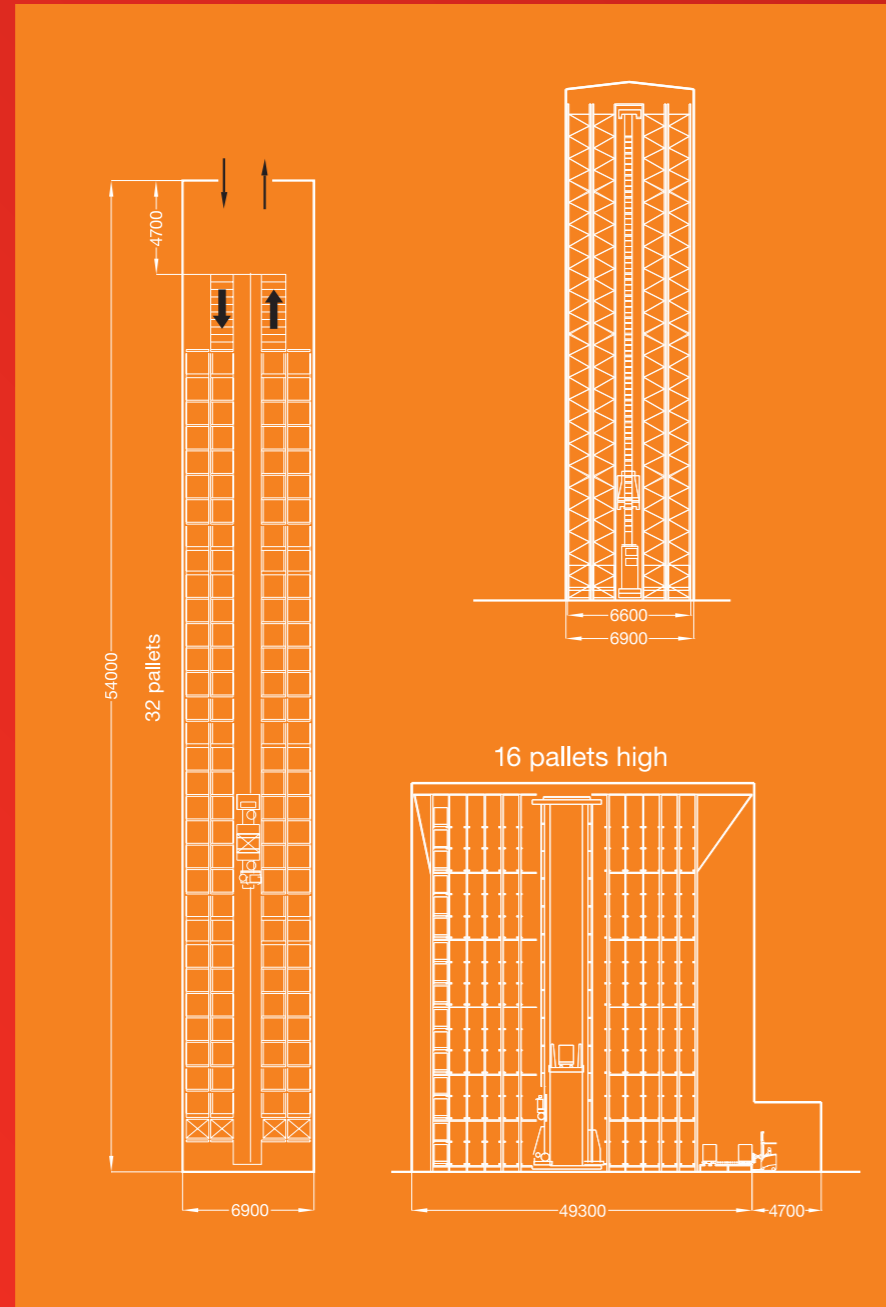
Average building volume/
pallet position:
13457 cbm/2048 pallets =
6.57 cbm/pallet

Automatic satellite systems. Open face double deep.

Stacker cranes usually floor mounted and rack guided overhead, store and retrieve pallets up to 40 metres. Typically these are automatically controlled units with many adaptations available which include double pallet handling, double deep storage, man-up capability, manual and semi-automatic modes.

Special consideration in AS/RS include infeed and outfeed systems, automatic fire protection, very high tolerance racking, closely controlled load sizing and weight checking.

Specialised building and installation techniques, offering seismic and rack supported buildings can be considered.



Advantages.

- Very high storage density with minimal building footprint, especially in double deep.
- Purpose built facilities ensure built for purpose features.
- Low running costs associated with automation.
- Highly efficient warehouse management is needed for double deep application.
- Fast and accurate operations in man free environment.

Open face double deep AS/RS example for 2048 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area:
54m x 6.9m = 372.6 sqm

Total building volume:
10433 cbm (28m high)

Average floor area/
pallet position:
372 sqm/2048 pallets =
0.18 sqm/pallet position

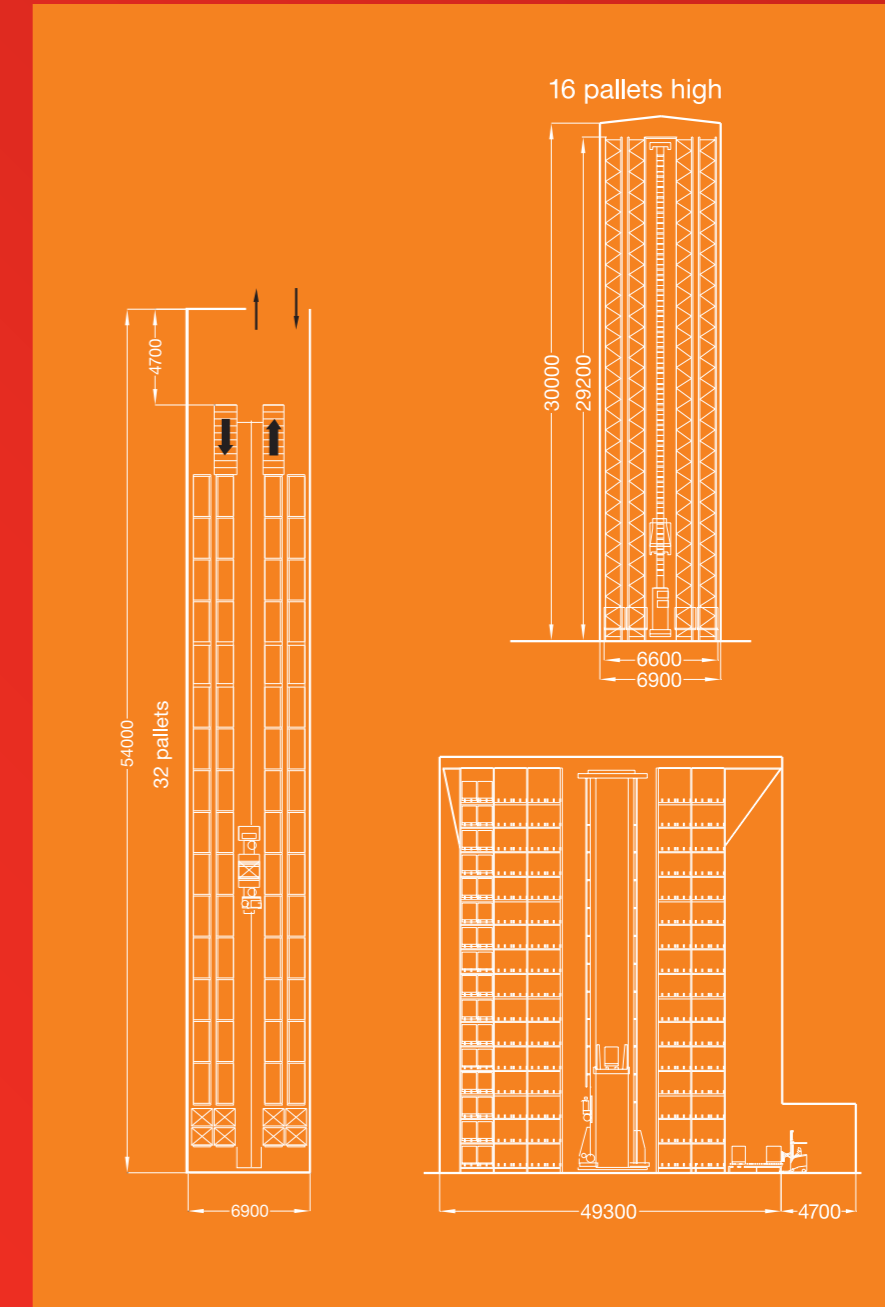
Average building volume/
pallet position:
10433 cbm/2048 pallets =
5.09 cbm/pallet

Automatic satellite systems. Closed face double deep.

Stacker cranes usually floor mounted and rack guided overhead, store and retrieve pallets up to 40 metres. Typically these are automatically controlled units with many adaptations available which include double pallet handling, man-up capability, manual and semi-automatic modes.

Special consideration in AS/RS include infeed and outfeed systems, automatic fire protection, very high tolerance racking, closely controlled load sizing and weight checking.

Specialised building and installation techniques, offering seismic and rack supported buildings can be considered.



Advantages.

- High storage density with minimal building footprint.
- Purpose built facilities ensure built for purpose features.
- Low running costs associated with automation.
- Highly efficient warehouse management is normal.
- Fast and accurate operations in man free environment.

Closed face double deep AS/RS example for 2048 pallets.

Pallet and load size:
1165mm (entry) x 1165mm x 1350mm (H)

Floor area:
54m x 6.9m = 372.6 sqm

Total building volume:
11178 cbm (30m high)

Average floor area/
pallet position:
372.6 sqm/2048 pallets =
0.182 sqm/pallet position

Average building volume/
pallet position:
11178 cbm/2048 pallets =
5.46 cbm/pallet



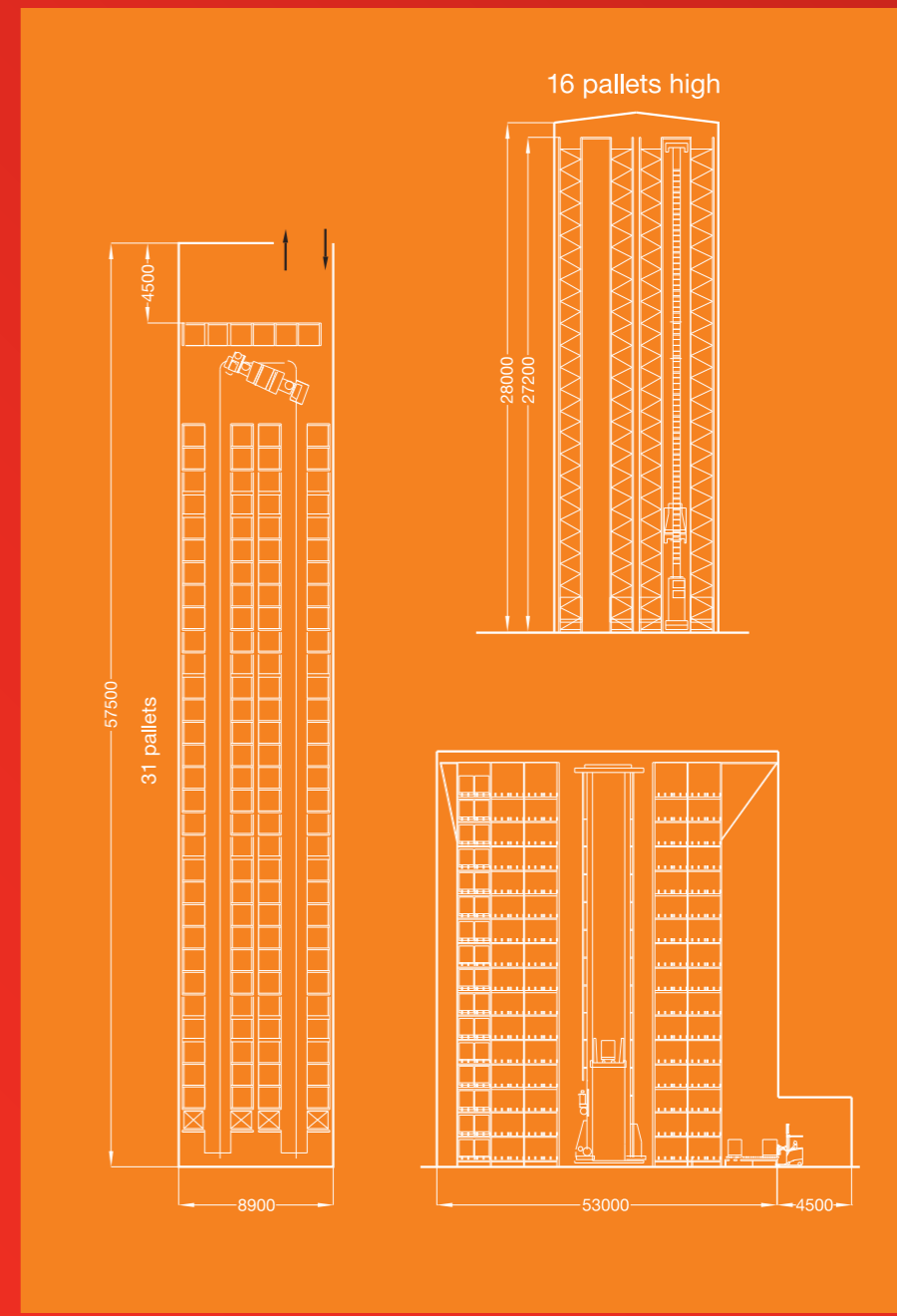
High automation low running costs.

Automatic satellite systems, Curve crane,

Stacker cranes with aisle switching ability, floor mounted and rack guided overhead, store and retrieve pallets up to 40 metres. Typically these are automatically controlled units with many adaptations available which include double pallet handling, double deep storage, man-up capability, manual and semi-automatic modes.

Special consideration in AS/RS include infeed and outfeed systems, automatic fire protection, very high tolerance racking, closely controlled load sizing and weight checking.

Specialised building and installation techniques, offering seismic and rack supported buildings can be considered.



- Advantages.**
- High storage density with minimal building footprint.
 - Purpose built facilities ensure built for purpose features.
 - Low running costs associated with automation and single crane activity.
 - Highly efficient warehouse management is normal.
 - Fast and accurate operations in man free environment.

Closed face single deep with aisle changing crane example for 2080 pallets.

Pallet and load size: 1165mm (entry) x 1165mm x 1350mm (H)

Floor area: 57.5m x 8.9m = 511.75 sqm

Total building volume: 14329 cbm (28m high)

Average floor area/pallet position: 511.75 sqm/2080 pallets = 0.246 sqm/pallet position

Average building volume/pallet position: 14329 cbm/2080 pallets = 6.88 cbm/pallet



Long term high density.

Manual satellite systems.

A compactor radio controlled, battery powered cart travels along rails that are supporting pallets above. The cart has the ability to travel below the pallet then elevate a pick up table that lifts the pallet from the support rails and carries it to the front of a rack where a conventional truck collects the pallet.

A fork lift truck (or stacker crane) can then select the cart from its rails and relocate to another location.

Normally one truck services each cart, but this is dependent on the lane length, number of lanes, height etc. This type of installation suits a low SKU's count, where long term storage is required.

Seismic installations to this design have been installed. Typical average usage is 80%.

Advantages.

- Very dense storage.
- FILO or LIFO.
- Excellent for long term storage.

Rack entry module example for 2000 pallets.

Pallet and load size: 1165mm (entry) x 1165mm x 1350mm (H)

Floor area: 36.7m x 37.3m = 1369 sqm

Total building volume: 13005 cbm (9.5m high)

Average floor area/pallet position: 1369 sqm/2000 pallets = 0.69 sqm/pallet position

Average building volume/pallet position: 13005 cbm/2000 pallets = 6.50 cbm/pallet

Block stacking.

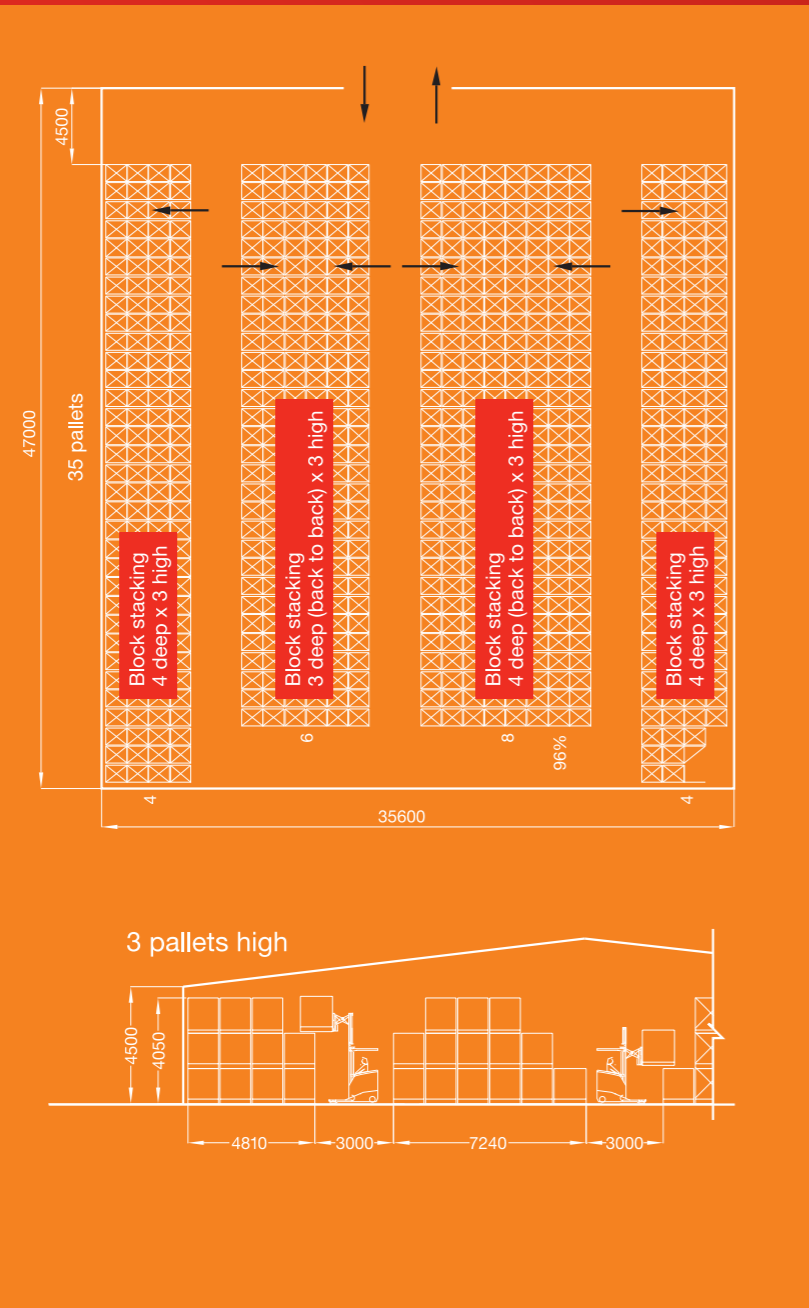
Simple block stacking is the simplest of all storage systems. Low capital cost and only a standard fork lift truck is necessary.

Subject to the product and pallets to be used, this very effective storage method can meet many requirements for some of the SKU range.

Strict driver control is needed to ensure minimum product damage.

Generally the product and its packaging needs to be robust or specially designed for block standing.

High volume low value products often suit block stacking.



Advantages.

- Low cost entry (high volume bulk is optimum).
- Highly flexible and adaptable (no fixed layout enables simple changes in operations).
- Issues include; selectivity, damage, stackability, rotation and safety.

Block pallet racking example for 2052 pallets.

Pallet and load size: 1165mm (entry) x 1165mm x 1350mm (H)

Floor area: 47m x 35.6m = 1673 sqm

Total building volume: 7530 cbm (4.5m high minimum)

Average floor area/pallet position: 1673 sqm/2052 pallets = 0.815 sqm/pallet position

Average building volume/pallet position: 7530 cbm/2052 pallets = 3.67 cbm/pallet

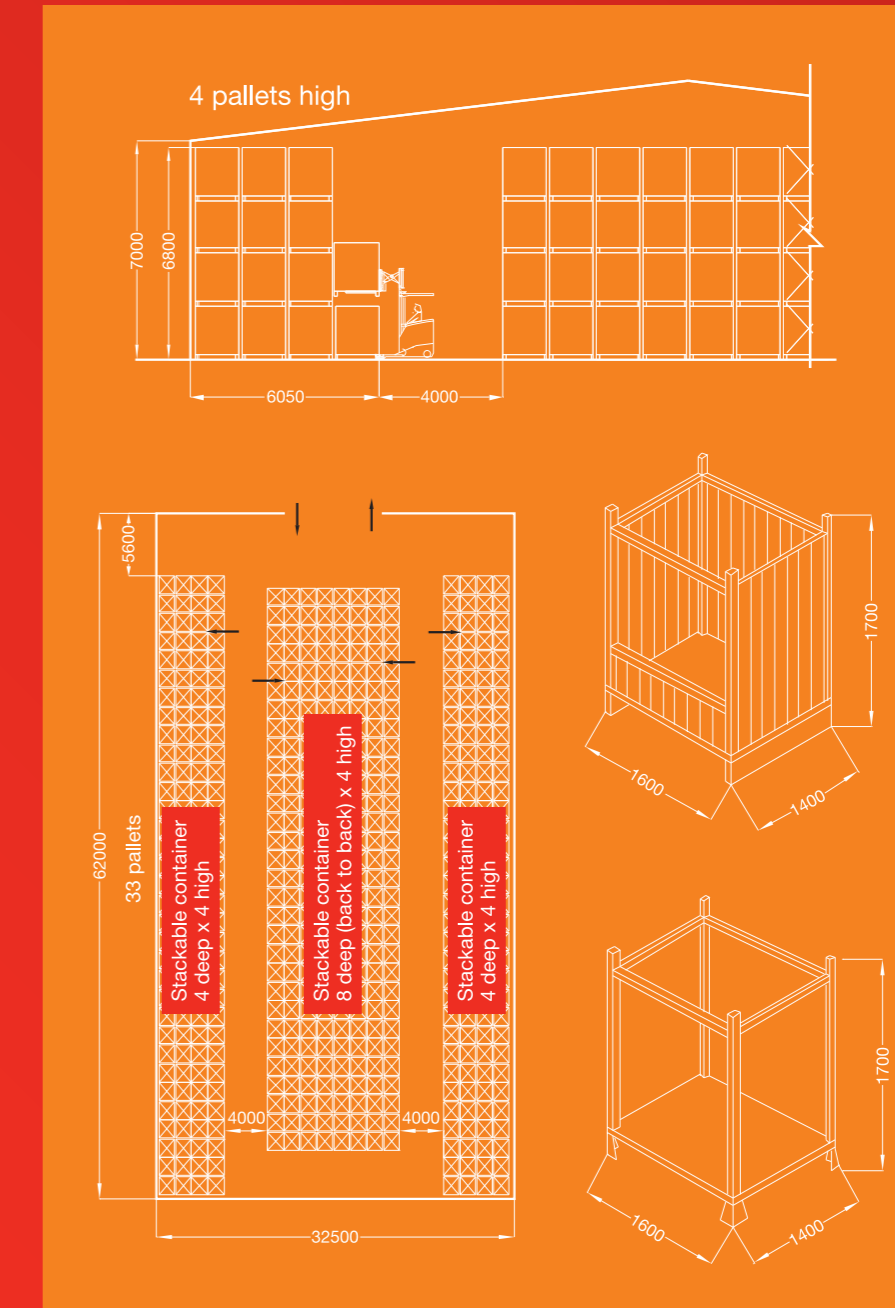
Stackable containers - cage pallets.

These can be independently stackable frames with or without standard pallets as part of the design.

Typically these frames stack up to 4 or 5 high and are nestable when empty. Design dependent, these frames are designed to carry up to 1 ton each. The stackability is achieved by having 4 corner posts that lock into the coned feet of the pallet above or interlocking rails that nest and lock into each other. This is often an inverted angle that acts as a top rail and floor rail.

It is necessary for the pallets to temporarily lock into each other to ensure that safety throughout the system is maintained and that the base pallet is strong enough to withstand the imposed loads above.

Typically utilisation tends to be low at about 75% or even less.



Advantages.

- High flexible unit handling available.
- Completely flexible layouts.
- Typically conventional trucks.

Block pallet racking example for 2016 pallets.

Cage pallet size: 1600mm (entry) x 1400mm x 1700mm (H)

Floor area: 62m x 32.5m = 2015 sqm

Total building volume: 14105 cbm (7m high)

Average floor area/pallet position: 2015 sqm/2016 pallets = 1.00 sqm/pallet position

Average building volume/pallet position: 14105 cbm/2016 pallets = 7.00 sqm/pallet



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