3D STORAGE SYSTEMS LIMITED

DYNAMIC STORAGE PRODUCTS SPECIFICATIONS **HANDBOOK**

905.830.0003 MAIL@3DSTORAGESYSTEMS.COM WWW.3DSTORAGESYSTEMS.COM


“WE DON’T SELL **OUR** SOLUTION TO **YOUR** PROBLEM.
IT’S **OUR** PROBLEM TO DEVELOP **YOUR** SOLUTION.”

CONTENTS

WHO WE ARE

Incorporated in 1992, 3D STORAGE SYSTEMS LIMITED has grown into one of the largest producers of dynamic storage systems in North America. We were the first to manufacture low profile cart pushback systems from 2 to 6 pallets deep and we also offer a full line of pallet flow and carton flow products.

3D and its' team have a long track record of working with our dealer network to develop cost effective solutions for their customers. Our expertise in developing solutions that are customized to the type of product to be stored, the environment, and the function of the system makes 3D unique in the typical "hardware only" market.

The simplicity of the patented designs, together with our superior safety features and rugged structural steel construction has resulted in thousands of successful installations worldwide. Our solutions have been implemented in small warehouses and in large facilities exceeding 1 million square feet. Many users of 3D products have done so in multiple locations which is testimony to the products' ease of use and durability.

Our inside sales representatives are trained to ask questions that enable our experienced staff to develop a custom designed solution for your end-users. This means engineering a system that reflects inventory characteristics, picking requirements and optimizes the physical layout. Combining high occupancy rates, low handling costs, and efficient cube utilization has become a signature of our proven design team. Professional CAD drawings and technical information support each proposed solution.

Careful attention to cost justification is a key component in all of our proposals.

Once ordered our production staff will co-ordinate closely with our plant and all of your subcontractors to ensure rack compatibility, coordinated freight delivery, ease of installation and customer satisfaction.

Satisfied end-users lead to repeat sales, a credo 3D not only believes in, but also relies on.

PRODUCTS

PUSHBACK

- 2 to 6 Deep, Low Profile Pushback
- 2 to 6 Deep, Heavy Duty Pushback Systems, up to 5000 lbs. per pallet
- 2, 3, 4 and 5 Deep, Ladder Style Pushback Systems
- 2, 3, 4 and 5 Deep, Wire Mesh or Full Cover Pushback Systems
- Drive-in conversion kits
- Risers for Floor Mounted Lanes
- Non-standard Pallet Sizes for all of the above

PALLET FLOW

- 1.9" Diameter Steel Skatewheel Pick Lanes
- Skatewheel Lanes with Speed Controllers
- 2.88" Diameter Polycarbonate Deep Lane Pallet Flow Systems
- 1.9" and 2.5" Diameter Roller Flow Lanes
- Pallet Entry Guides, Separators and Holdback Devices
- Risers for Floor Mounted Lanes

CARTON FLOW

- Heavy Duty Steel Wheel Skatewheel Beds
- Heavy Duty Plastic Wheel Beds
- Custom Mounts for All Beam Types
- Clip in Lane Dividers

SERVICES

- Quotations – Typically returned in less than 24 hours
- Rack Component Parts Lists
- Elevation Drawings emailed in AutoCad or PDF
- Layout work – A/D size plan views
- Inventory analysis
- Industry experience and rack knowledge
- Assisted sales calls with dealers to end-users
- Ability to provide turnkey systems with rack and installation if required
- WILL NOT SELL DIRECT TO END USERS

REQUEST FOR PUSHBACK / PALLET FLOW

Requested by: _____

Company: _____

Phone/Fax #: _____

End User: _____

Ship To: _____

Contact: _____

FLOWRACK ☐ **PUSHBACK** ☐

SYSTEM INFORMATION	A	B	C	D	E
# of pallets deep					
# of levels					
# of bays (single or double wide)					
Total # of pallets					

PALLET INFORMATION:

Size: _____"F x _____"D x _____"H

Weight: Up to 3000# or: _____

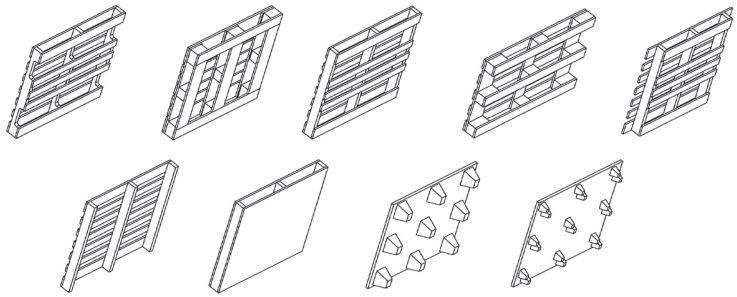
Load: Overhang - front to back: _____

Side to side: _____

Product to be stored: _____

Is it stretch wrapped: ☐ Yes ☐ No

Style:



* if pallet is steel or plastic please provide sketch

Condition: ☐ Consistently good quality
☐ Occasional disformity
☐ Poor quality

Can pallets be turned to other face? ☐ Yes ☐ No

Is pallet hardwood ☐ or softwood? ☐

Number and size of bottom boards: _____

ENVIRONMENT INFORMATION:

Building clear height: _____

Warehouse:
☐ Freezer
☐ Cooler
☐ Ambient
☐ Wet or Washdown
☐ Outdoors
☐ Dirty (why?) _____

Existing storage:
☐ Floor storage
☐ Standard pallet-rack
☐ Drive-in
☐ Pushback
☐ Flowrack

Lift truck data:

Maximum lift height: _____

Minimum aisle requirement: _____

Type of truck: _____

Maximum capacity: _____

General:

How many inventory turns per year? _____

Who is competition? _____

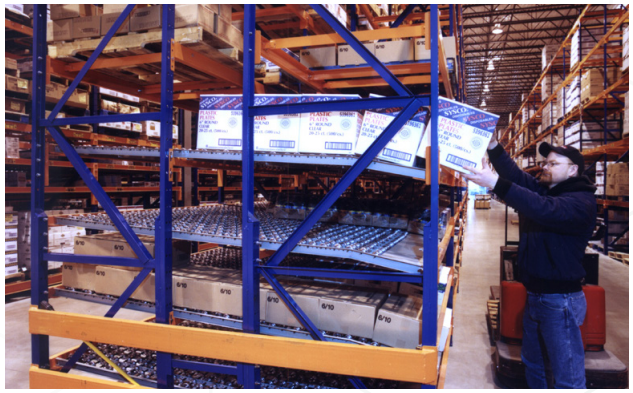
What are they bidding? _____

NOTES: _____

SOME OF OUR CUSTOMERS INSTALLATIONS







ADM


CHAPMAN'S
Ice Cream • Crème Glacée


Coca-Cola


CONAIR


COSTCO
WHOLESALE


DOLLARAMA
$1 plus


Ford


Freezer Queen
Homestyle Taste You Can Trust


GM


Heinz


Henkel
Sun
Products Corporation


Jason's deli


MARS
petcare


P&G


Publix


SYSCO

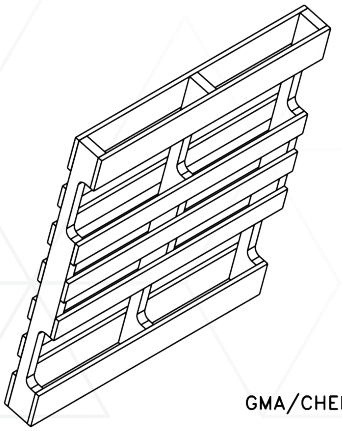

XEROX

WARRANTY

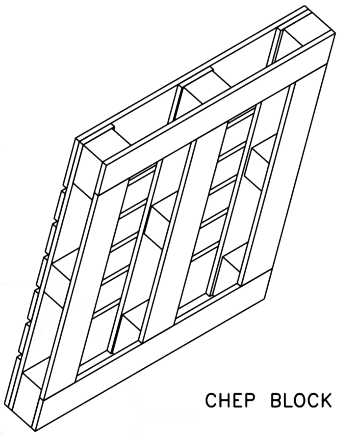
3D STORAGE SYSTEMS LIMITED (3D) warrants that all materials supplied will be free of defects in workmanship or materials for a period of one year from the time of shipment. We further warrant that **3D** will replace any parts found to be defective through normal use, FOB our facility. The cost of returning such defective parts to **3D** will be the responsibility of the customer.

This liability will not extend to defects caused by, in whole or in part, mis-use, negligence, improper maintenance or modifications or repairs not authorized by **3D** in writing. Liability of the warrantee is restricted to parts replacement only, and does not cover any labour, transportation or any other costs.

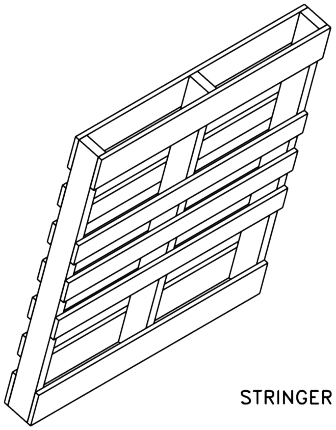
DIFFERENT TYPES OF PALLET DESIGNS AND CONSTRUCTION



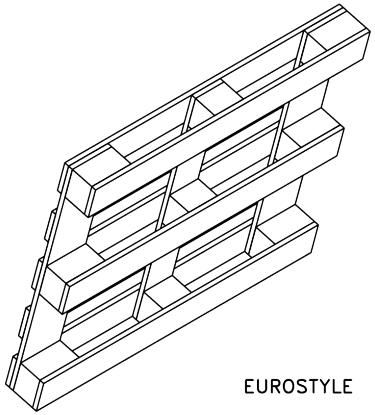
GMA/CHEP



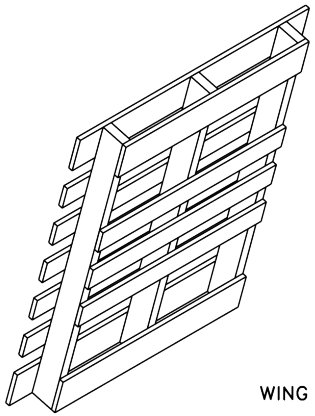
CHEP BLOCK



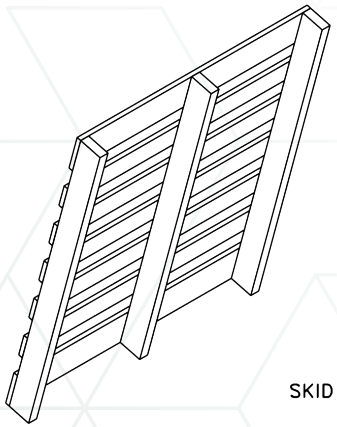
STRINGER



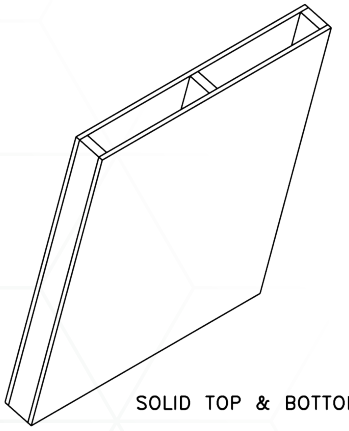
EUROSTYLE



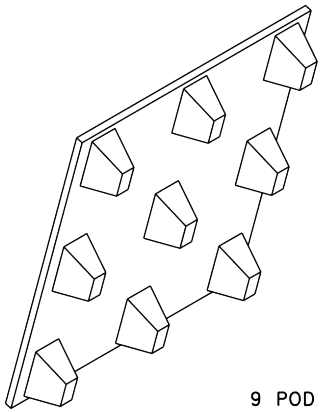
WING



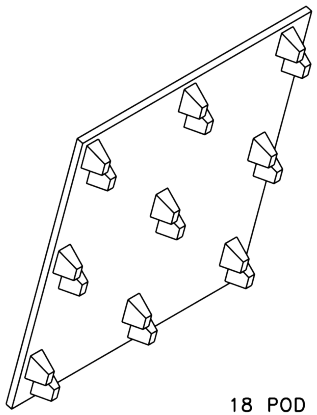
SKID



SOLID TOP & BOTTOM



9 POD

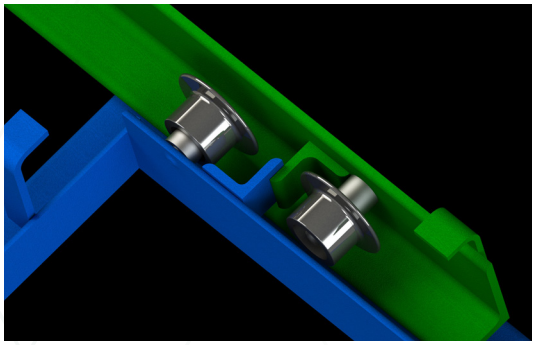


18 POD

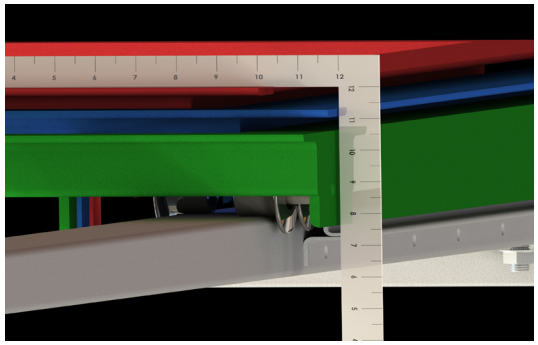
PUSHBACK
GENERAL

PUSHBACK GENERAL
FEATURES AND BENEFITS

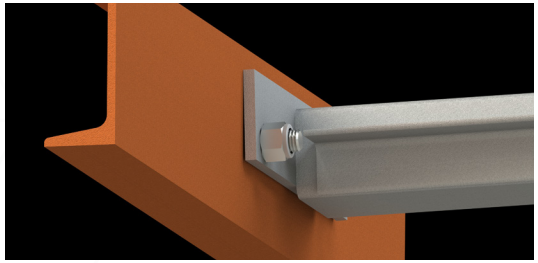
POWDER COATED TOUGH™

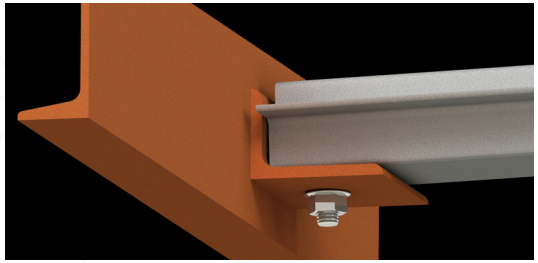


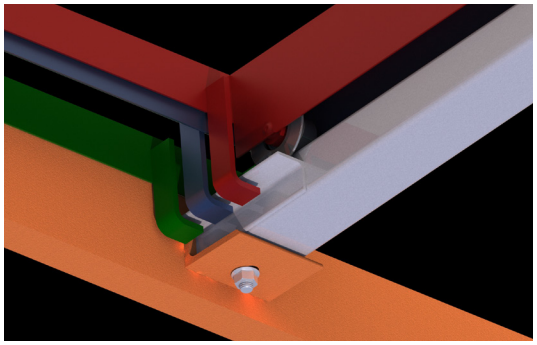
LINKED CARTS
Carts are linked when extended, eliminating the possibility of single pallet hang-ups. Without this feature, it would be possible for a pallet to become lodged at the back of a lane, release, and travel in an uncontrolled manner to the load end, spilling the load. The resulting potential for damage to product, and more importantly, personal injury, is obvious. No pushback product is complete without this important safety feature.



LOW PROFILE
Steadiflo has a lower profile than other cart type systems. This allows for extra lift clearance and may even mean the difference of an extra level.

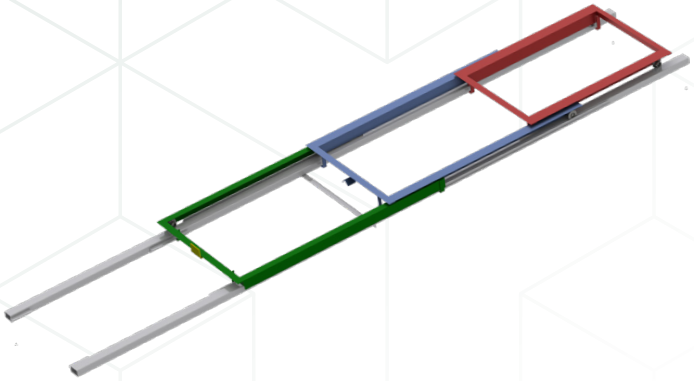






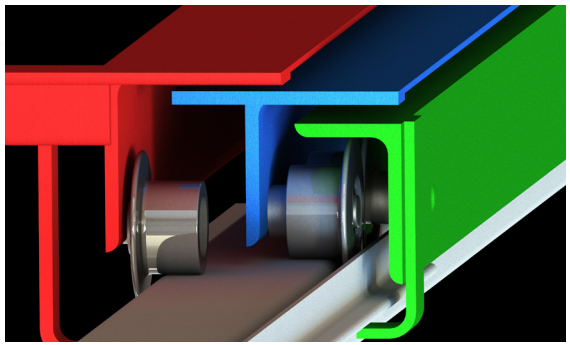
LIFT-OUT PROTECTORS
Each cart is equipped with lift-out protectors, which prevent accidental dislodgment of a cart by the fork lift operator.

SIMPLE DESIGN & EASE OF INSTALLATION
The Steadiflo design allows for easy installation, with wheels pre-installed from the factory and simple drop-in rail design that requires rack attachment at the front and rear only.



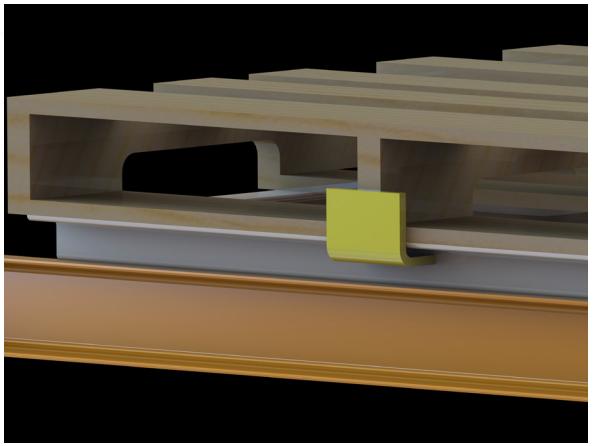
HSS RAIL

(Hollow Structural Steel) This is a strong, durable rail that is impact resistant and will not trap debris. The HSS rail is available in various wall thickness to provide flexibility in design.



FLANGED STEEL WHEELS

Our wheels are manufactured from solid steel and are equipped with heavy duty bearings. Sturdy 5/8” shafts are welded to the carts and are oversized to withstand shock loading. Capacities up to 1,400 lbs. per wheel.



MULTI PURPOSE PLATE

Height Gauge – When loading a pallet, the operator knows that if the load is high enough to clear the push plate, then the pallet will not prematurely move the awaiting cart.

Strip-Off Stop – If, after placing the pallet, the operator had his forks in an improper tilt position, the push plate will catch the bottom of the pallet and “strip” it off the forks.

End Stop – The push plate, which is situated on the lowest cart and protrudes 3/4” above the highest cart, acts as a safety stop to prevent pallets from shifting beyond the front load beam.

Push Plate – Pushing on the plate with the last pallet being inserted into the lane ensures proper placement on the rails.

Lane full Indicator – The operator can tell if a lane is full by the absence of the push plate. If it is not showing at the front, the last position has been loaded and there is a pallet on the rails – a full lane.

PUSHBACK
QUESTIONS AND ANSWERS

HOW MUCH SLOPE DO THE RAILS HAVE?
The system utilizes a slope of 3/8" per foot, or just a little less than two degrees. For example, a standard 4 deep lane for 48" deep pallets would have 6" of slope. This slope ensures that empty carts will always return to the front of the lane if accidentally pushed back by the operator. In most cases the total slope is less than the lift clearance above the pallet at the load end, and therefore, does not affect the number of storage levels.

DO I NEED SPECIAL FORKLIFTS?
No. There are systems installed with counterbalance, reach, deep reach, swing reach and even clamp trucks.

WHAT SIZE OF AISLE DO I REQUIRE?
Aisles should be sufficient to allow an operator to square up to the pallet without turning into the rack. Usually this is 6" more than the truck manufacturers' minimum aisle requirement.

HOW MUCH PUSH IS REQUIRED BY THE FORKLIFT?
Approximately 4% of the total weight being pushed back, not counting the pallet on the forks of the truck i.e. 2,000 lbs on a 6 deep would require 400 lbs of force to load. This is well within the capabilities of most lift trucks. We have several installations of six deep in freezers with reach trucks.

WHAT ARE THE SPACE REQUIREMENTS?
The following are general rules of thumb

- Vertical level to level of beams
  For 2, 3 & 4 deep pushback- pallet height + 12"
  For 5 & 6 deep pushback - pallet height + 14"
- Rack depth
  (# of pallets deep X (pallet depth + 2")) + 2"
  (i.e., 102",152", 202", 252", and 302" for a 48" deep pallet for 2/3/4/5/6 deep)
- Beam Width
  Single wide bays - pallet + 8"
  Double wide bays - (pallet x 2) + 16"

WHAT ABOUT TEMPERATURE RESTRICTIONS?
We have installations that range in temperature from +50 to -50 degrees Celsius, including blast freezers.

HOW DIFFICULT IS IT TO LOAD AND UNLOAD?
Experience has shown that most operators are completely efficient within a half day. Many operators state that pushback is easier to load and unload than standard pallet rack. Operating instructions are sent with each system.

PUSHBACK
QUESTIONS AND ANSWERS

WHAT ABOUT MAINTENANCE?
There is no required maintenance. Bearings are permanently lubricated.

CAN YOU ACHIEVE FIFO WITH PUSHBACK?
Contrary to popular belief, it is easy to achieve first-in first-out with pushback racking. The key is to configure your system to ensure that each product (SKU) utilizes multiple lanes. If each product has three or four lanes of pushback, the operator simply ships out the oldest lane first.

HOW DOES 3D PUSHBACK COMPARE TO THE COMPETITION?
- 3D has one of the lowest profiles in the market. Our 5 and 6 deep lanes are half the height of most other systems. This height difference results in extra lift clearance and future load height flexibility – it may also allow an extra pallet level.
- Our pushback system is equipped with several key safety features that others do not offer - linked carts, lane full indicators, pallet stops and cart lift-out protectors are all standard features.
- 3D assembles the carts before we ship them, including attaching shafts and wheels to the carts at our facility. We also only mount to the front and rear beams and do not need to mount to the internal beams. This results in faster and less expensive installations.
- We have some of the strongest wheels and shafts in the industry – the wheels are rated at 1,400 lbs and the 5/8" solid steel shafts that are welded to the cart.
- We offer 2 to 6 deep pushback to best suit the layout and application. Many others manufacture only 2 and/or 3 deep lanes. We also can produce many non-standard designs depending on the application, such as steel sheet or mesh covered carts, heavy duty lanes and level carts.

PUSHBACK
ELEVATION CALCULATOR

By following this simple 4 step process to calculate the level to level, beam heights, clear height required and lift height required, you will know whether a system will fit into the area you have available. If you have any questions or special considerations please do not hesitate to contact 3D Storage Systems for assistance with any of these calculations.

Depth of Pushback	Equipment Height	Slope of system
2 Deep	4.8125”	3”
3 Deep	5.375”	4.5”
4 Deep	6”	6”
5 Deep	6.75”	7.5”
6 Deep	7.6875”	9”

**Based on standard design 40”F X 48”D GMA/CHEP pallet 3,000lbs maximum*

STEP A – LEVEL TO LEVEL (TOP OF BEAM TO TOP OF BEAM)

Example: 48” load height – 4 deep

* Always round up to the next module, if calculation does not divide evenly into the “module” or adjustability of the rack system.

** 1” of space is sufficient when the front frame of the racking system is 6” deeper than the length of the pallet (i.e. 54” front frame with a 48” pallet depth).

	Sample	Insert
Load Height	48”	
+Equipment Height	+6”	
+Internal Beam Size	+5”	
+Space (1” is sufficient**)	+1”	1”
= level to level	*= 60” L/L	= L/L

STEP B – CALCULATING BEAM LEVELS

Example: 4 Deep pushback, 4 levels high, 48” load height

Based on the calculation in ‘Step A’ we know 48” load height will equal 60” L/L with a 4 deep pushback. Generally the top of the first level beam will be at 8” unless you are floor mounting in which case it would be 3”. Therefore at 4 levels high we would have beam levels at 8”, 68”, 128” and 188”.

PUSHBACK
ELEVATION CALCULATOR

STEP C – CALCULATING CLEAR HEIGHT REQUIRED

Example: 4 Deep pushback, 4 levels high, 48” load height

Based on the calculation in ‘Step B’ we know where the top beam level would be, which in our sample calculation is 188”.

	Sample	Insert
Top of top beam	188”	
-Top of beam to bottom of rail	- 2.75” (standard)	- 2.75”
Load Height	+48”	
+Equipment Height	+6”	
+Slope	+6”	
+ Space (2” is sufficient)	+2”	+2”
= Clear Height	= 247.25”	=

STEP D – CALCULATING LIFT HEIGHT REQUIRED

Example: 4 Deep pushback, 4 levels high, 48” load height

Based on calculation “B” we know are top beam level would be 188”.

	Sample	Insert
Top of top beam	188”	
-Top of beam to bottom of rail	-2.75” (standard)	- 2.75”
+Equipment Height	+6”	
+Lift	+8”	+8”
= Lift Height	199.25”	=

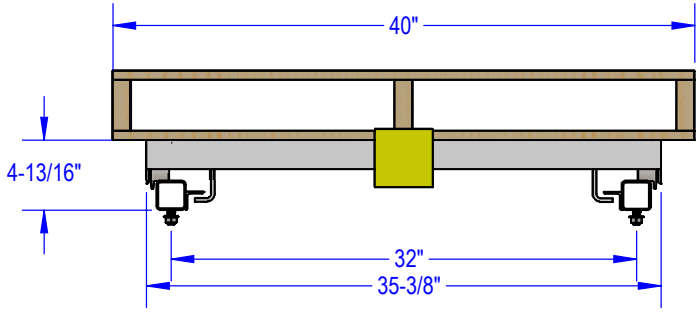

2 - DEEP
PUSHBACK

FEATURES AND BENEFITS:

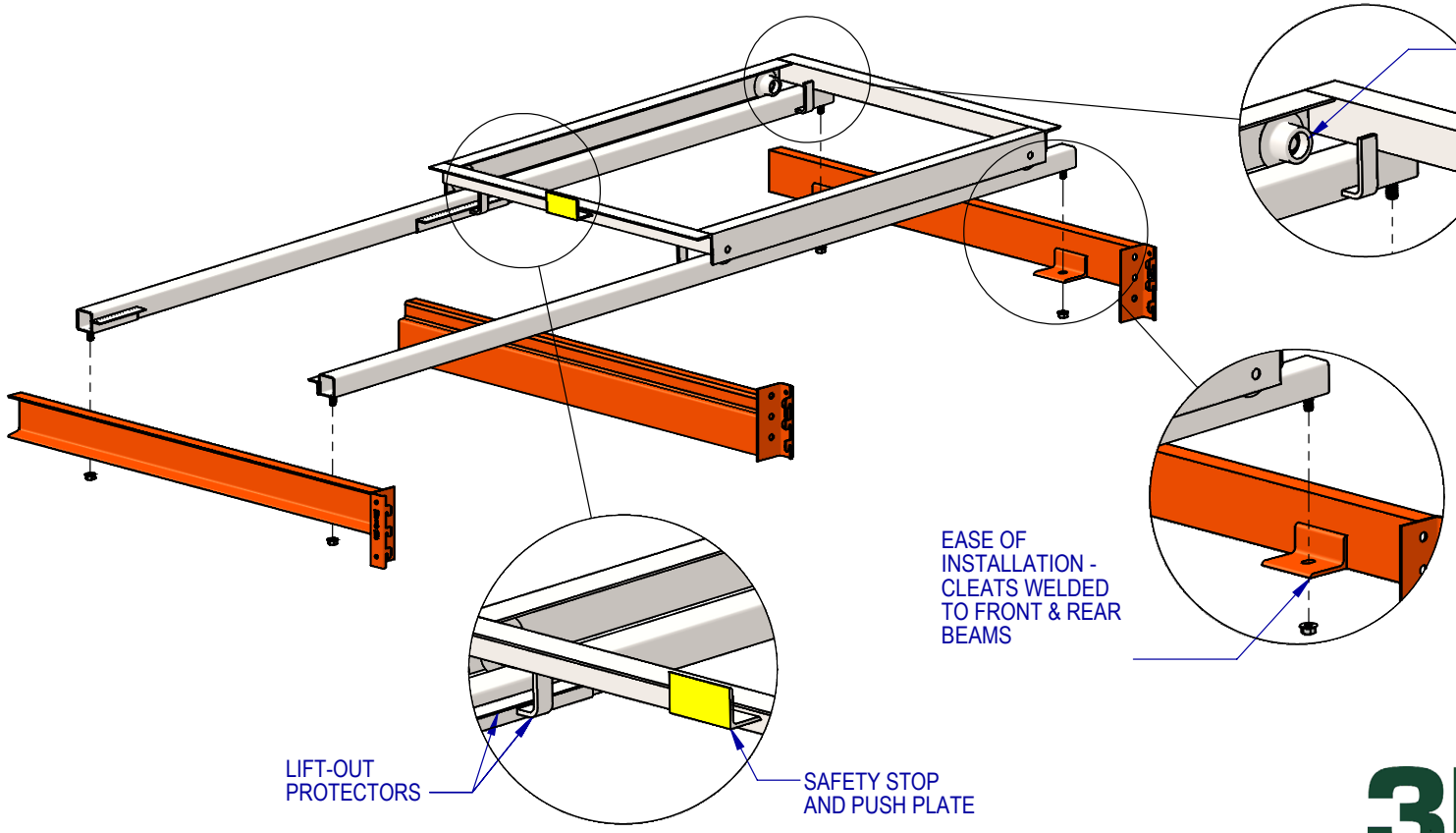
- PUSHBACK HAS THE LOWEST PROFILE HEIGHT ON THE MARKET.
- HEAVY DUTY STRUCTURAL STEEL CONSTRUCTION WITH SUPERIOR IMPACT RESISTANCE IS BUILT TO HANDLE 3,000 LB LOADS.
- CARTS HAVE INTEGRATED CRITICAL SAFETY FEATURES: LIFT-OUT PROTECTION, LINKED CARTS, AND SAFETY STOPS.
- STRUCTURAL TUBE RAILS OFFER A SMOOTH ROLLING SURFACE AND ONLY REQUIRE ATTACHMENT AT FRONT & REAR, NO ATTACHMENT TO INTERNAL BEAMS IS REQUIRED.
- MACHINED STEEL WHEELS WITH PRECISION BEARINGS ON WELDED STEEL SHAFTS - NO BOLTED WHEELS.
- CARTS COME FULLY ASSEMBLED - NO NEED TO INSTALL WHEELS.
- EASY TRANSPORTATION, EASY INSTALLATION AND EASY TO USE.
- DURABLE POWDER COATED FINISH, AVAILABLE IN GREY, BLUE OR GREEN.
- CUSTOM COLOURS OR HOT DIP GALVANISED FINISH AVAILABLE UPON REQUEST.

2 DEEP LOW PROFILE STEADIFLO PUSHBACK

(for a typical 40" wide x 48" deep GMA/CHEP style pallet)
PART NO. PB24048-STN

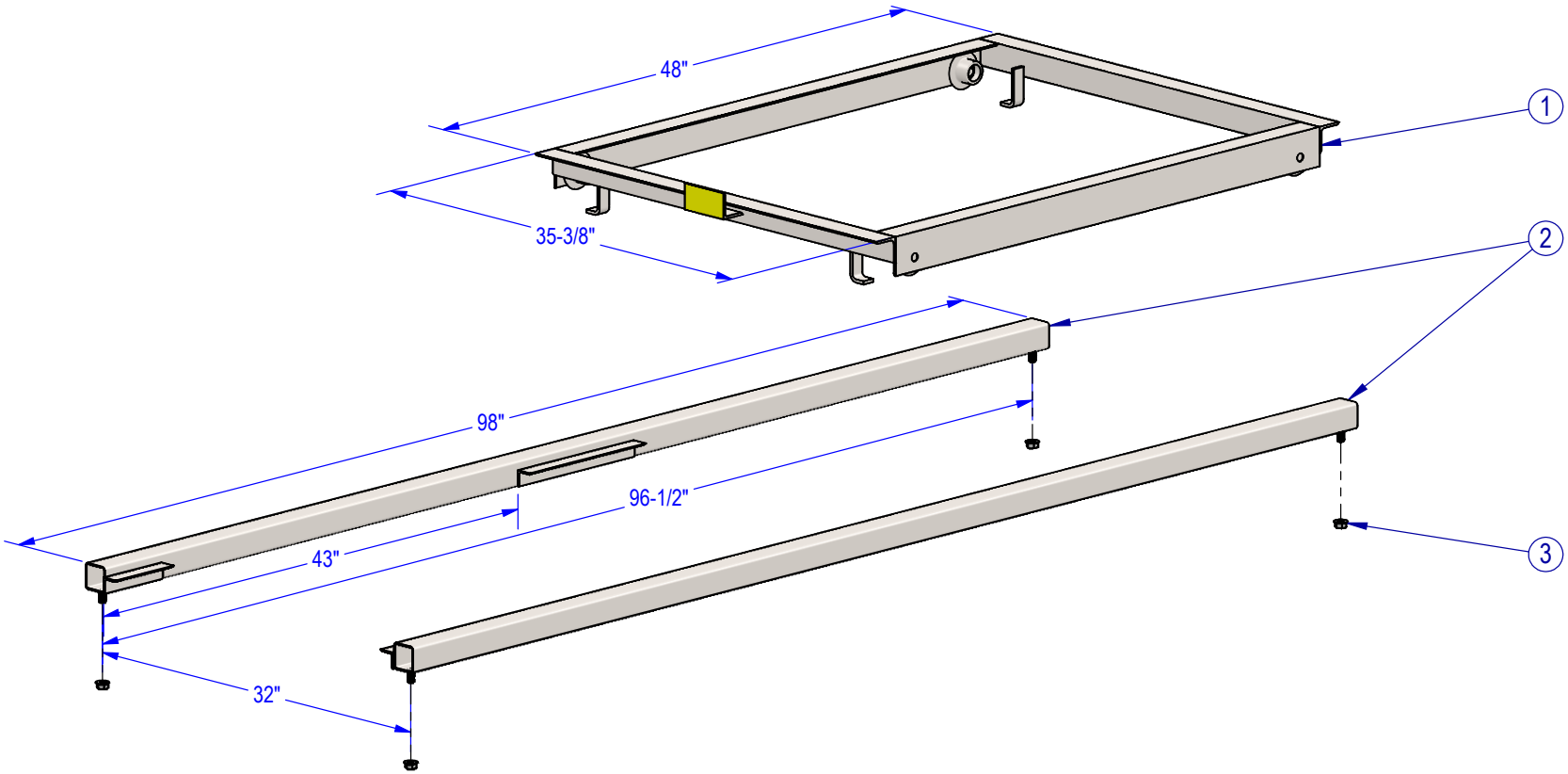


PROFILE



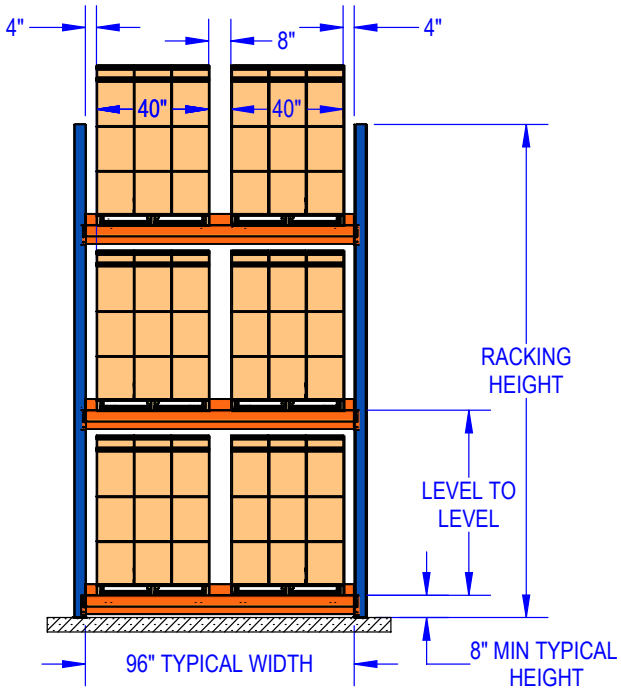
3D STORAGE SYSTEMS LIMITED

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	PB24048B-STN	2 DEEP CART	1
2	PB24048R-STN	2 DEEP RAIL	1
3	-	#1/2"-13 X 0.5 FLANGE NUT, ZP	4

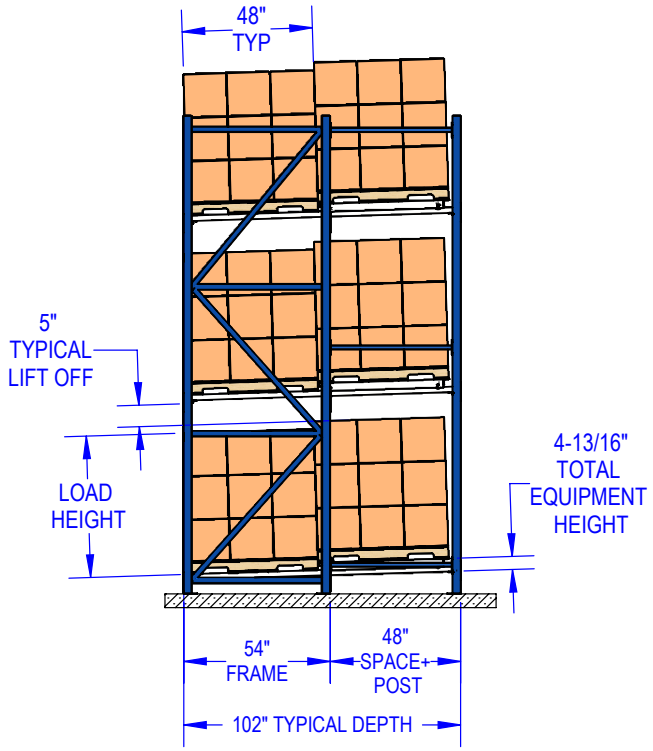


COMPONENT DIMENSIONS FOR STANDARD 2 DEEP PUSHBACK LANE.

3D STORAGE SYSTEMS LIMITED



FRONT VIEW



SIDE VIEW

TYPICAL DOUBLE WIDE 3-LEVEL HIGH BAY OF 2 DEEP PUSHBACK LANES FOR STANDARD 40" WIDE X 48" DEEP GMA/CHEP STYLE PALLET:

- LEVEL TO LEVEL DISTANCE = LOAD HEIGHT + INTERNAL BEAM HEIGHT + 4-13/16" + 1"
- RECOMMENDED RACKING HEIGHT = FRONT BEAM HEIGHT + LEVEL TO LEVEL DISTANCE x x NUMBER OF LEVELS + LOAD HEIGHT /2
- RECOMMENDED SLOPE = 3/8" DROP PER FOOT.
- CENTER TO CENTER DISTANCE FOR RAIL STUDS: 32" SIDE TO SIDE & 96-1/2" FRONT TO BACK.

3D STORAGE SYSTEMS LIMITED

PUSHBACK INSTALLATION GUIDE
2 - DEEP PUSHBACK SYSTEM

3D Pushback Systems are designed to be installed quickly, easily and without field measurement or adjustment. Standard rails have threaded studs welded on the bottom of the rail tube at each end. Front and rear beams, supplied by the rack manufacturer, are normally channel beam construction and include structural angle cleats with slots for mounting the rails. Alternatively, front and rear beams may be of structural angle construction with slots punched to exact spacing to ensure that rails are appropriately spaced and parallel.

Beams in the rack should be installed so that the rail slopes upward from the front beam (at the aisle) to the rear beam. Designers at the rack manufacturer determine the bracket drops on beams to achieve the appropriate slope, which is normally 3/8" per foot.

Typically the rails are fastened only at the front and rear beam positions. 3D has 2 methods of fastening the rails to the beams.

1. STUD MOUNT
This style of rail attaches with ½" threaded studs welded to the bottom of each end of the rail. Slots in the beam should line with these studs and a ½" flange nut should be fastened to the stud once in place. Keep in mind that the rails must be oriented with the lift out angle to the front and facing the inside of the lane.

2. PLATE MOUNT
This style of rail differs only slightly from the rail above. The front and rear of the rail tube should have plates with ½" holes. These should match up to the holes punched in the front and rear beam. These are then secured with a 1 ½" x ½" bolt and a ½" flange nut or nyloc nut.

Each two deep lane consists of two rails, plus one cart. The two rails in any lane are different from each other (one left hand, plus one right hand). Each of the rails has an (lift-out protector) angle 1 ¼" x 1 ¼" x approximately 6" long at the front and 12" long in the middle. Rails should be installed so that the end with the angle is at the load/unload end. Right-hand and left-hand rails vary in that the lift-out protector angles each face the middle of the lane. When the cart is installed, the lift-out angle brackets on the cart will fit under the angles on the rails.

The hardware required to fasten the rails to the beams is supplied by 3D Storage.

The cart is installed by placing it on the rails just past the lift out angle at the front of the lane. The cart has a push plate (4" wide, protruding ¾" above the cart) in the center of the front cross member. The cart is installed with the push plate closest to the load/unload end.

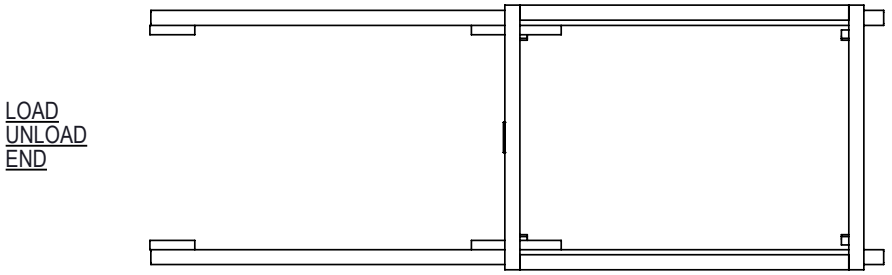
PUSHBACK INSTALLATION GUIDE

2 - DEEP PUSHBACK SYSTEM

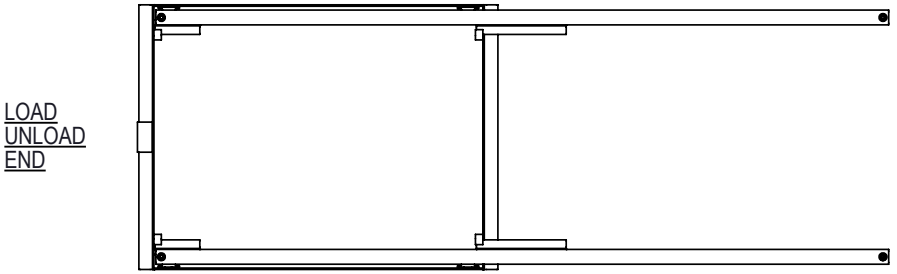
After the carts are installed, they should be checked to ensure that they roll freely up and down the lane. When pushed up a lane, a cart should return to the load/unload end when released. If not, check to ensure that the small lift-out brackets on the cart are running freely below the 1 ¼" x 1 ¼" angle on the inside of each of the rails.

Carts should have a small amount of side shift allowance to prevent binding of the wheels against the rail. This side shift allowance should be approximately 5/16". If side shift is significantly different from this dimension, then it is advisable that the installer measures the exact distance between the rails and then contacts the rack manufacturer who made the beams or 3D Storage to isolate the cause.

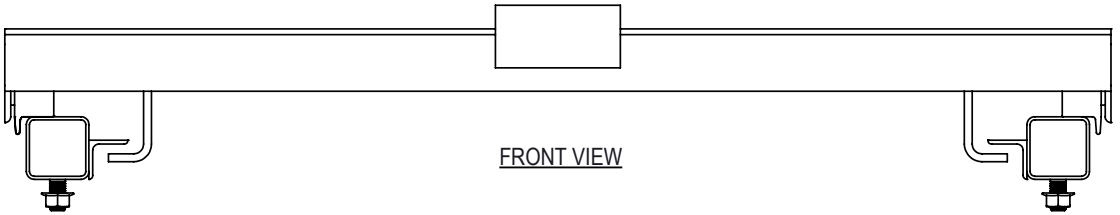
At times it is necessary to floor mount a lane, this is done by replacing beams with risers. The front beam is replaced by a structural angle that is anchored to the floor, the rails attach to it by means of a plate mount. The second position risers are welded to the rails at the time of manufacture. The rear beam is a rack-mounted beam, the same as the rear beams on the upper levels.



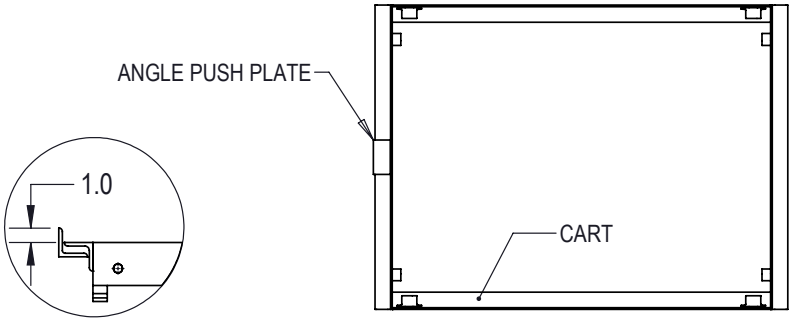
2 DEEP LANE - EXTENDED - TOP VIEW



2 DEEP LANE - EMPTY - BOTTOM VIEW



FRONT VIEW



2 DEEP PUSHBACK LANE - CART ONLY - BOTTOM VIEW

3D STORAGE SYSTEMS LIMITED

OPERATING INSTRUCTIONS

2 - DEEP PUSHBACK SYSTEM

1. Pallets must be loaded and unloaded with the forklift squared up to the face of the rack – **Do not approach or withdraw at an angle.**

2. When loading the first pallet, make sure the pallet is slightly tilted back towards the truck and 1 to 2 inches above the push plate. If the pallet catches the plate or any cart when loading, lift the pallet a few inches and allow the cart to return to the front before proceeding.

3. Put the first pallet down on the cart, ensuring that the pallet is flush with the front of the cart, and not resting on top of the push plate.

4. When loading the second pallet, enter low enough to catch the push plate with the back of the pallet. Push the pallet all the way in and place it on the rails behind the front beam. Always push back at a slow and constant speed.

5. When removing pallets from the lane, lift the pallet to a level position just high enough to clear the push plate or the front beam. **Withdraw at a slow and constant speed.**

6. Make sure that the following pallet comes to the front of the system. If for some reason the pallet is stuck and does not roll forward during unloading, push the pallet back in and back out again. If the pallet is still stuck, reload the lane and do not unload until the cause of the jam has been found and removed. **Do not leave stuck pallets in the back of a lane without a loaded pallet in front of it.**

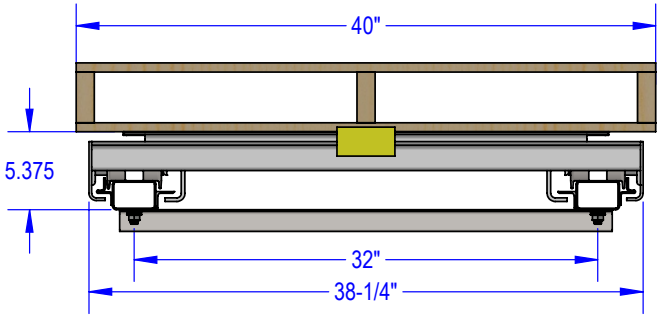

3 - DEEP
PUSHBACK

FEATURES AND BENEFITS:

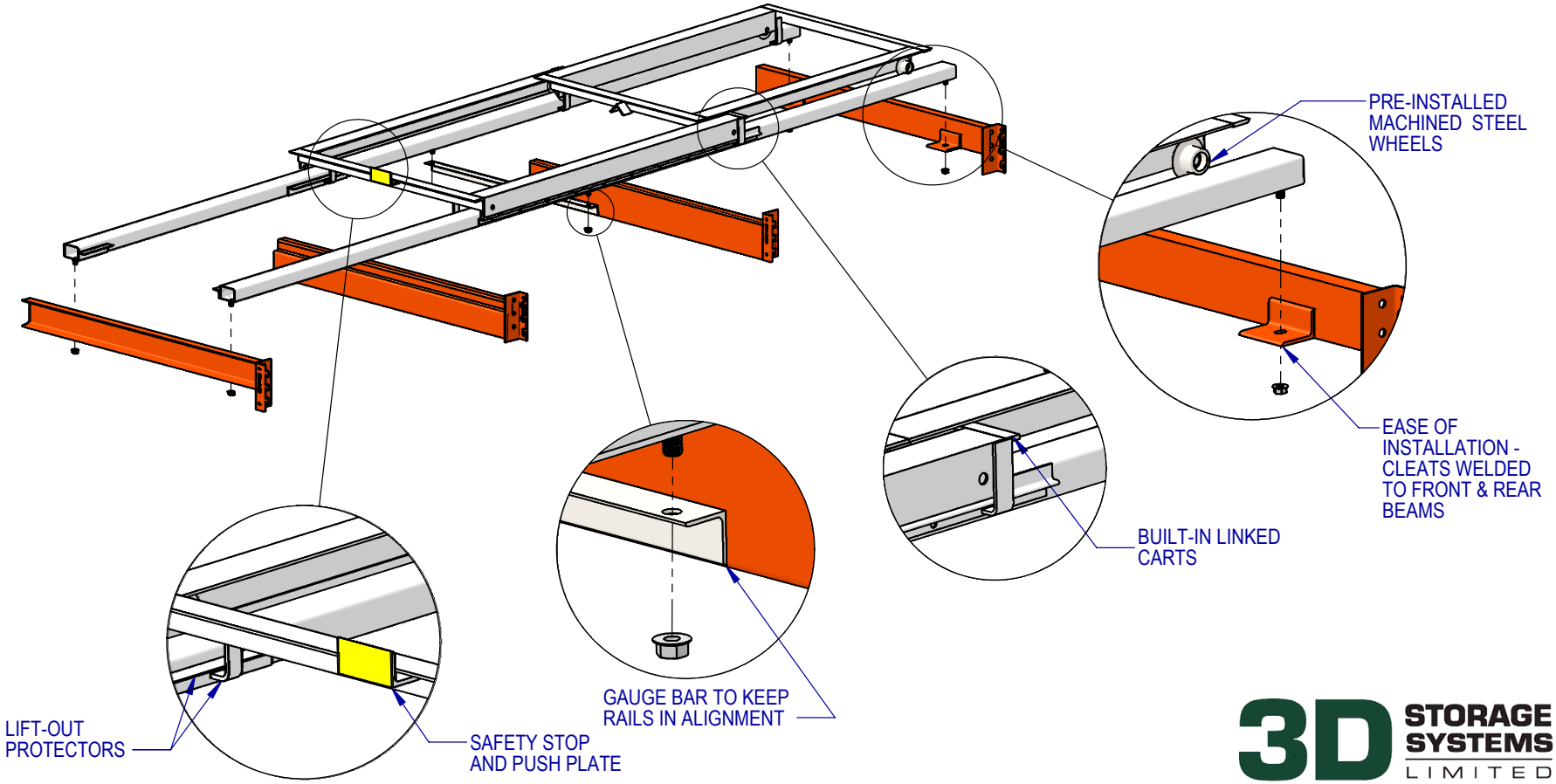
- PUSHBACK HAS THE LOWEST PROFILE HEIGHT ON THE MARKET.
- HEAVY DUTY STRUCTURAL STEEL CONSTRUCTION WITH SUPERIOR IMPACT RESISTANCE IS BUILT TO HANDLE 3,000 LB LOADS.
- CARTS HAVE INTEGRATED CRITICAL SAFETY FEATURES: LIFT-OUT PROTECTION, LINKED CARTS, AND SAFETY STOPS.
- STRUCTURAL TUBE RAILS OFFER A SMOOTH ROLLING SURFACE AND ONLY REQUIRE ATTACHMENT AT FRONT & REAR, NO ATTACHMENT TO INTERNAL BEAMS IS REQUIRED.
- MACHINED STEEL WHEELS WITH PRECISION BEARINGS ON WELDED STEEL SHAFTS - NO BOLTED WHEELS.
- CARTS COME FULLY ASSEMBLED - NO NEED TO INSTALL WHEELS.
- EASY TRANSPORTATION, EASY INSTALLATION AND EASY TO USE.
- DURABLE POWDER COATED FINISH, AVAILABLE IN GREY, BLUE OR GREEN.
- CUSTOM COLOURS OR HOT DIP GALVANISED FINISH AVAILABLE UPON REQUEST.

3 DEEP LOW PROFILE STEADIFLO PUSHBACK

(for a typical 40" wide x 48" deep GMA/CHEP style pallet)
PART NO. PB34048-STN

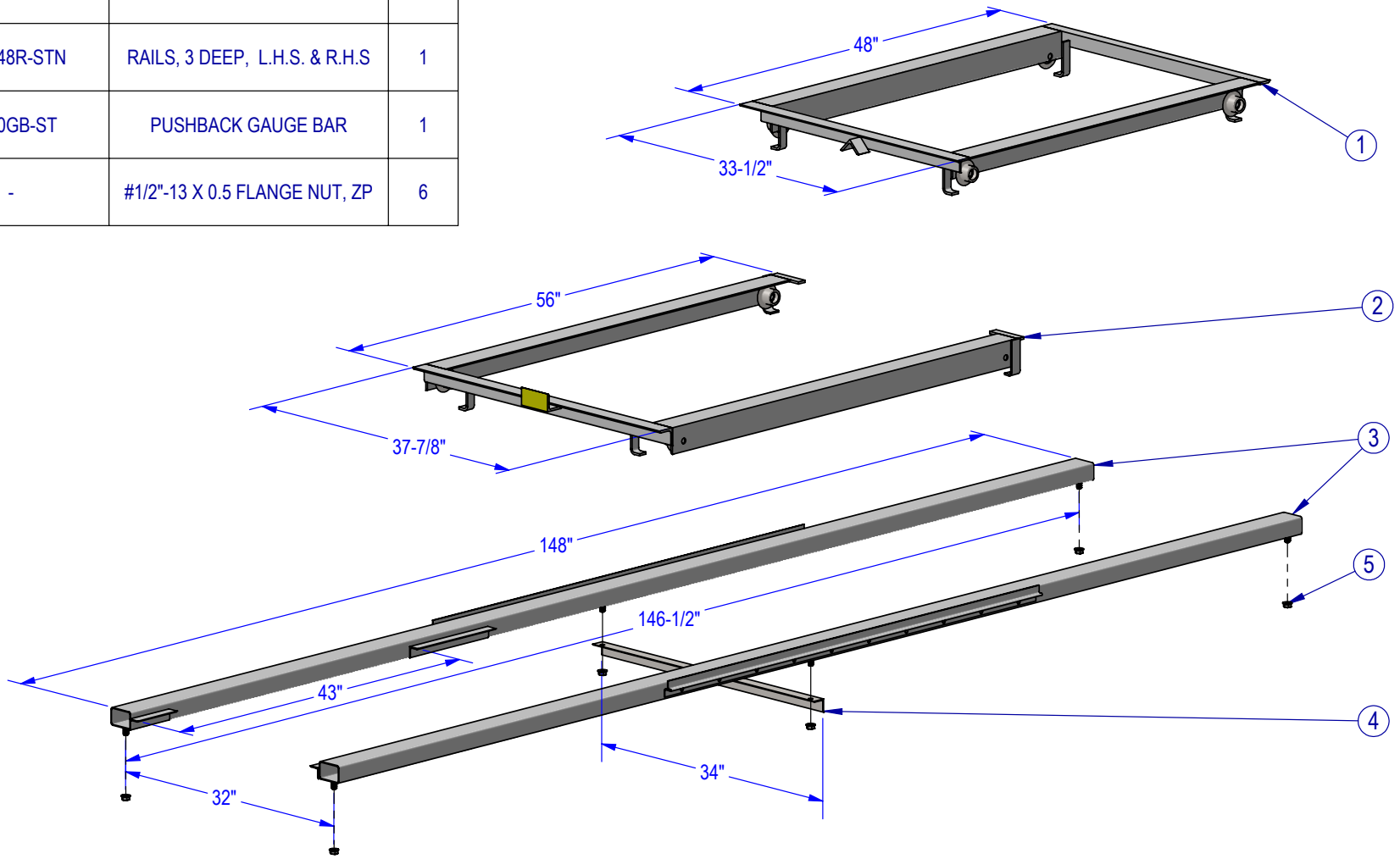


PROFILE



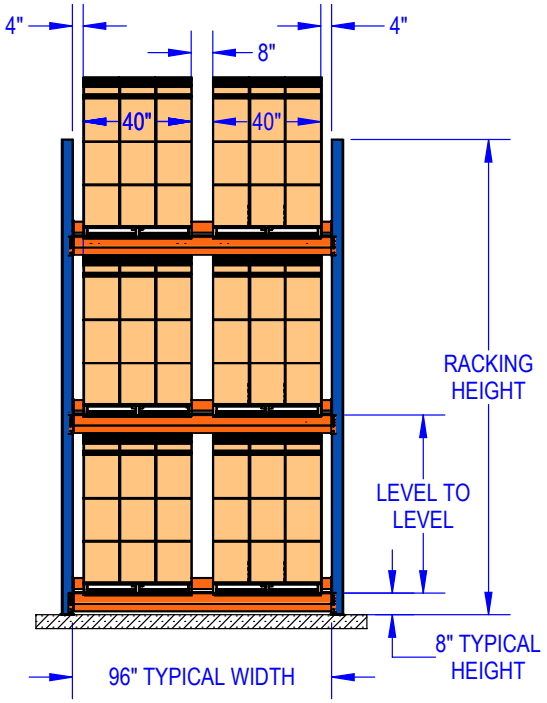
3D STORAGE SYSTEMS LIMITED

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	PB34646ST-AUS	3 DEEP TOP CART	1
2	PB34646SB-AUS	3 DEEP BOTTOM CART	1
3	PB34048R-STN	RAILS, 3 DEEP, L.H.S. & R.H.S	1
4	PB40GB-ST	PUSHBACK GAUGE BAR	1
5	-	#1/2"-13 X 0.5 FLANGE NUT, ZP	6

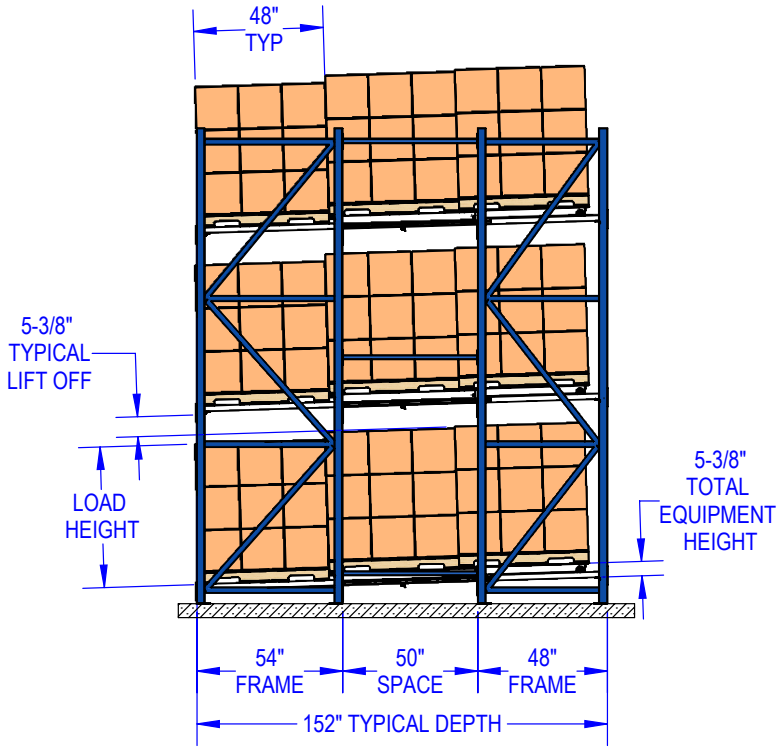


COMPONENT DIMENSIONS FOR STANDARD 3 DEEP PUSHBACK LANE.

3D STORAGE SYSTEMS LIMITED



FRONT VIEW



SIDE VIEW

TYPICAL DOUBLE WIDE 3-LEVEL HIGH BAY OF 3 DEEP PUSHBACK LANES FOR STANDARD 40" WIDE X 48" DEEP GMA/CHEP STYLE PALLET:

- LEVEL TO LEVEL DISTANCE = LOAD HEIGHT + INTERNAL BEAM HEIGHT + 5-3/8" + 1"
- RECOMMENDED RACKING HEIGHT = FRONT BEAM HEIGHT + LEVEL TO LEVEL DISTANCE x x NUMBER OF LEVELS + LOAD HEIGHT /2
- RECOMMENDED SLOPE = 3/8" DROP PER FOOT.
- CENTER TO CENTER DISTANCE FOR RAIL STUDS: 32" SIDE TO SIDE & 146-1/2" FRONT TO BACK.

3D STORAGE SYSTEMS LIMITED

PUSHBACK INSTALLATION GUIDE

3 - DEEP PUSHBACK SYSTEM

3D Pushback Systems are designed to be installed quickly, easily and without field measurement or adjustment. Standard rails have threaded studs welded on the bottom of the rail tube at each end. Front and rear beams, supplied by the rack manufacturer, are normally channel beam construction and include structural angle cleats with slots for mounting the rails. Alternatively, front and rear beams may be of structural angle construction with slots punched to exact spacing to ensure that rails are appropriately spaced and parallel.

Beams in the rack should be installed so that the rail slopes upward from the front beam (at the aisle) to the rear beam. Designers at the rack manufacturer determine the bracket drops on beams to achieve the appropriate slope, which is normally 3/8" per foot.

Typically the rails are fastened only at the front and rear beam positions. 3D has 2 methods of fastening the rails to the beams.

1. STUD MOUNT

This style of rail attaches with ½" threaded studs welded to the bottom of each end of the rail. Slots in the beam should line with these studs and a ½" flange nut should be fastened to the stud once in place. Keep in mind that the rails must be oriented with the lift out angle to the front and facing the inside of the lane.

2. PLATE MOUNT

This style of rail differs only slightly from the rail above. The front and rear of the rail tube should have plates with ½" holes. These should match up to the holes punched in the front and rear beam. These are then secured with a 1 ½" x ½" bolt and a ½" flange nut or nyloc nut.

Each three deep nested style lane consists of two rails and two carts. The two rails in any lane are different from each other (one left hand, plus one right hand). Each rail has an (lift-out protector) angle 1 ¼" x 1 ¼" x approximately 6" long at the front and 12" long in the middle. Rails should be installed so that the end with the angle is at the load/unload end. Right-hand and left-hand rails vary in that the lift-out protector angles each face the middle of the lane. When the cart is installed, the lift-out angle brackets on the cart will fit under the angles on the rails.

The hardware required to fasten the rails to the beams is supplied by 3D Storage.

The carts are installed by placing them on the rails just past the lift out angle at the front of the lane. Start with the bottom cart and then repeat this step to install the top cart. The bottom cart has a push plate (4" wide, protruding ¾" above the cart) in the center of the front cross member. The carts are always installed with the push plate and or the cross tie closest to the load/unload end.

After the carts are installed, they should be checked to ensure that they roll freely up and down the lane. When pushed up a lane, a cart should return to the load/unload end when released. If not, check to ensure that the small lift-out brackets on the cart are running freely below the 1 ¼" x 1 ¼" angle on the inside of each one of the rails.

PUSHBACK INSTALLATION GUIDE

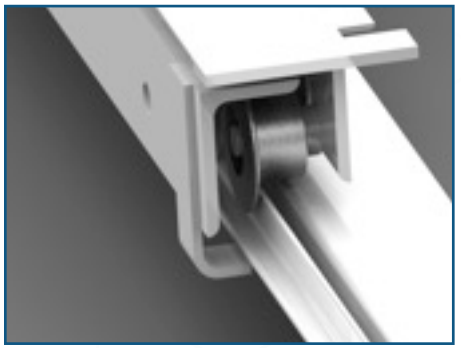
3 - DEEP PUSHBACK SYSTEM

Carts should have a small amount of side shift allowance to prevent binding of the wheels against the rail. This side shift allowance should be approximately 5/16”. If side shift is significantly different from this dimension, then it is advisable that the installer measures the exact distance between the rails and then contacts the rack manufacturer who made the beams or 3D Storage to isolate the cause.

At times it is necessary to floor mount a lane, this is done by replacing beams with risers. The front beam is replaced by a structural angle that is anchored to the floor, the rails attach to it by means of a plate mount. The second position risers are welded to the rails at the time of manufacture. The third position risers are placed on the floor underneath the rails and then slid forward to the front of the system to where the rails are just touching the risers. These risers are then anchored to the floor using the anchors supplied by the rack manufacturer. The rear beam is a rack-mounted beam, the same as the rear beams on the upper levels.

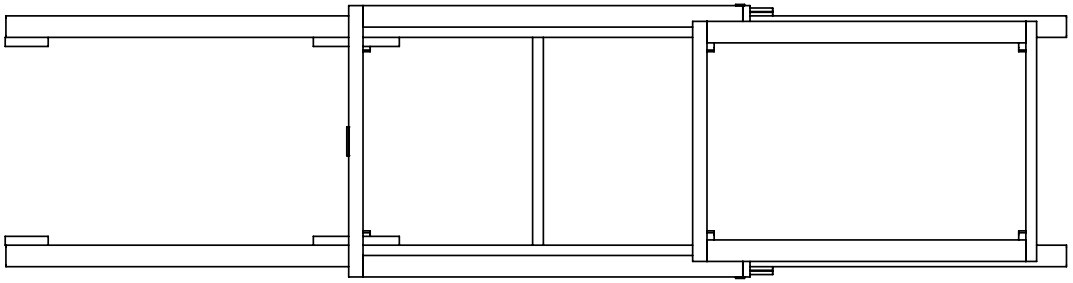
When installed flanged wheels should always sit inside the Z guide, not outside of it.

CORRECT



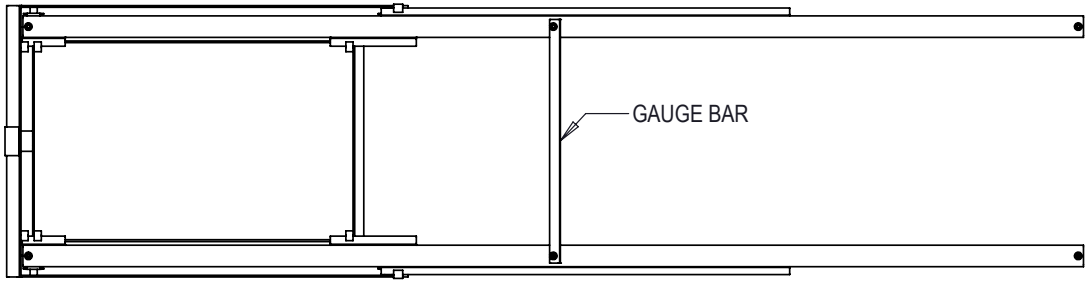
INCORRECT

LOAD
UNLOAD
END

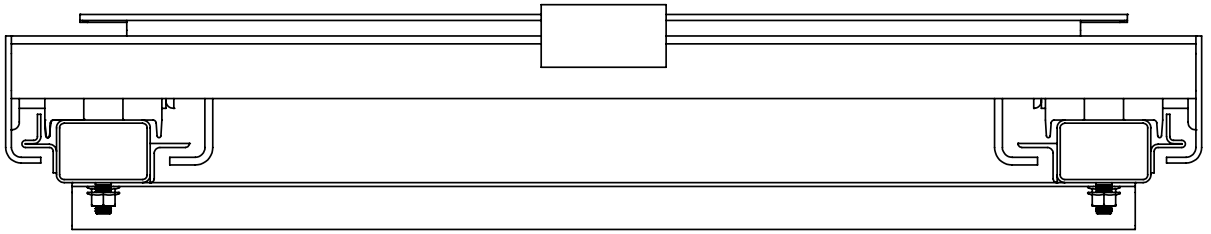


3 DEEP LANE - EXTENDED - TOP VIEW

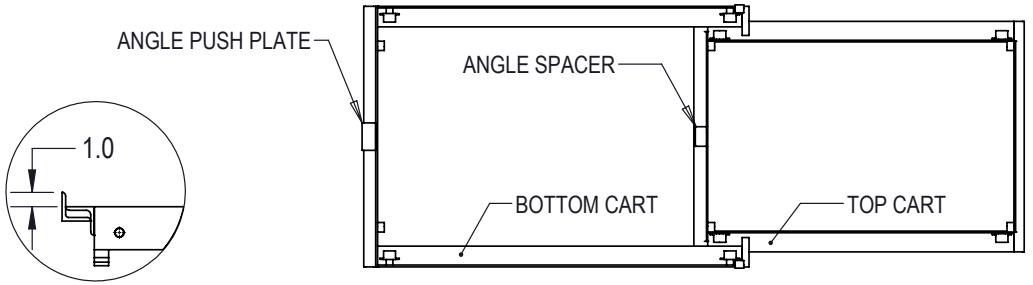
LOAD
UNLOAD
END



3 DEEP LANE - EMPTY - BOTTOM VIEW



FRONT VIEW



3 DEEP PUSHBACK LANE - CARTS ONLY - BOTTOM VIEW

3D STORAGE SYSTEMS LIMITED

OPERATING INSTRUCTIONS

3 - DEEP PUSHBACK SYSTEM

1. Pallets must be loaded and unloaded with the forklift squared up to the face of the rack – **Do not approach or withdraw at an angle.**

2. When loading the first pallet, make sure the pallet is slightly tilted back towards the truck and 1 to 2 inches above the push plate. If the pallet catches the plate or any cart when loading, lift the pallet a few inches and allow the cart to return to the front before proceeding.

3. Put the first pallet down on the cart, ensuring that the pallet is flush with the front of the cart, and not resting on top of the push plate.

4. When loading the second pallet, enter while pushing on the first pallet loaded with the back of the pallet being loaded. Push the pallet all the way in and place it on the waiting cart, continue to do this until you are loading the final pallet in the system. Here you are going to enter low enough to catch the Push plate with the pallet being loaded, push the pallet all the way in and place it on the rails behind the front beam. Always push back at a slow and constant speed.

5. When removing pallets from the lane, lift the pallet to a level position just high enough to clear the push plate or the front beam. **Withdraw at a slow and constant speed.**

6. Make sure that the following pallet comes to the front of the system. If for some reason the pallet is stuck and does not roll forward during unloading, push the pallet back in and back out again. If the pallet is still stuck, reload the lane and do not unload until the cause of the jam has been found and removed. **Do not leave stuck pallets in the back of a lane without a loaded pallet in front of it.**

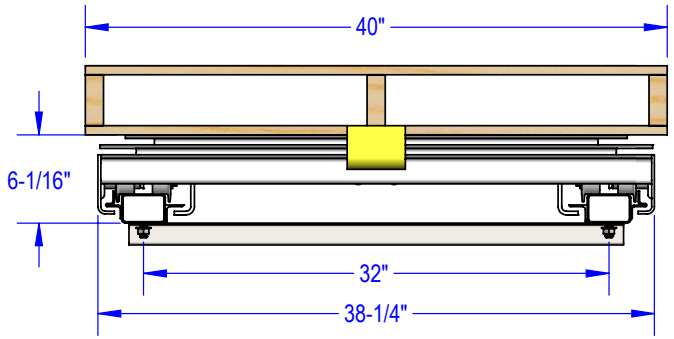

4 – DEEP
PUSHBACK

FEATURES AND BENEFITS:

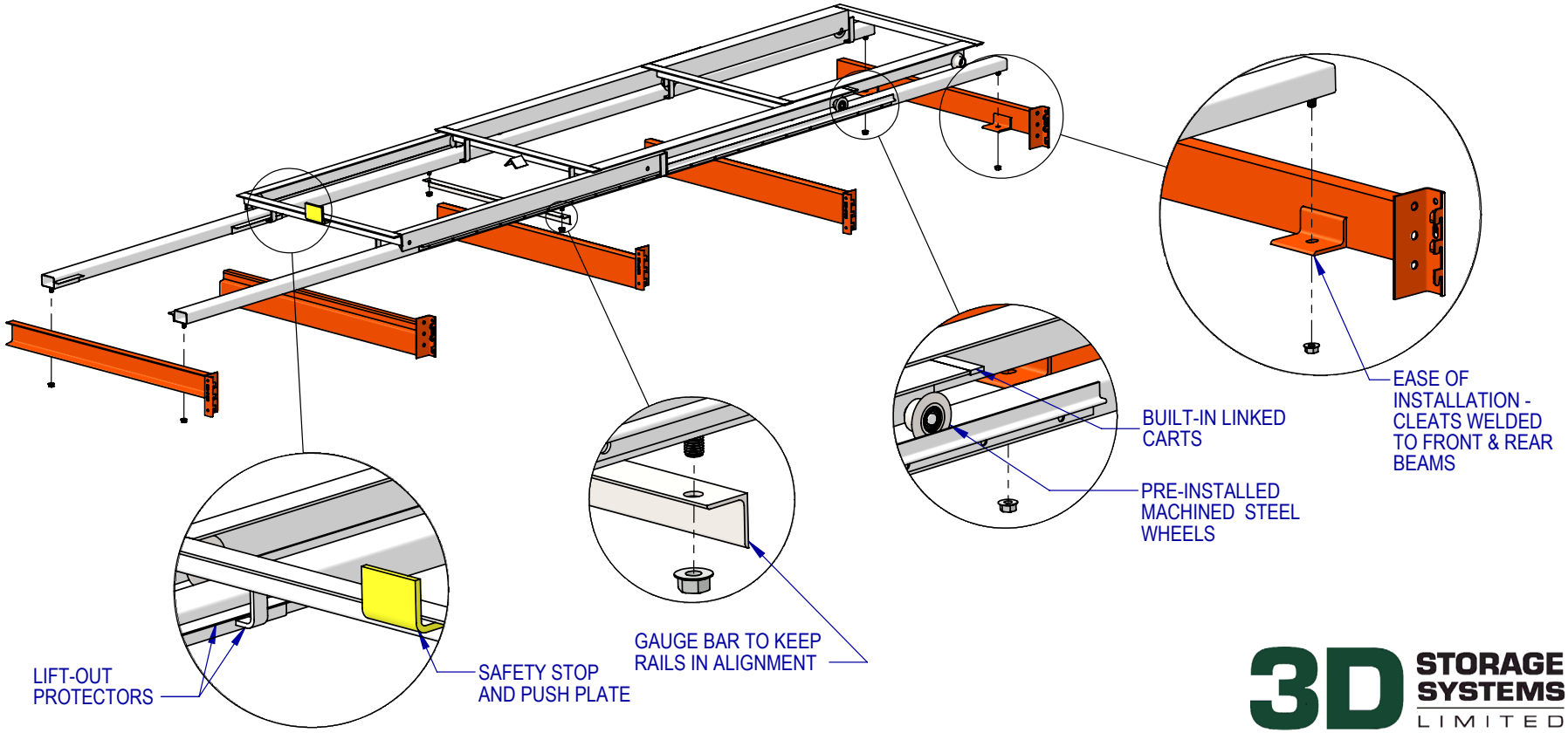
- PUSHBACK HAS THE LOWEST PROFILE HEIGHT ON THE MARKET.
- HEAVY DUTY STRUCTURAL STEEL CONSTRUCTION WITH SUPERIOR IMPACT RESISTANCE IS BUILT TO HANDLE 3,000 LB LOADS.
- CARTS HAVE INTEGRATED CRITICAL SAFETY FEATURES: LIFT-OUT PROTECTION, LINKED CARTS, AND SAFETY STOPS.
- STRUCTURAL TUBE RAILS OFFER A SMOOTH ROLLING SURFACE AND ONLY REQUIRE ATTACHMENT AT FRONT & REAR, NO ATTACHMENT TO INTERNAL BEAMS IS REQUIRED.
- MACHINED STEEL WHEELS WITH PRECISION BEARINGS ON WELDED STEEL SHAFTS - NO BOLTED WHEELS.
- CARTS COME FULLY ASSEMBLED - NO NEED TO INSTALL WHEELS.
- EASY TRANSPORTATION, EASY INSTALLATION AND EASY TO USE.
- DURABLE POWDER COATED FINISH, AVAILABLE IN GREY, BLUE OR GREEN.
- CUSTOM COLOURS OR HOT DIP GALVANISED FINISH AVAILABLE UPON REQUEST.

4 DEEP LOW PROFILE STEADIFLO PUSHBACK

(for a typical 40" wide x 48" deep GMA/CHEP style pallet)
PART NO. PB44048-STN

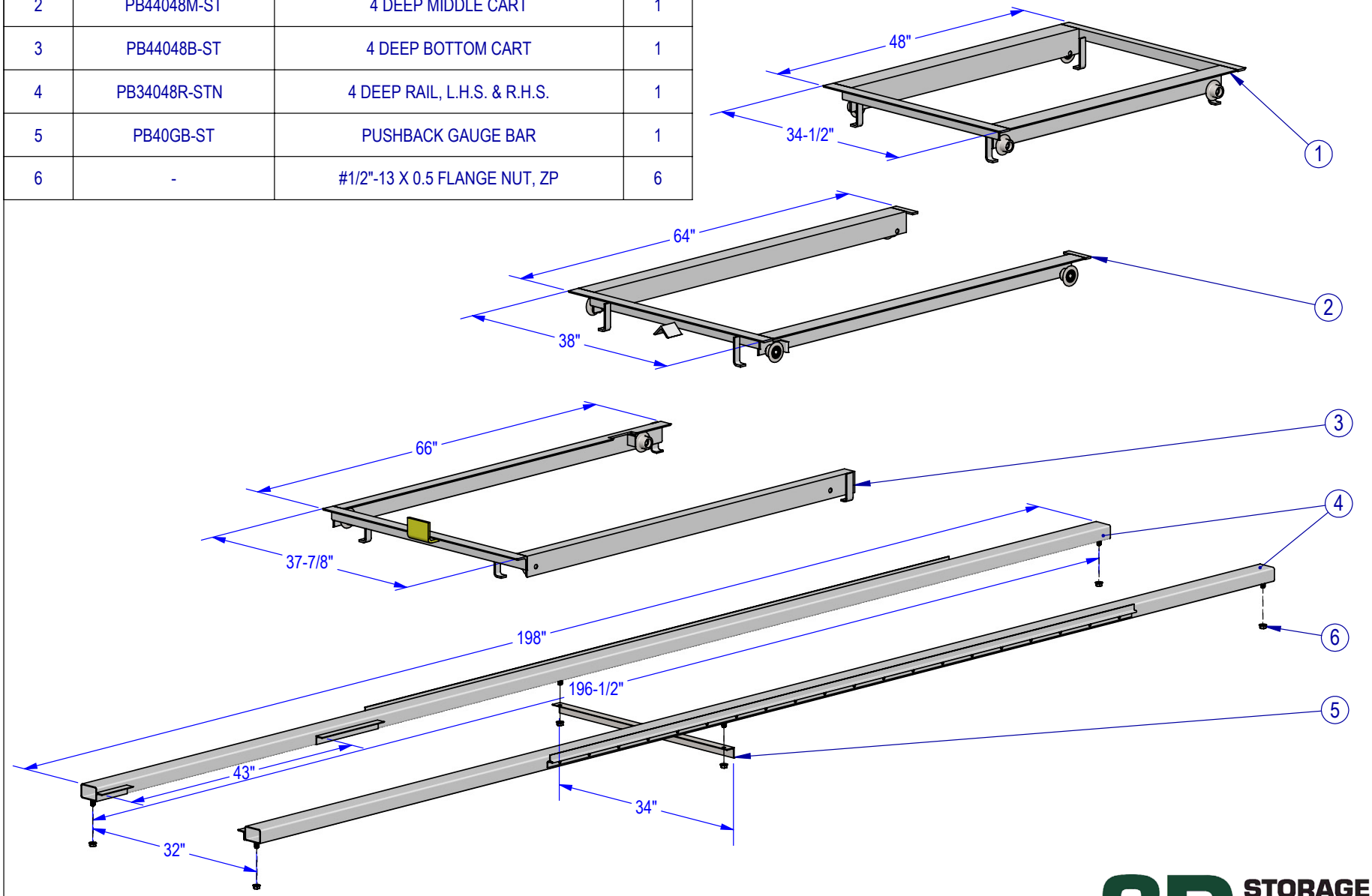


PROFILE



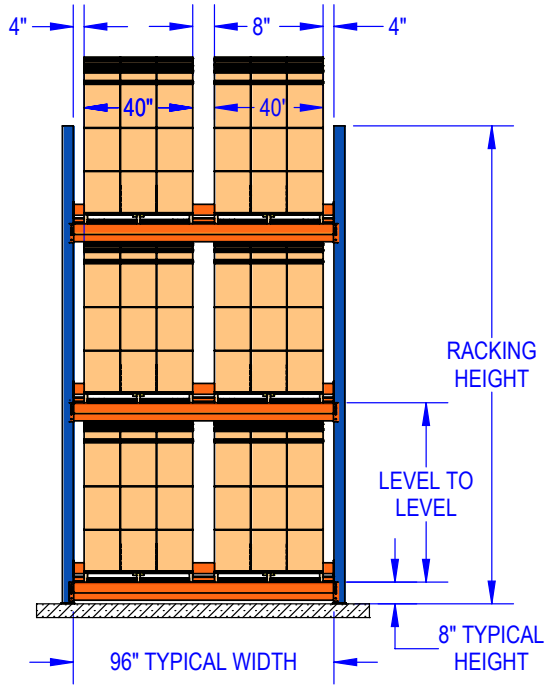
3D STORAGE SYSTEMS LIMITED

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	PB44048T-STN	4 DEEP TOP CART	1
2	PB44048M-ST	4 DEEP MIDDLE CART	1
3	PB44048B-ST	4 DEEP BOTTOM CART	1
4	PB34048R-STN	4 DEEP RAIL, L.H.S. & R.H.S.	1
5	PB40GB-ST	PUSHBACK GAUGE BAR	1
6	-	#1/2"-13 X 0.5 FLANGE NUT, ZP	6

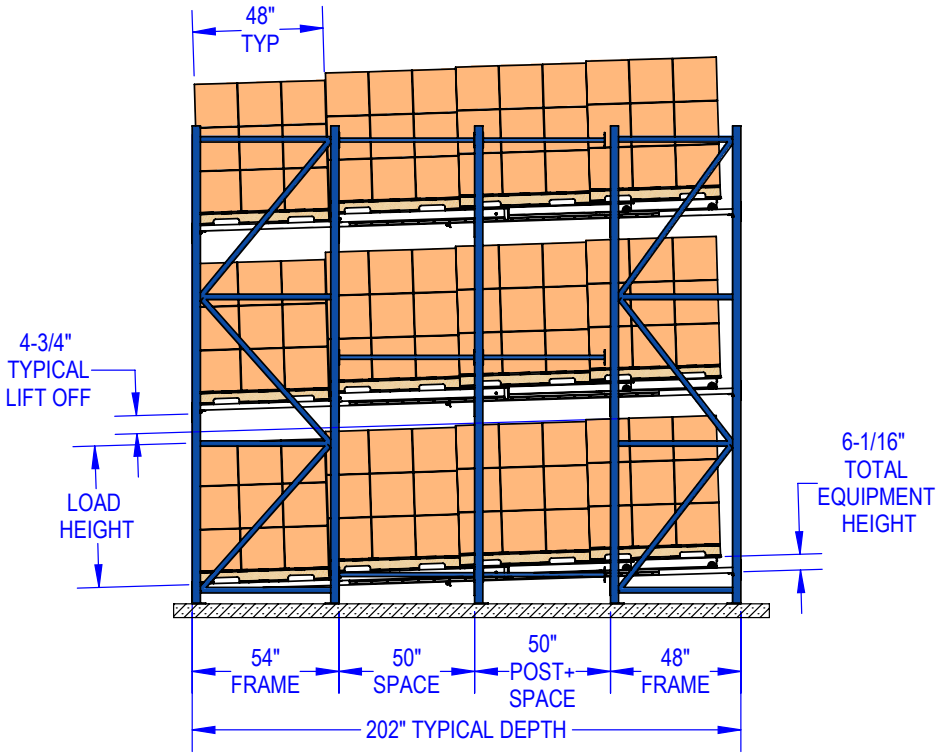


COMPONENT DIMENSIONS FOR STANDARD 4 DEEP PUSHBACK LANE.

3D STORAGE SYSTEMS LIMITED



FRONT VIEW



SIDE VIEW

TYPICAL DOUBLE WIDE 3-LEVEL HIGH BAY OF 4 DEEP PUSHBACK LANES FOR STANDARD 40" WIDE X 48" DEEP GMA/CHEP STYLE PALLET:

- LEVEL TO LEVEL DISTANCE = LOAD HEIGHT + INTERNAL BEAM HEIGHT + 6-1/16" + 1"
- RECOMMENDED RACKING HEIGHT = FRONT BEAM HEIGHT + LEVEL TO LEVEL DISTANCE x x NUMBER OF LEVELS + LOAD HEIGHT /2
- RECOMMENDED SLOPE = 3/8" DROP PER FOOT.
- CENTER TO CENTER DISTANCE FOR RAIL STUDS: 32" SIDE TO SIDE & 196-1/2" FRONT TO BACK.

3D STORAGE SYSTEMS LIMITED

PUSHBACK INSTALLATION GUIDE

4 - DEEP PUSHBACK SYSTEM

3D Pushback Systems are designed to be installed quickly, easily and without field measurement or adjustment. Standard rails have threaded studs welded on the bottom of the rail tube at each end. Front and rear beams, supplied by the rack manufacturer, are normally channel beam construction and include structural angle cleats with slots for mounting the rails. Alternatively, front and rear beams may be of structural angle construction with slots punched to exact spacing to ensure that rails are appropriately spaced and parallel.

Beams in the rack should be installed so that the rail slopes upward from the front beam (at the aisle) to the rear beam. Designers at the rack manufacturer determine the bracket drops on beams to achieve the appropriate slope, which is normally 3/8" per foot.

Typically the rails are fastened only at the front and rear beam positions. 3D has 2 methods of fastening the rails to the beams.

1. STUD MOUNT

This style of rail attaches with ½" threaded studs welded to the bottom of each end of the rail. Slots in the beam should line with these studs and a ½" flange nut should be fastened to the stud once in place. Keep in mind that the rails must be oriented with the lift out angle to the front and facing the inside of the lane

2. PLATE MOUNT

This style of rail differs only slightly from the rail above. The front and rear of the rail tube should have plates with ½" holes. These should match up to the holes punched in the front and rear beam. These are then secured with a 1 ½" x ½" bolt and a ½" flange nut or nyloc nut.

Each four deep nested style lane consists of two rails and three carts. The two rails in any lane are different from each other (one left hand, plus one right hand). Each rail has an (lift-out protector) angle 1 ¼" x 1 ¼" x approximately 6" long at the front and 12" long in the middle. Rails should be installed so that the end with the angle is at the load/unload end. Right-hand and left-hand rails vary in that the lift-out protector angles each face the middle of the lane. There is one set of studs on the bottom of the rails that require the attachment of a gauge bar. This simply fastens with flange nuts and is designed to keep the rails in gauge when under load. When the cart is installed, the lift-out angle brackets on the cart will fit under the angles on the rails.

The hardware required to fasten the rails to the beams is supplied by 3D Storage.

The carts are installed by placing them on the rails just past the lift out angle at the front of the lane. Start with the bottom cart and then repeat this step to install the middle and top cart. The bottom cart has a push plate (4" wide, protruding ¾" above the cart) in the center of the front cross member. The carts are always installed with the push plate and or the cross tie

PUSHBACK INSTALLATION GUIDE
4 - DEEP PUSHBACK SYSTEM

closest to the load/unload end. As the carts get deeper they get narrower.

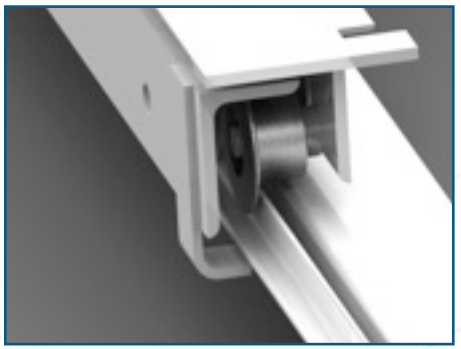
After the carts are installed, they should be checked to ensure that they roll freely up and down the lane. When pushed up a lane, a cart should return to the load/unload end when released. If not, check to ensure that the small lift-out brackets on the cart are running freely below the 1 ¼" x 1 ¼" angle on the inside of each one of the rails.

Carts should have a small amount of side shift allowance to prevent binding of the wheels against the rail. This side shift allowance should be approximately 5/16". If side shift is significantly different from this dimension, then it is advisable that the installer measures the exact distance between the rails and then contacts the rack manufacturer who made the beams or 3D Storage to isolate the cause.

At times it is necessary to floor mount a lane, this is done by replacing beams with risers. The front beam is replaced by a structural angle that is anchored to the floor, the rails attach to it by means of a plate mount. The second position risers are welded to the rails at the time of manufacture. The third position risers are placed on the floor underneath the rails and then slid forward to the front of the system to where the rails are just touching the risers. These risers are then anchored to the floor using the anchors supplied by the rack manufacturer. The subsequent interior and rear beams are rack-mounted beams, the same as on the upper levels.

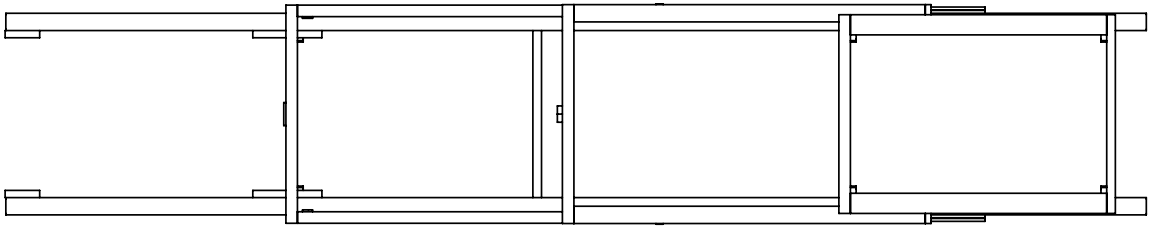
When installed flanged wheels should always sit inside the Z guide, not outside of it.

CORRECT



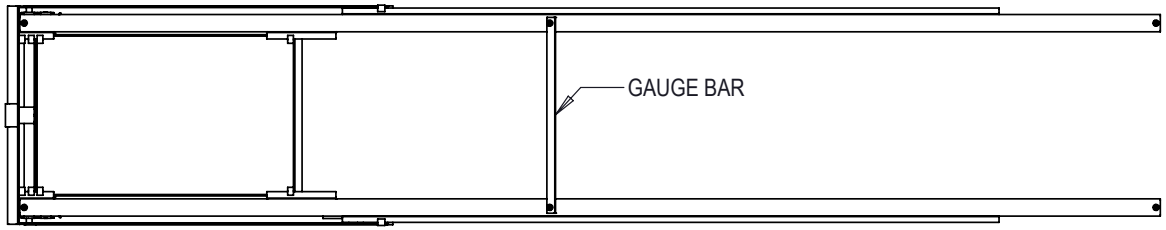
INCORRECT

LOAD
UNLOAD
END

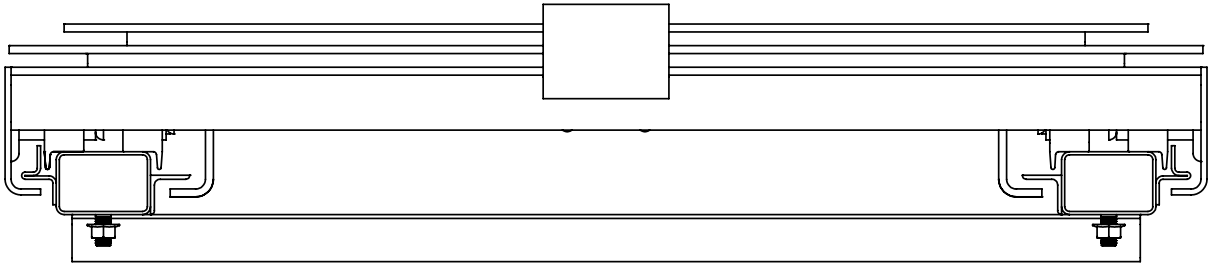


4 DEEP LANE - EXTENDED - TOP VIEW

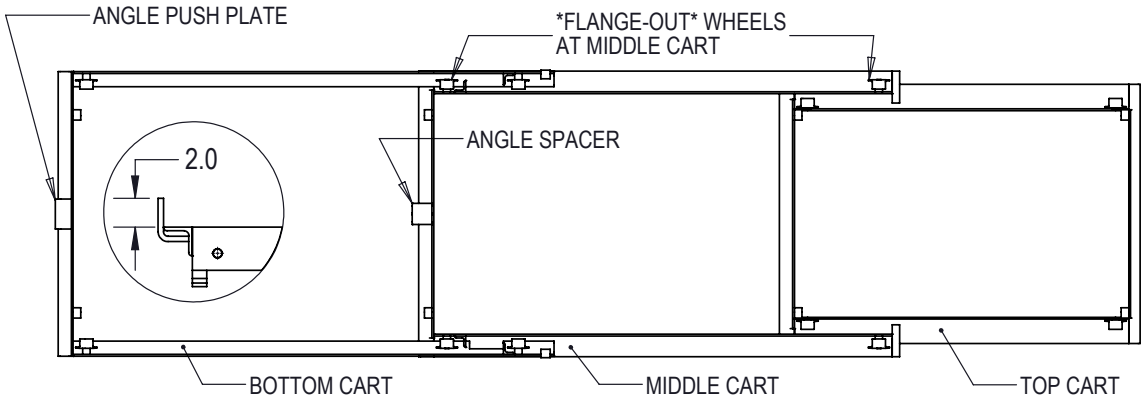
LOAD
UNLOAD
END



4 DEEP LANE - EMPTY - BOTTOM VIEW



FRONT VIEW



4 DEEP PUSHBACK LANE - CARTS ONLY - BOTTOM VIEW

3D STORAGE SYSTEMS LIMITED

OPERATING INSTRUCTIONS

4 - DEEP PUSHBACK SYSTEM

1. Pallets must be loaded and unloaded with the forklift squared up to the face of the rack – **Do not approach or withdraw at an angle.**

2. When loading the first pallet, make sure the pallet is slightly tilted back towards the truck and 1 to 2 inches above the push plate. If the pallet catches the plate or any cart when loading, lift the pallet a few inches and allow the cart to return to the front before proceeding.

3. Put the first pallet down on the cart, ensuring that the pallet is flush with the front of the cart, and not resting on top of the push plate.

4. When loading the second pallet, enter while pushing on the first pallet loaded with the back of the pallet being loaded. Push the pallet all the way in and place it on the waiting cart, continue to do this until you are loading the final pallet in the system. Here you are going to catch the Push plate with the pallet being loaded, push the pallet all the way in and place it on the rails behind the front beam. Always push back at a slow and constant speed.

5. When removing pallets from the lane, lift the pallet to a level position just high enough to clear the push plate or the front beam. **Withdraw at a slow and constant speed.**

6. Make sure that the following pallet comes to the front of the system. If for some reason the pallet is stuck and does not roll forward during unloading, push the pallet back in and back out again. If the pallet is still stuck, reload the lane and do not unload until the cause of the jam has been found and removed. **Do not leave stuck pallets in the back of a lane without a loaded pallet in front of it.**

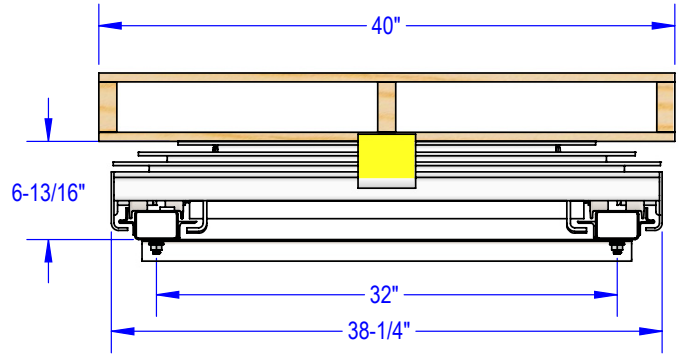

5 – DEEP
PUSHBACK

FEATURES AND BENEFITS:

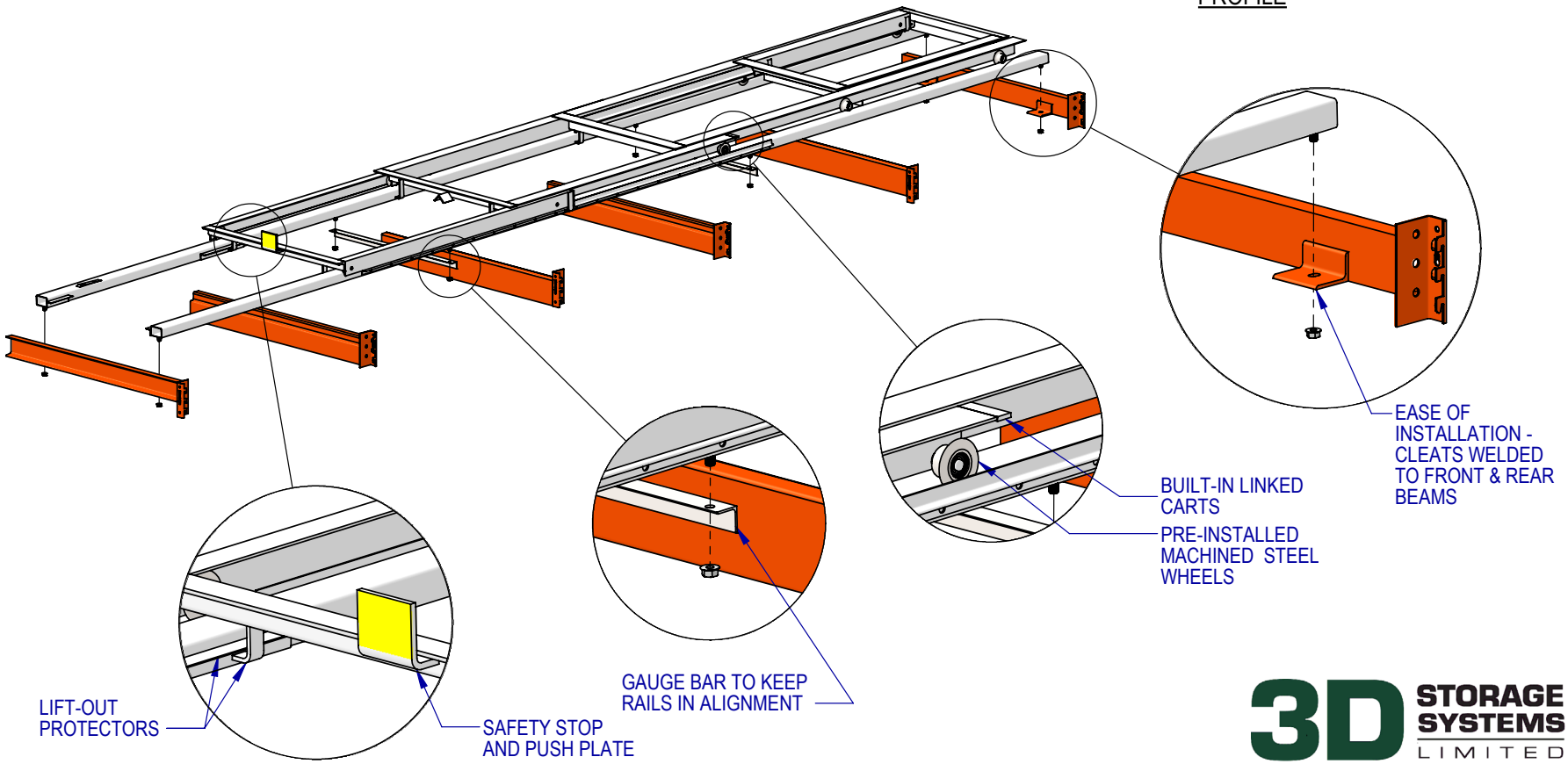
- PUSHBACK HAS THE LOWEST PROFILE HEIGHT ON THE MARKET.
- HEAVY DUTY STRUCTURAL STEEL CONSTRUCTION WITH SUPERIOR IMPACT RESISTANCE IS BUILT TO HANDLE 3,000 LB LOADS.
- CARTS HAVE INTEGRATED CRITICAL SAFETY FEATURES: LIFT-OUT PROTECTION, LINKED CARTS, AND SAFETY STOPS.
- STRUCTURAL TUBE RAILS OFFER A SMOOTH ROLLING SURFACE AND ONLY REQUIRE ATTACHMENT AT FRONT & REAR, NO ATTACHMENT TO INTERNAL BEAMS IS REQUIRED.
- MACHINED STEEL WHEELS WITH PRECISION BEARINGS ON WELDED STEEL SHAFTS - NO BOLTED WHEELS.
- CARTS COME FULLY ASSEMBLED - NO NEED TO INSTALL WHEELS.
- EASY TRANSPORTATION, EASY INSTALLATION AND EASY TO USE.
- DURABLE POWDER COATED FINISH, AVAILABLE IN GREY, BLUE OR GREEN.
- CUSTOM COLOURS OR HOT DIP GALVANISED FINISH AVAILABLE UPON REQUEST.

5 DEEP LOW PROFILE STEADIFLO PUSHBACK

(for a typical 40" wide x 48" deep GMA/CHEP style pallet)
PART NO. PB54048-STN

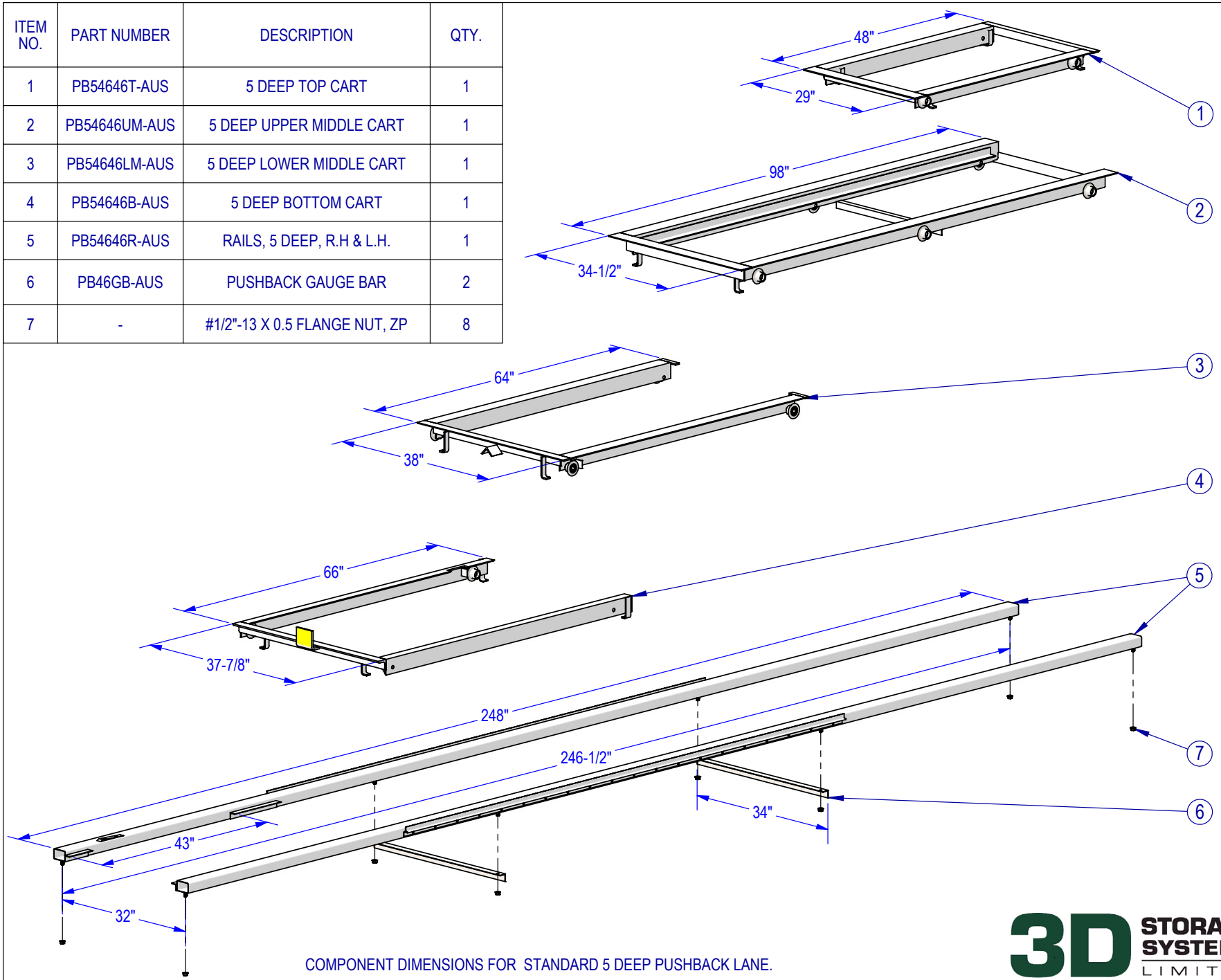


PROFILE



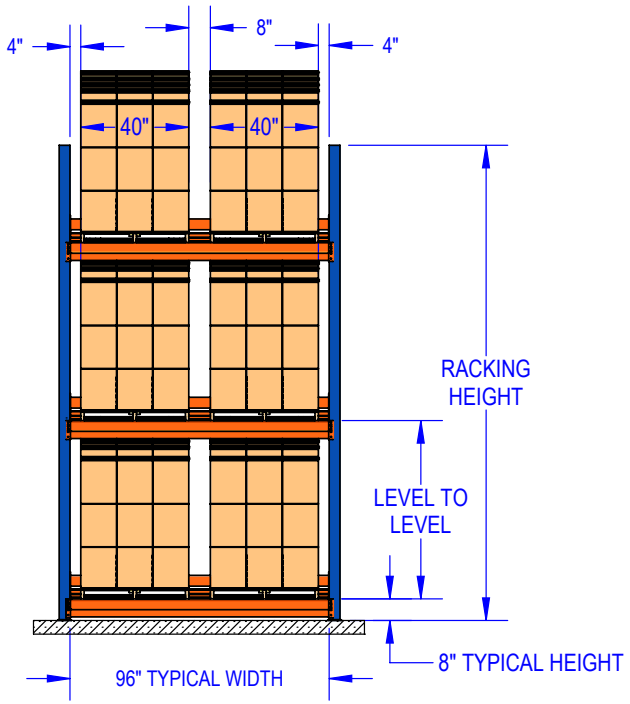
3D STORAGE SYSTEMS LIMITED

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	PB54646T-AUS	5 DEEP TOP CART	1
2	PB54646UM-AUS	5 DEEP UPPER MIDDLE CART	1
3	PB54646LM-AUS	5 DEEP LOWER MIDDLE CART	1
4	PB54646B-AUS	5 DEEP BOTTOM CART	1
5	PB54646R-AUS	RAILS, 5 DEEP, R.H & L.H.	1
6	PB46GB-AUS	PUSHBACK GAUGE BAR	2
7	-	#1/2"-13 X 0.5 FLANGE NUT, ZP	8

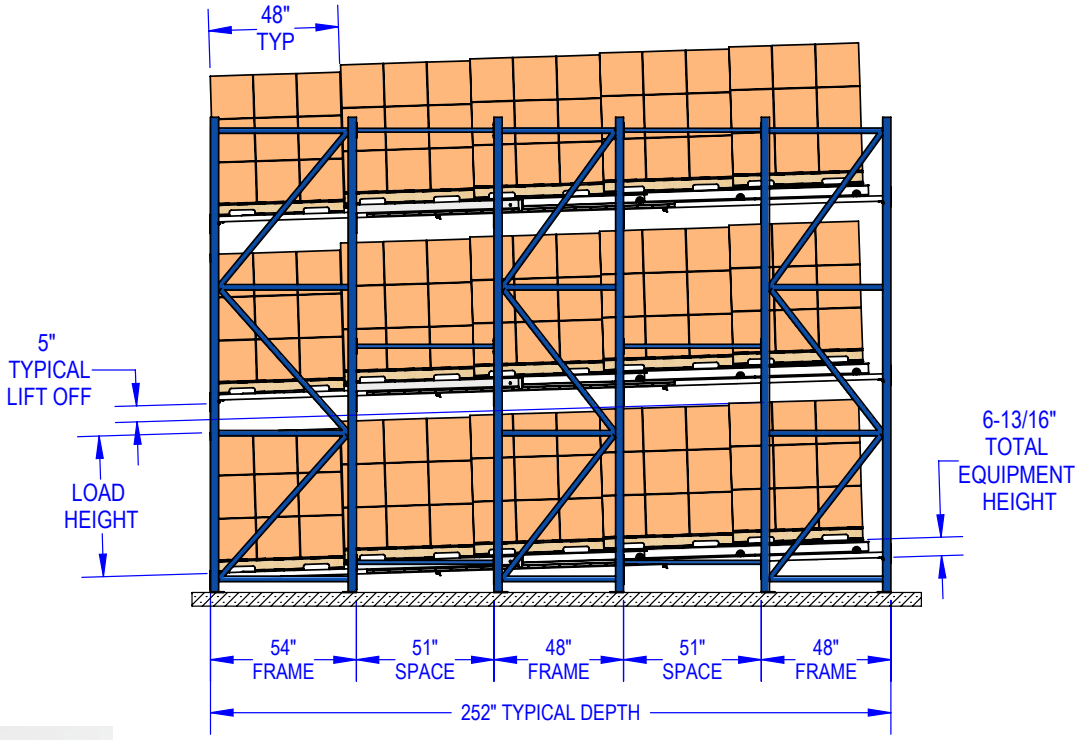


COMPONENT DIMENSIONS FOR STANDARD 5 DEEP PUSHBACK LANE.

3D STORAGE SYSTEMS LIMITED



FRONT VIEW



SIDE VIEW

TYPICAL DOUBLE WIDE 3-LEVEL HIGH BAY OF 5 DEEP PUSHBACK LANES FOR STANDARD 40" WIDE X 48" DEEP GMA/CHEP STYLE PALLET:

- LEVEL TO LEVEL DISTANCE = LOAD HEIGHT + INTERNAL BEAM HEIGHT + 6-13/16" + 1"
- RECOMMENDED RACKING HEIGHT = FRONT BEAM HEIGHT + LEVEL TO LEVEL DISTANCE x x NUMBER OF LEVELS + LOAD HEIGHT /2
- RECOMMENDED SLOPE = 3/8" DROP PER FOOT.
- CENTER TO CENTER DISTANCE FOR RAIL STUDS: 32" SIDE TO SIDE & 246-1/2" FRONT TO BACK.

3D STORAGE SYSTEMS LIMITED

PUSHBACK INSTALLATION GUIDE

5 - DEEP PUSHBACK SYSTEM

3D Pushback Systems are designed to be installed quickly, easily and without field measurement or adjustment. Standard rails have threaded studs welded on the bottom of the rail tube at each end. Front and rear beams, supplied by the rack manufacturer, are normally of channel beam construction and include structural angle cleats with slots for mounting the rails. Alternatively, front and rear beams may be of structural angle construction with slots punched to exact spacing to ensure that rails are appropriately spaced and parallel.

Beams in the rack should be installed so that the rail slopes upward from the front beam (at the aisle) to the rear beam. Designers at the rack manufacturer determine the bracket drops on beams to achieve the appropriate slope, which is normally 3/8”per foot.

Typically the rails are fastened only at the front and rear beam positions. 3D has 2 methods of fastening the rails to the beams.

1. STUD MOUNT

This style of rail attaches with ½” threaded studs welded to the bottom of each end of the rail. Slots in the beam should line with these studs and a ½” flange nut should be fastened to the stud once in place. Keep in mind that the rails must be oriented with the lift out angle to the front and facing the inside of the lane.

2. PLATE MOUNT

This style of rail differs only slightly from the rail above. The front and rear of the rail tube should have plates with ½” holes. These should match up to the holes punched in the front and rear beam. These are then secured with a 1 ½” x ½” bolt and a ½” flanged nut or nyloc nut.

Each five deep nested style lane consists of two rails and four carts. The two rails in any lane are different from each other (one left hand, plus one right hand). Each rail has an (lift-out protector) angle 1 ¼” x 1 ¼” x 6” long at the front and 12” long in the middle. Rails should be installed so that the end with the angle is at the load/unload end. Right-hand and left-hand rails vary in that the lift-out protector angles each face the middle of the lane. There are two sets of studs on the bottom of the rails that require the attachment of gauge bars. These simply fasten with flange nuts and are designed to keep the rails in gauge when under load. When the cart is installed, the lift-out angle brackets on the cart will fit under the angles on the rails.

The hardware required to fasten the rails to the beams is supplied by 3D Storage.

The carts are installed by placing them on the rails just past the lift out angle at the front of the lane. Start with the bottom cart and then place the lower middle cart inside the bottom cart. The upper middle and top cart are shipped together and should be installed next. The bottom cart has a push plate (4” wide,

PUSHBACK INSTALLATION GUIDE
5 - DEEP PUSHBACK SYSTEM

protruding 2 5/8” above the cart) in the center of the front cross member. The carts are always installed with the push plate and or the cross tie closest to the load/unload end. As the carts get deeper they get narrower.

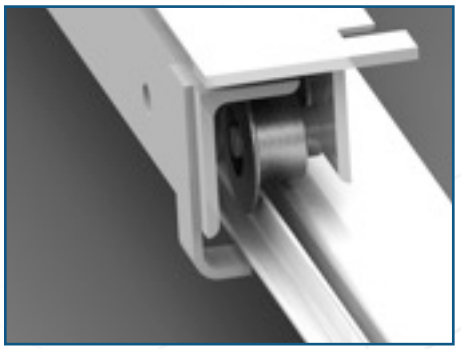
After the carts are installed, they should be checked to ensure that they roll freely up and down the lane. When pushed up a lane, a cart should return to the load/unload end when released. If not, check to ensure that the small lift-out brackets on the cart are running freely below the 1 ¼” x 1 ¼” angle on the inside of each one of the rails.

Carts should have a small amount of side shift allowance to prevent binding of the wheels against the rail. This side shift allowance should be approximately 5/16”. If side shift is significantly different from this dimension, then it is advisable that the installer measures the exact distance between the rails and then contacts the rack manufacturer who made the beams or 3D Storage to isolate the cause.

At times it is necessary to floor mount a lane, this is done by replacing beams with risers. The front beam is replaced by a structural angle that is anchored to the floor, the rails attach to it by means of a plate mount. The second position risers are welded to the rails at the time of manufacture. The third position risers are placed on the floor underneath the rails and then slid forward to the front of the system to where the rails are just touching the risers. These risers are then anchored to the floor using the anchors supplied by the rack manufacturer. The subsequent interior and rear beams are rack-mounted beams, the same as on the upper levels.

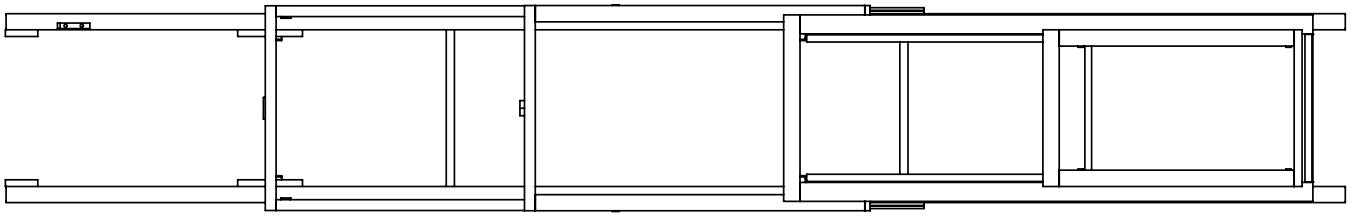
When installed flanged wheels should always sit inside the Z guide, not outside of it.

CORRECT



INCORRECT

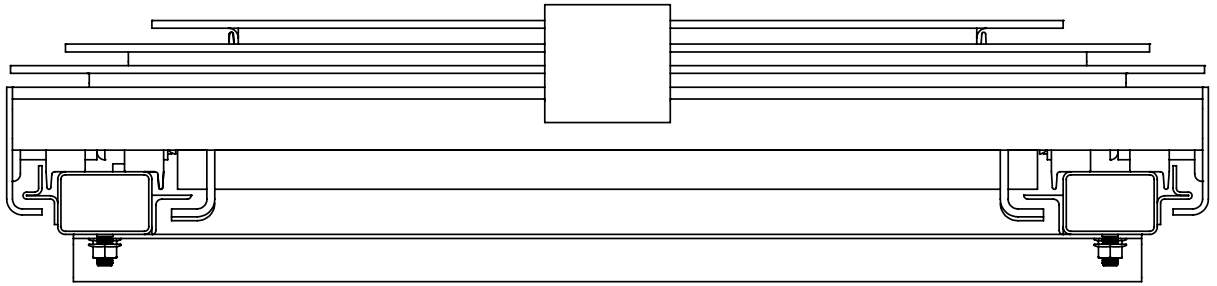
LOAD
UNLOAD
END



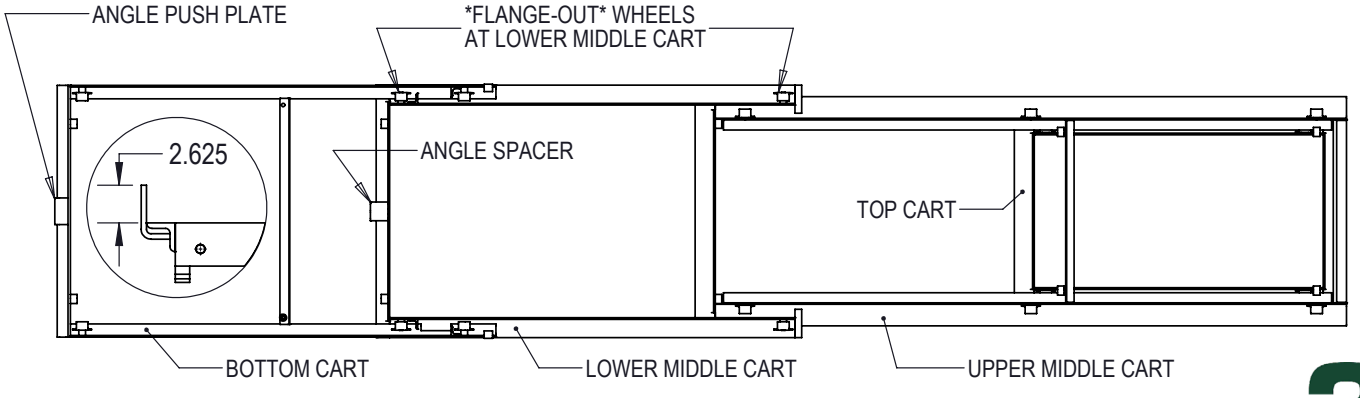
5 DEEP LANE - EXTENDED - TOP VIEW

LOAD
UNLOAD
END

5 DEEP LANE - EMPTY - BOTTOM VIEW



FRONT VIEW



5 DEEP PUSHBACK LANE - CARTS ONLY - BOTTOM VIEW

3D STORAGE SYSTEMS LIMITED

OPERATING INSTRUCTIONS

5 - DEEP PUSHBACK SYSTEM

1. Pallets must be loaded and unloaded with the forklift squared up to the face of the rack – **Do not approach or withdraw at an angle.**

2. When loading the first pallet, make sure the pallet is slightly tilted back towards the truck and 1 to 2 inches above the push plate. If the pallet catches the plate or any cart when loading, lift the pallet a few inches and allow the cart to return to the front before proceeding.

3. Put the first pallet down on the cart, ensuring that the pallet is flush with the front of the cart, and not resting on top of the push plate.

4. When loading the second pallet, enter while pushing on the first pallet loaded with the back of the pallet being loaded. Push the pallet all the way in and place it on the waiting cart, continue to do this until you are loading the final pallet in the system. Here you are going to catch the Push plate with the pallet being loaded, push the pallet all the way in and place it on the rails behind the front beam. Always push back at a slow and constant speed.

5. When removing pallets from the lane, lift the pallet to a level position just high enough to clear the push plate or the front beam. **Withdraw at a slow and constant speed.**

6. Make sure that the following pallet comes to the front of the system. If for some reason the pallet is stuck and does not roll forward during unloading, push the pallet back in and back out again. If the pallet is still stuck, reload the lane and do not unload until the cause of the jam has been found and removed. **Do not leave stuck pallets in the back of a lane without a loaded pallet in front of it.**

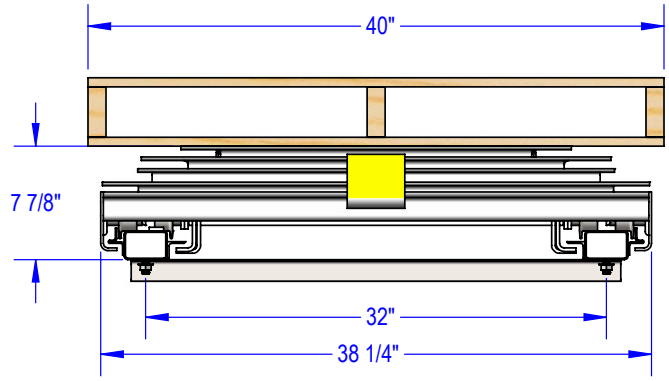

6 – DEEP
PUSHBACK

FEATURES AND BENEFITS:

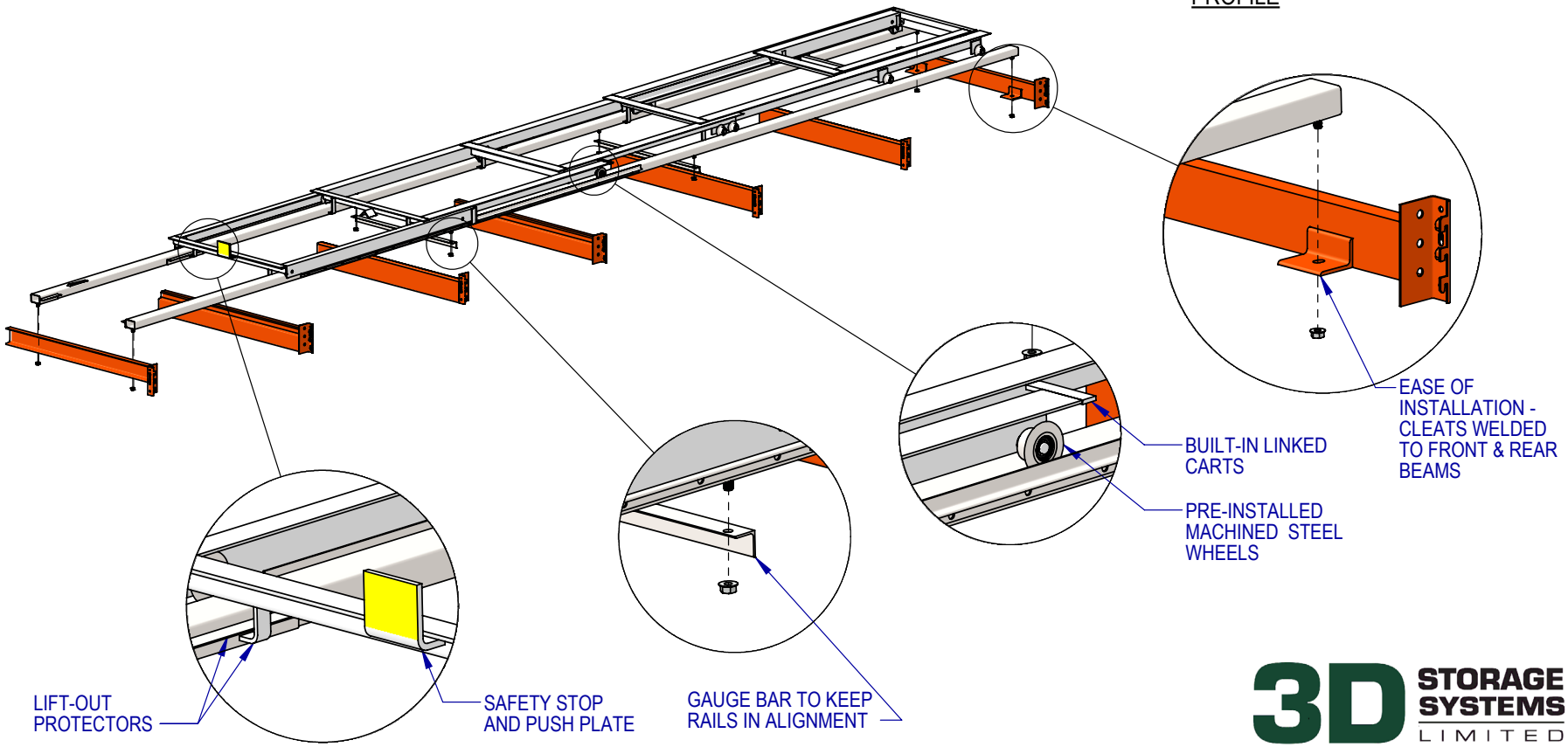
- PUSHBACK HAS THE LOWEST PROFILE HEIGHT ON THE MARKET.
- HEAVY DUTY STRUCTURAL STEEL CONSTRUCTION WITH SUPERIOR IMPACT RESISTANCE IS BUILT TO HANDLE 3,000 LB LOADS.
- CARTS HAVE INTEGRATED CRITICAL SAFETY FEATURES: LIFT-OUT PROTECTION, LINKED CARTS, AND SAFETY STOPS.
- STRUCTURAL TUBE RAILS OFFER A SMOOTH ROLLING SURFACE AND ONLY REQUIRE ATTACHMENT AT FRONT & REAR, NO ATTACHMENT TO INTERNAL BEAMS IS REQUIRED.
- MACHINED STEEL WHEELS WITH PRECISION BEARINGS ON WELDED STEEL SHAFTS - NO BOLTED WHEELS.
- CARTS COME FULLY ASSEMBLED - NO NEED TO INSTALL WHEELS.
- EASY TRANSPORTATION, EASY INSTALLATION AND EASY TO USE.
- DURABLE POWDER COATED FINISH, AVAILABLE IN GREY, BLUE OR GREEN.
- CUSTOM COLOURS OR HOT DIP GALVANISED FINISH AVAILABLE UPON REQUEST.

6 DEEP LOW PROFILE STEADIFLO PUSHBACK

(for a typical 40" wide x 48" deep GMA/CHEP style pallet)
PART NO. PB64048-STN

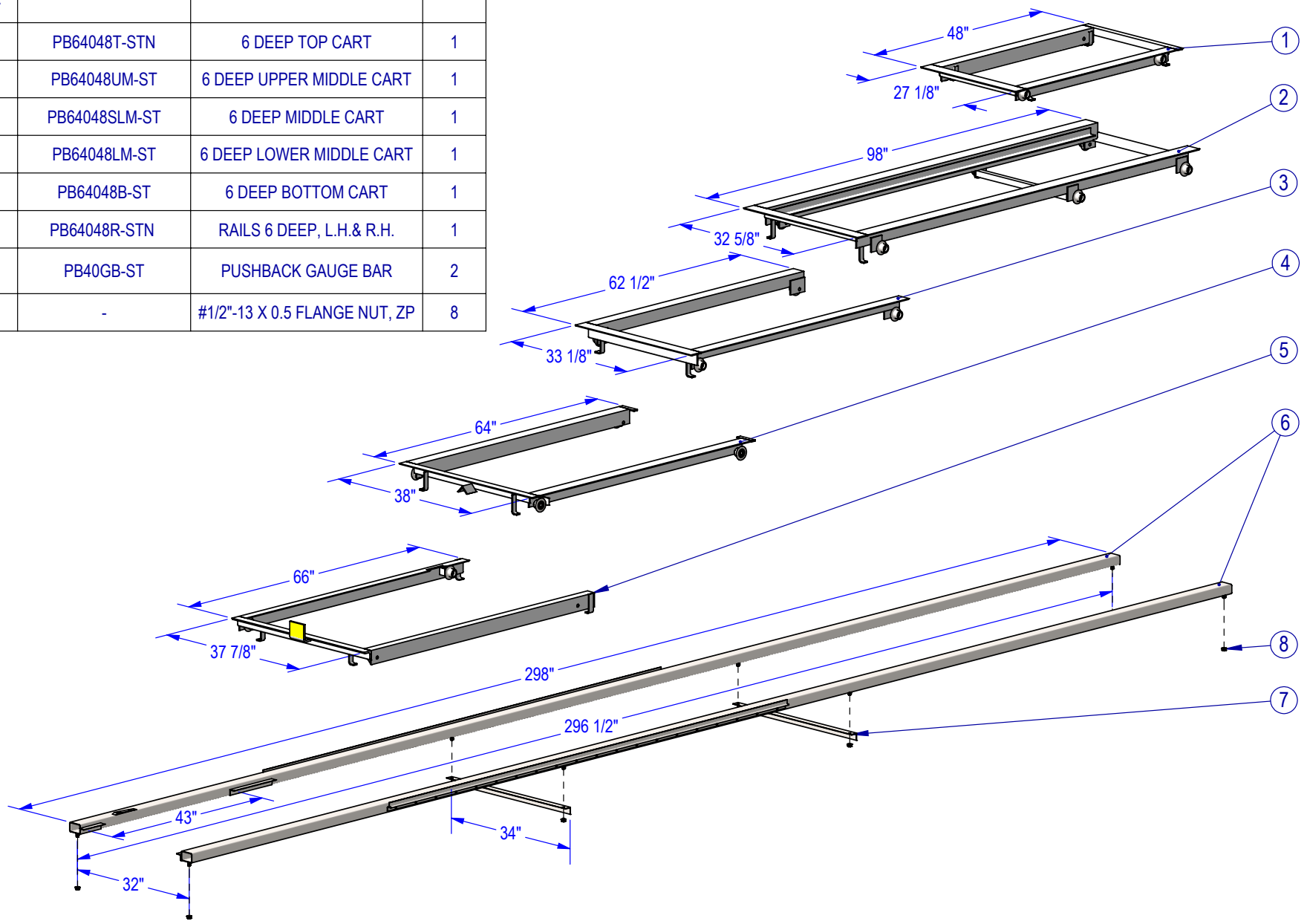


PROFILE



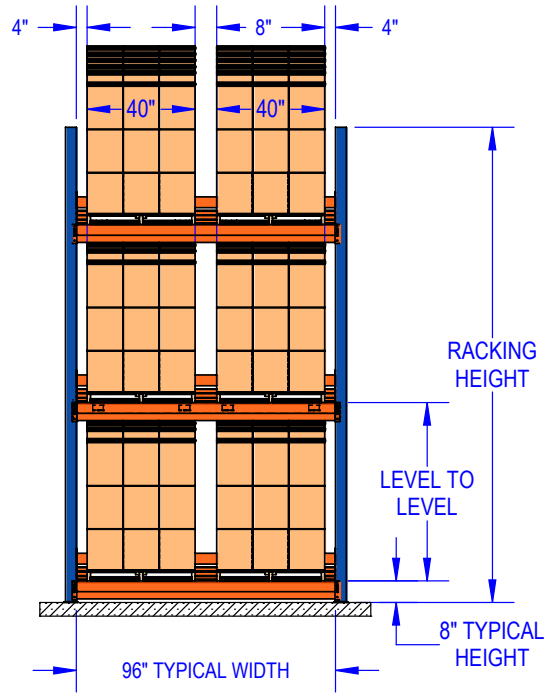
3D STORAGE SYSTEMS LIMITED

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	PB64048T-STN	6 DEEP TOP CART	1
2	PB64048UM-ST	6 DEEP UPPER MIDDLE CART	1
3	PB64048SLM-ST	6 DEEP MIDDLE CART	1
4	PB64048LM-ST	6 DEEP LOWER MIDDLE CART	1
5	PB64048B-ST	6 DEEP BOTTOM CART	1
6	PB64048R-STN	RAILS 6 DEEP, L.H.& R.H.	1
7	PB40GB-ST	PUSHBACK GAUGE BAR	2
8	-	#1/2"-13 X 0.5 FLANGE NUT, ZP	8

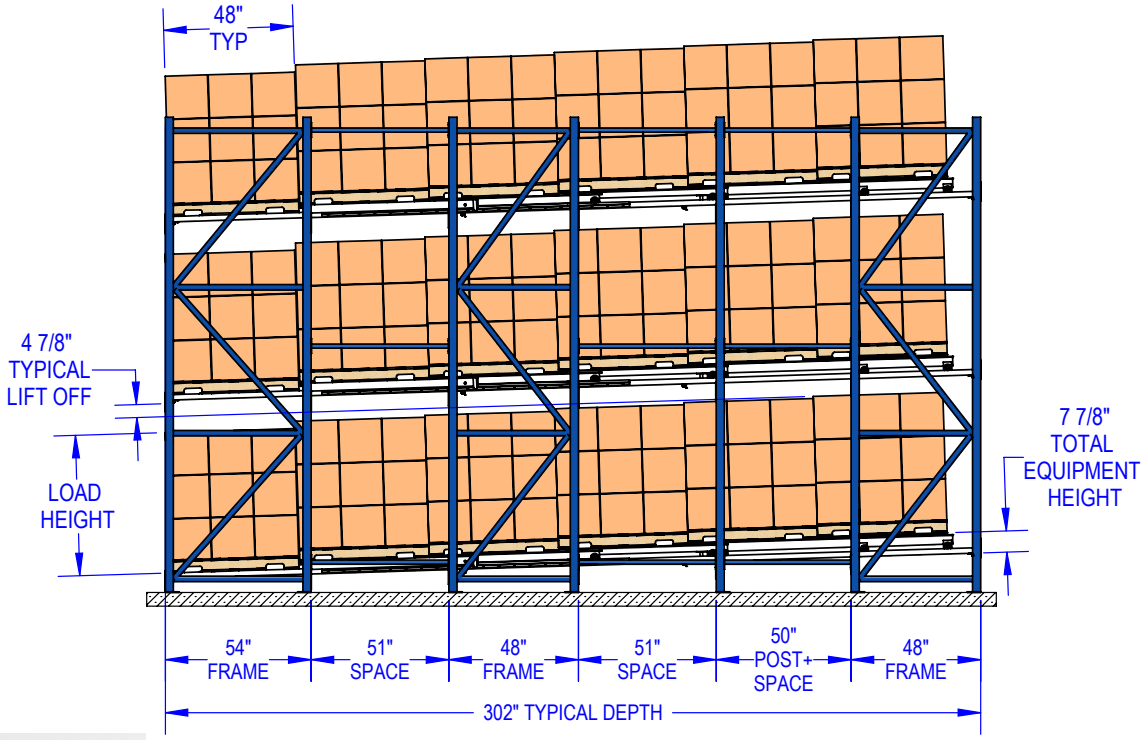


COMPONENT DIMENSIONS FOR STANDARD 6 DEEP PUSHBACK LANE.

3D STORAGE SYSTEMS LIMITED



FRONT VIEW



SIDE VIEW

TYPICAL DOUBLE WIDE 3-LEVEL HIGH BAY OF 6 DEEP PUSHBACK LANES FOR STANDARD 40" WIDE X 48" DEEP GMA/CHEP STYLE PALLET:

- LEVEL TO LEVEL DISTANCE = LOAD HEIGHT + INTERNAL BEAM HEIGHT + 7-7/8" + 1"
- RECOMMENDED RACKING HEIGHT = FRONT BEAM HEIGHT + LEVEL TO LEVEL DISTANCE X NUMBER OF LEVELS + LOAD HEIGHT /2
- RECOMMENDED SLOPE = 3/8" DROP PER FOOT.
- CENTER TO CENTER DISTANCE FOR RAIL STUDS: 32" SIDE TO SIDE & 296-1/2" FRONT TO BACK.

3D STORAGE SYSTEMS LIMITED

PUSHBACK INSTALLATION GUIDE

6 - DEEP PUSHBACK SYSTEM

3D Pushback Systems are designed to be installed quickly, easily and without field measurement or adjustment. Standard rails have threaded studs welded on the bottom of the rail tube at each end. Front and rear beams, supplied by the rack manufacturer, are normally channel beam construction and include structural angle cleats with slots for mounting the rails. Alternatively, front and rear beams may be of structural angle construction with slots punched to exact spacing to ensure that rails are appropriately spaced and parallel.

Beams in the rack should be installed so that the rail slopes upward from the front beam (at the aisle) to the rear beam. Designers at the rack manufacturer determine the bracket drops on beams to achieve the appropriate slope, which is normally 3/8" per foot.

Typically the rails are fastened only at the front and rear beam positions. 3D has 2 methods of fastening the rails to the beams.

1. STUD MOUNT

This style of rail attaches with ½" threaded studs welded to the bottom of each end of the rail. Slots in the beam should line up with these studs and a ½" flange nut should be fastened to the stud once in place. Keep in mind that the rails must be oriented with the lift out angle to the front and facing the inside of the lane.

2. PLATE MOUNT

This style of rail differs only slightly from the rail above. The front and rear of the rail tube should have plates with ½" holes. These should match up to the holes punched in the front and rear beam. These are then secured with 1 ½" x ½" bolts and ½" flanged nuts or nyloc nuts.

Each six deep nested style lane consists of two rails and five carts. The two rails in any lane are different from each other (one left hand, one right hand). Each rail has a lift-out protector, angle 1 ¼" x 1 ¼" x 6" long at the front and 12" long in the middle. Rails should be installed so that the end with the angle is at the load/unload end. Right-hand and left-hand rails vary in that the lift-out protector angles each face the middle of the lane. There are three sets of studs on the bottom of the rails that require the attachment of gauge bars. These simply fasten with flange nuts and are designed to keep the rails in gauge when under load. When the cart is installed, the lift-out angle brackets on the cart will fit under the angles on the rails.

The hardware required to fasten the rails to the beams is supplied by 3D Storage.

The carts are installed by placing them on the rails just past the lift out angle at the front of the lane. Start with the bottom cart and then place the lower middle inside the bottom cart. The middle cart, upper middle cart, and top cart are shipped together and should be installed next. The bottom cart has a push plate (4" wide, protruding 2 5/8" above the top cart) in the center of the

PUSHBACK INSTALLATION GUIDE
6 - DEEP PUSHBACK SYSTEM

front cross member. The carts are always installed with the push plate and or the cross tie closest to the load/unload end. As the carts get deeper they get narrower.

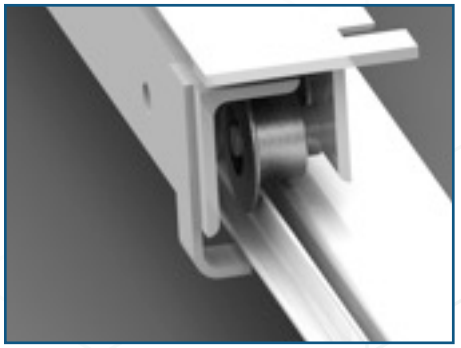
After the carts are installed, they should be checked to ensure that they roll freely up and down the lane. When pushed up a lane, a cart should return to the load/unload end when released. If not, check to ensure that the small lift-out brackets on the cart are running freely below the 1 ¼" x 1 ¼" angle on the inside edge of each of the rails. Be sure to check that the flange portion of the wheel on the 'U' shaped carts is not on the outside of the guide bar.

Carts should have a small amount of side shift allowance to prevent binding of the wheels against the rail. This side shift allowance should be approximately 5/16". If side shift is significantly different from this dimension, then it is advisable that the installer measures the exact distance between the rails and then contacts the rack manufacturer who made the beams or 3D Storage to isolate the cause.

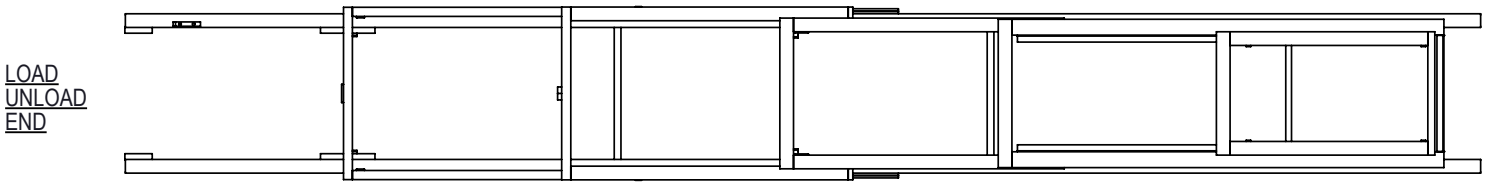
At times it is necessary to floor mount a lane, this is done by replacing beams with risers. The front beam is replaced by a structural angle that is anchored to the floor, the rails attach to it by means of a plate mount. The second position risers are welded to the rails at the time of manufacture. The third position risers are placed on the floor underneath the rails and then slid forward to the front of the system to where the rails are just touching the risers. These risers are then anchored to the floor using the anchors supplied by the rack manufacturer. The subsequent interior and rear beams are rack-mounted beams, the same as on the upper levels.

When installed flanged wheels should always sit inside the Z guide, not outside of it.

CORRECT

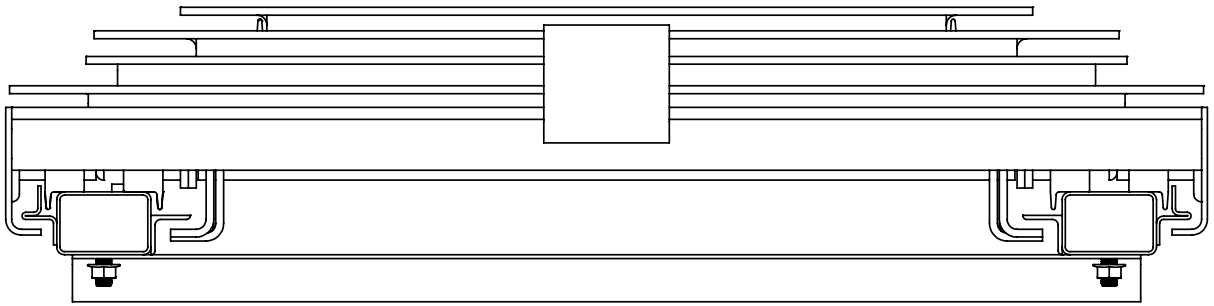


INCORRECT

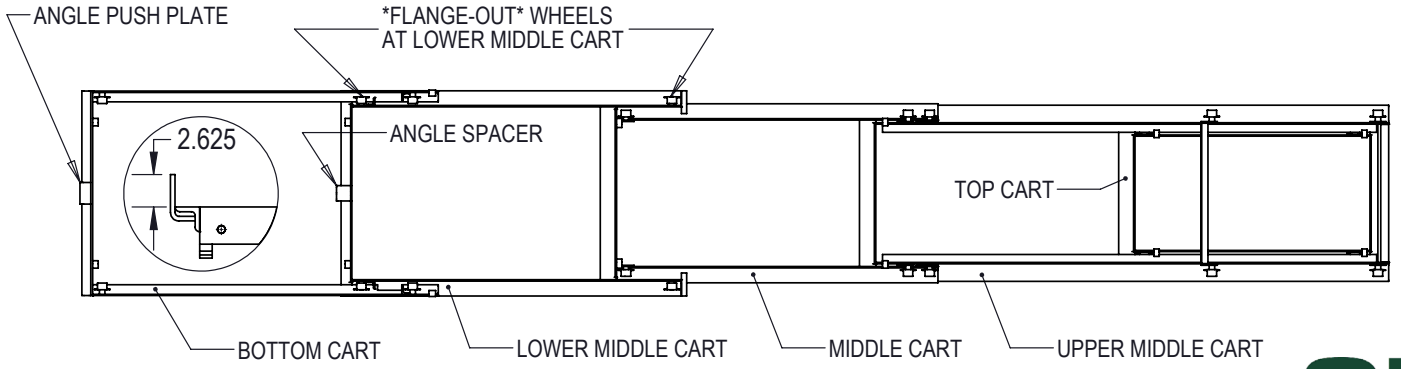


6 DEEP LANE - EXTENDED - TOP VIEW

6 DEEP LANE - EMPTY - BOTTOM VIEW



FRONT VIEW



6 DEEP PUSHBACK LANE - CARTS ONLY - BOTTOM VIEW

3D STORAGE SYSTEMS LIMITED

OPERATING INSTRUCTIONS

6 - DEEP PUSHBACK SYSTEM

1. Pallets must be loaded and unloaded with the forklift squared up to the face of the rack – **Do not approach or withdraw at an angle.**

2. When loading the first pallet, make sure the pallet is slightly tilted back towards the truck and 1 to 2 inches above the push plate. If the pallet catches the plate or any cart when loading, lift the pallet a few inches and allow the cart to return to the front before proceeding.

3. Put the first pallet down on the cart, ensuring that the pallet is flush with the front of the cart, and not resting on top of the push plate.

4. When loading the second pallet, enter while pushing on the first pallet loaded with the back of the pallet being loaded. Push the pallet all the way in and place it on the waiting cart, continue to do this until you are loading the final pallet in the system. Here you are going to catch the Push plate with the pallet being loaded, push the pallet all the way in and place it on the rails behind the front beam. Always push back at a slow and constant speed.

5. When removing pallets from the lane, lift the pallet to a level position just high enough to clear the push plate or the front beam. **Withdraw at a slow and constant speed.**

6. Make sure that the following pallet comes to the front of the system. If for some reason the pallet is stuck and does not roll forward during unloading, push the pallet back in and back out again. If the pallet is still stuck, reload the lane and do not unload until the cause of the jam has been found and removed. **Do not leave stuck pallets in the back of a lane without a loaded pallet in front of it.**


SPECIAL
PUSHBACK
DESIGNS

SPECIAL PUSHBACK DESIGNS

3D Storage Systems has several special pushback designs to accommodate a variety of non-standard applications. If your application has plastic pod pallets, many pallet sizes, heavy pallets over 3000 pounds or tight vertical clearance, we have a design to suit.

LADDER STYLE OR COVERED CART PUSHBACK SYSTEMS

For weak, odd shaped or special pallets we have several designs that add support. These carts can have additional left to right or front to back supports, or incorporate wire mesh, bar grating or a solid steel sheet. The last pallet position can have either a 3rd rail or a complete shelf to support the last pallet in the lane.

DRIVE IN CONVERSION

Many customers have issues with honeycombing in their drive-in systems as their SKU growth has led to fewer pallets per SKU. Rather than tear down a structurally sound drive-in to replace it with a pushback system, we can retrofit the drive-in system with "drop-in" style pushback lanes and save the expense of the new rack and installation labor.

FLOOR MOUNT LANES

The primary purpose of a floor mount lane is to reduce the starting height of the pushback system by eliminating beams in the front and the first 2 intermediate positions. Generally, the first beam level for a standard system would be at 8". By utilizing a floor mount lane that height is pared down to 3", thus saving 5" in height overall. These lanes are also helpful if you are picking cases from the bottom level.

48" FACE FOR GMA/CHEP STYLE PALLET

We have designs that can accommodate GMA/CHEP style pallets when turned on the 'Cut-Out' Face. The carts require access for the forks, so we need to drop the front tie of the cart and make the cart surface level. We have manufactured systems ranging 2 through 5 deep for this pallet orientation up to 3,000 lbs loads.

HEAVY-DUTY SYSTEMS

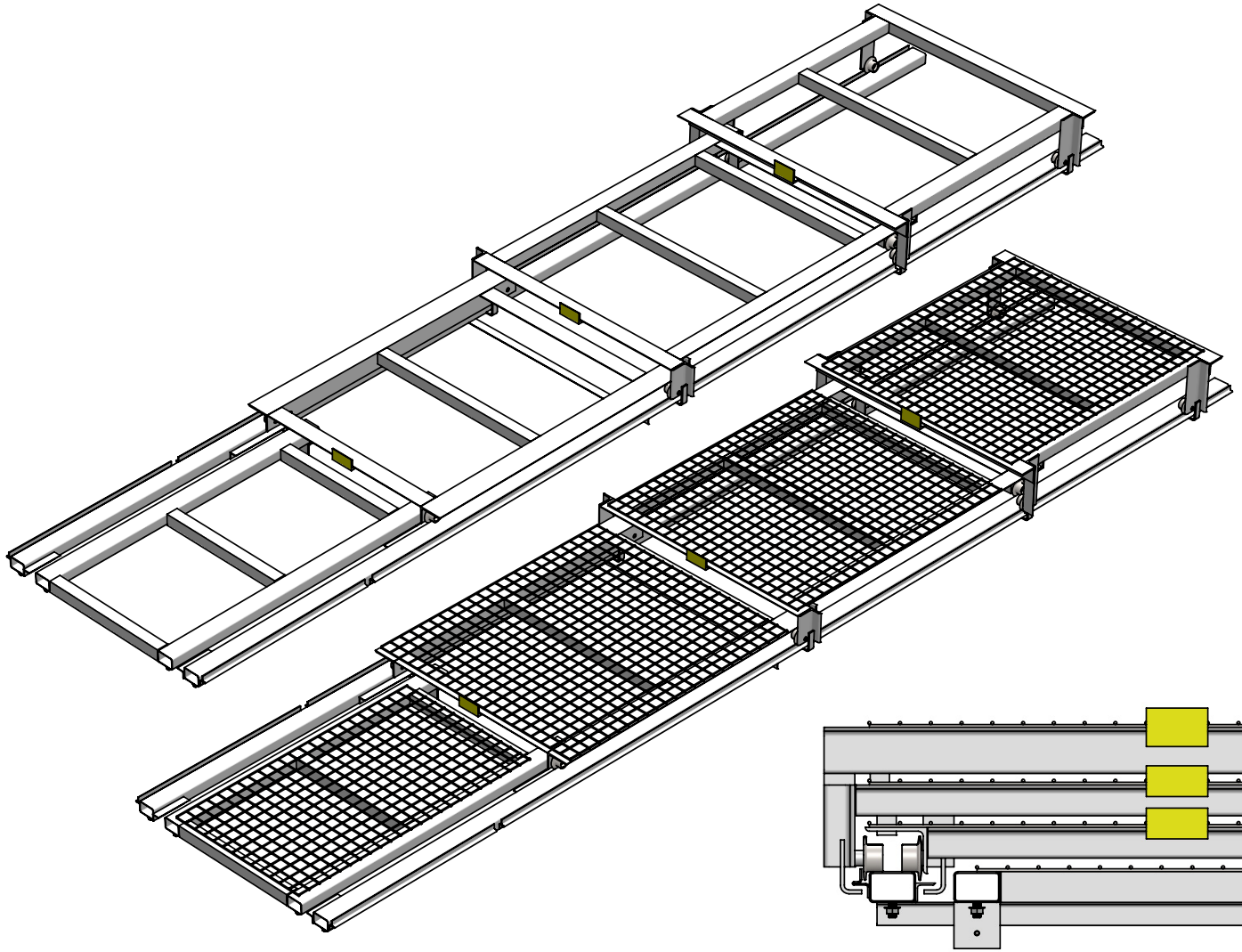
Our standard pushback designs are rated to a maximum of 3,000lbs. For load weights above that we can upgrade the carts and rails; these designs can handle up to 5,000lbs. and are available from 2 to 6 deep.

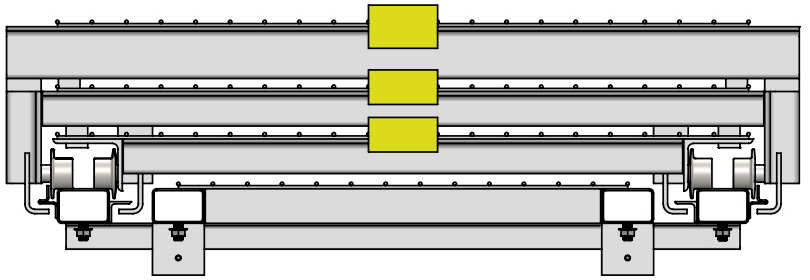
LEVEL CART SYSTEMS

We can accommodate requirement of level cart surface for 2 through 5 Deep pushback.

LADDER / COVERED CART PUSHBACK

Available in 2 deep thru 5 deep configurations
4 deep example shown

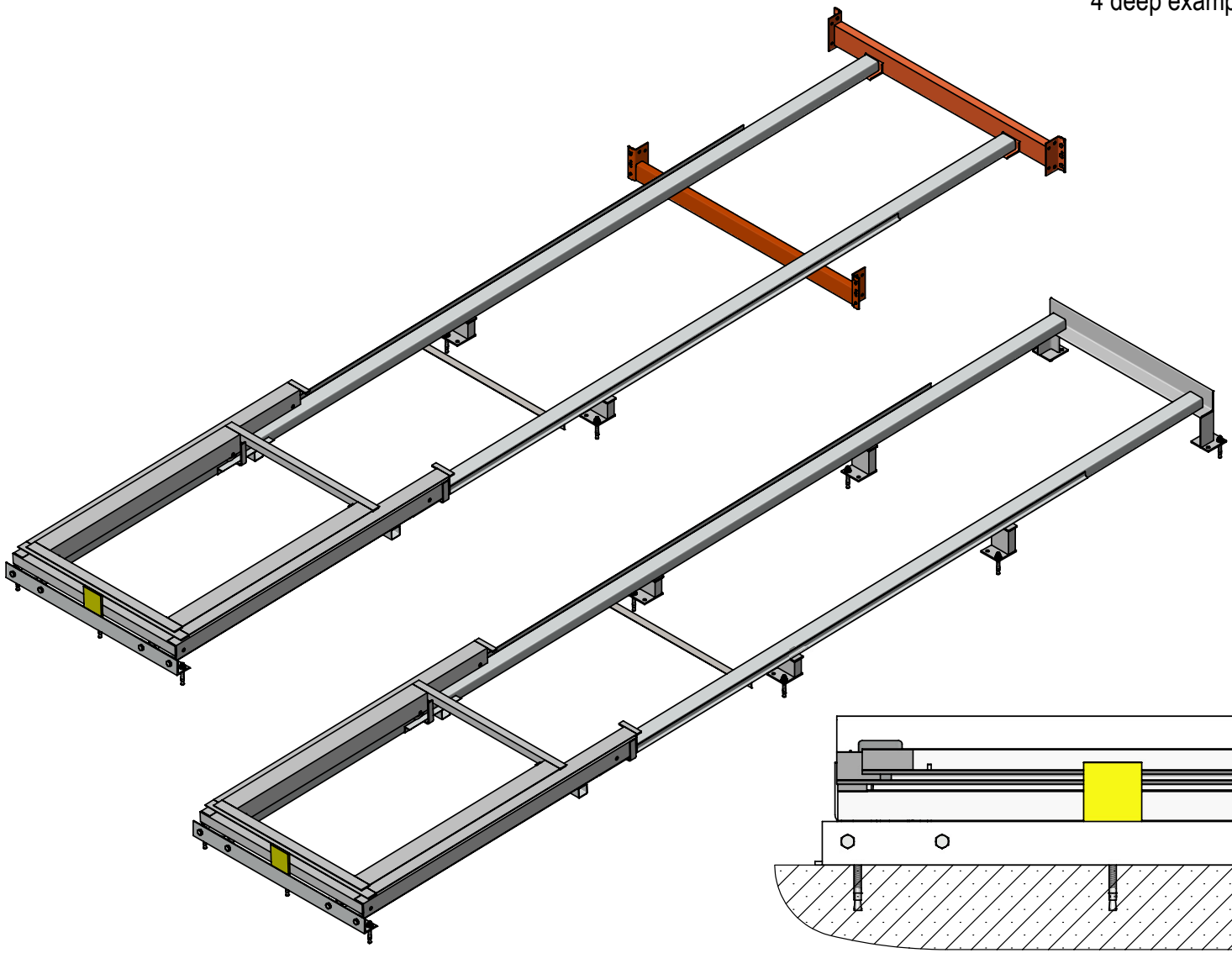


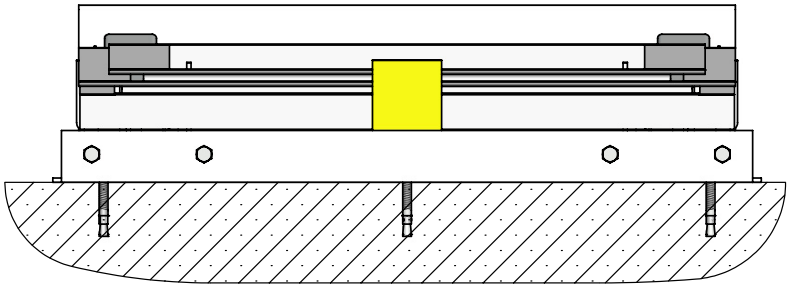


3D STORAGE SYSTEMS LIMITED

FLOOR MOUNT LANES

Available in all configurations
4 deep example shown

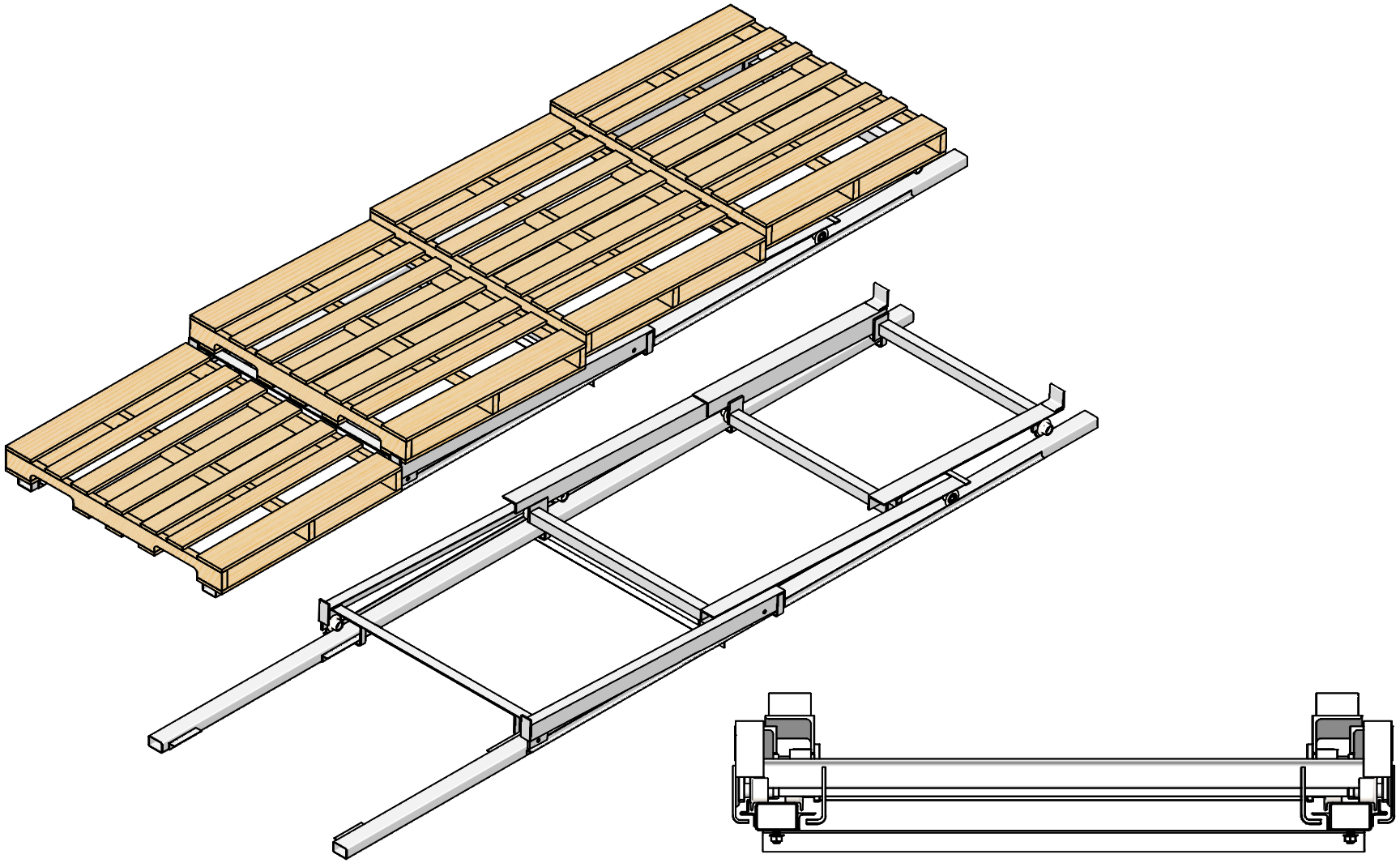




3D STORAGE SYSTEMS LIMITED

48" FACE FOR GMA - DROPPED FRONT TIE

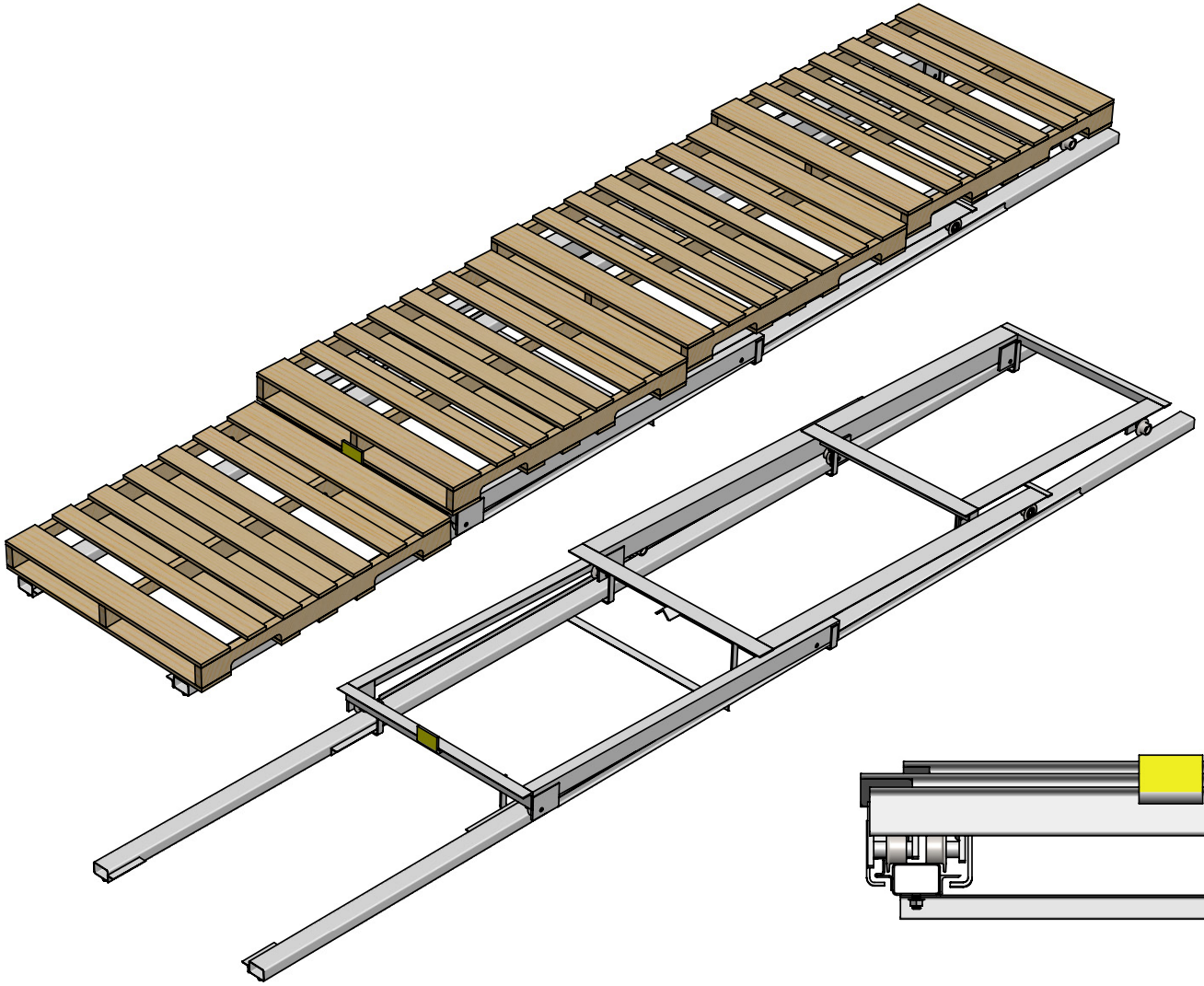
Available in 2 deep thru 5 deep configurations
4 deep example shown

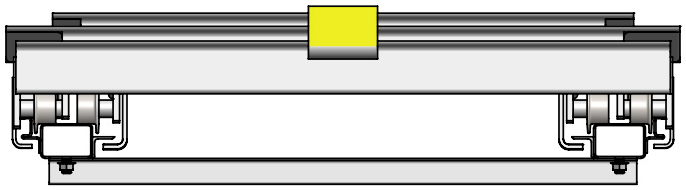


3D STORAGE SYSTEMS LIMITED

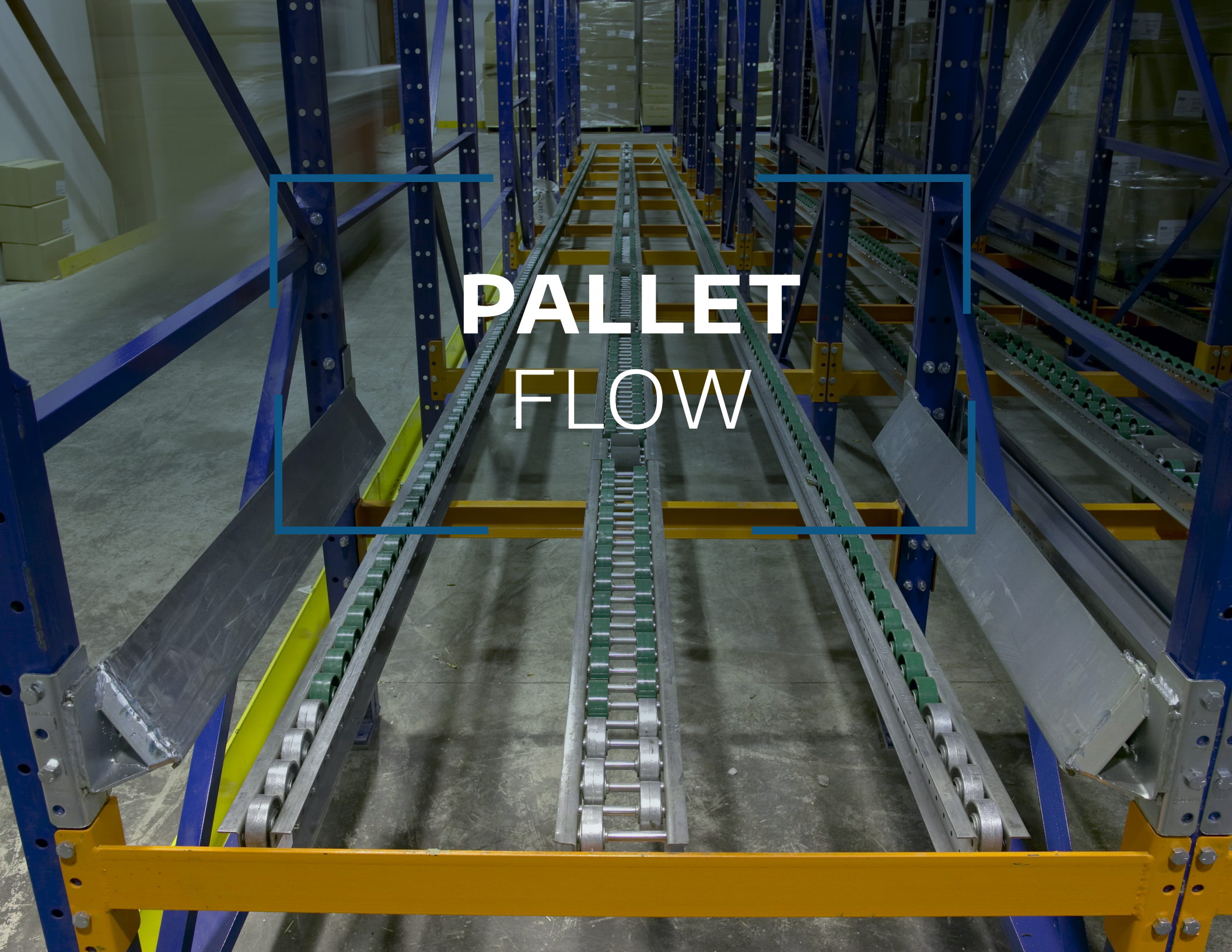
LEVEL CART DESIGN

Available in 2 deep thru 5 deep configurations
4 deep example shown





3D STORAGE SYSTEMS LIMITED


PALLET
FLOW

PALLET FLOW

FLOWRACK

3D offers a wide range of dynamic flow products which are engineered to meet specific needs. The key to successful flow systems is developing a solution that is customized to the type of product to be stored, the pallet type, the environment and the function required by that system.

OUR FLOW PRODUCTS INCLUDE:

- Skatewheel lanes for picking systems
- Polycarbonate wheels with ball bearings for typical pallet flow applications 4-26 pallets deep
- Rollers, both 1.9" and 2.5" diameter for custom pallet/container requirements
- Direct and indirect mounted brakes for speed control

Our design staff has many years of experience in the supply of dynamic storage products and will configure the appropriate components to meet specific customer criteria ensuring maximum system performance. To that end we have attached a flowrack application sheet that covers items such as pallet size and type, system requirements, environment etc, which will assist us in designing the right pallet flow system.

FLOW CLASSIFICATIONS

When proposing a pallet flow to a customer it is important that everyone's expectation of a system performance be understood, especially in a competitive situation. Because of the wide range of systems available there is a trend to provide a flowrack at the lowest cost per pallet and ignore the performance issue. However, if performance was irrelevant, then all flowracks would utilize skatewheel. Obviously, this is not the case.

We classify flowrack into one of three categories that we will call 'A', 'B' and 'C'.

Class 'A' – Top Performance

This type of flowrack is usually sold in deep lane applications for GMA/CHEP type pallets. The performance expected is straight forward – every pallet put into the system should flow in a controlled manner to the unload end, and all pallets in a lane will move forward on their own when a pallet is removed from the unload end (known as stop-restart). These systems will typically use polycarbonate wheels or steel rollers. It should be noted that even with this type of performance, any pallet flow system will have a hang-up from time to time due to thins like cracked or missing boards, nail protrusions, dangling stretch wrap or leaning loads.

Class 'B' – Assisted Stop-Restart

Systems of this type typically use bearingless wheels, or use polycarbonate wheels or rollers on a greater than normal spacing, or use (disposable) softwood pallets. Pallets loaded into a class B flowrack should flow to the unload end in a controlled manner, however when a pallet is removed from a lane the remaining pallets may not restart and move forward on their own accord. If this happens the operator is forced to push back all the pallets in the lane a few inches to give the pallets some momentum to flow to the unload end successfully.

PALLET FLOW

Class ‘C’ – Picking Systems
In lanes of two and three pallets deep, feeding a conveyor or pick aisle, skatewheel picking lanes are used. By it’s very nature of small diameter (1.9”) and narrow crown width, a skatewheel has reduced “rollability” compared to rollers or polycarbonate wheels. Pallets loaded into these systems, may or may not roll forward on their own accord but this is of little consequence since the picker can pull the pallet forward with little difficulty. These systems do not utilize any speed controllers and usually consist of two runs of skatewheels.

LAYERPICKING SYSTEMS

3D Storage Systems specializes in layer picking applications where separation is required between the picking pallet and the balance of the lane. Contact 3D Storage Systems for information.

CUSTOMER RESPONSIBILITY

It is important to discuss with the customer their responsibility to provide “flowable” pallets for use in the system. Specifically, there should be consistency in the size of a pallet, bottom board configuration, and pallet quality and load stability. It is recommended that a typical sample of the customers’ pallets, loaded with the customers’ products be tested prior to providing a final quotation. This will ensure a design with a correct wheel configuration, slope, and rack design.

PICKING SYSTEMS

As discussed in the introduction, skatewheel tracks are most commonly used for picking systems. These wheels are tough, cheap and will provide class ‘C’ performance. The majority of these systems use 2 double staggered runs of wheels on 1.5” centers per lane – this will work with most GMA/CHEP style pallets up to 2500 pounds. For heavier pallets, three double staggered runs may be necessary.

SKATEWHEELS

15 gauge shell, 1/4” diameter shaft, 1.9” diameter, 150 pound load rating.

Can be spaced as close as 1.5” centers in a double staggered run or on spacing of 2.0” centers or more when mounted in single row configuration.

CHANNEL SUPPORTS

1” x 3” x 1”, 12 gauge galvanized steel side channel. Other sizes are available for special applications.

RAMP STOPS

Constructed from structural steel to withstand impact of heavy pallets and lift truck abuse. Utilize a gentle ramp slope that brings pallets to stop in a smooth and controlled manner. Incorporate a vertical stop at the end to ensure operator and pedestrian safety.

PALLET FLOW

ANTI-ROLLBACK DEVICE

Provided as standard equipment on all skatewheel picking systems, this prevents a pallet from rolling back up a lane (as may be the case when a picker steps on a pallet to reach a case at the back). Constructed from structural steel for long life.

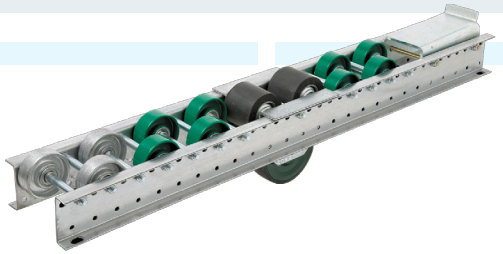
DEEP LANE PALLET FLOW

Once a lane depth of four or more pallets is desired, a whole new range of variables enter the pallet flow equation. Speed controllers will be required to ensure that a pallet does not accelerate down the lane and spill its load out into the aisle. As well, jammed or non-moving pallets become more of an issue due to the difficulty in reaching those pallets – unlike a picking system. Therefore we feel it is important to design this type of flowrack with a class 'A' performance in mind.

Typical deep lane pallet flow systems are designed around a GMA or CHEP type pallet. In most cases with weights ranging from 500 to 2,500 pounds, a three track configuration is used, with the outside tracks having single runs of polycarbonate wheels on 3" centers and a center run that contains the speed controllers. Heavier pallets may require double staggered outside runs.

POLYCARBONATE WHEELS

These wheels are 2.875" in diameter, 1" crown width and are made from a polycarbonate and polyester blend (polycarbonate is the same material they use in "bullet proof" glass). This blend



is suited to wide temperature ranges and is resistant to impact. Each wheel has two sets of ball bearings giving the wheel a 150 pound capacity. Shafts are 3/8" diameter. Wheels are "hard bolted" to the side channels which provides for a straight, rigid assembly.

It is important to note that the larger the diameter of the wheel, the more "rollability" it has. That is why these wheels provide a much smoother flow and are less prone to stop-restart problems than the smaller diameter skatewheels. The crown width also helps prevent pallet boards from indenting (and then hanging up) if they sit for long periods of time.

METAL IMPACT WHEELS

To provide additional resistance to impact, metal wheels are included at the load end. These are typically used in the first 12" of the lane, but for high turnover or heavy applications can be supplied for a full pallet position at the load end and unload end.

CHANNEL SUPPORTS

1" x 3" x 1", 12 gauge galvanized steel side channel. Other sizes are available for special applications.

RAMP STOPS

Constructed from structural steel to withstand impact of heavy pallets and lift truck abuse. Utilize a gentle ramp slope that brings pallets to stop in a smooth and controlled manner. Incorporate a vertical stop at the end to ensure operator and pedestrian safety.

PALLET FLOW

INDIRECT MOUNTED BRAKES

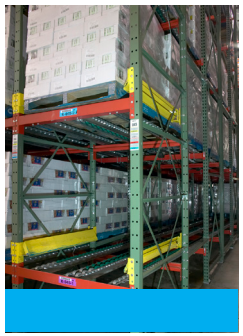
Pallet flow brakes prevent load acceleration and ensure that pallets travel at a safe and controlled speed. Brakes are generally spaced at one pallet intervals (e.g. 48" with GMA/CHEP style pallet). Indirect brakes provide a superior braking surface with increased friction, using two friction contact rollers. This type is normally specified with our standard flowrack systems.

DIRECT MOUNTED BRAKES

In some cases, where a low profile or a floor mounted lane is required direct mounted brakes are utilized.

LOAD GUIDES

Load guides are recommended for most flow racks six or more pallets deep. These guides are constructed from structural steel and have sloped entry to center the pallet in the flow lane. A wide variety of load guides are available depending on pallet type and durability required.



ROLLERS

Steel rollers ensure stability as well as provide a large load bearing capacity and support for special pallets, steel containers or plastic totes. While generally more expensive than other flowrack systems, rollers typically provide the most durable class 'A' performance. The automotive industry is a large user of roller based systems for these reasons. While rollers come in a multitude of sizes and styles, there are two types that are most commonly used: 1.9" diameter and 2.5" diameter. These can be provided with either a galvanized or unfinished surface.

1.9" DIAMETER ROLLERS

Generally used with lighter pallets or with formed pallets with "pods". These rollers are normally provided with 16 gauge wall thickness. However, heavier wall versions are often used at the load end of these lanes to give a greater resistance to impact damage. Maximum load rating is 250 pounds per roller.

2.5" DIAMETER ROLLERS

These rollers would be used for heavier loads, longer rollers and where increased "rollability" is required. Standard version rollers have a 12 gauge wall thickness with a load rating of 280 pounds per roller. A heavy duty roller with a 10 or 8 gauge wall thickness and a welded structural steel frame can provide a 500 pound roller rating.

RACK DESIGN

There are few basic considerations that should be taken into account when considering a supporting rack structure:

SINGLE WIDE BAYS VS DOUBLE WIDE BAYS

With the exception of two and three deep picking systems, we recommend that all flowrack systems utilize single pallet wide rack bays. There are 2 basic reasons for this. First and foremost is the issue of beam deflection. On a double wide bay, beam deflection could result in pallets 'drifting' towards the center of a bay. If the lane is long enough eventually pallets will end up

PALLET FLOW

against each other and the lanes will jam. Secondly, single wide bays are inherently more abuse resistant, and since flowracks typically have higher throughput than most other types of racking, this additional strength is an asset.

DOUBLE POSTS

Because of high throughput mentioned above, it is also a worthwhile investment to double post the load and unload end frames. This double posting will add less than 1% to the cost of the project, but will go a long way in maintaining a strong durable flowrack.

STRUCTURAL LOAD AND UNLOAD BEAMS

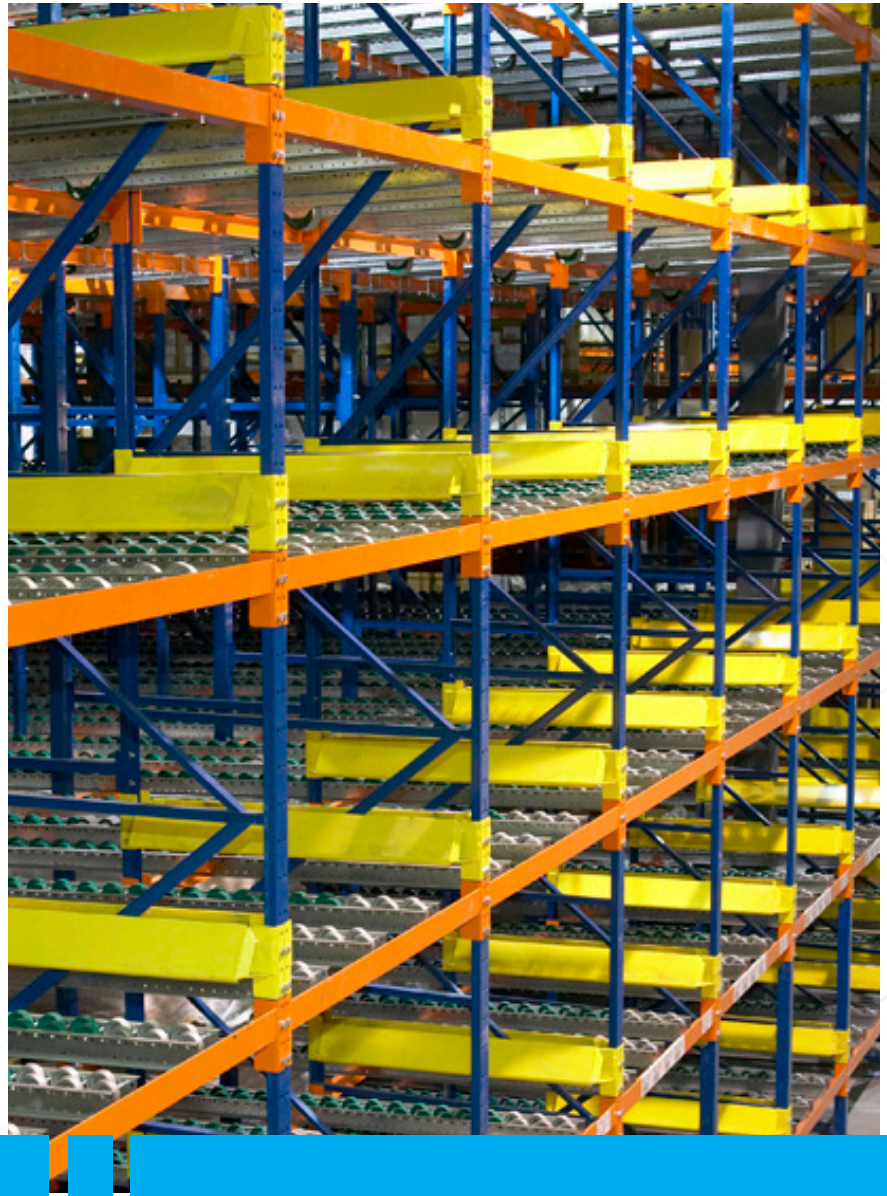
Load and unload beams should be constructed from structural material for impact resistance. Most common beam designs utilize either a 3 1/2" x 3 1/2" angle or a C4 beam with mounting cleats.

STRUCTURAL & ROLLFORMED RACK COMBINATION

Designing the support structure to utilize a combination of structural load & unload frames and rollformed internal components allows for significant cost reductions on structure while maintaining the abuse resistance where required to protect against forklift abuse.

SLOPE

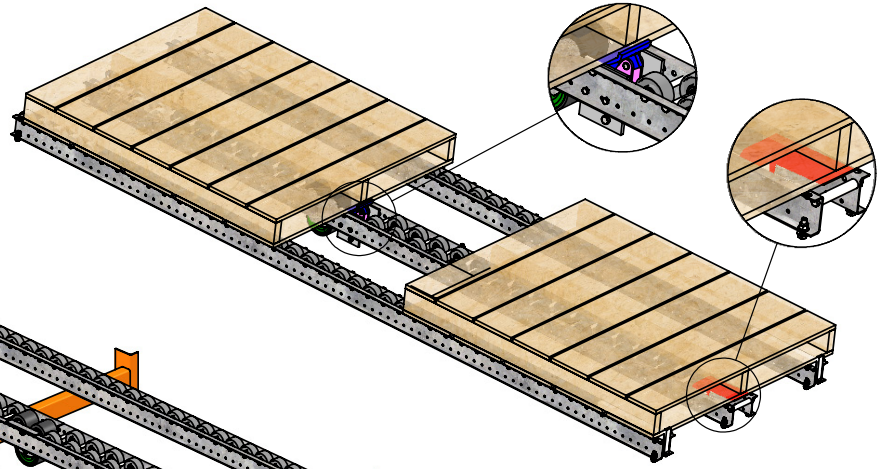
Slope will range from 1/4" per foot to 5/8" per foot depending on the application, the wheel type used and the class of performance desired; the majority of our flowracks are installed at or close to 7/16" per foot. This equates to 1¾" of slope per pallet based on a 48" deep pallet.



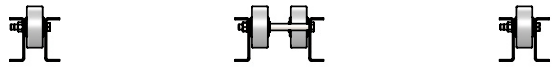
POLYCARBONATE WHEEL PALLET FLOWRACK

FEATURES AND BENEFITS:

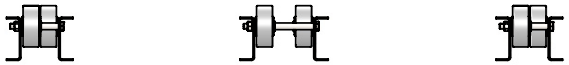
- TOP PERFORMANCE FLOWRACK SYSTEM FOR DEEP LANE FLOW APPLICATIONS (UP TO 26 PALLET).
- SPECIFICALLY FORMULATED POLYCARBONATE BLEND SUITED FOR A WIDE TEMPERATURE RANGE AND IMPACT RESISTANCE.
- STEEL IMPACT WHEELS ARE TYPICALLY INSTALLED IN THE FIRST 12" OF EACH LANE TO PROVIDE A FIRST LINE OF DEFENSE AGAINST LOADING IMPACTS. OPTIONALLY THESE WHEELS CAN ALSO BE INSTALLED THROUGHOUT THE LANE
- ALL WHEELS ARE "HARD BOLTED" IN PLACE PROVIDING A STRAIGHT AND RIGID ASSEMBLY.
- 3D STORAGE FLOWRACK IS DESIGNED TO FLOW PALLETS IN A CONTROLLED MANNER USING INDIRECT MOUNTED BRAKES. THESE BRAKES ARE DESIGNED FOR SUPERIOR BRAKING PERFORMANCE.
- SIDE CHANNELS ARE 1" X 3" X 1", 12 ga GALVANIZED STEEL.
- OPTIONAL LOAD ENTRY GUIDES CENTER THE PALLET FOR OPTIONAL PERFORMANCE.



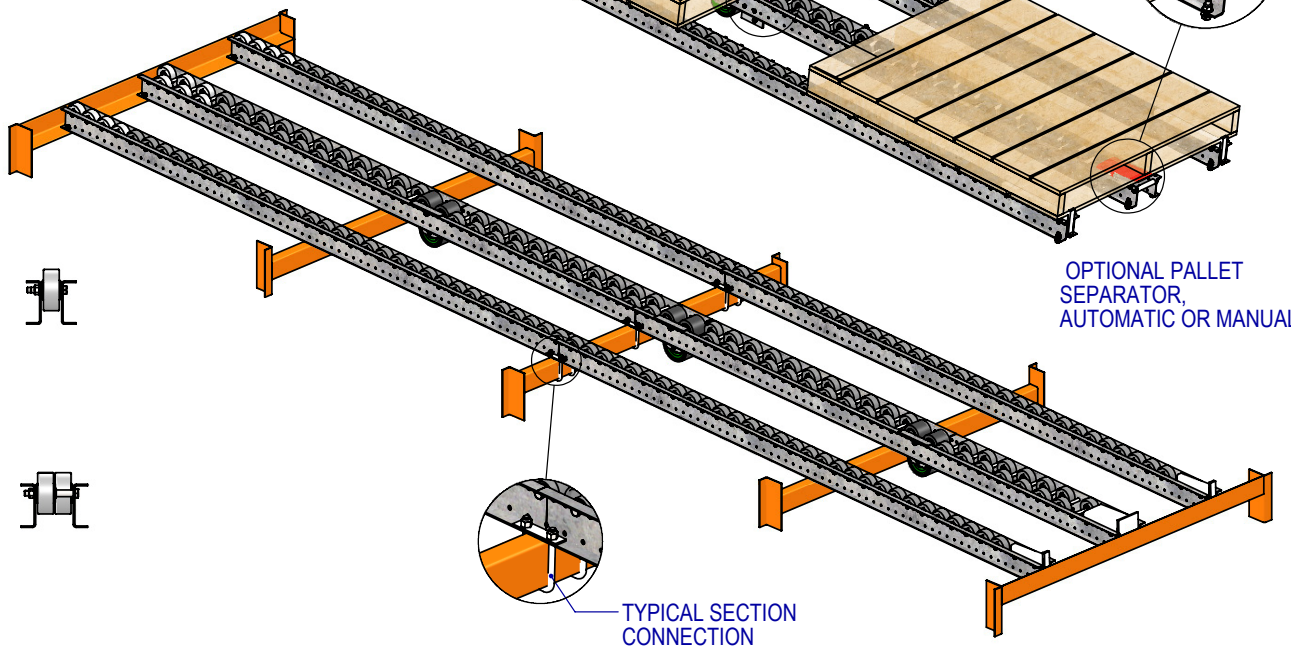
OPTIONAL PALLET SEPARATOR, AUTOMATIC OR MANUAL



TYPICAL SINGLE/ DOUBLE/ SINGLE CONFIGURATION

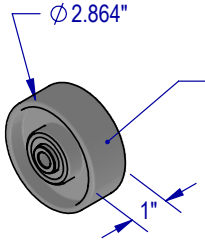


TYPICAL DOUBLE/ DOUBLE/ DOUBLE CONFIGURATION

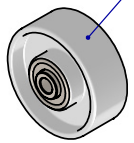


TYPICAL SECTION CONNECTION AND SECURING TO BEAM USING U-BOLT KIT

TYPICAL 4 DEEP FLOWRACK LANE WITH SINGLE / DOUBLE / SINGLE PATTERN OF POLYCARBONATE WHEELS MOUNTED ON STRUCTURAL (ANGLE) LOAD & UNLOAD BEAMS AND ROLL FORMED INTERNAL BEAMS



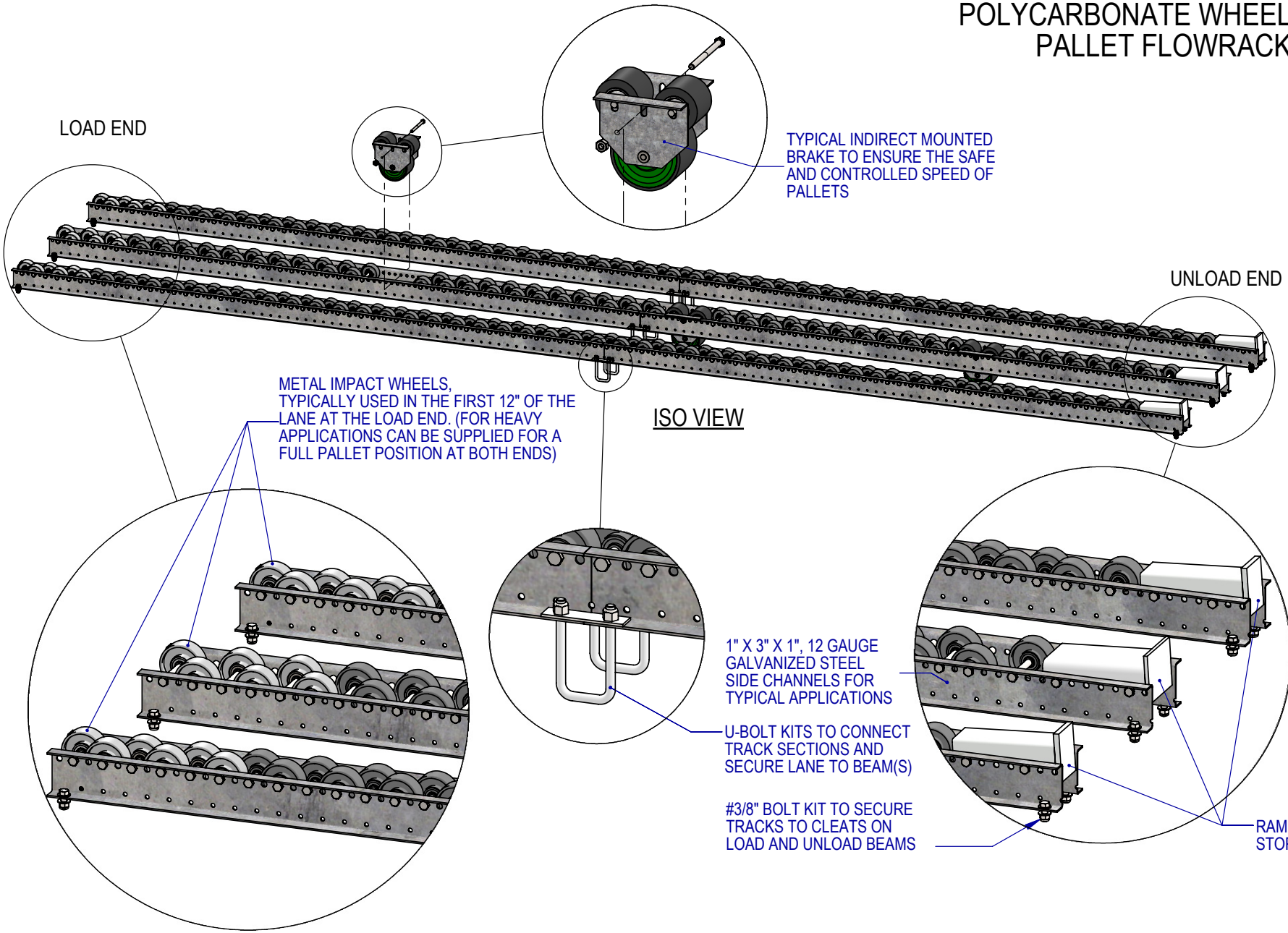
POLYCARBONATE WHEEL WITH 2 SETS OF BALL BEARING, 150 LBS CAPACITY RATE, TYPICALLY CONFIGURED ON 2" OR 3" CENTERS.



CAST IMPACT WHEEL WITH 2 SETS OF BALL BEARINGS

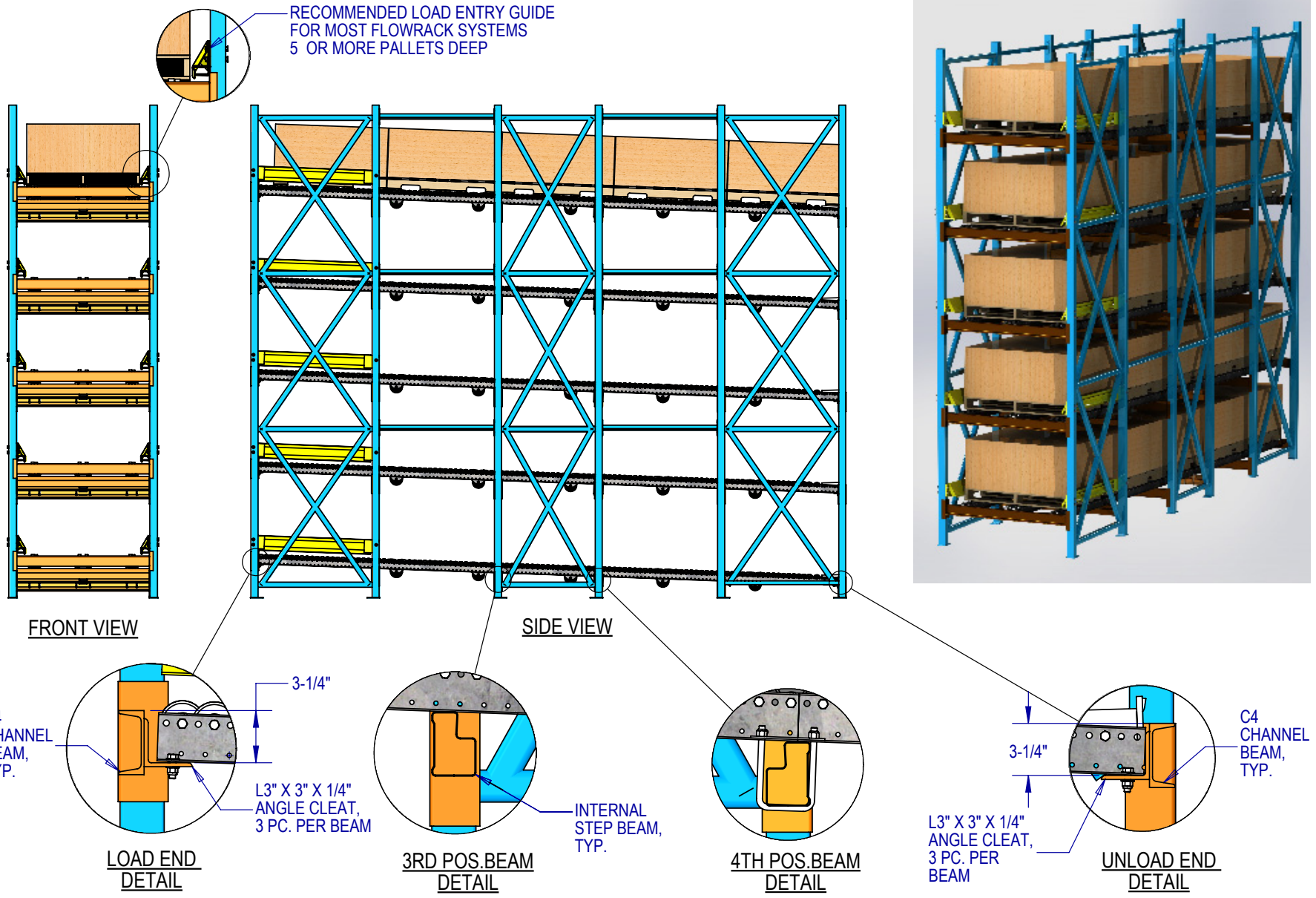
3D STORAGE SYSTEMS LIMITED

POLYCARBONATE WHEEL PALLET FLOWRACK



TYPICAL 4 DEEP FLOWRACK LANE WITH DOUBLE / DOUBLE / DOUBLE PATTERN OF POLYCARBONATE WHEELS - DESIGN DETAILS.

3D STORAGE SYSTEMS LIMITED



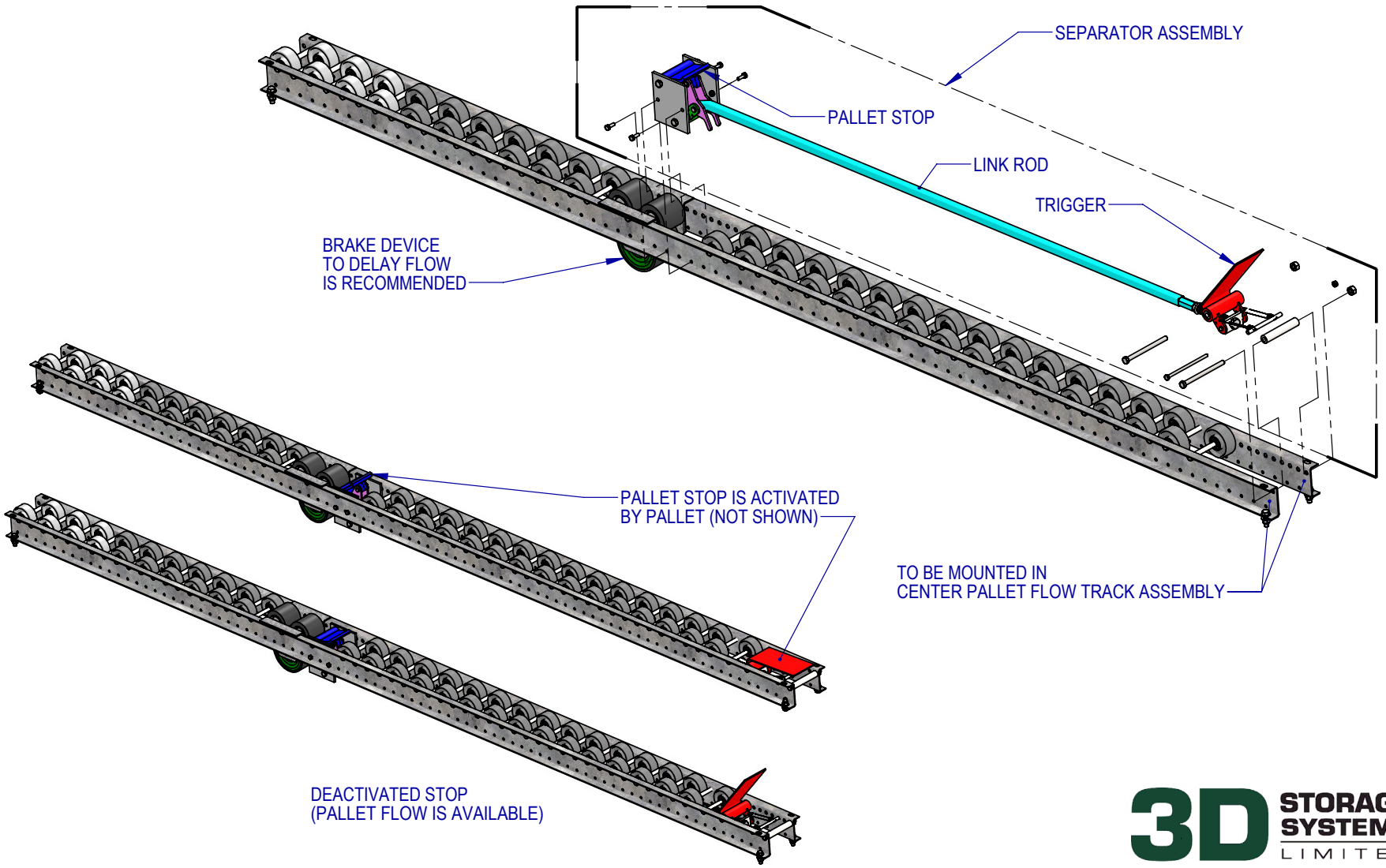
TYPICAL SINGLE WIDE BAY OF 5 DEEP FLOWRACK LANES, 5 LEVELS HIGH - INSTALLATION DETAILS.

3D STORAGE SYSTEMS LIMITED

PALLET FLOW SEPARATOR

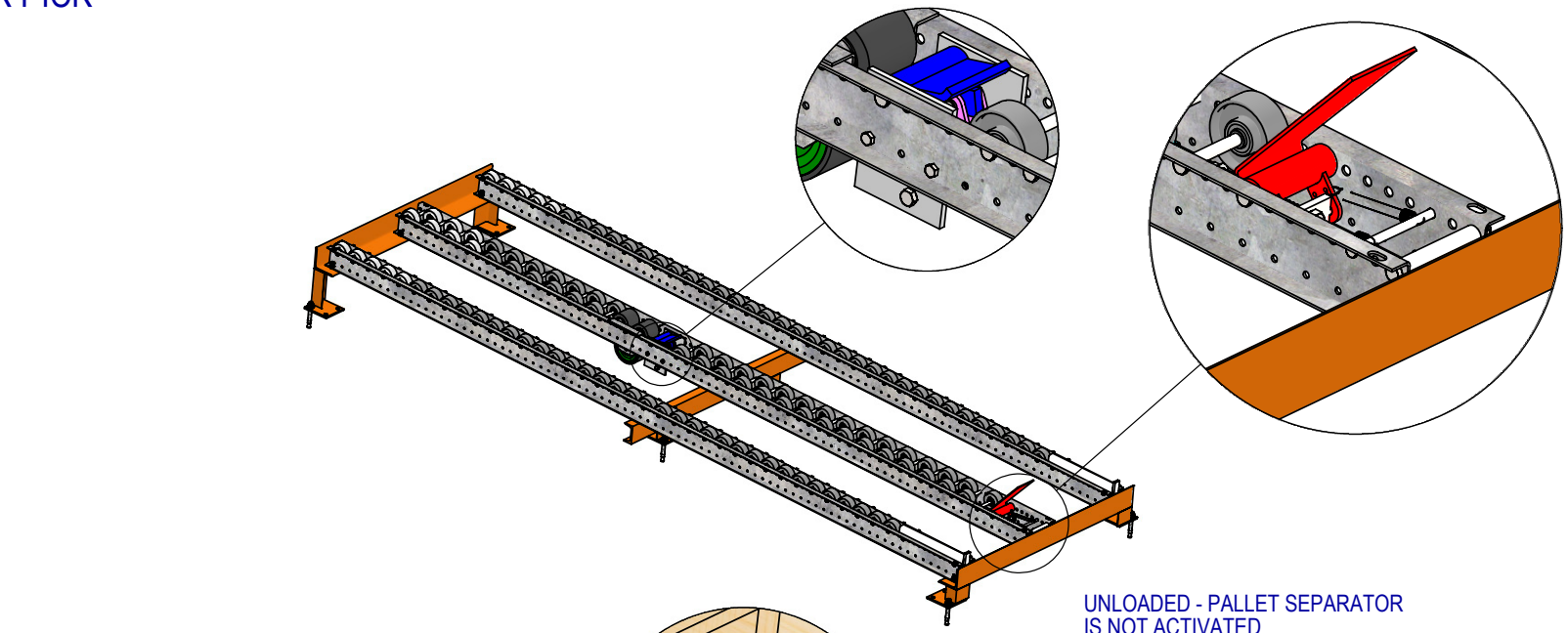
FEATURES AND BENEFITS:

- AUTOMATICALLY CONTROLLED BY PALLET FLOW.
- OPTION WITH MANUAL RELEASE OF TRIGGER AVAILABLE.
- DURABLE POWDER COATED FINISH; GREY COLOUR IS STANDARD.
- CUSTOM COLOURS OR ZINC PLATED FINISH AVAILABLE UPON REQUEST.

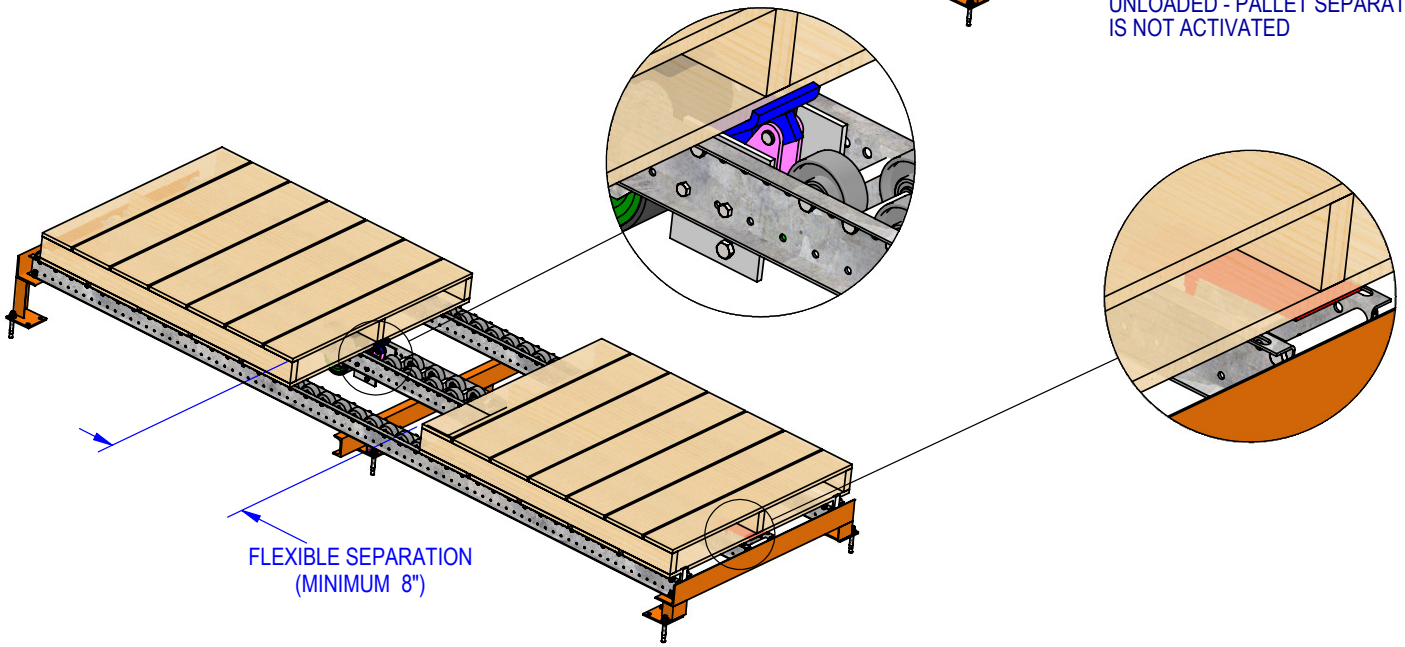


3D STORAGE SYSTEMS LIMITED

LAYER PICK



UNLOADED - PALLET SEPARATOR
IS NOT ACTIVATED



LOADED - PALLET SEPARATOR
IS ACTIVATED

3D STORAGE SYSTEMS LIMITED

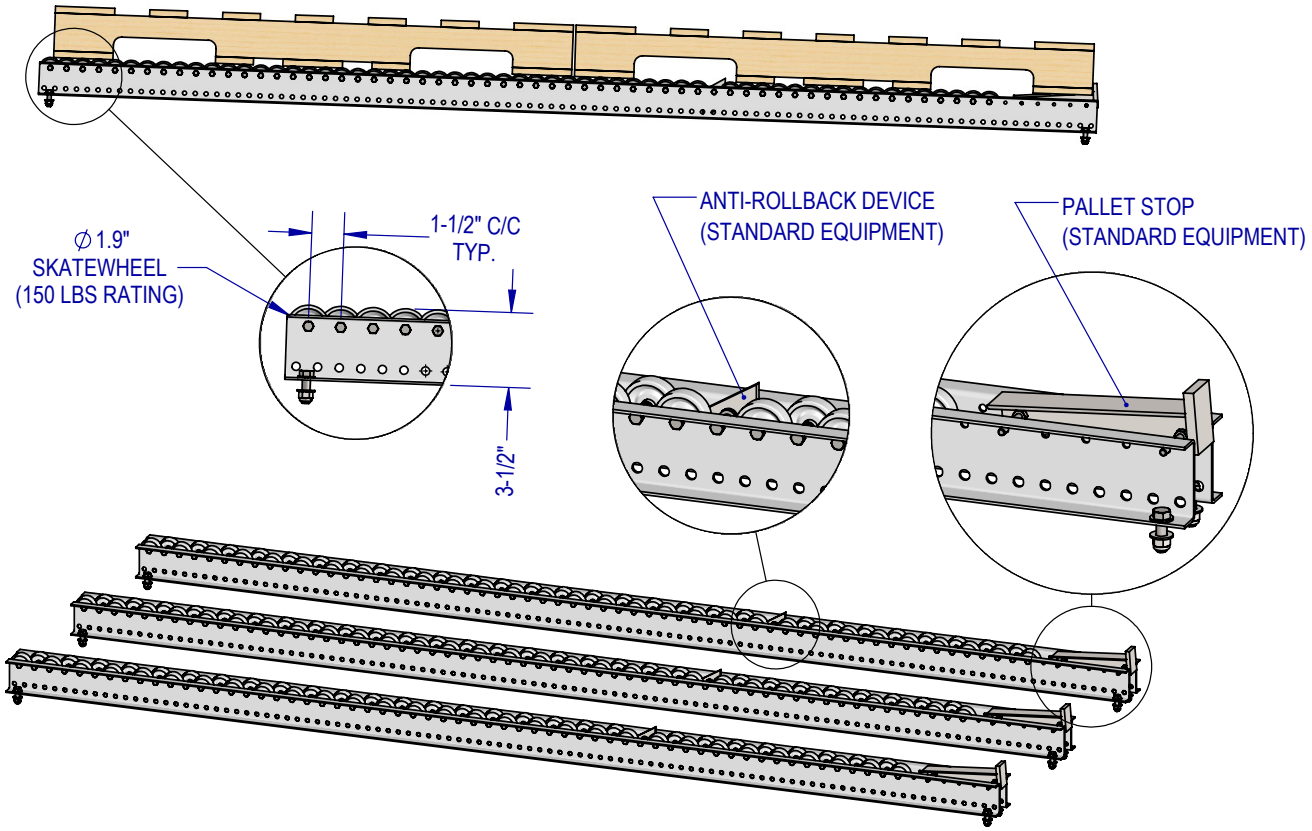
SKATEWHEEL PICKING SYSTEM

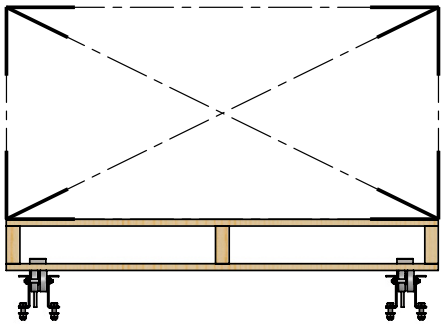
FEATURES AND BENEFITS:

- DURABLE AND INEXPENSIVE SOLUTION FOR 2 OR 3 DEEP PICKING SYSTEMS.
- AN IMPRESSIVE OVERALL LOAD RATING OF 150 LBS.PER WHEEL.
- USUALLY USE TWO DOUBLE STAGGERED RUNS OF WHEELS ON 1.5" CENTERS - WORKS WELL WITH MOST STANDARD GMA/CHEP STYLE PALLET UP TO 2,500 POUNDS.
- THREE DOUBLE STAGGERED RUNS OF WHEELS ON 1.5" CENTERS - FOR HEAVIER GMA/CHEP STYLE PALLET.
- CONFIGURATION WITH SINGLE ROW OR WHEELS IN 2" CENTERS IS ALSO AVAILABLE FOR SPECIAL APPLICATIONS.
- RAMP STOPS CONSTRUCTED FROM STRUCTURAL STEEL TO WITHSTAND IMPACT OF HEAVY PALLETS; INCORPORATE A VERTICAL STOP FOR OPERATOR AND PEDESTRIAN SAFETY;
- ANTI-ROLLBACK DEVICE PROVIDED AS STANDARD EQUIPMENT; CONSTRUCTED FROM STRUCTURAL STEEL FOR LONG LIFE.
- SIDE CHANNELS ARE 1" X 3" X 1", 12 GA. GALVANIZED STEEL.

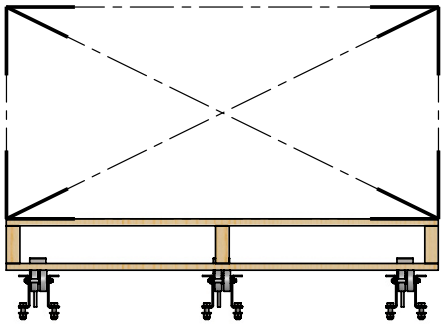
LOAD END

UNLOAD END





TYPICAL CONFIGURATION WITH
TWO DOUBLE STAGGERED RUNS



CONFIGURATION WITH
THREE DOUBLE STAGGERED RUNS -
FOR HEAVIER PALLETS

3D STORAGE SYSTEMS LIMITED

FLOWRACK INSTALLATION GUIDE

GENERAL COMMENTS

Flowrack systems are used to store pallets of goods two or more pallets deep between aisles. Pallets are loaded into the rack from one aisle and rely on gravity to cause the pallets to flow to another aisle from which it can be unloaded. Flowtracks may use either wheels or rollers, with different spacings depending on the application.

Polycarbonate wheel flowracks generally have three runs (or sets of tracks) for deep pallet storage. Skatewheel Picking systems, two or three pallets deep, generally have two runs, and roller flowrack systems generally have one (full width), two, or three runs of roller track per lane. With the exception of Skatewheel Picking lanes, brake rollers (or speed controllers) are used to prevent the pallets from traveling at excessive speeds. Longer lanes of flowrack usually have entry guides at the load end in order to ensure that pallets are placed accurately in the centre of the tracks, since pallets placed off-center into a flowrack lane may drift further off centre to the point where a pallet could come off the track completely.

All dynamic storage systems, because the pallets move, require greater accuracy in installation than is necessary for selective, double deep, or drive-in racking systems. To ensure proper flow of pallets through the system, flowrack frames must be accurately shimmed, and tracks must be installed straight and parallel.

Beams in the rack should be installed so that the beam at the unload end is lower than the second beam which in turn is lower than the next beam etc. Designers at the rack manufacturer determine the bracket drops on beams to achieve the appropriate slope, which is normally approximately 7/16” per foot.

FLOWRACK INSTALLATION PROCEDURES

1. Shoot The Floor

Using a Transit Level or Laser Level, find the high point of the floor in the area where the racking will be installed, and mark or map the rest of the area, in order to determine what amount of shimming will be required to have all the rack frames level +/- 1/16”.

FLOWRACK INSTALLATION GUIDE

2. Identify Beams and Tracks

In order to provide appropriate slope for the flowrack lanes, rack manufacturers use various weld-down or drop-on-bracket dimensions on intermediate beams. Generally, these beams are standard box beams or structural channel beams, with the exception of the weld-downs. Load and Unload beams may be angle beams with slots in the horizontal legs, structural channel beams with angle cleats, or HSS structural beams with angle cleats. If the beams are not marked, it is important to identify them, using the parts list descriptions or drawings provided by the rack manufacturer. Please note that usually there are several different frame depths and row spacer lengths. The flow track components supplied by 3D Storage Systems have labels on each track section, indicating the item and the direction of flow. The installation instructions, normally attached to the boxes of hardware, should include a map showing placement of each track section.

3. Stand Frames

Choose one corner of the system as the start point of the installation. Stand two frame lines using beams placed at convenient heights to hold the frames steady. Make sure that the frame lines are straight, square to the face of the rack, and properly shimmed. Install row spacers loosely, but do not tighten row spacer hardware. Anchor only one frame at the start point of the installation. If row spacers are tightened, or remaining frames are anchored, it may be difficult to install the flowtrack sections.

4. Install Frameworks

Place the flowtrack sections in their correct place and orientation in one lane. Loosely fasten the tracks to the load and unload beams with the hardware provided. The splices between sections of flowtrack do not bolt to the beams in the same fashion as the load and unload beams. Instead, the ends of the track sections are designed to meet on top of the intermediate beams. Insert the U-bolts from the top down, through the slots in the bottom flanges of the flowtracks, and around the beam. Install the small strap plates over the open ends of the U-bolts, and loosely fasten with the Nyloc nuts provided. Run a taut string from the load end of the lane to the unload end in order to provide a “straight edge” close to one track, and adjust the position of the flowtrack sections until they are straight. Fasten the U-bolts at the intermediate splices and the nuts and bolts at each end for that track. If the lane has two or three tracks per lane, repeat with the other tracks in that lane. Pallets will not flow if the tracks are not parallel.

Anchor the remaining frames in the first bay, ensuring that the frames have the appropriate shims under each post.

If the lane is designed with entry guides, install one set in the first lane. Note that there are left-hand and right-hand entry guides. They are designed to be installed at the load end of the lane, sloping slightly at the same slope as the flowtracks, They should be installed so that the narrowest point between the guides is lower than the top of the pallets. Generally, they are installed using the lowest set of holes available in the frame

FLOWRACK INSTALLATION GUIDE

posts that are not already occupied by beam brackets. In order to make the Entry Guides taper outward slightly as the pallet flows down the lane, the brackets at the aisle ends should be thicker than at the other end of the guides.

5. Test Lane

Prior to installing additional lanes, test the first lane, with pallets that the customer will be using in the system. Preferably, actual customer loads should be tested, to ensure that pallet weights, heights, etc. are the same as will be used, since such factors, if different than what the system was designed for, can result in significantly different flow characteristics.

6. Install Remaining Flowracks

After successful completion of testing in the first lane, install remaining lanes in a similar manner. After all flowtracks have been installed and fastened down, complete the tightening of the row spacer hardware. Finally, anchor the remaining frames, again ensuring that the frames have the appropriate shimming under each post.

7. Technical Assistance

If you experience difficulty during the identification or installation of the flowrack system, please call 3D Storage Systems for assistance at 905-830-0003. If we receive a call from an installer on site with a cellular phone, we can compare our notes drawings and measurements, in order to sort out questions or difficulties, usually with no further time delay.

OPERATING INSTRUCTIONS
FLOWRACK SYSTEM

GENERAL COMMENTS

Flowrack Systems are used to store pallets of goods two or more pallets deep between aisles. Pallets are loaded into the rack from one aisle and rely of gravity to cause the pallets to flow to another aisle from which it can be unloaded. Flowracks may use either wheels or rollers with different spacings depending on the application.

Polycarbonate wheel flowrack generally have three runs (or sets of tracks) for deep pallet storage. Skatewheel picking systems, two or three deep generally have two runs and roller flowrack systems generally have one (full width), two or three runs of roller track per lane. With the exception of skatewheel picking lanes, brake rollers (or speed controllers) are used to prevent the pallets from traveling at excessive speeds. Longer lanes of flowrack usually have entry guides at the load end in order to ensure that pallets are placed accurately in the center of the tracks, since pallets placed off-center could come off the track completely. All dynamic storage systems require accuracy in loading, with flowrack the accuracy becomes more of a factor the deeper the pallet has to travel to be unloaded.

FLOWRACK OPERATING PROCEDURES

1. Pallets must be loaded and unloaded with the forklift squared up to the face of the rack, and with the pallet centered relative to the flowrack lane. **Do not approach or withdraw at an angle**
2. When loading a pallet, make sure the pallet is 4 to 6 inches above the top of the wheels or rollers. This is especially important if the lane is outfitted with entry guides, since damage to the pallets or loads could occur if the pallet hits the end of the guide.
3. Lower the pallet onto the wheels or rollers in a controlled, fairly gentle manner. Lowering the pallet at a maximum rate that the hydraulic system on the lift truck allows can result in damage to wheels or rollers. Pallets will not flow over bent rollers or "flattened" wheels.
4. When loading a pallet it may be necessary to give the pallet a small push with the forklift, especially if the pallet is pressing against the side of an entry guide. Entry guides are designed to be approximately one inch wider than the widest pallet for which the system was designed. Even pallets that are leaning against the side of a guide will not normally require more than a gentle assist to start flowing, unless the pallet is wider than the system was designed to handle.
5. Check the underside of pallets before loading into a flowrack lane. Broken or missing bottom boards can result in pallets failing to resume flowing when pallets are unloaded from the system. In certain cases, missing boards or nail heads protruding from bottom boards can result in serious damage to the flowrack components. Stretch wrap hanging below the pallet can become entangled in the wheels and prevent the proper flow of pallets.
6. When removing pallets from the lane, lift the pallet to a level position just high enough to clear the front beam. **Withdraw at a slow constant speed**
7. When unloading a pallet, it may be necessary to give the remaining pallets in the lane a gentle "bump", in order to help the remaining pallets start moving toward the unload end of the lane. This should be done by lifting the pallet two or three inches off the flowrack, then driving forward approximately two inches, then backing out at a normal, controlled speed. The requirement for bumping will depend on factors, such as the number and width of the bottom boards, the material that the bottom boards are made of, the weight of the load, the number of pallets loaded in the system, the amount of time that the pallets have been in the system without moving, and the temperature of the warehouse, etcetera. In optimum conditions, such as GMA or CHEP pallets, with load weights of 1,000 to 2,000 pounds, this bumping is rarely required.

OPERATING INSTRUCTIONS
FLOWRACK SYSTEM

IF YOU HAVE A PROBLEM

1. Make sure that the following pallets come to the front of the system. If for some reason that pallets do not roll forward during unloading, even after "bumping", push the pallet back in and back out again. If the pallets still do not then flow to the unload end, it may be necessary to put pallets in the load end in order to push the problem pallet to the unload position.
2. If you have removed a problem pallet from the system, try to determine the cause of the hang-up, in order to attempt to prevent similar problems in the future. If no apparent reason is readily visible, make note of the lane location, so that if subsequent problems occur in the same lane, the lane can be checked for damaged wheels, rollers, brake rollers, etcetera.
3. On occasion, it may be necessary to enter a flowrack lane that still has loads hung up in the interior of the rack system. For example, if a leaning load, or off-center load gets caught behind an upright frame post, it will be necessary to partially unload the pallet before it can flow to the unload end. If it is necessary to go into the interior of a flowrack lane in these conditions, a lane next to the offending lane should be emptied, so that there is a safe escape route when the pallet starts to move. The problem pallet should be blocked prior to attempting to rectify the problem, so that the individuals working at the pallet can control when the pallet is able to resume its travel.

A LIST OF "DON'TS"

1. Do not side shift a load without lifting it off the flowrack, since this will usually result in damage to wheels, rollers or brakes.
2. Do not load pallets into a system that are in excess of the weight that the system was designed to handle. Brake rollers are designed to operate in a reasonably narrow weight range, and excess weight can result in damage to the system or to the product, or it can result in serious injury or death if the pallet falls out of the unload end of the system.
3. Never load a pallet into a lane that has been identified as having significant damage to wheels, rollers, or brakes. Isolate and clearly mark the lane in such a manner that all operators can easily see that the lane should not be used until proper mechanical problems can be repaired.

TECHNICAL ASSISTANCE

If you have questions regaring the proper operation of the flowrack system, or in identifying possible problems, please call 3D Storage Systems for assistance at 905-830-0003. Under most circumstances, we can help with suggestions after asking some questions regarding observed symptoms, usually with no further time delay.


CARTON
FLOW

HEAVY DUTY CARTON FLOW

3D Storage Systems offers a heavy duty carton flow to suit a multitude of uses. Skatewheel beds are ideal for heavy duty case and carton flow applications. Frames are welded from 12 gauge material and are built to withstand impact from cases of hardware, batteries etc. These can be configured to reduce pick paths, enhance first-in first-out, increase pick slot locations, and offer enhanced picking efficiencies.

FEATURES & BENEFITS

- 'Bed' design allows flexibility in box size and weight and still provides the ability to maximize the use of the entire shelf. "No fixed roller width", all wheels roll independently allowing infinite flexibility and superior flow of product to the pick aisle.
- Both plastic and bearinged steel wheels are available to suit any load requirement.
- Plastic wheels typically range to 35 lbs. per sq. foot.
- Steel wheels allow weight ranges up to 50 lbs. per sq. foot. Bearing wheels typically allow for smoother flow at a lower slope. Steel skatewheels have 20 gauge shells.
- Steel shafts that run the width of the bed give the system added impact resistance and weight capacity.
- Welded one piece bed frame with a durable powder coated finish for a lifetime of use.
- The ability to add impact plates, tilt shelf and nose-over shelves add additional flexibility to
- Optional snap-in wire dividers allow for product separation while maintaining flexibility in width. Dividers can adjust with just one hand and can snap in virtually anywhere on the bed.

WE CUSTOM DESIGN EACH APPLICATION TO SUIT THE NEEDS OF EACH AND EVERY FACILITY.

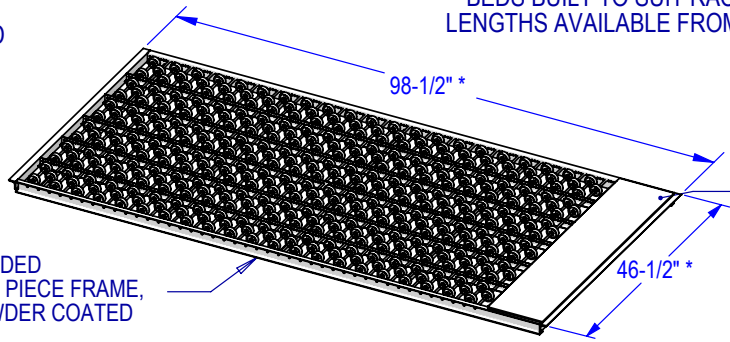
- Custom wheel centers ranging from 1½" to 6" center to center in ½" increments
- Custom lengths and widths to suit new or existing rack types.
- Beds are available with a variety of mounting styles, for use with angle, channel or step beams.

CARTON FLOW WHEEL BEDS

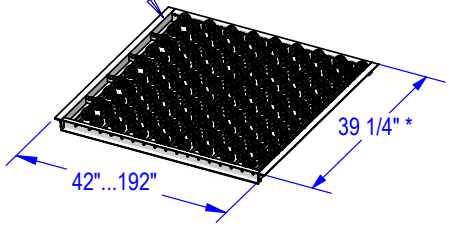
FEATURES AND BENEFITS:

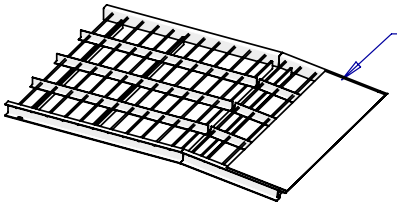
- SUPERIOR ABUSE RESISTANCE, VIRTUALLY IMPOSSIBLE TO DAMAGE
- CARTON SIZE AND WEIGHT FLEXIBILITY, ELIMINATES THE NEED TO RE-PROFILE
- SMOOTH FLOWING BALL BEARINGED STEEL WHEELS MEANS LESS SLOPE REQUIRED
- OPTIONAL PLASTIC WHEELS AVAILABLE FOR LIGHTER PRODUCTS
- WELDED ONE PIECE FRAME, POWDER COATED TOUGH FOR LONG LASTING LIFE
- HIGHLY DURABLE 1/4" DIAMETER STEEL SHAFTS PROVIDE IMPACT RESISTANCE
- FULL WIDTH SHAFTS WITH INTERMEDIATE SUPPORT ANGLES
- AN IMPRESSIVE OVERALL LOAD RATING OF 50 LB. PER SQUARE FOOT
- HEAVY DUTY WIRE DIVIDERS AID IN PRODUCT SEPARATION AND FLOW CONTROL

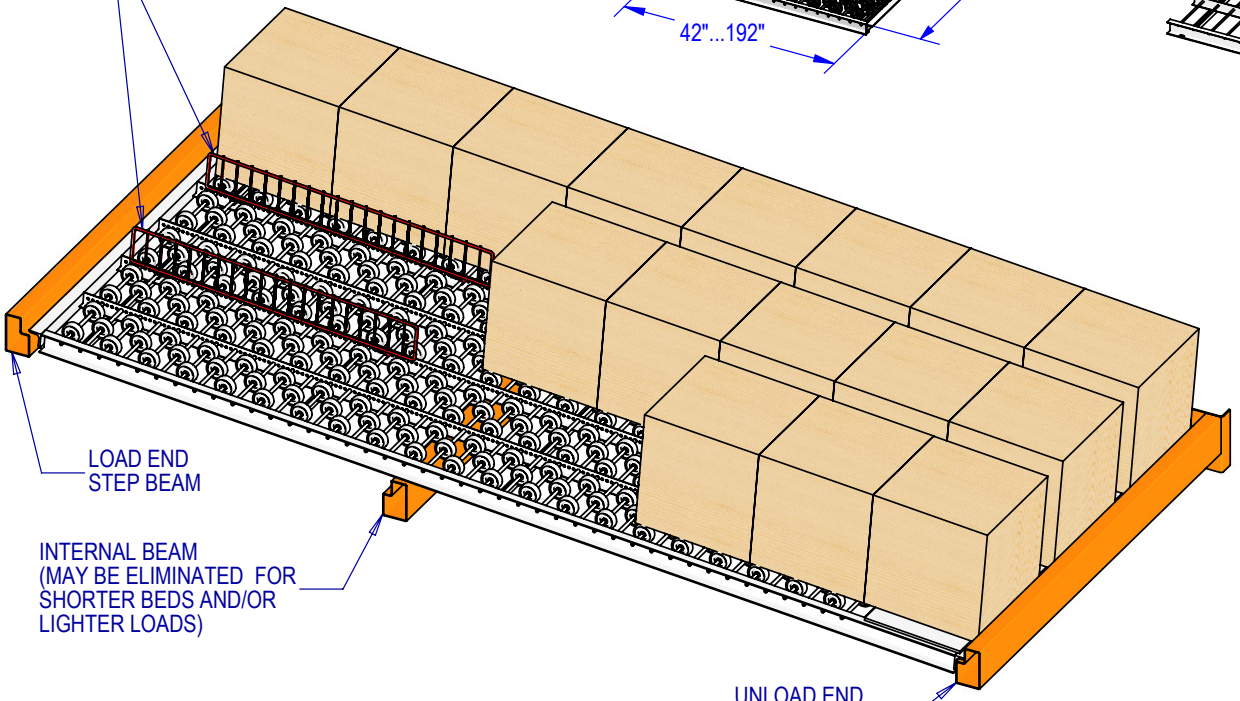
* BEDS BUILT TO SUIT RACK LAYOUT.
LENGTHS AVAILABLE FROM 42" TO 192".

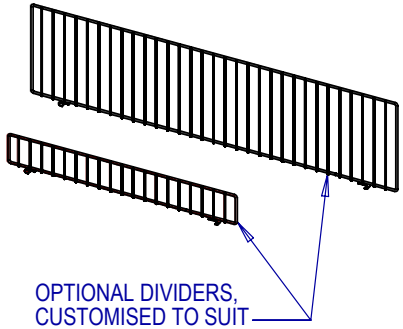


* OTHER WIDTHS AVAILABLE: 24-1/2, 31-1/2", 39-1/4", 46-1/2", 53-1/2".



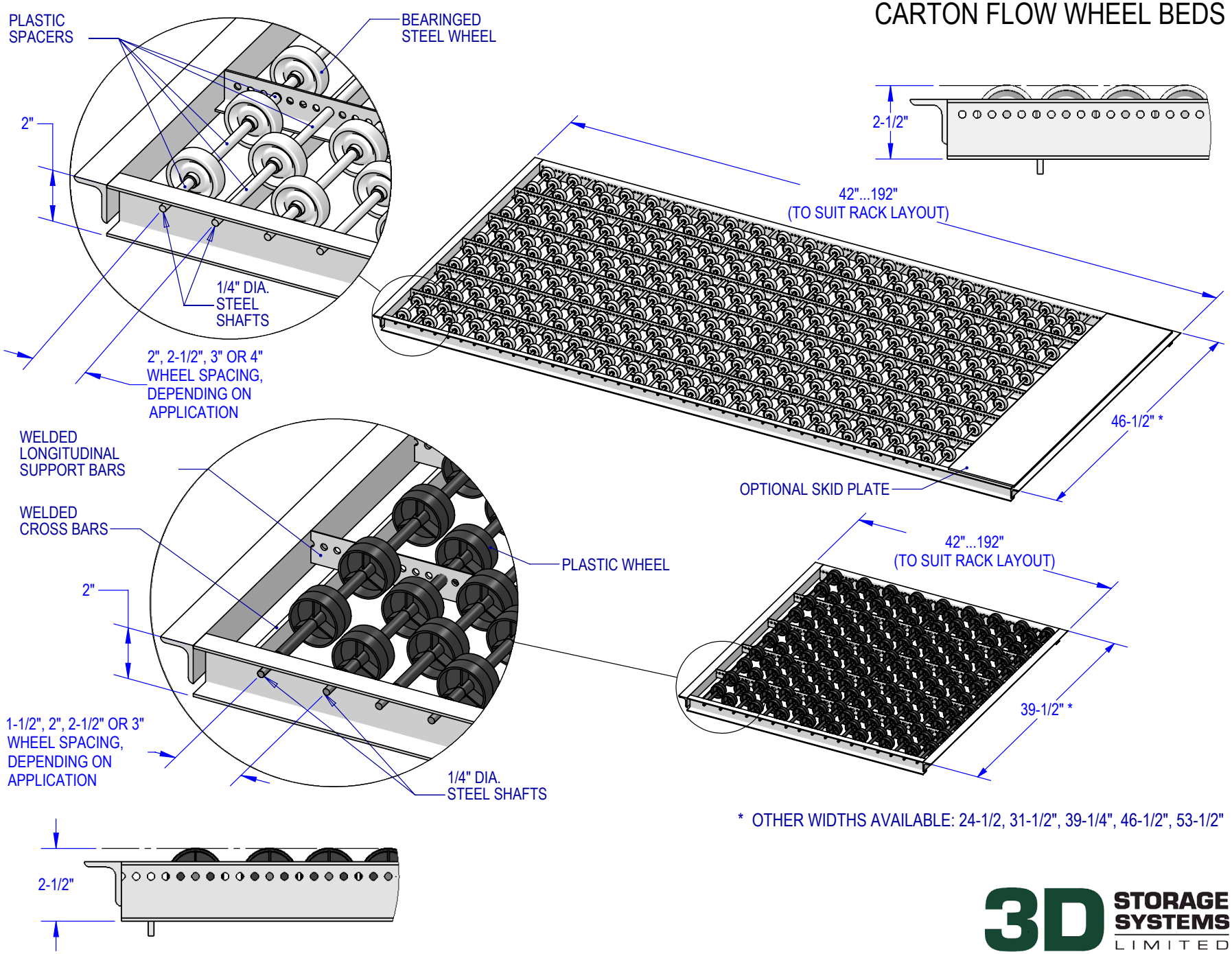






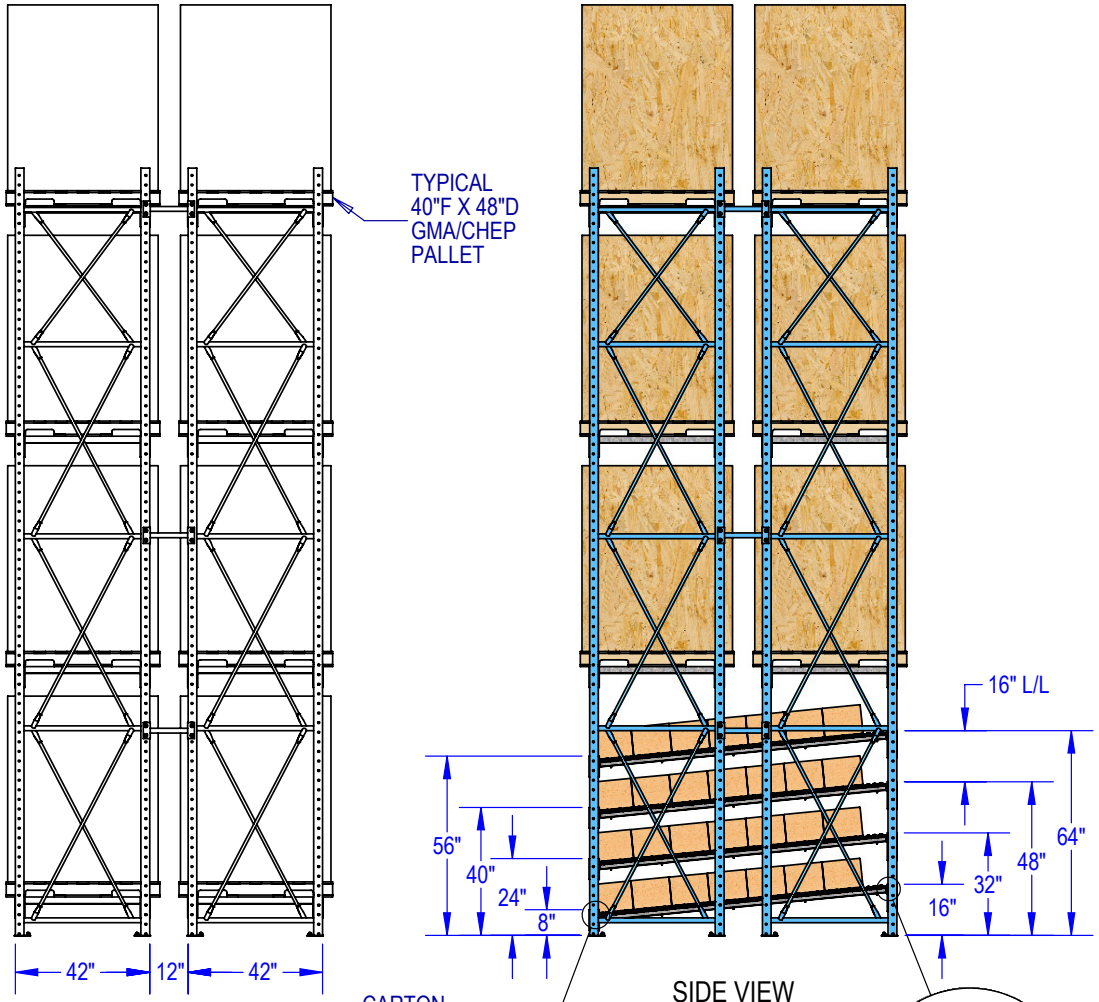
3D STORAGE SYSTEMS LIMITED

CARTON FLOW WHEEL BEDS



* OTHER WIDTHS AVAILABLE: 24-1/2, 31-1/2", 39-1/4", 46-1/2", 53-1/2"

3D STORAGE SYSTEMS LIMITED



SIDE VIEW
STANDARD SELECTIVE
PALLET STORAGE

SIDE VIEW
CARTON FLOW +
SELECTIVE
PALLET
STORAGE

UNLOAD END
DETAIL

LOAD END
DETAIL

3D STORAGE SYSTEMS LIMITED

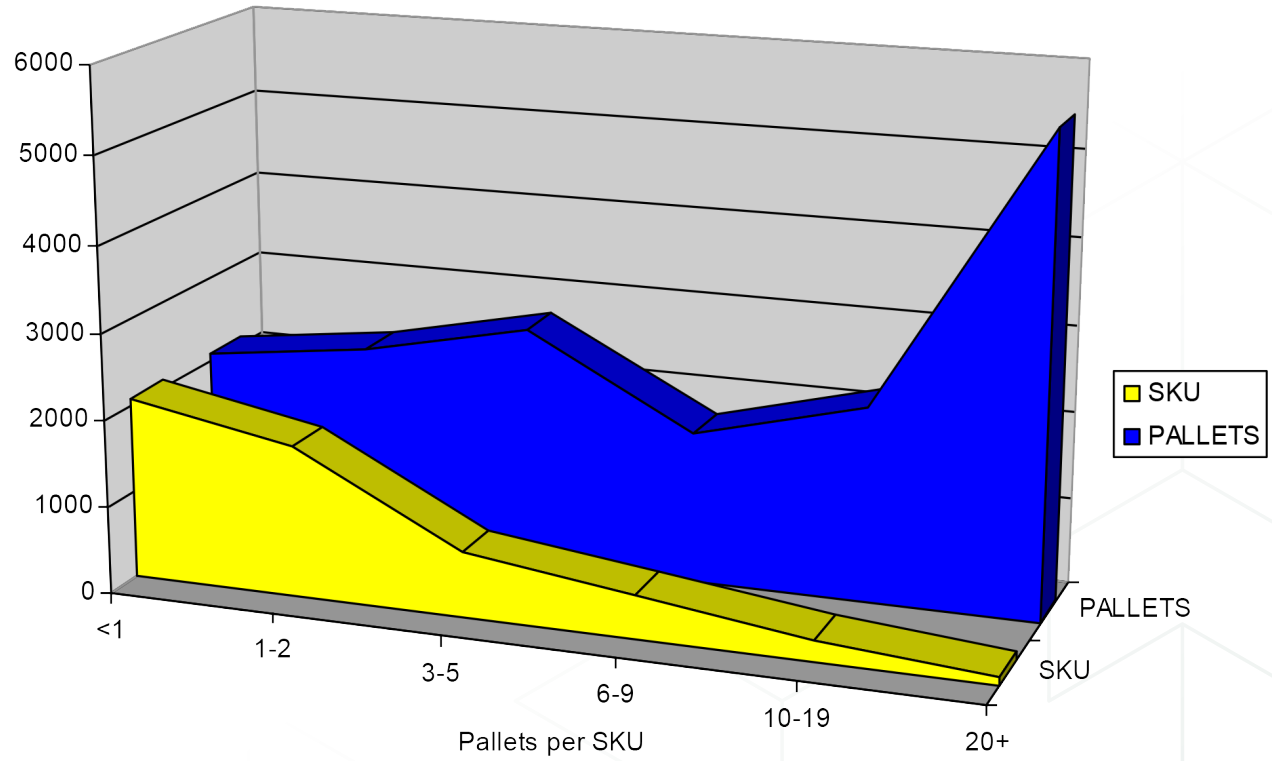

JUSTIFICATION

JUSTIFICATION

When the average number of pallets per product (SKU) exceeds five, a pushback system is easily justified. The higher the number of pallets per SKU, the deeper lane depths are more feasible (usually three lanes per product minimum). These multiple lanes allow rotation of product so that you can achieve first-in first-out. Because of its high density, pushback systems can be configured to attain up to 100% more pallets stored than standard pallet racking, and equal or greater increases over poorly occupied drive-in or floor storage layouts.

The chart below shows a typical distribution center's inventory. The "80/20 rule" where 20% of the products (SKU) represent 80% of the volume is common to most customers. Pushback would be applicable for the following categories:

- 6 - 9 pallets/sku – 2 and 3 deep pushback
- 10 – 19 pallets/sku – 3 and 4 deep pushback
- 20+ pallets/sku – 4, 5 and 6 deep pushback



JUSTIFICATION

THE TRUE COST PER PALLET STORED INCLUDES ALL ELEMENTS WITHIN THE WAREHOUSE:

- **Capital costs**
  - land
  - buildings
  - mobile handling equipment (forklifts)
  - storage systems

- **Operating costs**
  - labour
  - transportation
  - product damage
  - maintenance/insurance/taxes

THE FOLLOWING SIMPLE EXAMPLES (SOLUTIONS A, B, C AND D) ARE FOUR DESIGNS THAT COMPARE THE COST OF FOUR RACKING LAYOUTS.

A. All standard selective rack

B. All pushback while holding the building the same size as solution A

C. All pushback and resizing the building to hold the same number of pallets as solution A

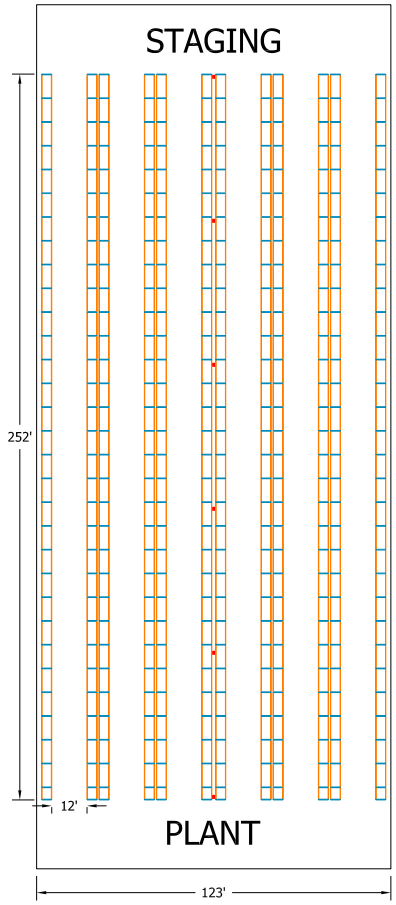
D. Mix of standard selective rack, pushback and floor storage, where the building size has been adjusted to hold the same number of pallets as solution A

The solutions just look at the cost of building and racking, no allowances have been made for operating costs or forklifts.

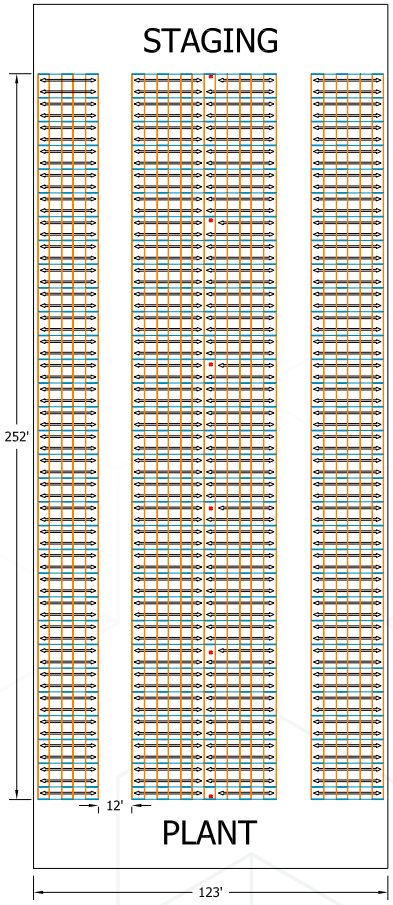
The lowest cost storage is the one that matches the proper storage type to the inventory. An inventory analysis usually reveals that a minimum of three or four types of storage will be required.

JUSTIFICATION

SOLUTION A
Standard Selective Rack
2,928 Pallets, 31,000 square feet

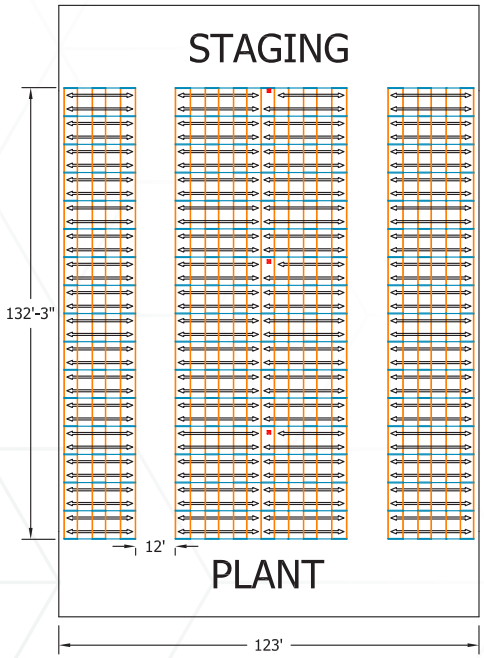


SOLUTION B
5 and 6 Deep Pushback
5,588 Pallets, 31,000 square feet

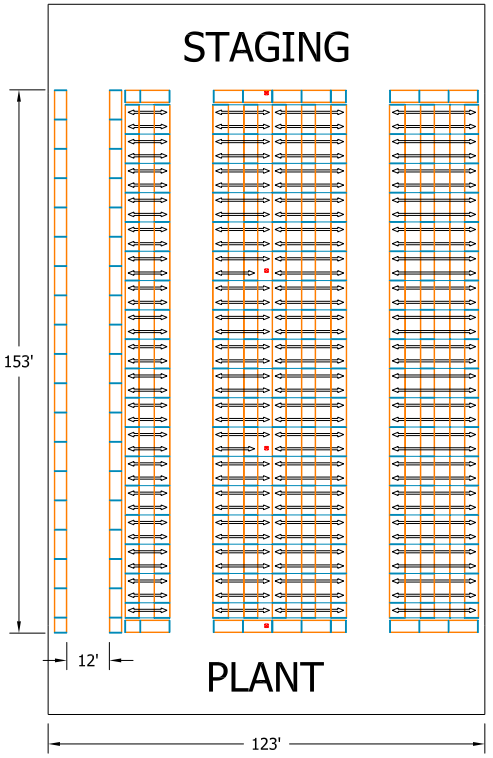


JUSTIFICATION

SOLUTION C
5 and 6 Deep Pushback
2,932 Pallets, 16,300 square feet



SOLUTION D
Standard Selective Rack, 3, 4, 5 & 6 Deep Pushback above floor Storage
2,944 Pallets, 18,900 square feet



JUSTIFICATION
COST COMPARISON

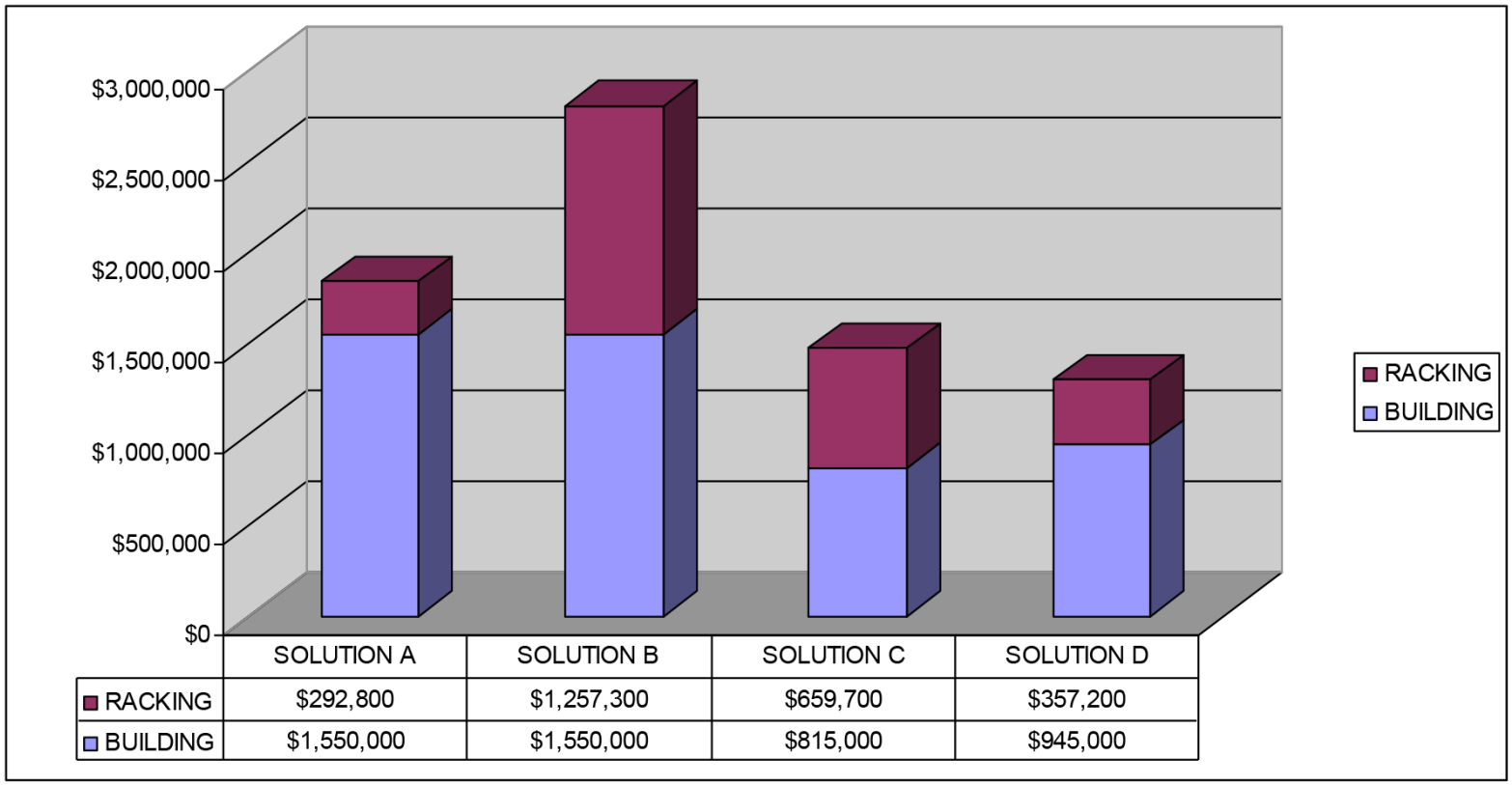
STANDARD AMBIENT WAREHOUSE
$50 US per square foot

Solution A – 31,000 SQ. FT. in total
2,928 pallet positions of standard selective rack

Solution B – 31,000 SQ. FT. in total
5,588 pallet positions of 5 & 6 deep pushback rack

Solution C – 16,300 SQ. FT. in total
2,932 pallet positions of 5 & 6 deep pushback rack

Solution D – 18,900 SQ. FT. in total
2,944 pallet positions total, 432 in standard selective rack, 1256 in pushback and 1256 in floor storage.



	SOLUTION A	SOLUTION B	SOLUTION C	SOLUTION D
RACKING	$292,800	$1,257,300	$659,700	$357,200
BUILDING	$1,550,000	$1,550,000	$815,000	$945,000

JUSTIFICATION
COST COMPARISON

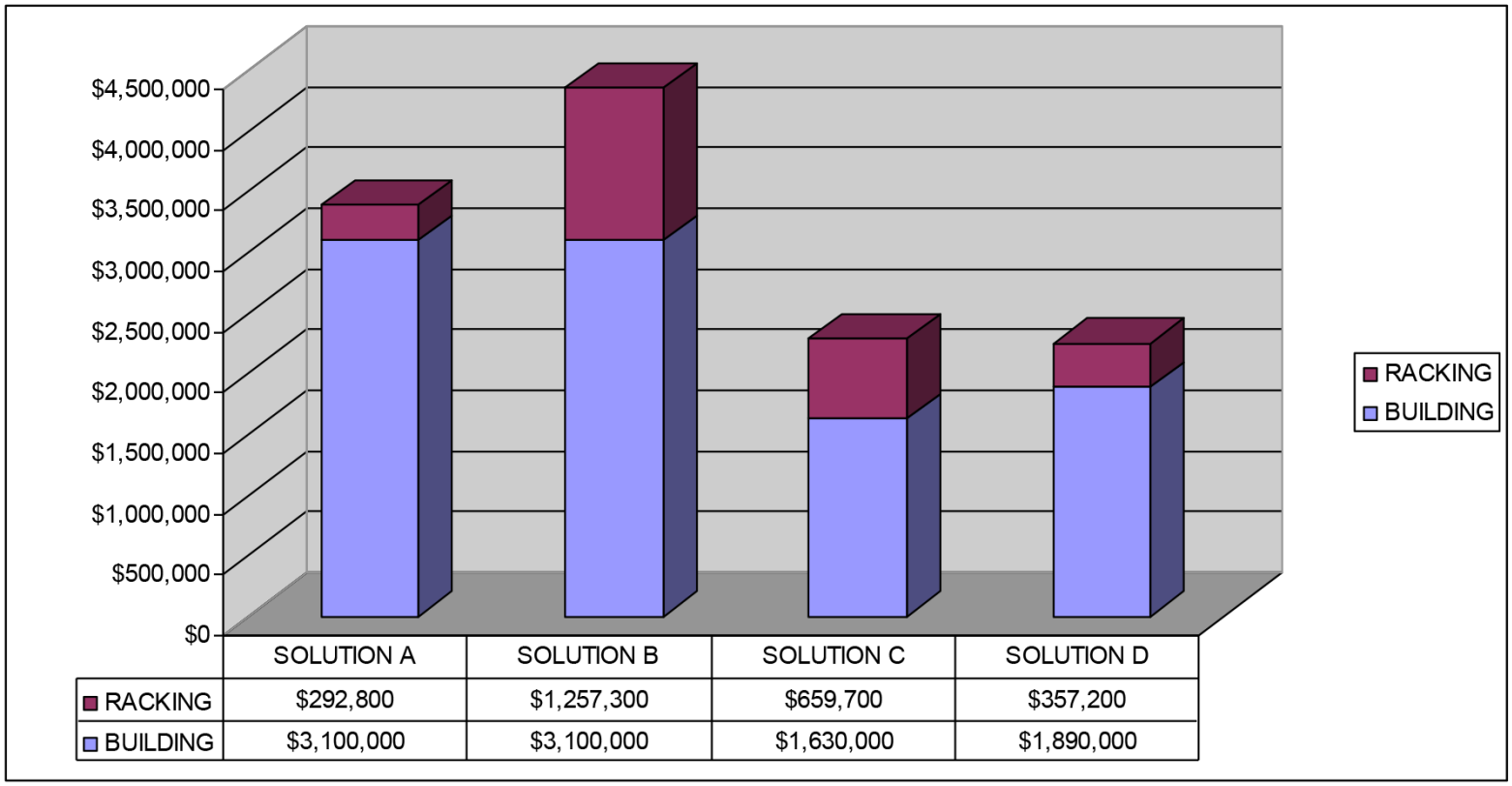
FREEZER WAREHOUSE
$100 US per square foot

Solution A – 31,000 SQ. FT. in total
2,928 pallet positions of standard selective rack

Solution B – 31,000 SQ. FT. in total
5,588 pallet positions of 5 & 6 deep pushback rack

Solution C – 16,300 SQ. FT. in total
2,932 pallet positions of 5 & 6 deep pushback rack

Solution D – 18,900 SQ. FT. in total
2,928 pallet positions total, 432 in standard selective rack, 1256 in pushback and 1256 in floor storage.



	SOLUTION A	SOLUTION B	SOLUTION C	SOLUTION D
RACKING	$292,800	$1,257,300	$659,700	$357,200
BUILDING	$3,100,000	$3,100,000	$1,630,000	$1,890,000

JUSTIFICATION
STORAGE TYPE RULE OF THUMB

Average Pallets per Product	Standard Rack	Drive-In	Pushback	Flowrack
1 to 5	1 Deep	N/R	N/R	N/R
6 to 8	2 Deep	N/R	2 Deep	N/R
9 to 11	N/R	N/R	2/3 Deep	N/R
12 to 14	N/R	N/R	3 Deep	N/R
15 to 23	N/R	N/R	3/4 Deep	N/R
24 to 35	N/R	2 Deep	4/5 Deep	8 Deep
36 to 47	N/R	3 Deep	4/5/6 Deep	12 Deep
48 to 59	N/R	4 Deep	5/6 Deep	16 Deep
60 to 71	N/R	5 Deep	5/6 Deep	20 Deep
72 to 83	N/R	6 Deep	6 Deep	24 Deep

Chart assumes 4 levels high.
Floor storage would use the same spatial constraints as drive-in.
N/R – not recommended

JUSTIFICATION

SOME COMMON METHODS FOR CHOOSING STORAGE SYSTEMS

"We have always stored our product this way"

"Our building layout and truck requirements dictate this layout"

"We laid out the rack in the same format as we used to store in bulk storage"

"Our drive-in storage gave us the largest number of pallet locations"

"Rack or high density storage was just too expensive, so we bulk stack"

"If we need more space we expand"

CURRENT WAREHOUSING TRENDS

An ever increasing number of products (SKU) versus the number of pallets to be stored

Increasing pressure to lower inventories in total even though sales volume is growing

Packaging is becoming lighter and weaker resulting in increased product damage and reduced pallet stack heights due to safety concerns

Increased enforcement (Government and marketing) of first-in first-out (FIFO)

Corporate desire to maintain use of current warehouse rather than build or lease more space

JUSTIFICATION
STORAGE TYPE CHARACTERISTICS

BULK FLOOR STACKING
- High theoretical pallet count
- Lowest average occupancy, as a result of honeycombing
- Poor height utilization
- Vertical and horizontal product unity required
- Stock rotation is difficult
- Highest level of product damage
- Safety risk in high, unstable piles
- **Best use:** large number of pallets per SKU and slow turnover

STANDARD SELECTIVE RACKING
- Lowest theoretical pallet count / density
- Highest average occupancy
- Good height utilization
- **Best use:** high number of SKU and low quantities of pallets per SKU (1-5)

DRIVE-IN & DRIVE-THROUGH RACK
- High theoretical pallet count / density
- Low average occupancy
- Good height utilization
- Vertical and horizontal product unity required
- Some forktruck and pallet limitations
- Stock rotation can be difficult if poorly configured
- **Best use:** large number of pallets per SKU, averaging 3+ tunnels storage per product, low turnover

DOUBLE DEEP RACK
- Medium theoretical pallet count / density
- Medium average occupancy
- Good height utilization
- Handling is slow
- Special forktrucks required
- **Best use:** large new facilities with large number of products averaging 5 to 10 pallets per SKU, slow turnover

PALLET FLOW RACKING
- High theoretical pallet count / density
- Good average occupancy
- Height utilization ranges from good to poor dependent on length of lane and slope required
- Horizontal product unity only
- "Automatic" stock rotation, reduced handling
- Reduced product damage, shrinkage
- **Best use:** manufacturing environment, high number of pallets and a low number of SKU, high turnover

PUSHBACK RACKING
- Good theoretical pallet count / density
- Good average occupancy
- Good height utilization
- Horizontal product unity only
- **Best use:** medium to high number of pallets per SKU, high turnover


FIRST-IN,
FIRST-OUT

FIRST-IN, FIRST OUT
THE FIFO MYTH

Originally submitted for print to "The MHEDA Journal", Fall 2007

For the last 50 years our industry has taken for granted the basic concept that pallet flowrack is First-in First-out (FIFO) and drive-in and pushback racks are Last-in First-out (LIFO). While this may be true in theory, practical use of these storage methods shows us otherwise. As a manufacturer of both pallet flow and pushback rack systems, and as an organization that spends a lot of its time with dealers and end-users configuring rack layouts to maximize space and efficiency, we take issue with pallet flow racks being touted as the only way to achieve FIFO. With the following diagrams and explanations, we'll try to explain our concepts and show that you can achieve FIFO with any storage method – from floor storage to pushback.

We'll first have to tackle the issue of what is to be stored, and make some generalizations. We realize that no two situations are identical and that rules of thumb are just that – good approximations to use for most, but not all, situations. When we ask an end-user for inventory information, the key bits of data we are looking for include the number of products (SKU), the number of pallets per product and the typical incoming and outgoing quantities (ie 1 pallet at a time, a truckload at a time, or something in between). In our experience, the most successful flowrack applications involve high volumes of similar product, typically a manufacturer of consumer products with a limited number of SKU, say, less than 100. The key reason that high volumes and low SKU counts are necessary: to avoid honeycombing.

To illustrate the honeycombing issue, lets use an example of a 10 deep flowrack system and see how varying inventory amounts change the occupancy of the racking (occupancy being defined as the actual number of pallets being stored divided by the theoretical maximum pallets stored as a percentage – for example, 75 pallets being stored in a system that has a capacity of 100 would be 75% occupancy).

Illustration A shows a 10 deep flowrack system with one full lane of 10 pallets of "RED" product. Now, if all we had were the 10 pallets in the one lane of 10 deep flow our occupancy would be 100%. However, inventory by its very nature fluctuates. If we average 10 pallets, that means that sometimes we have less and sometimes we have more. It's when we have more that we

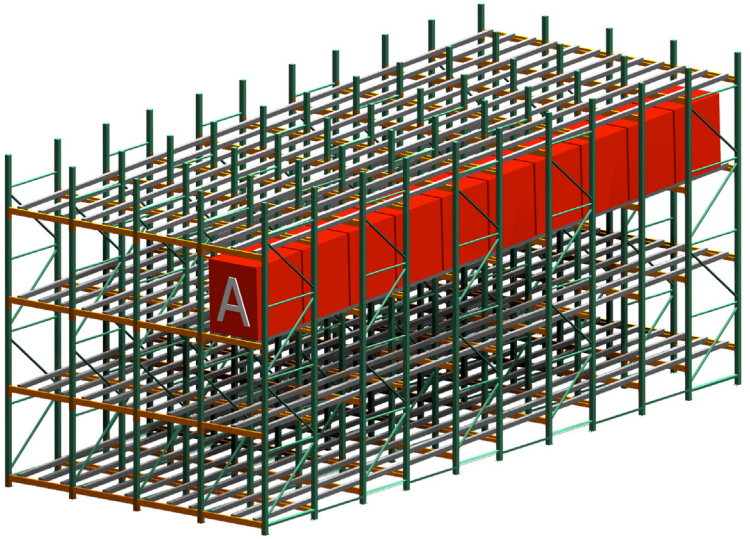


ILLUSTRATION A

FIRST-IN, FIRST OUT

THE FIFO MYTH

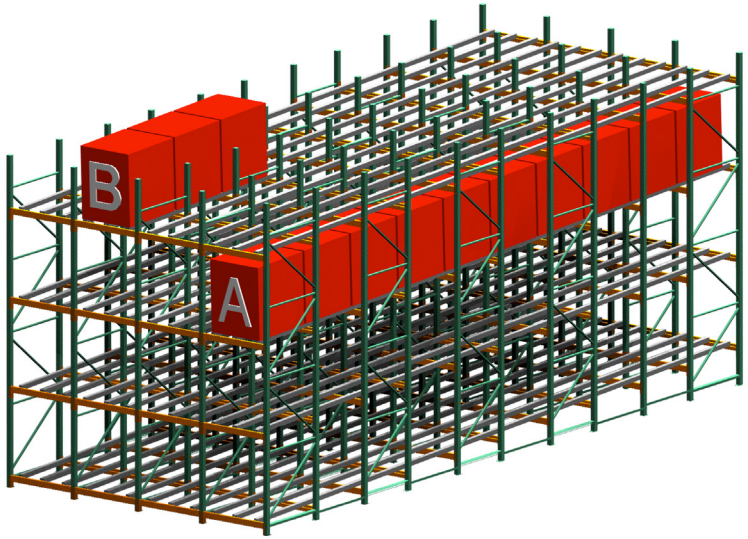


ILLUSTRATION B

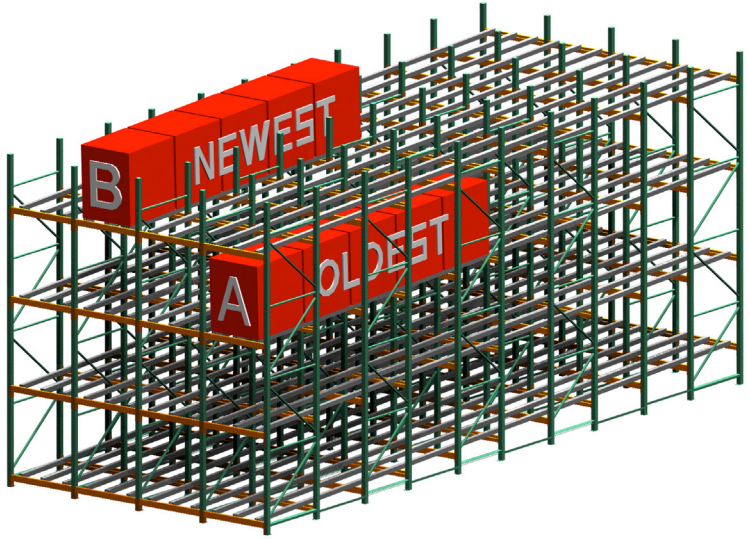


ILLUSTRATION C

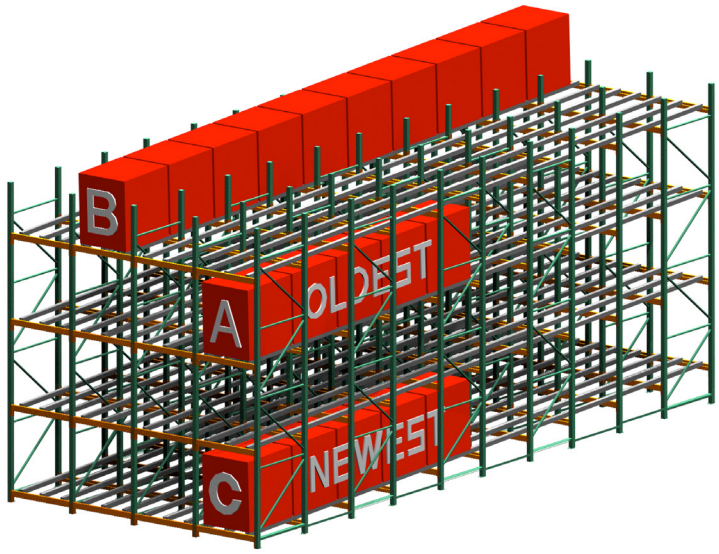


ILLUSTRATION D

run into trouble. **Illustration B** shows what happens when the inventory climbs up to 13 pallets – we end up using an additional lane and now our occupancy has dropped to 13/20 = 65%. Statistically speaking, over time as our pallet count goes up and down and we average 10 pallets per product the flowrack will look like the example in **Illustration C**, where we have one part lane of incoming product and one part lane of outgoing product. Our occupancy is now 50%, that is, we are storing 10 pallets in 20 locations.

Operating any storage system at 50% occupancy is very expensive. In order to increase our storage density we'll have to add more pallets of the same product. **Illustration D** shows 66% occupancy (20 pallets in 30 locations) and **E** shows 75%

FIRST-IN, FIRST OUT
THE FIFO MYTH

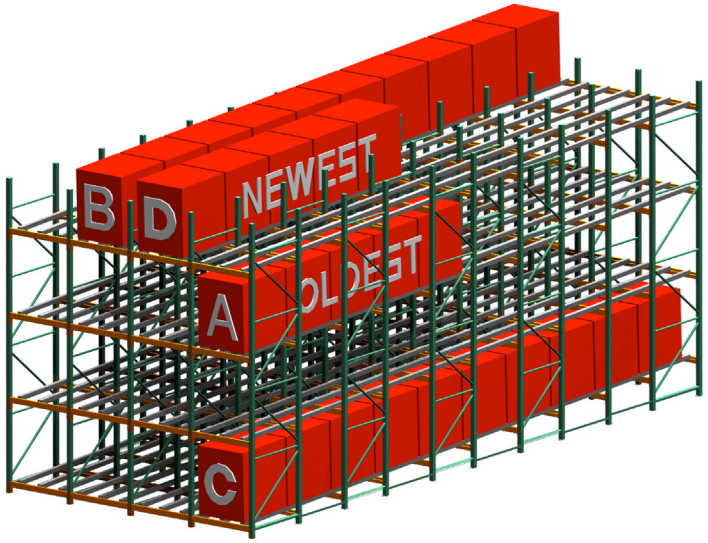


ILLUSTRATION E

occupancy (30 pallets in 40 locations). It is our belief that any storage solution should target 75% as minimum acceptable utilization. That being the case, you can see that for a 10 deep flowrack, you would need 30 pallets per product as a minimum to achieve this, or **3 times** the storage depth. For the last 15 years or so we have being calling that the "Rule of 3", and this general rule of thumb is a quick way to determine the feasibility of any storage system. As an example, if our customer was considering a 15 deep flowrack, then we'd check inventory levels to see if they had a minimum of 3 X 15 or 45 pallets per product. If those levels were 45 or more then we'd know that occupancy levels would be 75% or higher.

There is one other very important factor at work here. Notice that in **Illustration E** we have one part lane of outgoing product, one part lane of incoming product and 2 full lanes of the same product; the significance of this is that we must take care when retrieving or putting away pallets – **if we pull stock from the wrong lane we lose FIFO!** If a forklift operator picks from the "C" lane instead of the "A" lane when loading a truck (because it was easier to get to), stock rotation is lost. Properly configured Flowrack does not guarantee First-in First-out, we must still have some inventory management system that keeps track of which location to pick from.

Now let's look at pushback and see how it compares. For our example we'll use a 4 deep lane, and by instituting two key rules – a) apply the "Rule of 3", and b) never replenish a partially filled lane with a new lot code of the same product or with a different product. Using the "Rule of 3" dictates that we will only put products that average 12 or more pallets (3 X 4 deep) in the system. **Illustration F** shows 12 pallets stored in 4 lanes - one part lane of outgoing product, one part lane of incoming product and 2 full lanes of the same product. When it comes time to pick pallets for shipping, we just pick

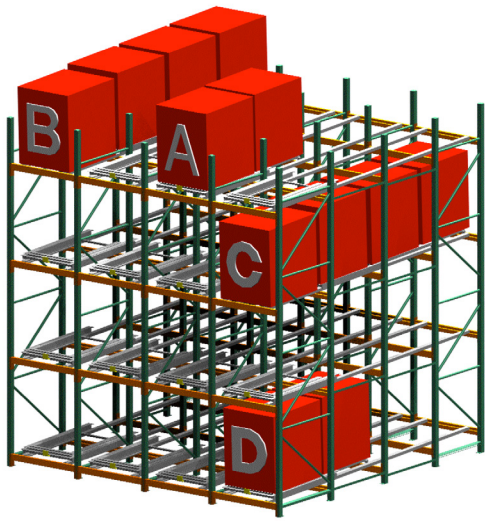


ILLUSTRATION F

FIRST-IN, FIRST OUT
THE FIFO MYTH

the oldest lanes first – A, then B, C and D (just like we have to do with the Flowrack). When new product comes in, even though we have part lanes that have room, we will put E in a new lane. As long as we follow the "Rule of 3" we'll always have 75% occupancy or higher.

The fact that over half of our pushback systems are sold to manufacturers and distributors of food products is testament to the case that FIFO is possible with pushback. You can even achieve FIFO with drive-in racking providing you follow the "Rule of 3". That's why successful drive-in rack systems typically house 100's of pallets of the same product. As an example, if we have a 4 deep by 4 high drive-in system, that gives us 16 pallets per tunnel. 3 times 16 gives us a minimum of 48 pallets per product that would be required to achieve an occupancy of 75% and rotate the stock. Any quantity less than that will make stock rotation difficult and result in poor occupancy. With ever increasing pressure to decrease inventories, there are few customers left who have such high volumes of product, and hence we see the growing popularity of pushback which allows us to efficiently store smaller lots.

In summary, we've included a chart that gives the rule of thumb for all of the storage types, based on a 4 pallet high scenario.

You can see from this chart that no one storage type is suitable for all categories of inventory, and therefore we generally like to see at least 2 if not 3 or more storage methods used in any given warehouse. Using these rules of thumb, and following some simple stock rotation practices ensures the best combination of FIFO, selectivity, storage density and lowest overall cost.

AVERAGE PALLETS PER PRODUCT	SELECTIVE RACK	DRIVE-IN RACK	PUSHBACK RACK	PALLET FLOW RACK
1 TO 5	SINGLE DEEP	N/A	N/A	N/A
6 TO 8	DOUBLE DEEP	N/A	2 DEEP	N/A
9 TO 11	N/A	N/A	2/3 DEEP	N/A
12 TO 14	N/A	N/A	3 DEEP	N/A
12 TO 23	N/A	N/A	3/4 DEEP	N/A
24 TO 35	N/A	2 DEEP	4/5 DEEP	8 DEEP
36 TO 47	N/A	3 DEEP	5/6 DEEP	12 DEEP
48 TO 59	N/A	4 DEEP	6 DEEP	16 DEEP
60 TO 71	N/A	5 DEEP	6 DEEP	20 DEEP
72 TO 83	N/A	6 DEEP	6 DEEP	24 DEEP

905.830.0003 MAIL@3DSTORAGESYSTEMS.COM WWW.3DSTORAGESYSTEMS.COM

3D STORAGE SYSTEMS LIMITED