



PALLET FLOW

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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 things 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.

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Class 'C' – Picking Systems

In lanes of two and three pallets deep, feeding a conveyor or pick aisle, skatewheel picking lanes are used. By its 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.

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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.

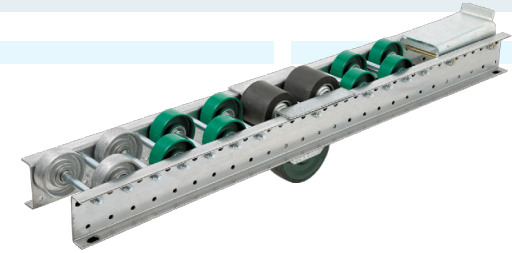
DEEP LANE PALLET FLOW

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.



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

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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

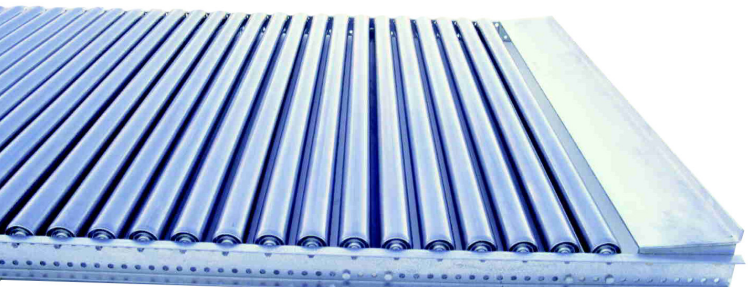
Load guides are recommended for most flow racks six or more pallets deep. These guides are constructed from structural steel and have sloped entry to center the pallet in the flow lane. A wide variety of load guides are available depending on pallet type and durability required.



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

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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

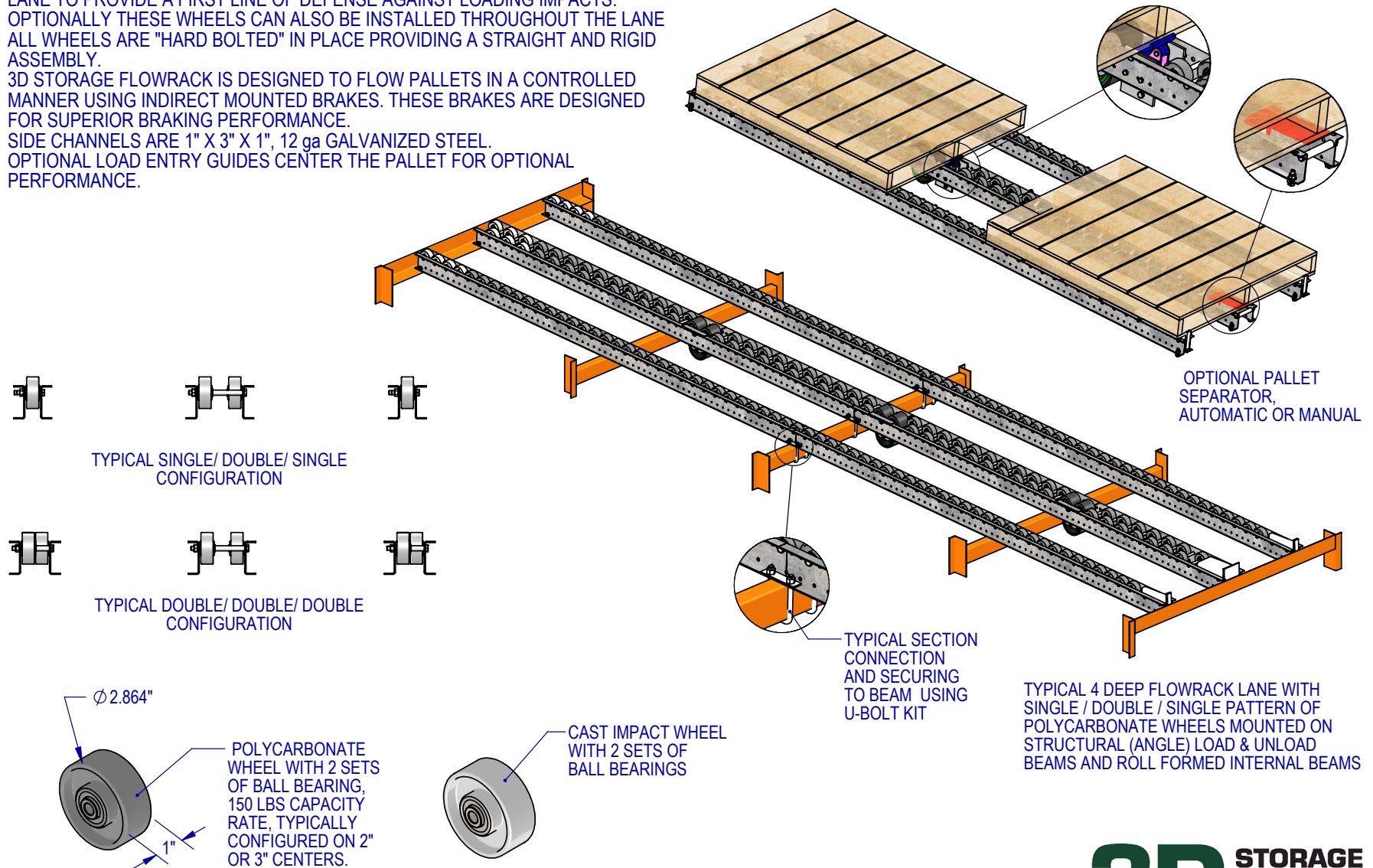
Slope will range from 1/4" per foot to 5/8" per foot depending on the application, the wheel type used and the class of performance desired; the majority of our flowracks are installed at or close to 7/16" per foot. This equates to 1 3/4" of slope per pallet based on a 48" deep pallet.



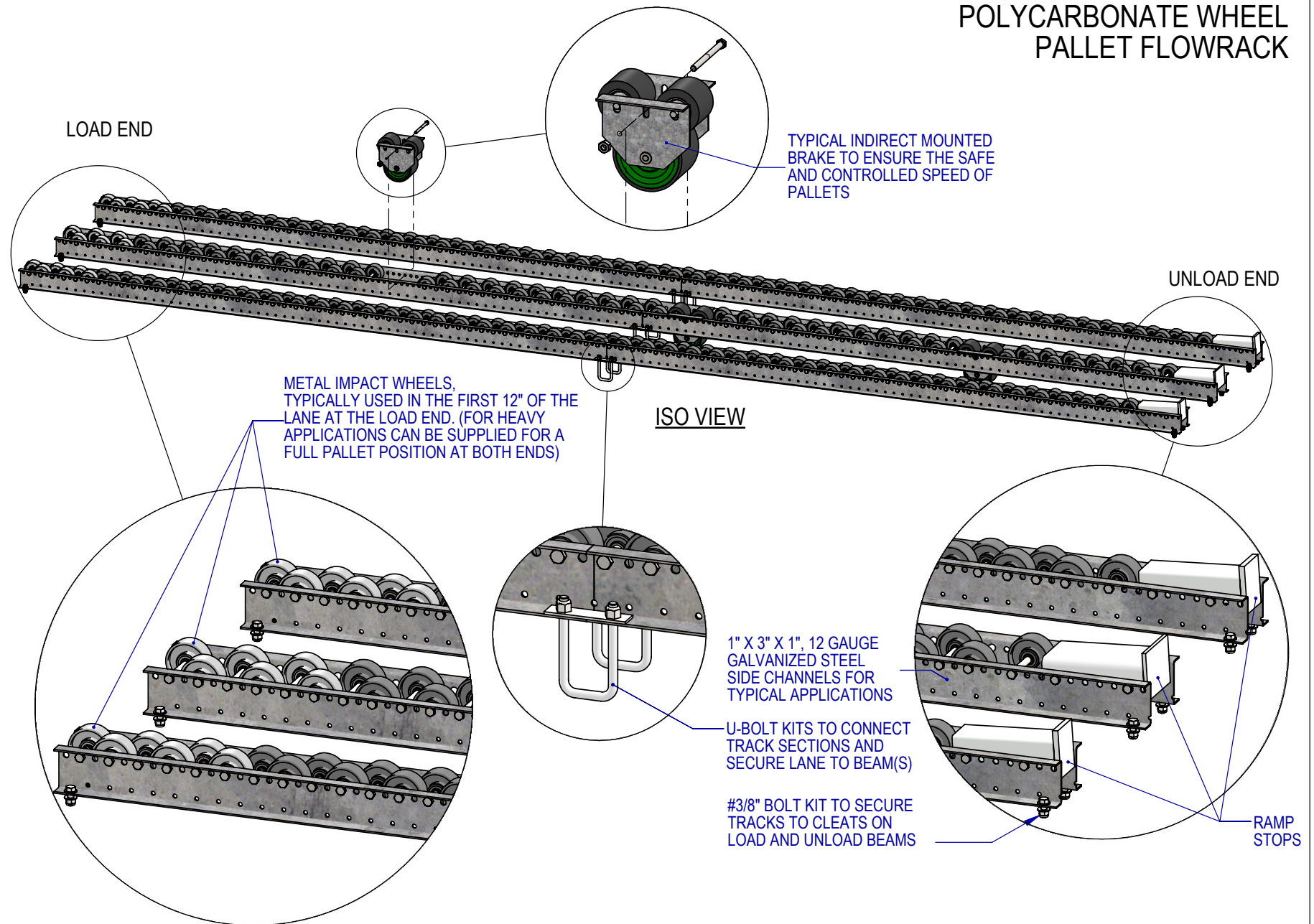
FEATURES AND BENEFITS:

- 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.

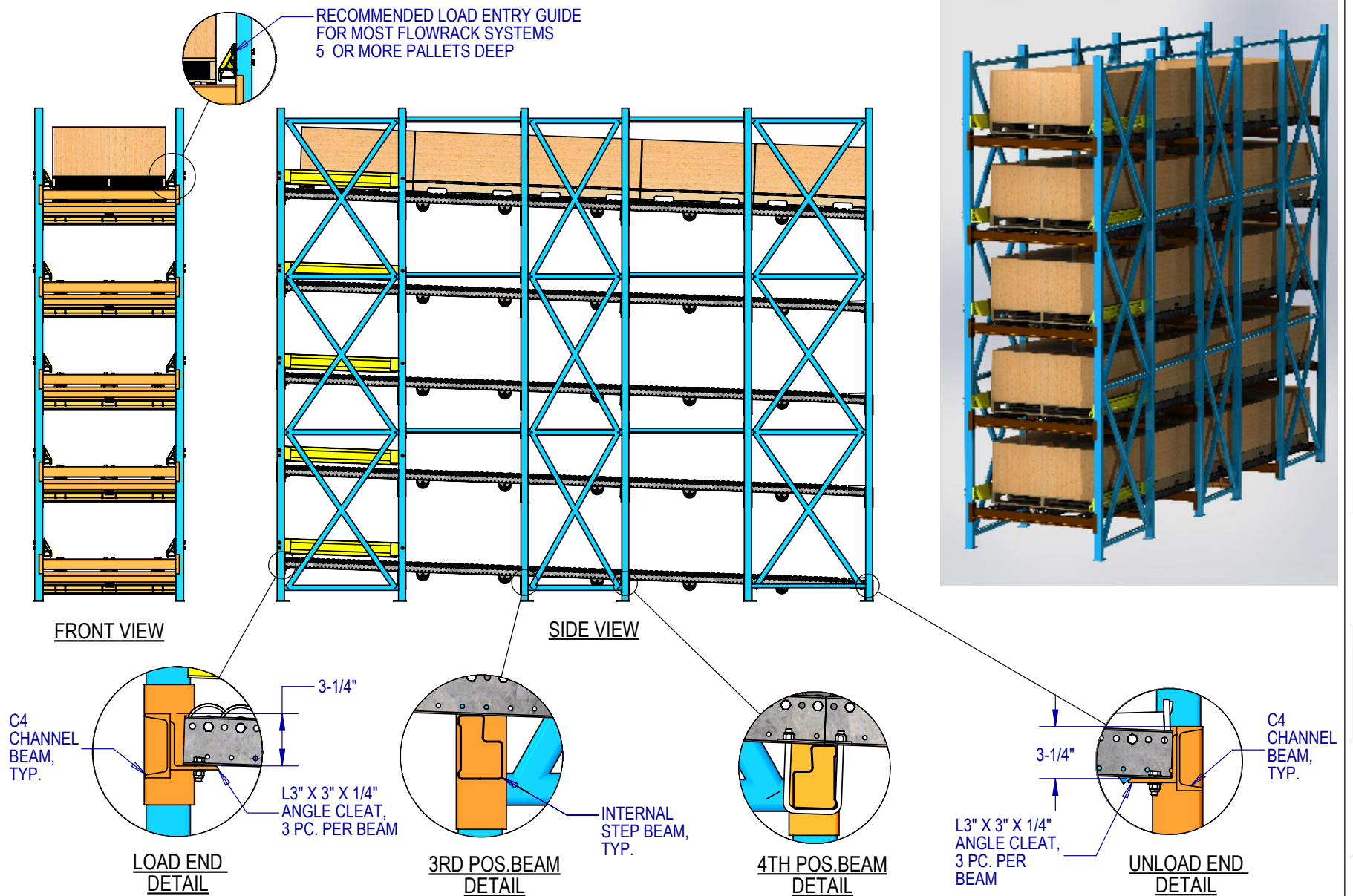
POLYCARBONATE WHEEL PALLET FLOWRACK



POLYCARBONATE WHEEL PALLET FLOWRACK



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

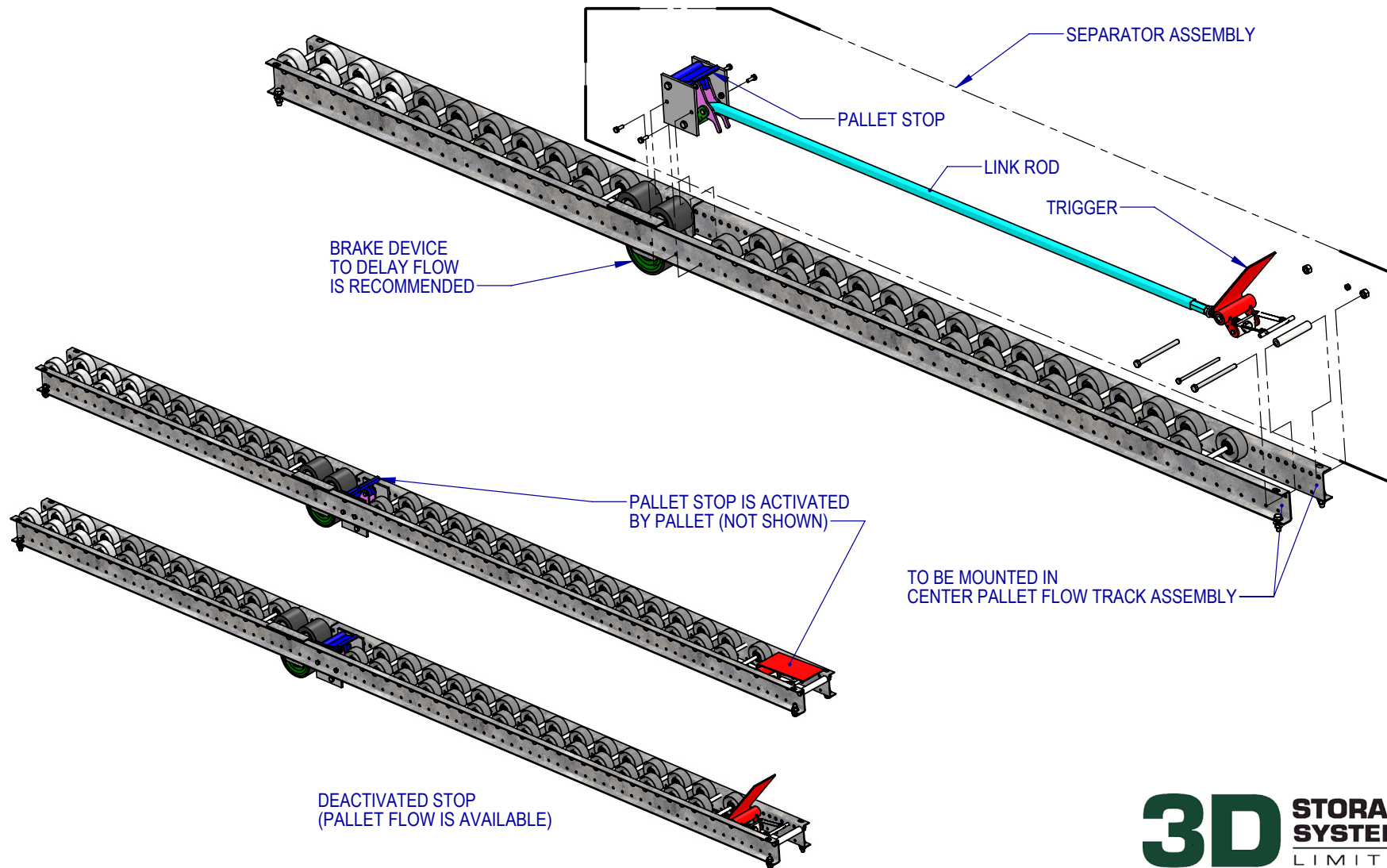


TYPICAL SINGLE WIDE BAY OF 5 DEEP FLOWRACK LANES, 5 LEVELS HIGH - INSTALLATION DETAILS.

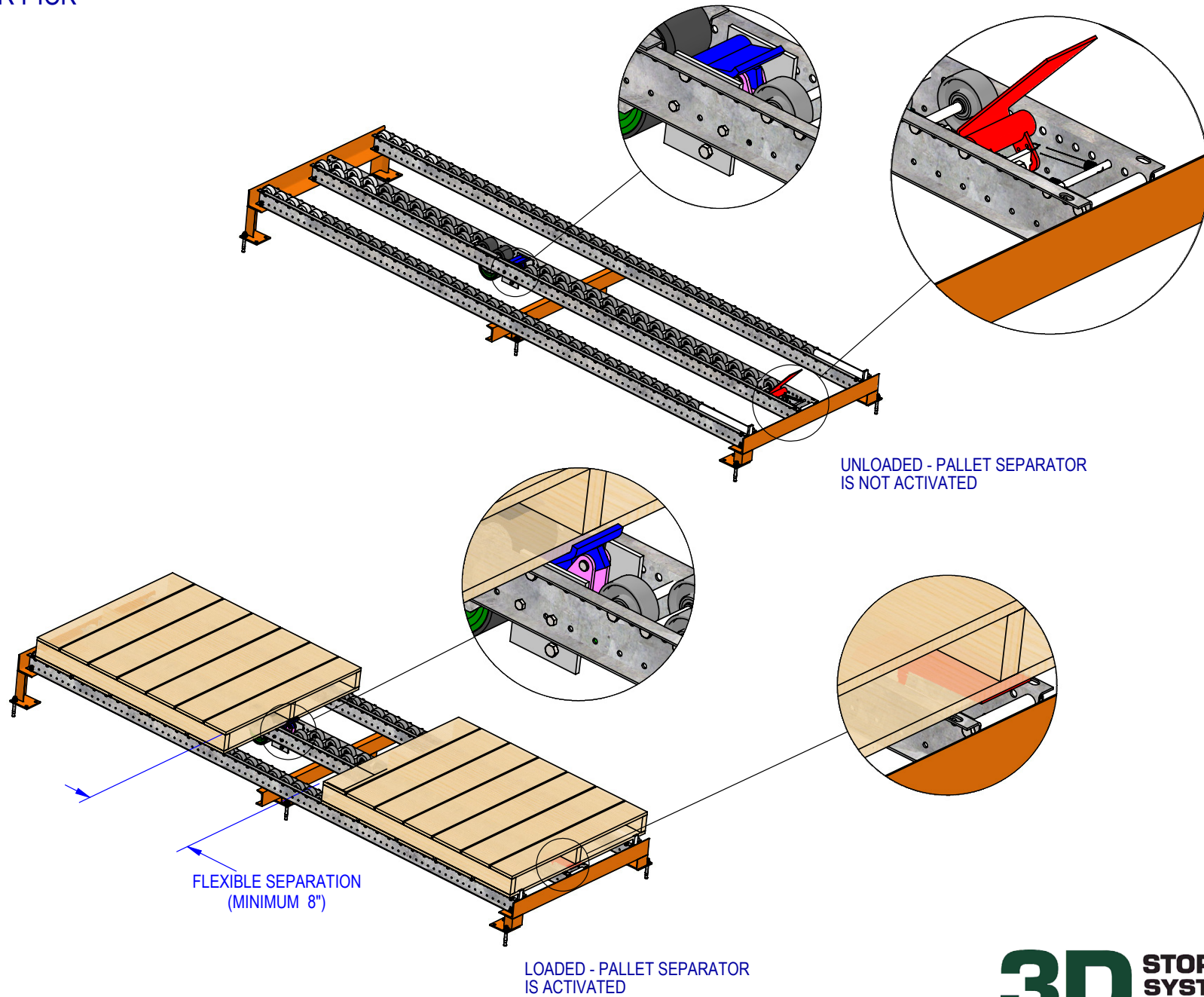
FEATURES AND BENEFITS:

- 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.

PALLET FLOW SEPARATOR



LAYER PICK

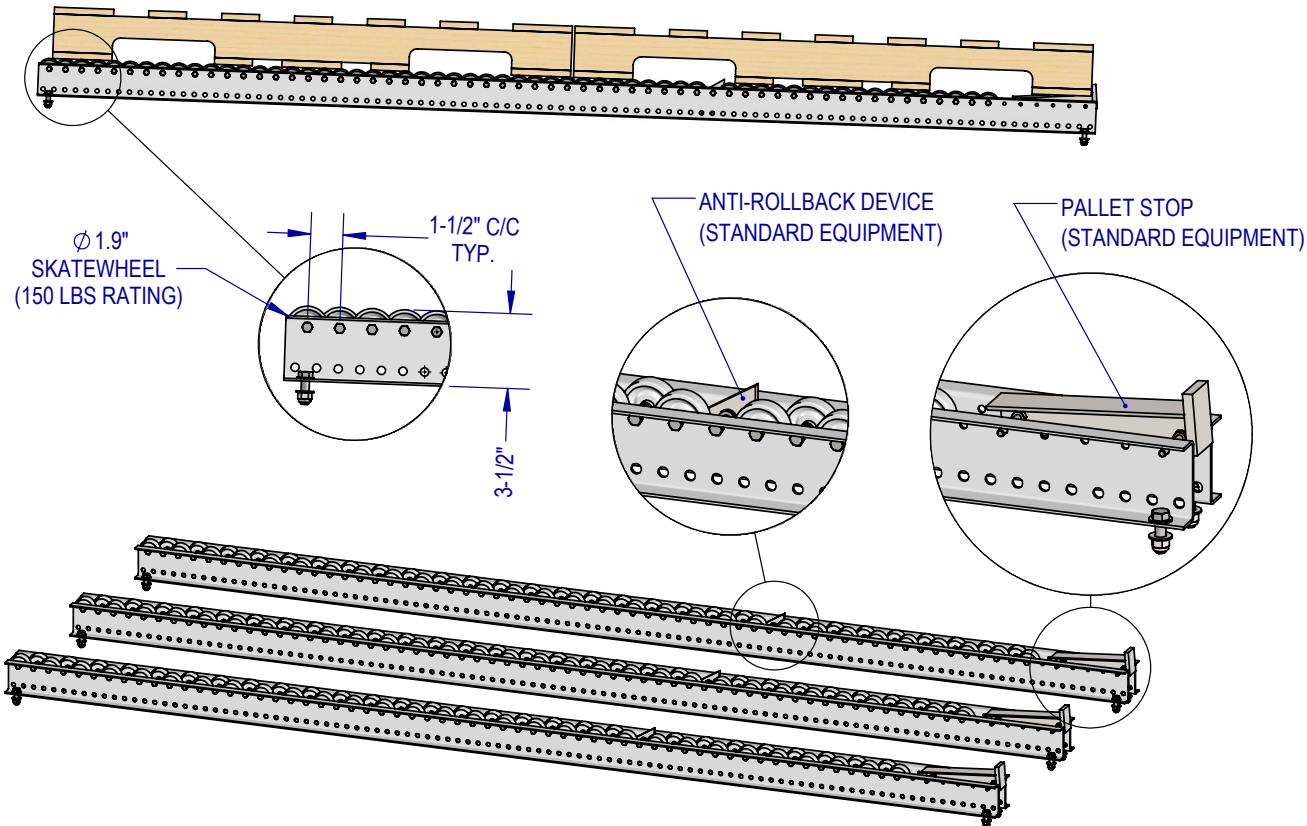


FEATURES AND BENEFITS:

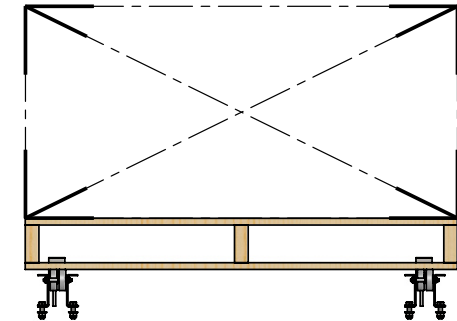
- DURABLE AND INEXPENSIVE SOLUTION FOR 2 OR 3 DEEP PICKING SYSTEMS.
- AN IMPRESSIVE OVERALL LOAD RATING OF 150 LBS.PER WHEEL.
- USUALLY USE TWO DOUBLE STAGGERED RUNS OF WHEELS ON 1.5" CENTERS - WORKS WELL WITH MOST STANDARD GMA/CHEP STYLE PALLET UP TO 2,500 POUNDS.
- THREE DOUBLE STAGGERED RUNS OF WHEELS 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

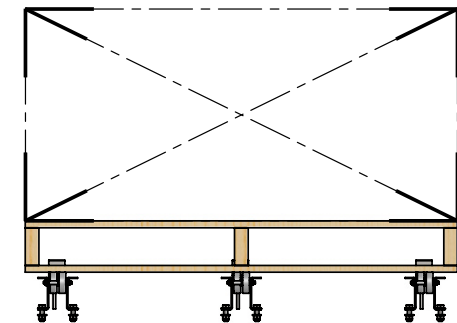
UNLOAD END



SKATEWHEEL PICKING SYSTEM



TYPICAL CONFIGURATION WITH TWO DOUBLE STAGGERED RUNS



CONFIGURATION WITH THREE DOUBLE STAGGERED RUNS - FOR HEAVIER PALLETS

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.

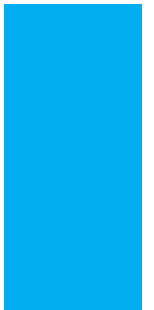
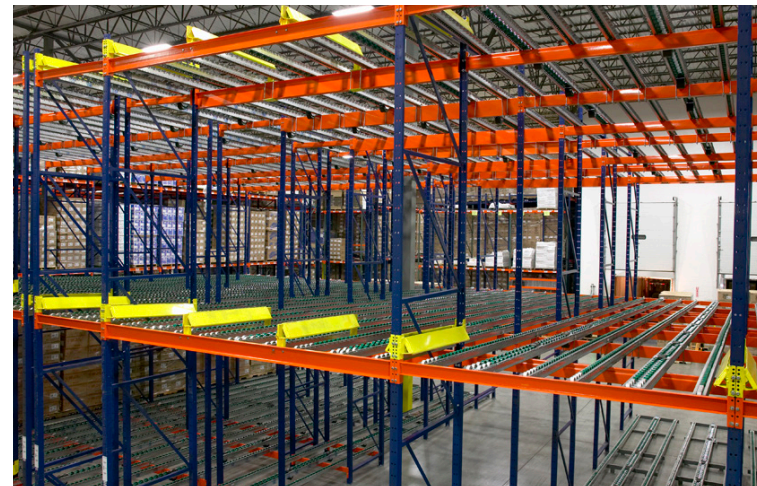
Beams in the rack should be installed so that the beam at the unload end is lower than the second beam which in turn is lower

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 on 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.

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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 regarding 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.