



Princeton PIGGYBACK[®]

EZ HITCH[™] Truck/Trailer Mounting Installation Instruction Manual

Princeton PIGGYBACK®

**EZ HITCH™ Truck/Trailer
Mounting Installation
Instruction Manual**

Manual Part No: 625-268
Rev. 8/2016

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IMPORTANT INFORMATION

The information provided in this manual are suggested basic guidelines for the installation of a EZ Hitch™ mounting system on a transport vehicle. Not all installation scenarios are covered in this manual. Princeton PIGGYBACK® offers free technical mounting advice for all applications. Our Technical Support Mounting Specialists can be reached anytime between 8am-5pm EST at 1-800-331-5851.

The information provided in this document herein supersedes any previous EZ Hitch™ mounting installation information.

If the transport vehicle is a 'Box Truck/Trailer', 'Soft Side' or 'Curtainside', refer immediately to sections 10 and 12, to see if you have the correct kit P/N and/or need additional information.

Most EZ Hitch™ mount installs require counter weight for the transport vehicle. In order to ensure the safe operation of the transport vehicle, unladen with a mounted PIGGYBACK®, a truck or trailer analysis sheet must be filled out. Truck or trailer analysis sheets can be obtained at the end of this document, our website at www.piggy-back.com or by contacting directly our Technical Support Mounting Specialists. Failure to properly counter weight a transport vehicle may result in poor traction, braking and/or vehicle instability.

In addition, truck/trailer weighing procedures can also be found at the end of this document.

Based on the transport vehicle frame structure, additional frame reinforcement might be necessary. Frame body reinforcement recommendations (if applicable) will be provided, at the time of a finalized truck or trailer analysis calculation(s).

The complete EZ Hitch™ mounting system must be installed to provide proper mounting and to retain full PIGGYBACK® warranty.

While installing the EZ Hitch™ mounting system, the truck/trailer brakes must be applied and wheels must be chocked so that no unwanted movement occurs.

All welding must be done by certified welder(s) with qualification in accordance with AWS D1.1.

Disconnect battery cables on the PIGGYBACK® forklift and the truck/trailer before welding or battery explosion may occur. It is also advisable to disconnect the ECU on PIGGYBACK® model forklifts with Tier 4 final engines.

Contact your local State Highway Patrol for information concerning local load limits, width limits, and other limitations.

The Princeton EZ Hitch Mounting System incorporates three safety features for proper transport of a PIGGYBACK® forklift. The frame hooks, safety chains and hitch pins. All three of these items must be in proper working order and free of damage for proper and safe transport of a PIGGYBACK® forklift.

LIMITED WARRANTY

PRINCETON PIGGYBACK® WARRANTS THAT FOR INITIAL USE THIS VEHICLE IS FREE FROM DEFECTS IN MATERIAL OR WORKMANSHIP. IF THIS VEHICLE IS DEFECTIVE UPON INITIAL USE, CONTACT YOUR AUTHORIZED PRINCETON DEALER FROM WHOM IT WAS PURCHASED AND THE VEHICLE WILL BE REPAIRED OR EXCHANGED FOR A NEW ONE. THIS WARRANTY EXCLUDES DEFECTS OR DAMAGE DUE TO MISUSE OR NEGLIGENCE.

THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS THAT VARY FROM STATE TO STATE. THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL PRINCETON PIGGYBACK® BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHETHER CONTRACT, TORT OR NEGLIGENCE. AS WITH ALL HEAVY MACHINERY, THE USE OF THIS VEHICLE IS POTENTIALLY DANGEROUS IF THE OPERATOR DOES NOT EXERCISE PROPER OPERATOR PROCEDURES PROVIDED FOR YOU IN THE OPERATOR MANUAL AND HAVE READ AND BEEN INSTRUCTED ON THE PROPER LOADING AND UNLOADING PROCEDURE FOR THE PRINCETON PIGGYBACK®.

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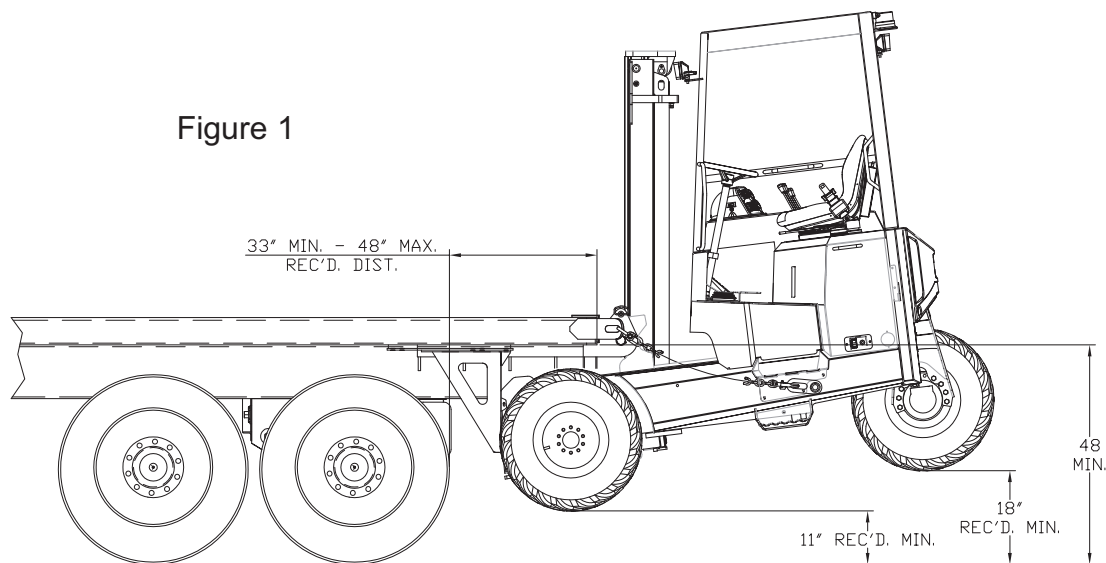
1

General Truck/Trailer Requirements

The illustrations below describe the factory-approved methods of mounting a Princeton PIGGYBACK® to a transport vehicle (Truck or Trailer).

This section covers the general setup information on the PIGGYBACK® and transport vehicle.

NOTE: This information is necessarily general and is based on similar applications. Contact Princeton and fill out a Mounting Application Form to assure your specific transport vehicle application meets the requirements for installation of a Princeton PIGGYBACK®.



Dimensions

Axle Location

Axles must be located as far to rear as possible while leaving clearance for the PIGGYBACK® front tires. As a requirement, minimum dimensions of 33" to maximum of 48" are acceptable. In some instances, special consideration can be given for some applicable forklift models.

Bed Height

The PIGGYBACK® must be installed as high as possible to avoid contact with the ground when driving onto steep inclines, ramps, etc. The minimum distance from the ground to the bottom of the truck or trailer crossmember is 48". The minimum recommended distance tire clearances, with an unladen/level transport vehicle, is 11" front & 18" rear to ground.

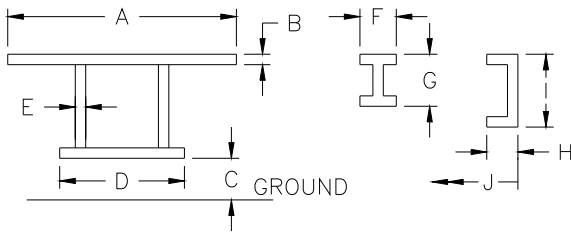
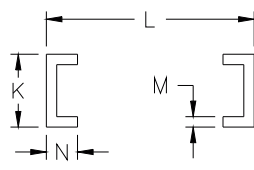
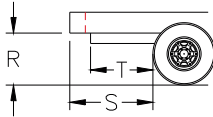


Dimensions (cont.)

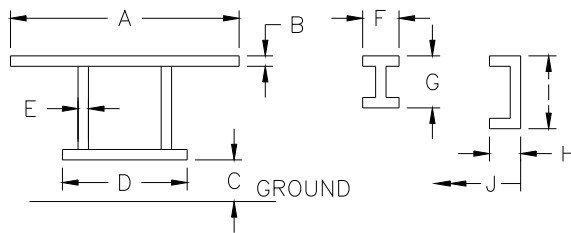
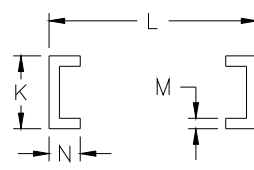
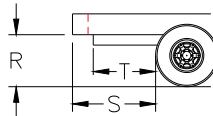
Frame Structure	Bed side and rear members-minimum C6 x 10.5 pounds per foot. Bed cross members-minimum C4 x 7.7 pounds per foot, 10-12" center to center.
Rear Sill	Truck/trailer rear sills must be of adequate strength for supporting the mounted PIGGYBACK [®] forklift. In some instances it may require removal of the OEM rear sill. A recommended rear sill replacement material is ASTM A500 Gr. B 6"x3"x3/8" wall rectangular tubing.
ICC Bumper	On trailers manufactured after 1-26-98, the ICC bumper may need to be replaced with a certified bumper, similar to Sun Underride PN M24416. Underride installation instructions can be found in Chapter 11 of this installation manual.
Electrical	On most trucks or trailers, tail light buckets will need to be relocated. Tail, clearance and identification lights should be mounted as high as possible to allow the PIGGYBACK [®] to be raised as close to the bed bottom as possible to meet minimum ground clearance requirements. Lights should be no wider than 54" (outside edge to outside edge), when mounted below rear sill. If lights are mounted on the rear sill, per FMSS 108, they must be located ' <i>as far apart as practical..</i> '. Always check to insure proper light operation before and after tail light relocation.
License Plate	The license plate bracket and light must be mounted such that they are clearly visible when the forklift unit is and is not on the transport vehicle.
Suspension	Air-ride suspension system is recommended.

Dimensions (cont.)

Truck/Trailer Bed and Chassis Specifications

<u>Bed Data</u>		<u>Chassis Data</u>		<u>Clearance Data</u>
				
A	92' min.-102" max.	J	20' min.	
B	5" min.	K	10" min.	
C	16" min.-22" max.	L	34" min.	
D	53" max.	M	3/8" min.	
E	3" min.	N	3" min.	
F	2" min.	R	48" min.	
G	4" min.-6" max.	S	33" min.	
H	2.25" min.	T	FLUSH AT REAR	
I	6" min.-8" max.			

Standard Dimensions For Trailer

<u>Bed Data</u>		<u>Chassis Data</u>		<u>Clearance Data</u>	
					
A	92' min.-102" max.	G	4" min.-6" max.	M	3/8" min.
B	6" min.-8" max.	H		N	4" min.
C	16" min.-22" max.	I		R	48" min.
D	53" max.	J		S	33" min.
E	3" min.	K	10" min.	T	FLUSH AT REAR
F	2" min.	L	38" min.-44" max.		

2

Installation Kit

A complete EZ Hitch™ mounting kit as described below is available from Princeton PIGGYBACK®.

P90.2360 EZ Hitch Mounting Kit w/Adjustable Tire Pads

Parts List

<u>Item</u>	<u>Description</u>	<u>Quantity</u>
P10.376C	Chain Loop	2
P80.07B	7-Pin Harness	1
P90.269B	Main Gusset	8
P90.292A	3x3 Gusset	6
P90.303B	Shaft Pin	2
P90.321A	Transverse Tubing	2
P90.1067C	Hanger Plate Weldment	2
P90.1069B	Bed Strengthener	2
P90.1074B	15" Gusset	6
P90.2352	Base Plate Weldment	2
M25716	Adj. Tire Pad Kit (LHS & RHS)	1
118-115	Snap Ring	4
402-105	Hitch Pin	2
604-125	Safety Sign, Pinch Point	4
604-127	Decal, PIGGYBACK® Transport	1
604-143	Safety Sign Warning	1
604-152	Safety Sign, Warning Mounting	1
625-268	EZ Hitch Mtg. Installation Instructions	1

Optional items that can be purchased seperately

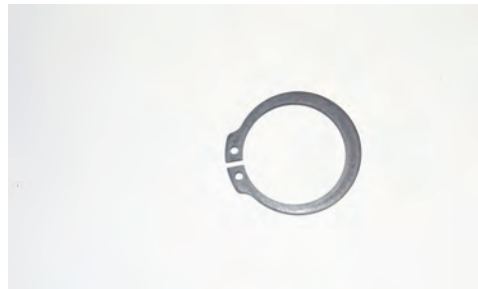
M24416	Underride Protection Asm.	1
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3

Major Component Photos



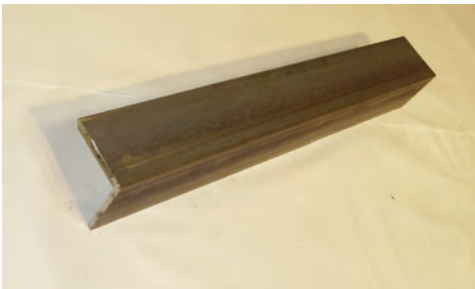
Shaft P/N P90.303B (2x)



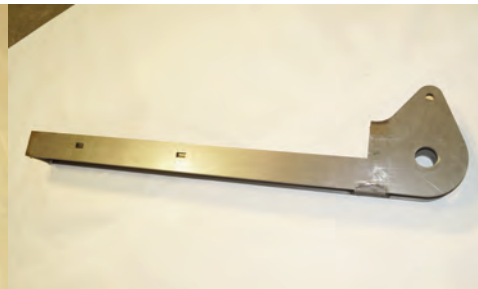
Retaining Ring, P/N 118-115 (4x)



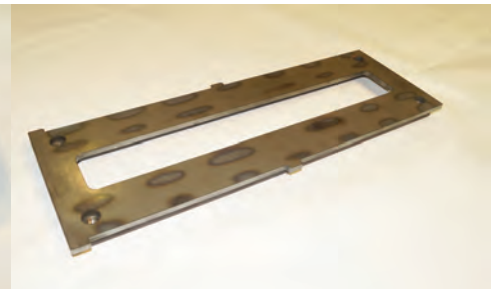
Hitch Pin w/Clip, P/N 402-105 (2x)



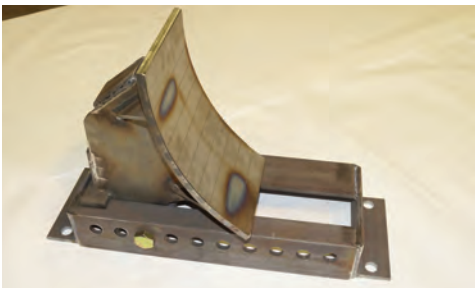
Bed Strengthener P/N P90.1069B (2x)



Hanger Widmt. P/N P90.1067C (2x)



Base Plate Widmt. P/N P90.2352 (2x)



Adj. Tire Pad Kit P/N M25716 (1x)
(LHS & RHS w/Mtg. Hardware)



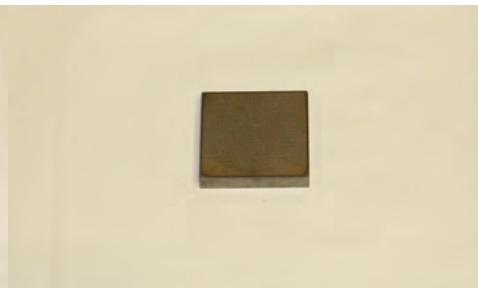
Transverse Tube P/N P90.321A (2x)



Main Gusset P/N P90.269B (8x)



15" Gusset P/N P90.1074B (6x)



3" x 3" Gusset P/N P90.292A (6x)



Chain Loop P/N P10.376C (2x)



7- Pin Harness P/N P80.07B (1x)



Misc. Decals

EZ Hitch
Manual
P/N 625-268

4 Fork Supports

EZ HITCH™

Only one method of fork supports is approved with the EZ Hitch™ mounting system. The transverse mount uses two 2" x 4" rectangular tubes parallel to the truck axle. This method can be used on PIGGYBACK® Delivery Systems with block or pallet forks.

Material Required	Quantity	Description	Part No.
	2	Steel Rectangular Tubing 2" x 4" x 1/4" wall x 48" long ASTM A-500, Gr. B	P90.321A

Transverse Tube Install

The 48" long tubing can be cut down to fit between the truck/trailer main rails, however, it must be long enough to support all of the forks. If the forks on the Princeton PIGGYBACK® are 36" or longer, space the tubes at a 30" centerline (Figure 2) with the bottom of the front tube level with the top of the rear tube. The distance between the bottom of the rear truck or trailer sill and the top of the rear transverse tube should be 3" min (Fork pocket opening). Make sure both tubes are square and parallel with one another and the frame body. Using 3/8" fillet welds, weld all around the tubing to the frame rails.

NOTE:

The bottom of (front transverse tube) must be in the same plane or lower than the top of (rear transverse tube). IF the bottom of **B** is higher than the top of **A**, the PIGGY BACK® will not have enough tilt to angle the front tires away from the tire pads when mounting and the PIGGYBACK's mounting hooks will NOT reach the mounting pins.

IF the PIGGYBACK's hooks will not reach the mounting pins, check the Tire Pad's location.

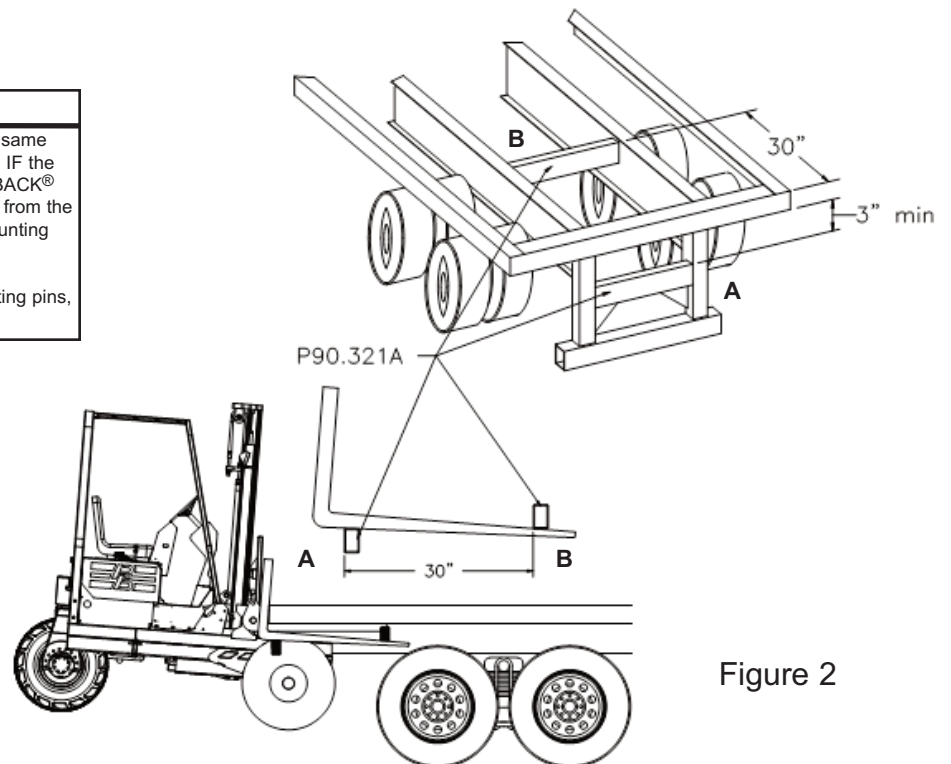


Figure 2

5 Main Installation

Transverse Tube Install (Cont.)

In special instances, where there is a conveyor or boom mechanism, that extends beyond the rear sill of a transport vehicle, a 'low fork tine setup' may be necessary. The minimum distance of the rear transverse tube, from the top surface to level ground should be set between 18" to 22". Check for any obstructions, before proceeding with final welding.

Hanger Plate Installation

Cut notches in c-channel at rear of bed as shown in Figure 3. Clean weld area.

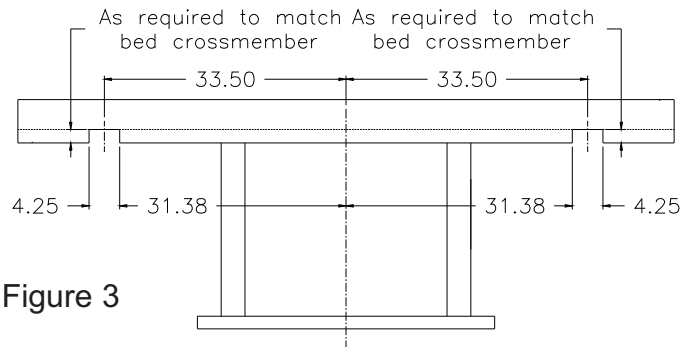


Figure 3

Measure centerlines of the truck or trailer bed crossmembers. Install P90.292A (1/2 " x 3" x 3") Plates in the P90.1067C Hanger Plate Weldments at each crossmember dimensional centerline as shown in Figure 4 and Figure 5. Tack weld in place.

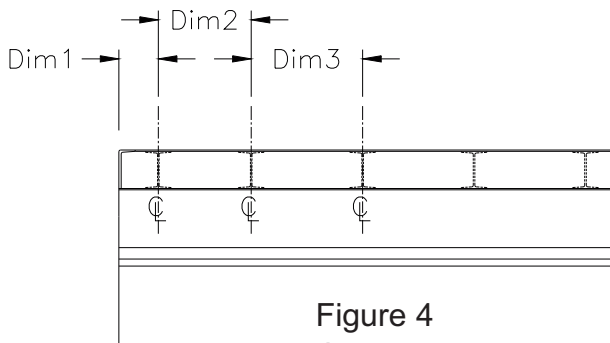


Figure 4

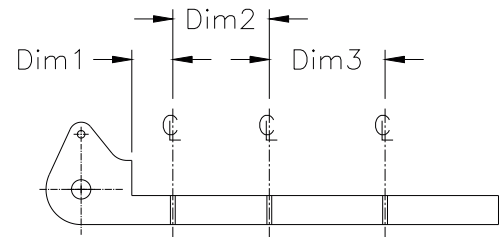


Figure 5

5

Main Installation (Cont.)

Hanger Plate Install

Install Hanger Plate Assemblies (P90.1067C with P90.292A Gussets) at 67" centerlines as shown in Figure 6 and Figure 7. Square the assemblies and clamp them in place.

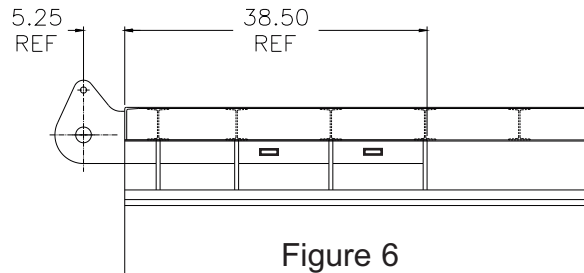


Figure 6

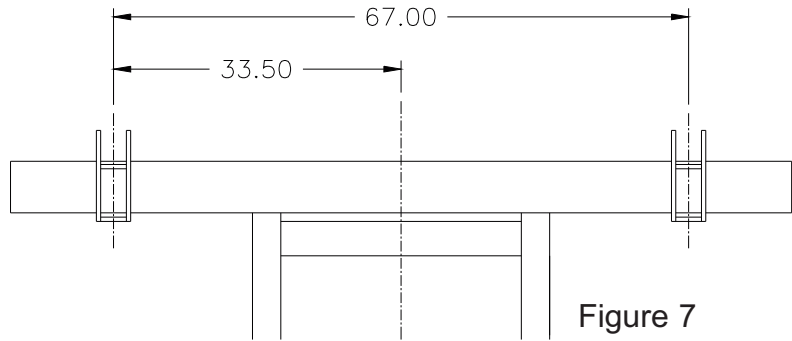


Figure 7

Install the gussets connecting the Hanger Plate Assemblies and the main c-channel as shown in Figure 8, and tack weld into place. If gussets are too long, trim to fit, from 6" end only. **Do not move Cradle Plate Assemblies.** Check to insure the Hanger Plate Assemblies are still square and at 67" centerline.

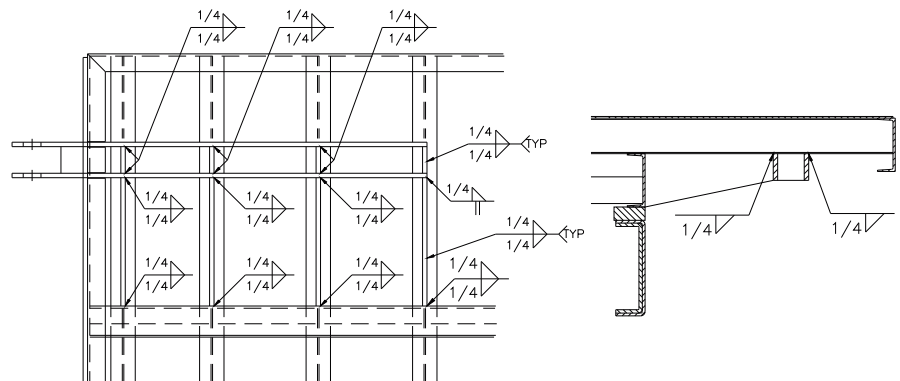


Figure 8

5 Main Installation (Cont.)

Hanger Plate Install (Cont.)

Weld Hanger Plate Assembly to the rear c-channel as shown.

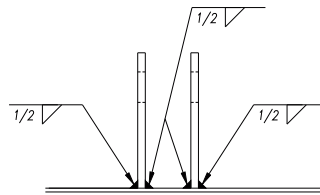


Figure 9

Prepare the Bed Strengtheners for installation as shown in Figure 10 (right shown, left opposite). Chamfer the notch to allow the Bed Strengtheners to fit over the Cradle Plate Assemblies. Also, chamfer the strengtheners to allow them to be welded together.

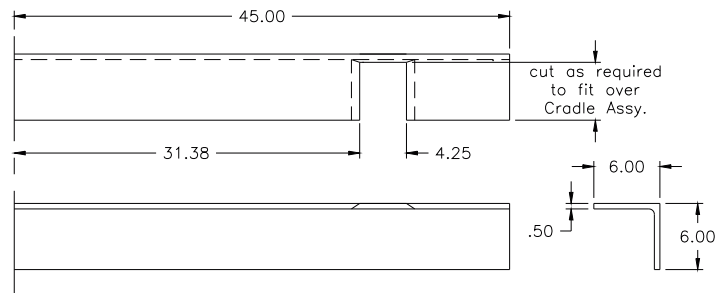


Figure 10

Locate Bed Strengthener, clean notches, and tack weld into place.

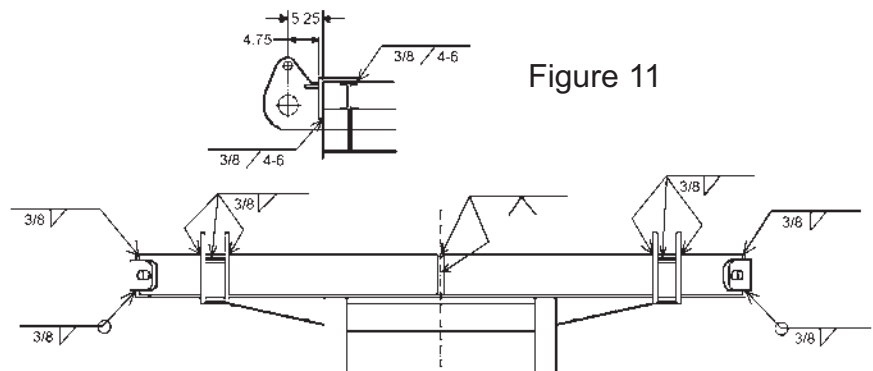


Figure 11

Complete finish welding as shown in Figure 9 and Figure 11.

Install Shafts (P90.303B) with Snap Rings (118-115) in each Hanger Plate Assembly. Install Hitch Pins (402-105).

6 Tire Pads

Tire Pads reduce the loading on the mast structure and bearings. There are two types of tire pad designs. The first design is the older 3-position vertical tire pads, which require removing 4x bolts to adjust position (*These tire pads are still available (P/N P90.971C & P90.976C), but must be purchased separately and used in conjunction with P90.1107B Base Plate Weldments only*). The second tire pad design is the newer curved tire pad, which can be adjusted in 1" increments with the removal of one bolt and lynch pin.

(These tire pads are currently offered in the P90.2360 EZ Hitch Kit only).

Base Plate Weldments and Gussets

Qty.	Description	P/N
2	Upper Base Plate (Curved Tire Pads Only)	P90.2352
1	Adj. Curved Tire Pad, Left	(M25716)
1	Adj. Curved Tire Pad, Right	(M25716)
8	Bolt, 3/4"-10 x 2" Long, Grade 8	8301210160
8	Lockwasher, 3/4"	8111200000
6	15" Gusset Plate	P90.1074B

Base Plate Weldments

Install the Upper Base Plate (P90.2352) by inserting the one inch tabs into the Hanger Plate Weldment slots. Clamp and tack weld the Base Plate in position. Tack weld a 15" Gusset Plate (P90.1074B) between the Hanger Plate and the bed frame side member. Support the front and rear edges of the Base Plate, by tack welding (2x) 15" Gusset Plates at each end of Base Plate (Figure 12). When setting 15" Gusset Plates front and rear, set the plates at an angle to Base Plate for increased strength. **Re-check dimensions, then complete finish welding per below.**

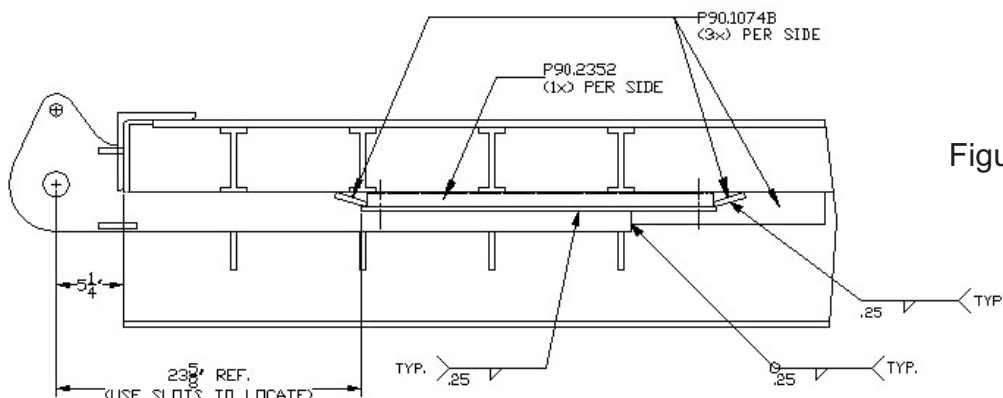


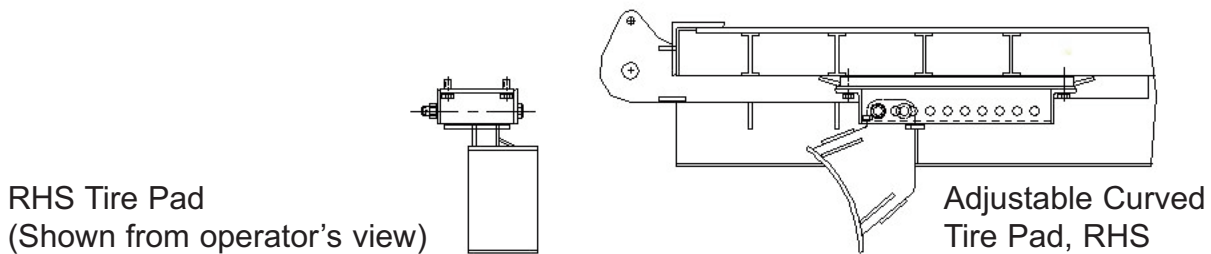
Figure 12

6 Tire Pads (Cont.)

Installation of Tire Pads

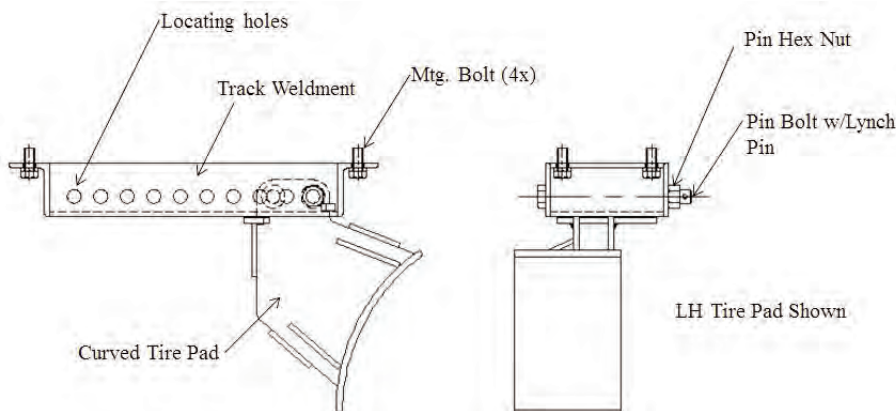
The Adjustable Curved Tire Pads are designed to install in the former base plate, P90.1107B (3-Position Vertical Tire Pad system) and the current P90.2352. The Tire Pads are adjustable in 1" increments, by removal of just one bolt and lynch pin. Mount each Tire Pad (LHS & RHS) with (4x) 3/4"-10 x 2" Lg. Grade 8 Bolts per side with lock washers. Apply medium thread locker, Loctite 243 or equal, to each thread and torque to 125 ft.-lbs.

Note: The Adjustable Curved Tire Pads are incompatible with US built PBs w/load arms. The entire load arm assembly must be removed.



Tire Pad Components

The Adjustable Curved Tire Pads comprises of two major components which consist of a Track Weldment and Curved Tire Pad. These components are assembled at fabrication and cannot be removed. The (4x) Mounting Bolts secure the Tire Pad to the Base Plate permanently. The Tire Pad is located and secured in place by a Pin Bolt, Hex Nut and Lynch Pin.



WARNING:
The entire Adjustable Curved Tire Pad Assembly must be supported during installation and/or removal of the 4x mounting bolts.

6

Tire Pads (Cont.)

Tire Pad Position Nomenclature

The Adjustable Curved Tire Pads can be positioned in 1" increments by utilizing two pin bosses in the Tire Pad and horizontal holes in the Track Weldment. The two pin bosses are noted from operator's view and labeled 'Rear' and 'Front' as shown in Figure 13. The horizontal holes in the Track Weldment are labeled from rear to forward 1 thru 9. The 1" pin bolts should always be secured with a hex nut and lynch pin.

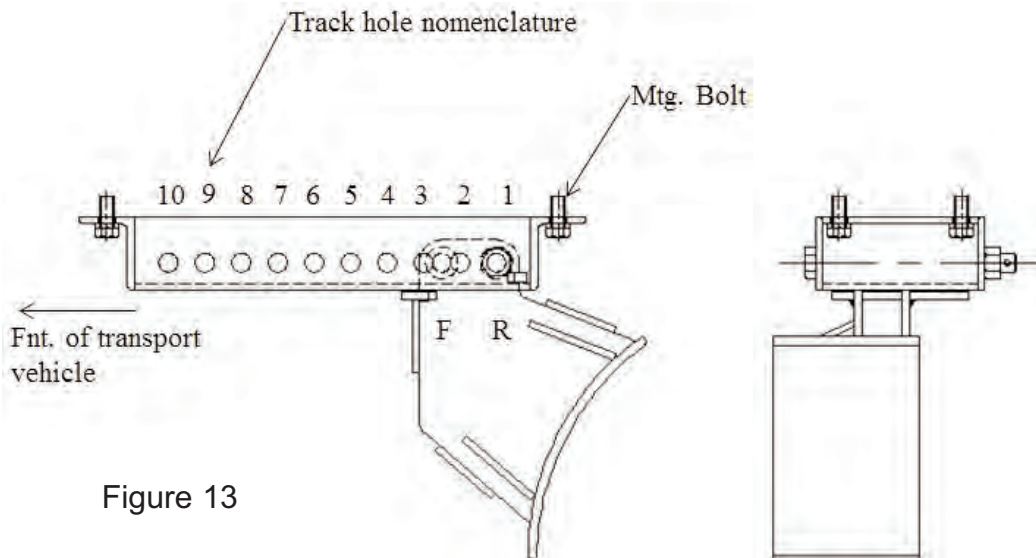


Figure 13

Tire Pad Position, Per Model

Use the chart below as a guide for known models and tire pad locations. Due to the adjustability of the Tire Pads, these locations can vary. Always ensure, when mounting a PIGGYBACK®, that the transport vehicle has its brakes set. Verify that you have at least 3/4" clearance between the curved tire pad edge and tire, with the mast fully tilted to the rear, prior to relaxing the unit. As always it's recommended to have at least 11" minimum ground clearance under front tires and 18" clearance in the rear, when the unit is fully relaxed on the EZ Hitch mount.

PB Models	Location
D45, PB50, PB55, PBX, PB55.3, PB55.3X	1R
PB70, PB80, PB70.3, PB80.3, PB55.4	5F

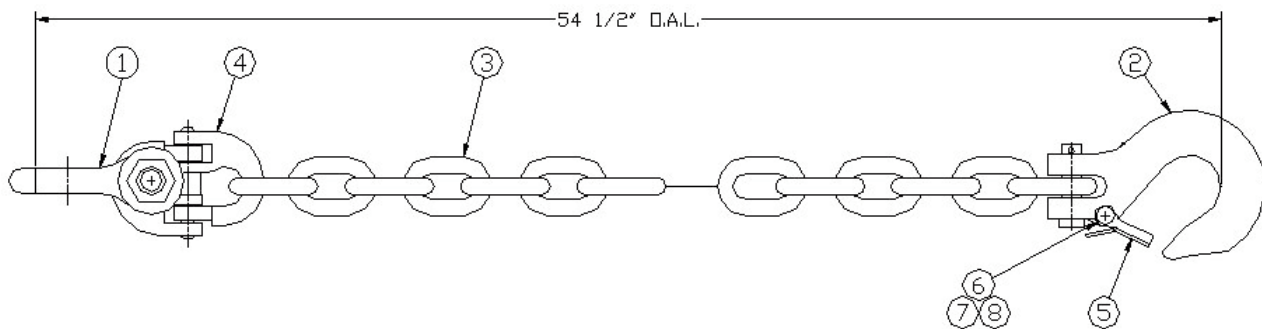
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Safety Chains

Safety chains are the secondary component of securing a PIGGYBACK® forklift to a transport vehicle. EZ Hitch™ Safety chains are design to be in the slack condition. There are two distinct style of safety chains, which are model specific.

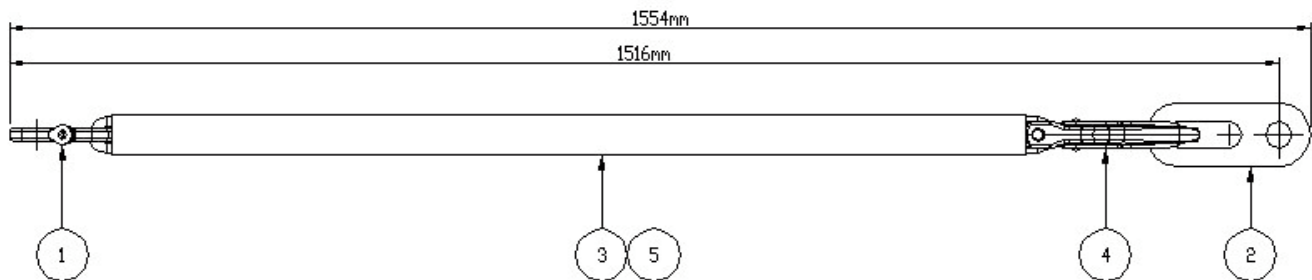
NOTE: Standard chains may NOT be substituted. Safety chains are no longer included in the EZ Hitch™ mounting kits (Must be purchased separately, through Princeton Parts Dept.).

Safety Chain, prior and incl. up to 2013 (P/N P90.291B)



- | | |
|---|--|
| 1.) 5/8" Shackle, P/N 606-117. | 2.) Slip Hook, P/N 606-107 or 606-115. |
| 3.) 3/8" Chain, P/N 606-108. | 4.) 3/8" Coupler Link, P/N 606-116. |
| 5.) Thumb Latch, P/N P90.904B. | 6.) Latch Spring, P/N 103-129. |
| 7.) 8-32UNC x 1-1/4" Lg. Pan Hd. Screw. | 8.) 8-32UNC Nyloc Hex Nut. |

Safety Chain, after 2013 (P/N 520.230.0009)



- | | |
|---|--|
| 1.) "D" Shackle, P/N 260369. | 2.) Chain Adapter Plate, P/N 520.230.0008. |
| 3.) 29 Link Safety Chain, P/N 520.230.0010. | 4.) Sling Hook, P/N 520.230.0016. |
| 5.) Protective Sleeve, N.P.N. | |

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Safety Chains (Cont.)

Safety Chain Selection

To select the proper Safety Chain for your PIGGYBACK® forklift, you must first identify the frame mounting point style (clevis or pin style) as shown below. The clevis style mounting point is designed to accept the 3/8" chain assembly, P/N P90.291B. The pin style is designed to accept the latest 1/2" chain with adapter plate, P/N 520.230.0009.



Clevis Style Mounting Point



Pin Style Mounting Point

Either style chain assembly is designed to be stowed either on the transport vehicle or on the PIGGYBACK®. New forklifts have a stow bracket located either on the side panels or affixed to the corner of the Overhead Guard.



Chains stowed on transport vehicle
(P/N P90.291B)



Chains stowed on fork lift.
(P/N 520.230.0009)

8

Truck/Trailer 7-Pin Wiring Kit

Material Required	<u>Quantity</u>	<u>Description</u>	<u>Part No.</u>
	1	7-Pin Receptacle Kit	P80.07B

Installation

For placement of the 7-pin receptacle, mount the PIGGYBACK® to the transport vehicle. The PIGGYBACK® receptacle is located on the left side, so locate the receptacle on the left side of the truck/trailer. The coil plug provided with the PIGGYBACK® is approximately 12 ft. long at full extension for mounting location flexibility.

With the unit mounted, insert end of the coil plug into the PIGGYBACK®.

Stretch the cable to the truck/trailer to determine a convenient and protected location for the truck/trailer receptacle (Fwd. of the Tire Pad pinch points is preferable).

With the receptacle location determined, layout the mounting holes, and drill or torch out a 2" diameter through hole for the receptacle body. Use the bracket supplied in the P80.07B wiring kit as a guide.

Feed the receptacle harness through the hole and mark the location of the mounting holes. Drill 2 holes, 3/16" diameter for self-tapping mounting screws. Secure the receptacle to the truck/trailer with the screws.

Wiring - Trailer

With the seven tap-in connectors provided, splice into the trailer wiring. In the package, there will be six blue and one yellow wire taps. The yellow tap is for the white wire or ground.

All wiring is required to be color coded to S.A.E. Standards. Use Table 1 to locate the proper wire for trailers that have separate turn lamps & stop lamps.

If you have taken the unit off the trailer, reload to check electrical installation. Install coil plug from your trailer to the receptacle on the left side of the forklift. The plug can go in only one way to ensure proper alignment of wires.

Wiring - Truck

With the seven tap-in connectors provided, splice into the truck wiring. In the package, there will be six blue and one yellow wire taps. The yellow tap is for the white wire or the ground. All wiring is required to be color coded to S.A.E. Standards. Use Table 2 to locate the proper wire for trucks which have combined turn lamps & stop lamps.

To use both lights on each side of the PIGGYBACK®, cut the red wires to the outside lamps and at the connector. On the left pair, install a jumper wire to connect to the yellow wire on the inside lamp to the red wire on the outside lamp. On the right pair, install a jumper wire to connect to the green wire on the inside lamp to the red wire on the outside lamp.

8

Truck/Trailer 7-Pin Wiring Kit (cont.)

If you have taken the unit off the truck/trailer, reload to check electrical installation. Install coil plug from your truck/trailer to the receptacle on the left side of the forklift. The plug can go in only one way to insure proper alignment of the wires as shown in Figure 15 below.

Table 1 - Wiring Circuits - Trailer with Separate Stop and Turn Lamps

<u>Conductor</u>	<u>Wire Color</u>	<u>Lamp and Signal Circuits</u>
Wht	White	Ground return to towing vehicle
Blk	Black	Clearance, side marker, and identification lamps
Yel	Yellow	Left-hand turn signal and hazard signal
Red	Red	Stop lamps and anti wheel lock devices
Grn	Green	Right-hand turn signal and hazard signal
Brn	Brown	Tail and license plate lamps
Blu	Blue	Back-up lamps

Table 2 - Wiring Circuits - Truck with Single Stop and Turn Lamps

<u>Conductor</u>	<u>Wire Color</u>	<u>Lamp and Signal Circuits</u>
Wht	White	Ground return to towing vehicle
Blk	Black	Clearance, side marker, and identification lamps
Yel	Yellow	Left-hand turn signal, hazard signal, and stop lamp.
Red	-	Not Used.
Grn	Green	Right-hand turn signal, hazard signal, and stop lamp.
Brn	Brown	Tail and license plate lamps
Blu	Blue	Back-up lamps

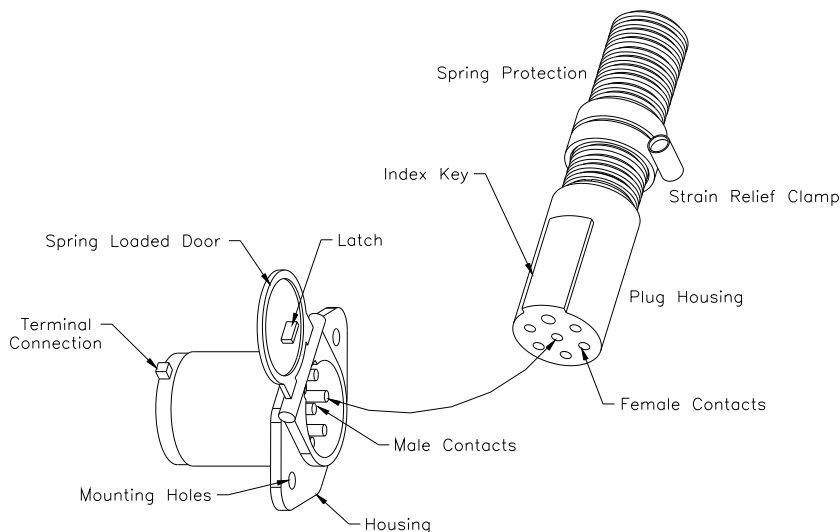
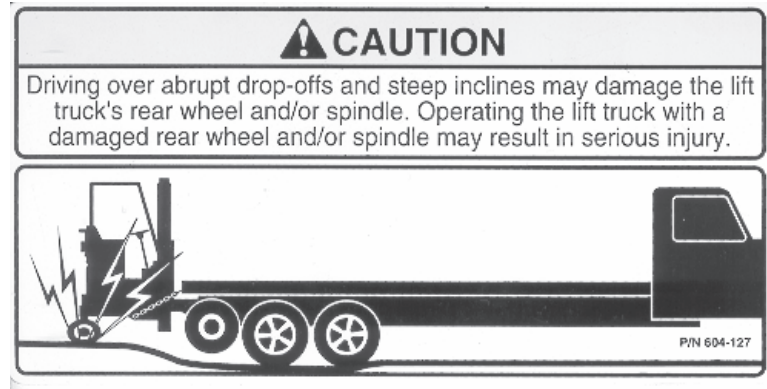


Figure 15

9

Safety Signs

Install safety sign 604-127 (shown below) on the truck dashboard or other prominent area inside the cab.



Install safety signs 604-143 and 604-152 (shown below) at the rear of the transport vehicle (Rear Sill).



Install safety signs 604-125 (shown below) on the Cradle Plates & Tire Pads of the transport vehicle.

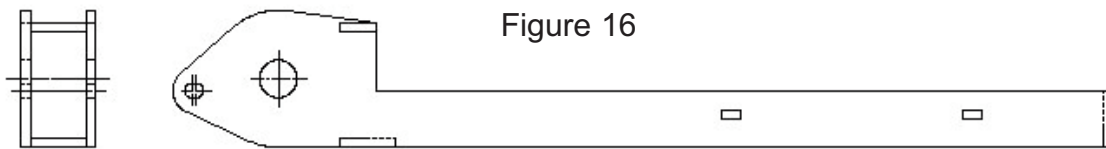


10

Dump Bed Style EZ Hitch™

Some transport vehicles have a bed that elevates at an angle hydraulically to unload cargo. This type of bed is called a Dump Bed and requires a different style of Hanger Plate Weldment. There is a Dump Bed EZ Hitch™ mounting kit available, P/N P90.2362.

The kit consists of all the same componentry as the standard EZ Hitch™, but P/N P90.1067C is replaced with P90.424D. As shown below in Figure 16, the difference is the location hole for the hitch pin. It is relocated from the top to the rear of the 2" pin hole. This is to allow the cargo to slide past the Hanger Plate Weldment Arms unimpeded.



Important Dump Bed Installation Notes

1. Because of the flexibility of the Adj. Curved Tire Pads, there may be more than one location, that will work with a particular forklift model.
2. The bed of the transport vehicle is required to be tied down, while transporting the PIGGYBACK® forklift. Tie-downs are not part of any mounting kit, however they may be purchased through our Parts Department. Tie-down P/N is 629-109 and two per transport vehicle are required.
3. If the bed frame is of a c-channel construction, it will require additional welded 1" thick stiffening plates, on the inside of each bed frame rail. Measure the distance from the bed frame pivot point to the rear of the bed frame rail. The stiffening plates should extend that same distance forward of the pivot point.
4. An additional ramp of flat stock may be necessary on the leading edge of the 6" x 6" Angle Bed Stiffener, to facilitate dumping without catching load on the front lip.

10

Dump Bed Style EZ Hitch™ (Cont.)

P90.2362 EZ Hitch Dump Bed Mounting Kit w/Adjustable Tire Pads

Parts List

<u>Item</u>	<u>Description</u>	<u>Quantity</u>
P10.376C	Chain Loop	2
P80.07B	7-Pin Harness	1
P90.269B	Main Gusset	8
P90.292A	3x3 Gusset	6
P90.303B	Shaft Pin	2
P90.321A	Transverse Tubing	2
P90.424D	Dump Bed Hanger Plate Weldment	2
P90.1069B	Bed Strengthenener	2
P90.1074B	15" Gusset	6
P90.2352	Base Plate Weldment	2
M25716	Adj. Tire Pad Kit (LHS & RHS)	1
118-115	Snap Ring	4
402-105	Hitch Pin	2
604-125	Safety Sign, Pinch Point	4
604-127	Decal, PIGGYBACK® Transport	1
604-143	Safety Sign Warning	1
604-152	Safety Sign, Warning Mounting	1
625-268	EZ Hitch Mtg. Installation Instructions	1

Optional items that can be purchased seperately

M24416	Underride Protection Asm.	1
629-109	Dump Bed Tie-Down	2



Dump Bed style EZ Hitch™ Mount, P/N P90.2362

11

Underride M22416

FMVSS 223 & 224 (Requirements)

Per Federal Motor Vehicle Safety Standards, FMVSS 223 & 224, all trailers and semi-trailers manufactured after January 26th, 1998, with a GVWR of 4,536 Kg (10,000 lbs.), must be equipped with a underride bumper.

'The standard does not apply to pole trailers, pulpwood trailers, road construction controlled horizontal discharge trailers, special purpose vehicles, wheels back vehicles, or temporary living quarters as defined in 49 CFR 529.2. If a cargo tank motor vehicle, as defined in 49 CFR 171.8 is certified to carry hazardous materials and has a rear bumper or rear end protection device conforming with 49 CFR part 178 located in the area of the horizontal member of the rear underride guard required by this standard, the guard need not comply with the energy absorption requirement (S5.2.2) of 49 CFR 571.223.'

This includes trailers that carry truck-mounted forklifts, while the forklift is not installed. The trailer manufacturer is responsible for their bumper until it is altered to accommodate a truck-mounted forklift. Since the original width of the bumpers do not allow for the transport of a forklift, the underride bumper will need to be altered/replaced. The installer of the forklift mounting kit is responsible for replacing the original underride bumper protection with one carrying dimension/certification that will allow for the forklift to be transported.

Princeton Piggyback, a product of Hiab US, offers a certified replacement bumper kit, M24416. This is a direct replacement for the previous supplied 628-258.

Note: The underride bumper kit is sold separately and not included in any mounting kit.

For a complete standard listing and definition of terms, please refer to the website, <http://www.ecfr.gov/>.

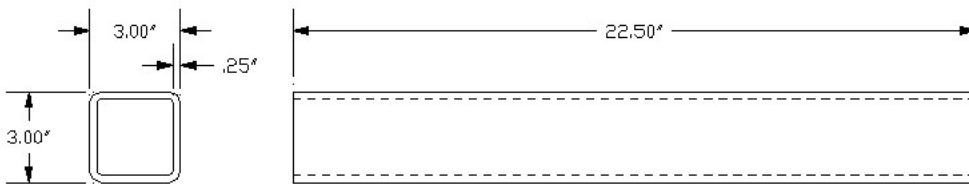
The installation instructions in this manual are to assist in the proper installation of the replacement underride bumper. Qualified Princeton Piggyback personnel are available to answer any questions concerning the installation or clarification of this bumper kit at 1-800-331-5851.

11

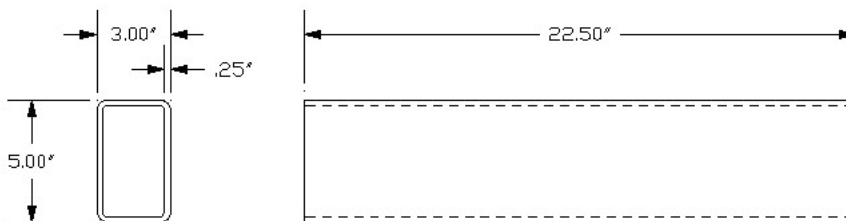
Underride M22416 (Cont.)

Underride Installation

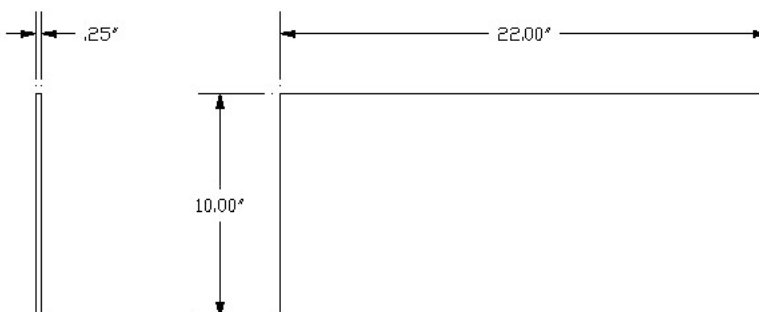
- 1.) With the trailer unloaded, on a flat level surface, tires and air suspension properly inflated, note the location of the existing underride bumper (distance from bottom surface to ground and offset from rear sill). See figure 17 on next page.
- 2.) Completely remove existing underride bumper from rear of trailer. Any lighting, bracketry, etc., that is present on the existing underride must also be removed and relocated. See figure 18 on next page.
- 3.) Prep. existing areas for welding of new underride bumper.
- 4.) Install EZ Hitch™ or applicable mounting kit, per provided instructions in this manual.



Item 2: M23193-3



Item 3: M24463



Item 4: M23874-10

11

Underride M22416 (Cont.)

Underride Installation

5.) If necessary, using the existing underride bumper location dimension, cut both Rear Upright Tubes (M23193-3), so the bottom surface of the new underride bumper (main tube) is at the former location, but no higher than noted below in figure 19. Keep in mind, the higher the bumper the better the chance of interference with trailer/mounting components, when it's in the stowed position.

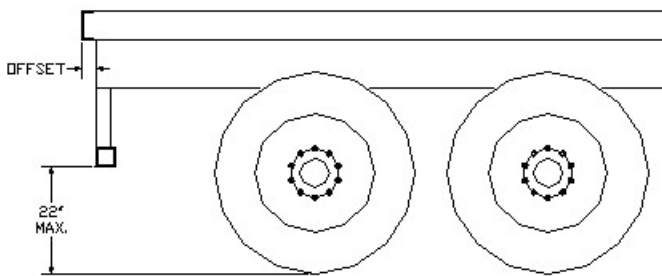


Figure 17

Figure 18

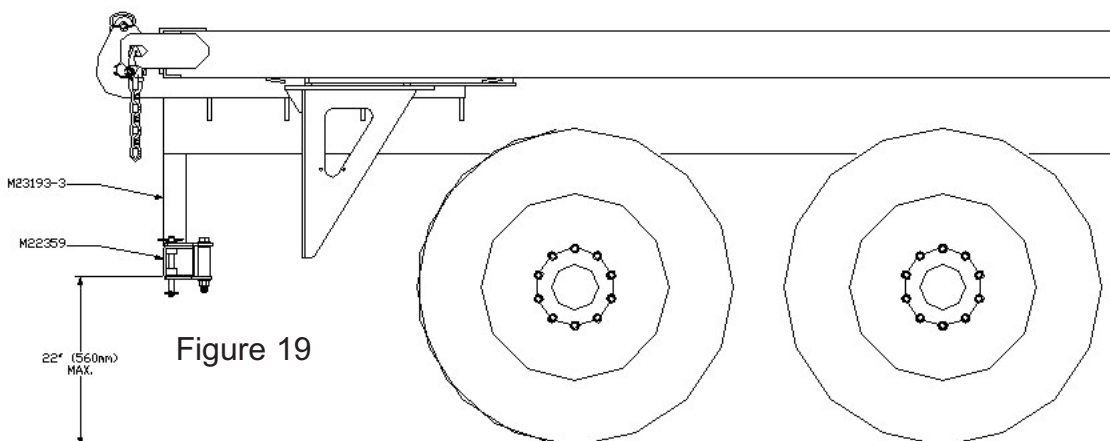
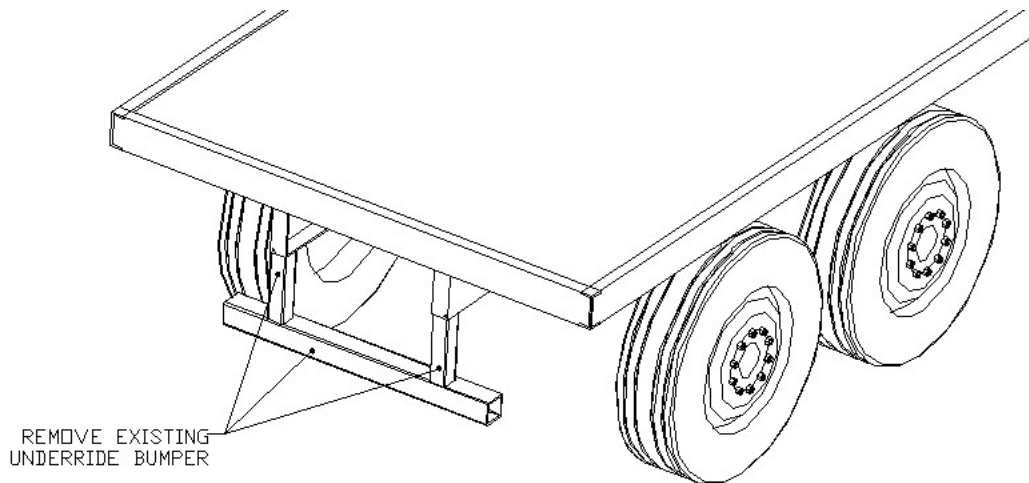


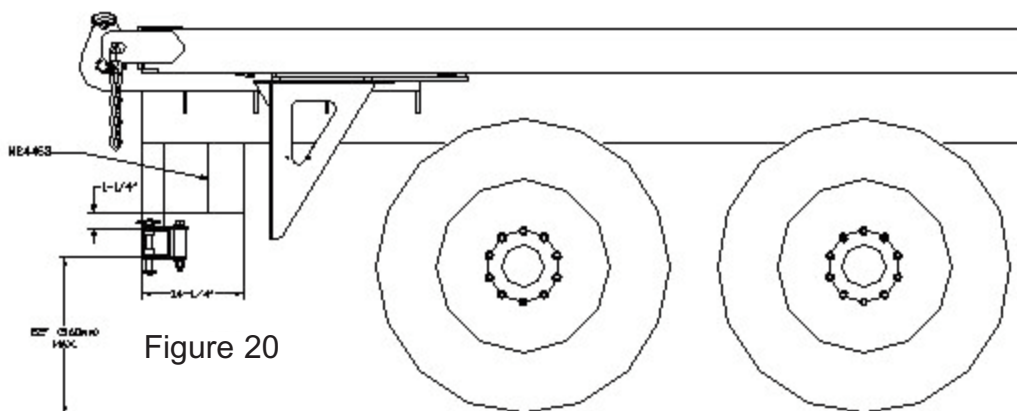
Figure 19

11

Underride M22416 (Cont.)

Underride Installation

- 6.) Cut the Front Upright Tubes (M22463), so that their overall length is 1-1/4" shorter than the Rear Upright Tubes.
- 7.) Prep. Front & Rear Upright Tube (M23193-3 & M22463) ends by grinding a minimum 1/8" to 3/16" chamfer all around top and bottom edges.
- 8.) Locate and tack in place both Rear Upright Tubes (M23193-3), to bottom of trailer frame, flush with the rear of the frame rail and the inside bottom rail flange.
- 9.) Center and located the Foldable Bumper Assembly (M22359), on the longitudinal axis of the trailer and flush with the back surface of the Rear Upright Tubes. Check for interference, when bumper ends are in the stowed position.
- 10.) Tack Foldable Bumper Assembly to bottom of Rear Upright Tubes.
- 11.) Locate and tack in place both Front Upright Tubes (M22463). See figure 20.
- 12.) Cut and locate Joining Plates (M23874-10), so that the rear edge is 1/4" offset towards the rear axle(s) and flush with the bottom surface of the trailer frame rails. Tack plates in place. See figure 21 on next page.



11

Underride M22416 (Cont.)

Underride Installation

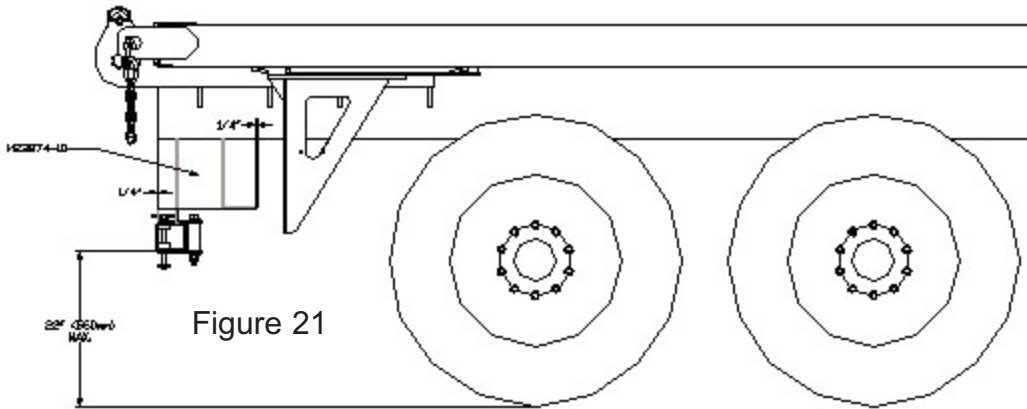


Figure 21

- 13.) After ensuring the Foldable Underride Bumper doesn't interfere with any mounting or trailer components in the stowed position, weld kit components, per ANSI/AWS D1.1. See figure 22 below.
- 14.) Re-install/relocate any items removed from steps 2.
- 15.) Paint newly installed underride bumper components to match customer specification.

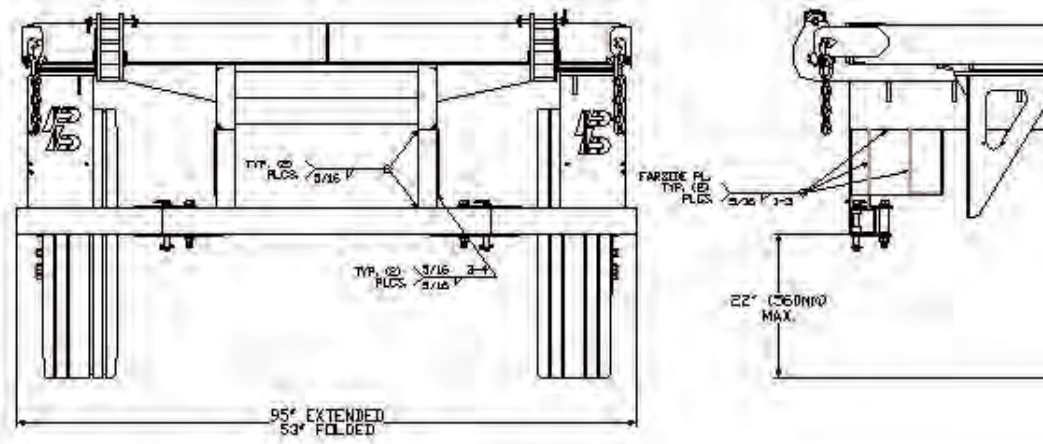


Figure 22

12

Special Mounting

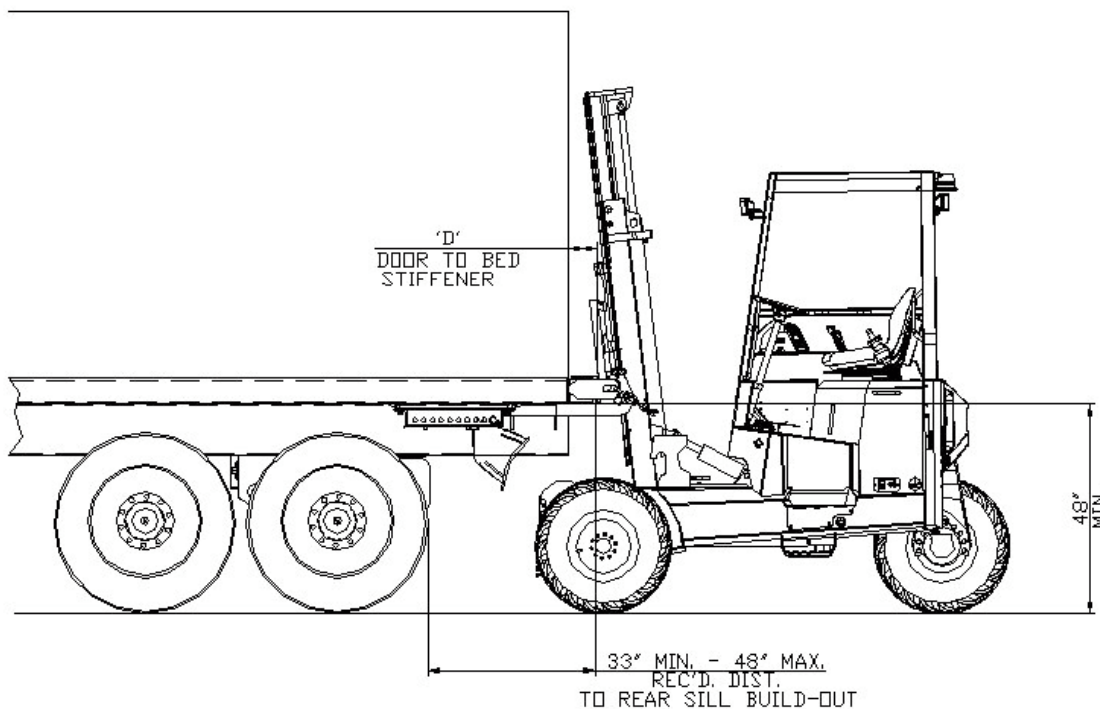
Box Truck/Trailer, Softside or Curtainside

Special consideration must be given to transport vehicles that have enclosures built around the beds of truck or trailers. These types of enclosures are called 'Box Truck/Trailers', 'Soft Sides' or 'Curtainsides'. Items such as the rear door, lock rods and rear door hardware, can cause interference with the PIGGYBACK®, during the mounting process. The rear sill and possibly the frame of the transport vehicle must be built out to allow for mast clearance.

The rear sill build-out can be accomplished using structural tubing, ASTM A500 Gr. B, welded to existing rear sill. Strengthen surrounding structure as needed with frame extensions and gussets.

The dimensions below are intended as a guideline, which can also vary based on forklift model, mast forward tilt and mast height.

<u>Mast Ht.</u>	<u>Req'd. Minimum Clr. 'D' Dimension</u>
86"	4"
120"	6"
138"	7"
144"	7"
154"	8"
165"	8"



12

Special Mounting (Cont.)

Box Truck/Trailer, Softside or Curtainside



Picture to the left shows a 'Box Trailer' with rear sill build-out and 'Dump Bed' style Hanger Plate Weldments, P90.424D.

Composite Trailer

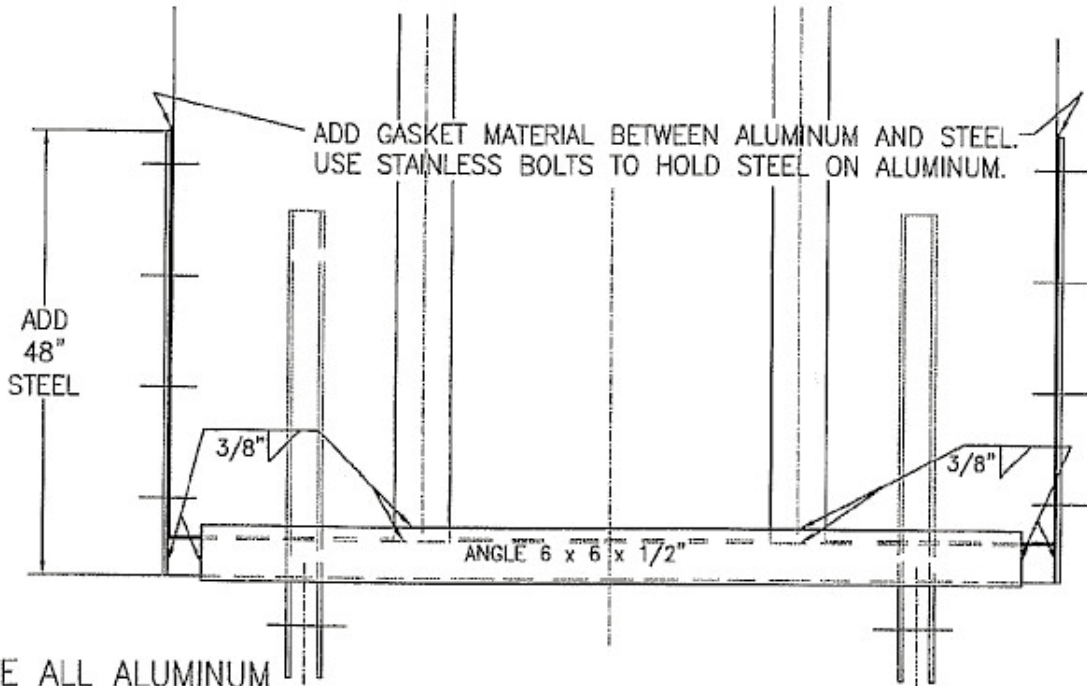
Another special consideration, that needs to be addressed is a Composite Trailer. Composite Trailers have an aluminum bed, but steel frame work. Aluminum's material properties are different from steel, in that it sacrifices strength for weight. Because of the difference in strength, the aluminum rear sill must be replaced and supported by welded/bolted connections. In addition, due to the chemical reaction between steel and aluminum, a gasket material must be employed between these two metals.

The instructions on the following page are to be used as a guideline. It's up to the installer to ensure that the bolted connections are adequate to handle the loads induced by the mounted PIGGYBACK® forklift.

12

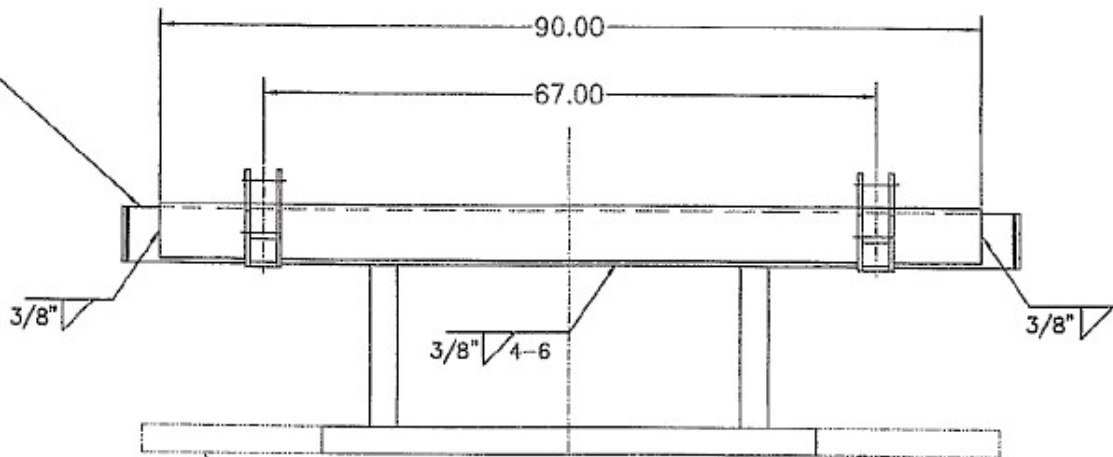
Special Mounting (Cont.)

Composite Trailer Special Instructions



REMOVE ALL ALUMINUM
FROM END OF BED.

REPLACE WITH TUBE 6 x 4 x 3/8" WALL.

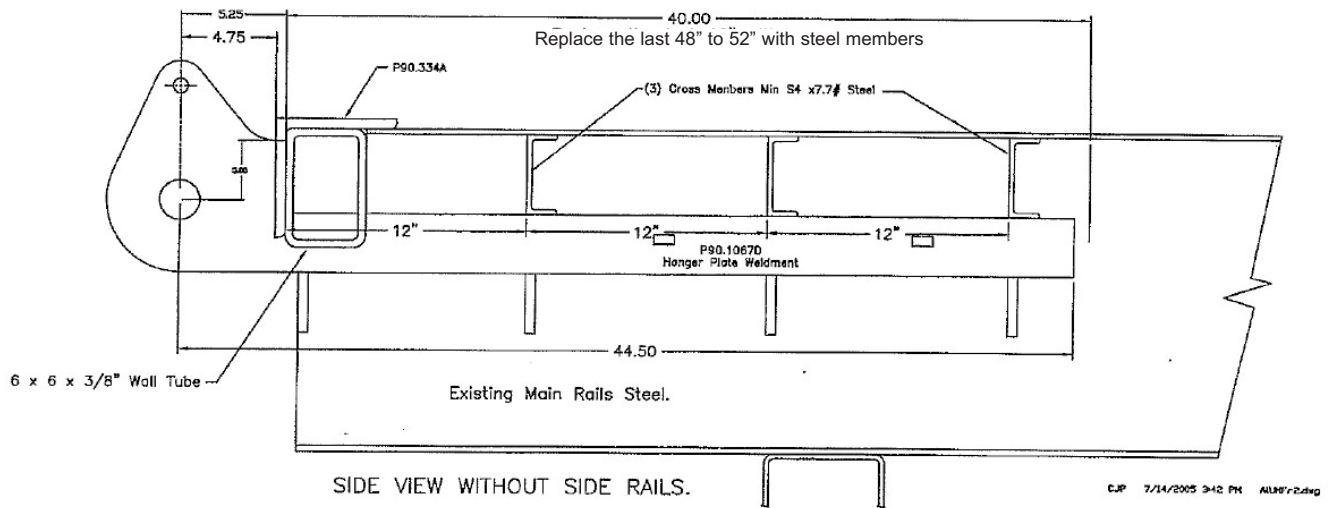
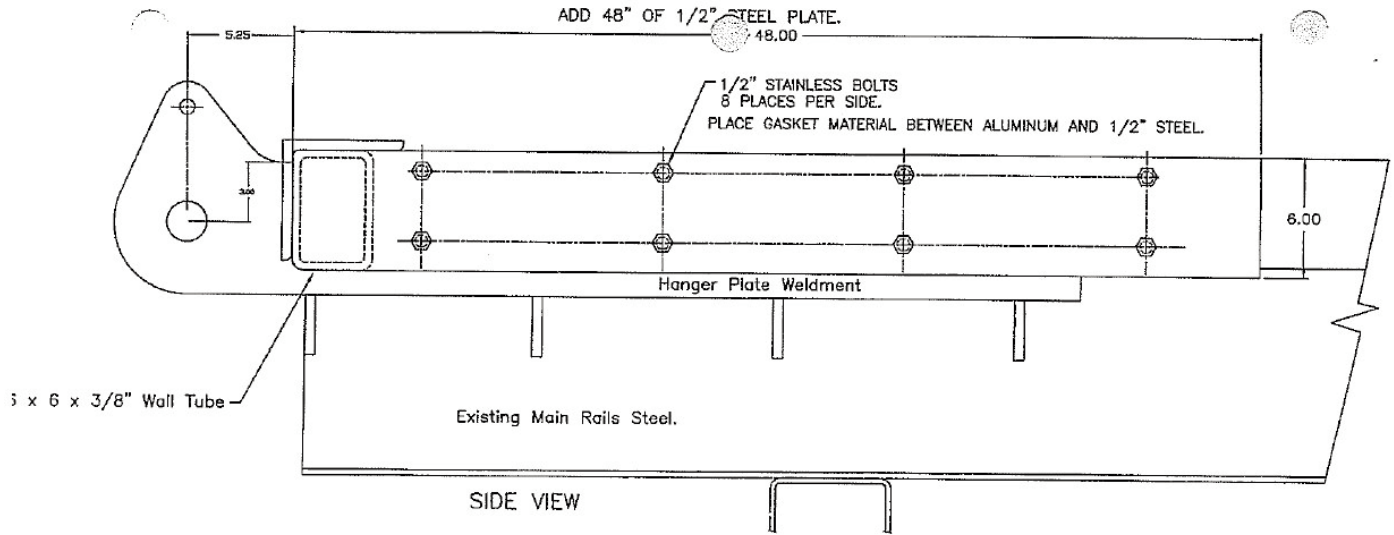


Underride Protection,
P/N M24416

12

Special Mounting (Cont.)

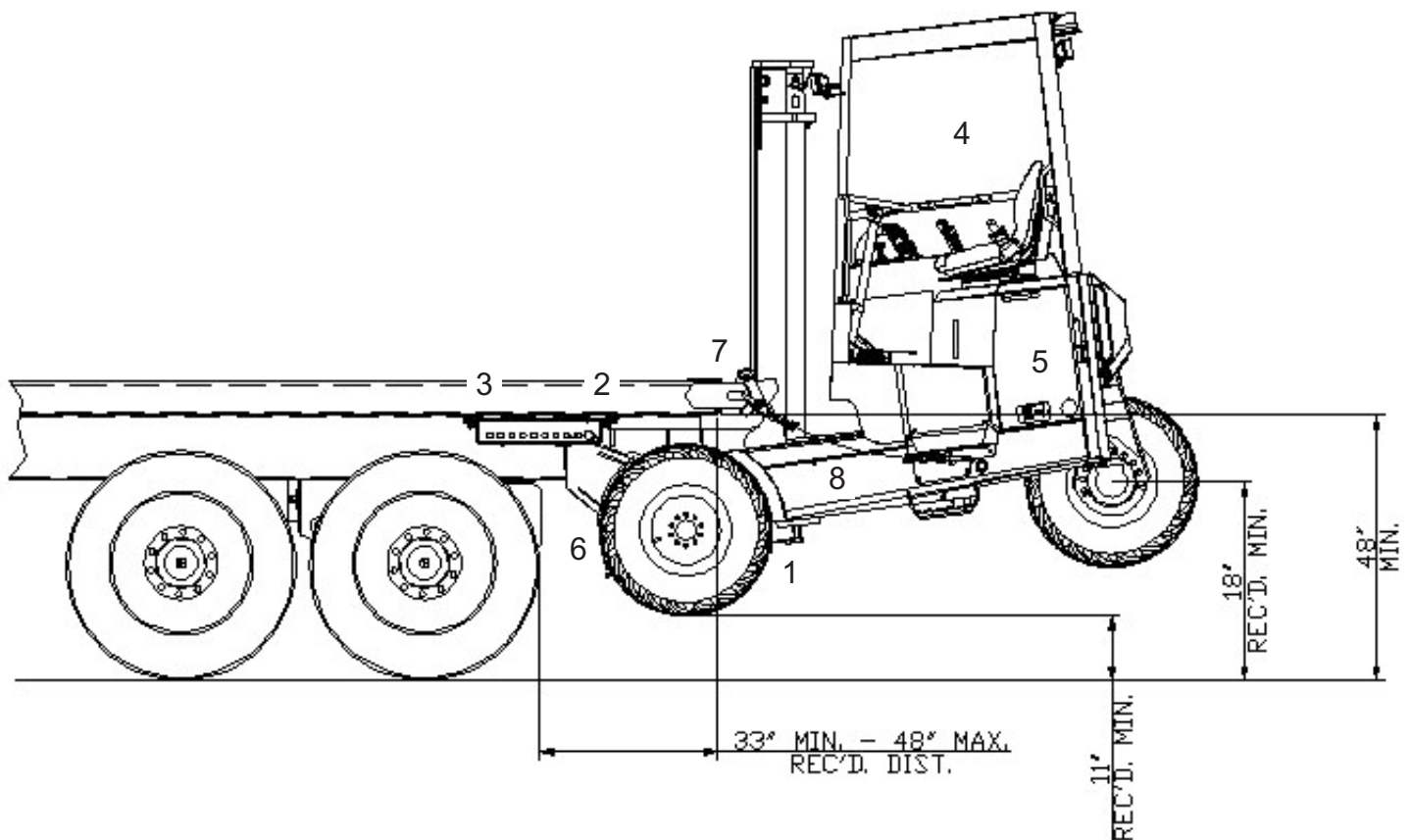
Composite Trailer Special Instructions



13

Mount Installation Check

- 1.) Check that the front tire pressures are correct, per the rating on the tire sidewall.
- 2.) Position both tire pads, per the particular forklift model. Check that the Pin Bolt Nuts are tight and that the Lynch Pins are in their locked position.
- 3.) Check that the 4x mounting bolts on both Track Weldments are torqued properly.
- 4.) Mount the forklift on the transport vehicle.
- 5.) Depress the Lower-N-Go button on the left rear side of the forklift. (Earlier models you'll need to install the 7-Pin Harness and activate the right turn signal in the transport vehicle).
- 6.) Check that there is approximately 3/4-1" of tire compression.
- 7.) Ensure that both Hitch Pins can be freely (With the forklift relaxed and front tires resting against tire pads) inserted and removed. Check that both Lynch Pins on the Hitch Pins are in their locked position.
- 8.) Check that both Sling Hooks can be installed and removed easily in the Chain Loops or to the frame. When the Sling Hooks are installed, the safety chains should be slack.
- 9.) Check that both ends of the 7-Pin connector can be installed and removed easily.



14

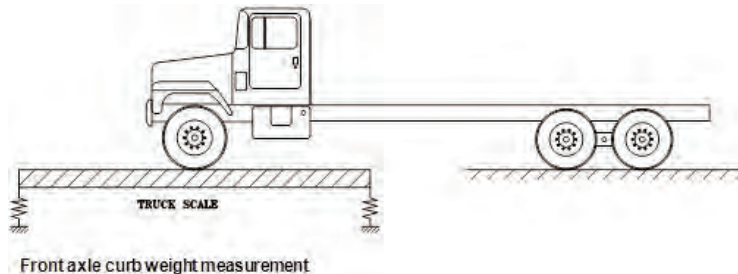
Truck/Trailer Weighing Procedures

Important Weight Distribution Information

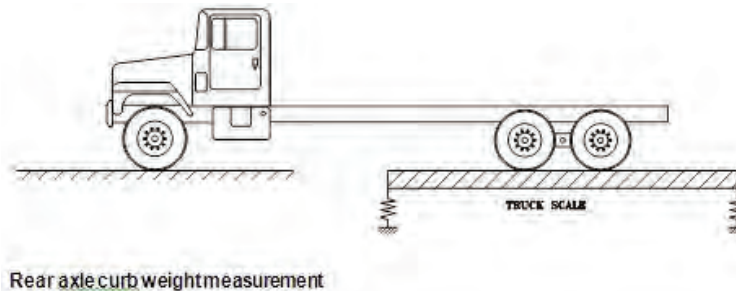
Princeton PIGGYBACK® can assist with the calculation of allowable payloads, and prediction of the weight distribution resulting from the installation of the Princeton forklift. One of the most important pieces of information required for the completion of an accurate weight distribution is the curb weight of the empty truck. Be sure to record the condition of the truck when taking weight measurements – i.e., Is there a body or mount kit outfitted? How much fuel is in the tanks? Was the weight taken with the driver? Passenger? etc. Following is the procedure for determining the empty weight of a truck.

Straight Truck Curb Weights

1. Position the front axle of the bare chassis over the truck scale (as shown below), such that only the front axle weight is measured. Measure the weight on the axle. This is the '**Front Axle Curb Weight**' (**FAW**).



2. Drive the truck forward until the front axle is clear of the scale and only the rear axle(s) is on the scale. Measure the weight on the axle(s). This is the '**Rear Axle Curb Weight**' (**RAW**).



3. Use the **FAW** and **RAW** measurements from above to fill in the Truck Mounting Application Analysis sheet located at the end of this document.

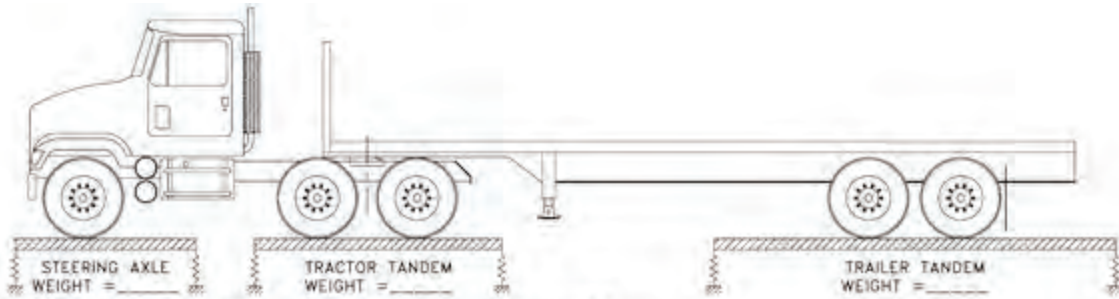
CAUTION - Failure to properly and accurately calculate the weight and weight distribution of the transport vehicle could lead to serious injury, death, or significant property damage.

14

Truck/Trailer Weighing Procedures (Cont.)

Trailer Curb Weights

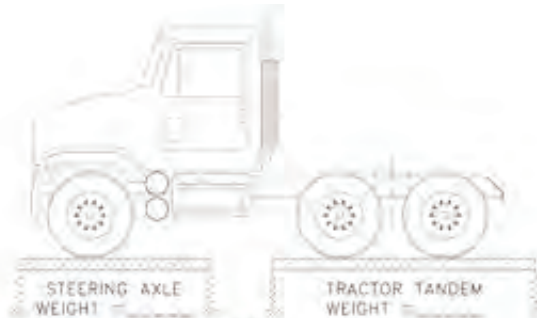
1. With the empty trailer connected to the tractor, drive the tractor onto the scale, as shown below. Measure the weight on the axles, and record all three weights.



Measurement of the tractor and trailer curb weights

Steering Axle Weight = _____
 Tractor Tandem Weight = _____
 Trailer Tandem Weight = _____

2. With the trailer removed from the tractor, drive onto the scale as shown below. Measure the weight on the axles, and record both weights.



Measurement of the tractor curb weights only

Steering Axle Weight = _____
 Tractor Tandem Weight = _____

3. Use the weight measurements from above to fill in the Trailer Mounting Application Analysis sheet located at the end of this document.

CAUTION - Failure to properly and accurately calculate the weight and weight distribution of the transport vehicle could lead to serious injury, death, or significant property damage.



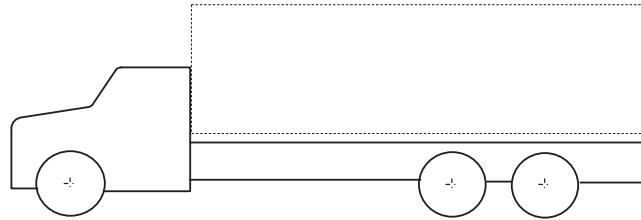
Princeton Delivery Systems

8020C Dove Parkway
Canal Winchester, Ohio 43110
1-800-331-5851 www.piggy-back.com



TRUCK MOUNTING APPLICATION ANALYSIS

Fax Forms to: 614-834-5001



Step 1. Input Customer and General Analysis Information.

Customer:	Analysis Date:
Street Address:	Phone:
City, State & Zip:	Fax:
Contact:	Email:
Truck Make:	Comment:

Select the following by typing letter x in appropriate box

<p><u>Step 2. Select axle type:</u></p> <p>Single <input type="checkbox"/> Tandem <input type="checkbox"/> Tandem +Pusher <input type="checkbox"/> Other <input type="checkbox"/></p> <p>If other specify: _____</p>	<p><u>Step 3. Select Truck Bed Type:</u></p> <p>Flat <input type="checkbox"/> Box <input type="checkbox"/> Curtainside <input type="checkbox"/> Flat Dump <input type="checkbox"/> Rolloff Dump <input type="checkbox"/> Other <input type="checkbox"/></p> <p>If other specify: _____</p> <p>Box & Curtainside Trucks May Require 5" Bed Extension for Mast Clearance</p>
--	---

Step 4. Select Piggyback Model:

D45 <input type="checkbox"/>	PB45 <input type="checkbox"/>	PB50 <input type="checkbox"/>	PB55 <input type="checkbox"/>	PB70 <input type="checkbox"/>	PB80 <input type="checkbox"/>	PBX <input type="checkbox"/>	Z UNITS <input type="checkbox"/>	E2-3RVX <input type="checkbox"/>	<input type="checkbox"/>
PB45MM <input type="checkbox"/>	PB45STM <input type="checkbox"/>	PB55.3 <input type="checkbox"/>	PB55.3X <input type="checkbox"/>	PB55.4 <input type="checkbox"/>	PB70.3 <input type="checkbox"/>	PB80.3 <input type="checkbox"/>	Other <input type="checkbox"/>	Serial # (REQUIRED) _____	

Step 5. Select Mast Height Option:

Class II Mast (D45, PB40, PB45, PB50, PB55, PBL, PBX)					Class III Mast (PB65, PB70, PB80)		
86" <input type="checkbox"/>	120" <input type="checkbox"/>	144" <input type="checkbox"/>	154" <input type="checkbox"/>	165" <input type="checkbox"/>	86" <input type="checkbox"/>	120" <input type="checkbox"/>	144" <input type="checkbox"/>
Z Series				E Series			
86" <input type="checkbox"/>	120" <input type="checkbox"/>	138" <input type="checkbox"/>		86" <input type="checkbox"/>	120" <input type="checkbox"/>	138" <input type="checkbox"/>	154" <input type="checkbox"/>

Step 6. Select Additional Options:

Forklift without load arms Forklift with load arms Fork positioners

(Load arms are used to stabilize wide loads)

Step 7. Specify Additional Weight and Weight Center-Of-Gravity:

Additional weight: lb C. G. distance behind trailer end: in

(Positive center-of-gravity distance indicates forward of truck end and negative distance indicates afterwards of truck end)



Princeton Delivery Systems

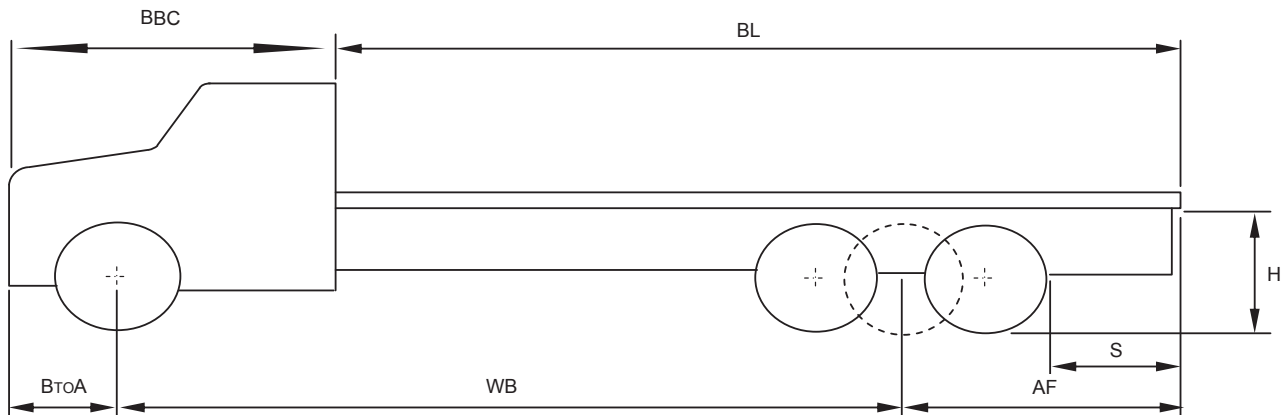
8020C Dove Parkway
 Canal Winchester, Ohio 43110
 1-800-331-5851 www.piggy-back.com



TRUCK MOUNTING APPLICATION ANALYSIS (CONTINUED)

Customer and General Analysis Information

Customer:	Date:
Street Address:	Phone:
City, State & Zip:	Fax:
Contact:	Email:
Truck Make:	Truck Model:



Step 8. Input truck geometry information:
 (All dimensions in inches)

- Vehicle wheel base (WB):
- Centerline rear axle or center of axles to end of bed (AF):
- Back of rear tire to end of bed (S):
- Bed length (BL):
- Distance from bottom of cross members to ground (H):
- Truck front to center of forward axle (BTOA):
- Hanger pin distance from truck end:
- Bumper back to cab

in
in
in
in
in
in
in

(Must be less than 95")
 (33" Min. to 48 Max")
 (48" Minimum Required)
 (5.25" Standard)

Step 9. Input truck weight information:
 (All weights in pounds)

- Front Axle Capacity (FAC):
- Rear Axle Capacity (RAC)(Single axle or multiple):
- Gross Vehicle Weight Rating (GVWR):
- Weight on Front Axle (FAW) (Weigh on scale if necessary):
- Weight on Rear Axle(s) (RAW) (Weigh on scale if necessary):
- Total Vehicle Weight (total of weight on front and rear axle(s)):

lb
lb
lb
lb
lb
lb

(Truck Empty, See Note Below)
 (Truck Empty, See Note Below)
 (Truck Empty, See Note Below)

Note: All geometry and weight on front and rear axle(s) values are required for minimum counterweight calculation. Weigh truck on scales if necessary to obtain.



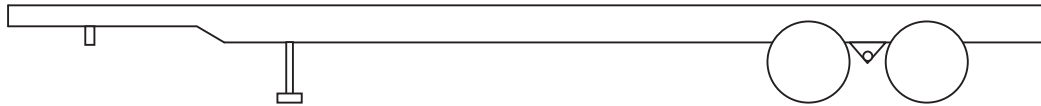
Princeton Delivery Systems

8020C Dove Parkway
Canal Winchester, Ohio 43110
Phone: 1-800-331-5851 Web: www.piggy-back.com



TRAILER MOUNTING APPLICATION ANALYSIS

Fax Forms to: 614-834-5001



Step 1. Input Customer and General Analysis Information.

Customer:	Analysis Date:
Street Address:	Phone:
City, State & Zip:	Fax:
Contact:	Email:
Trailer Make & Model:	Comment:

Step 2. Select axle type:

Tandem Single Other

If Other Specify: _____

Step 3. Select bed type:

Flat Box Curtainside Other

If Other Specify: _____

Box & curtainside beds may require 5" bed extension for mast clearance

Step 4. Select bed construction

All Steel Composite Steel & Aluminum All Aluminum Other If Other Specify: _____

If bed construction is composite or all aluminum check with Princeton for special instructions.

Step 5. Select Piggyback Model:

D45 <input type="checkbox"/>	PB45 <input type="checkbox"/>	PB50 <input type="checkbox"/>	PB55 <input type="checkbox"/>	PB70 <input type="checkbox"/>	PB80 <input type="checkbox"/>	PBX <input type="checkbox"/>	Z UNITS <input type="checkbox"/>	E2-3RVX <input type="checkbox"/>
PB45MM <input type="checkbox"/>	PB45STM <input type="checkbox"/>	PB55.3 <input type="checkbox"/>	PB55.3X <input type="checkbox"/>	PB55.4 <input type="checkbox"/>	PB70.3 <input type="checkbox"/>	PB80.3 <input type="checkbox"/>	Other <input type="checkbox"/>	Serial # (REQUIRED) _____

Step 6. Select Mast Height Option:

D45, PB40, PB45, PB50, PB55, PBX, PBL (Class II Mast)					PB65, PB70, PB80 (Class III Mast)			
86" <input type="checkbox"/>	120" <input type="checkbox"/>	144" <input type="checkbox"/>	154" <input type="checkbox"/>	165" <input type="checkbox"/>	86" <input type="checkbox"/>	120" <input type="checkbox"/>	144" <input type="checkbox"/>	
Z Series				E Series				
	86" <input type="checkbox"/>	120" <input type="checkbox"/>	144" <input type="checkbox"/>		86" <input type="checkbox"/>	120" <input type="checkbox"/>	144" <input type="checkbox"/>	154" <input type="checkbox"/>

Step 7. Select Additional Options:

Forklift without load arms Forklift with load arms Fork positioners

Load arms are used to stabilize wide loads.

Step 8. Specify Additional Weight and Weight Center-Of-Gravity:

Additional weight: lb Weight C. G. distance from trailer end: in

(Positive center-of-gravity value indicates aft of trailer end and negative value indicates forward of trailer end)



Princeton Delivery Systems

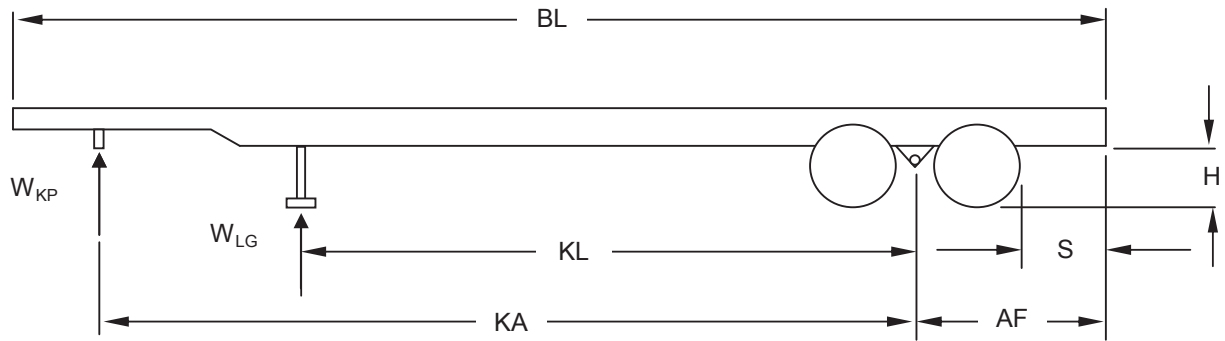
8020C Dove Parkway
Canal Winchester, Ohio 43110
1-800-331-5851 www.piggy-back.com



TRAILER MOUNTING APPLICATION ANALYSIS (CONTINUED)

Customer and General Analysis Information

Customer:	Analysis Date:
Street Address:	Phone:
City, State & Zip:	Fax:
Contact:	Email:
Trailer Make & Model:	Comment:



Step 8. Input Trailer Geometry Information:
(Dimensions in inches)

Horizontal Distance Rear Tire to Trailer End (S):	in	(36" Min. to 48 Max")
Distance Bottom of Cross Members to Ground (H):	in	48" Minimum Required
Trailer Length (BL):	in	
Centerline rear axle or center of axles to end of bed (AF):	in	
Distance kingpin to rear axle or center rear axles (KA):	in	
Distance landing gear to rear axle(s) center (KL):	in	

Note: if H is less than 48 inches must use Princeton Top Mount or High Mount. If S is less than 36" contact Princeton for options.

Step 9. Input Trailer Weight Information:

(Specify weight on kingpin **or** landing gear. Note only one weight is required, not both. Weights are without forklift mounted.)

Trailer kingpin weight (weight before modifications)(W _{KP}):	lb
Trailer landing gear weight (weight before modifications)(W _{LG}):	lb
Weight on rear axle or rear axles (weight before modifications)(W _{RA}):	lb
Rear axle(s) rated weight capacity (RAC):	lb

Note: The kingpin and tandem weights in Step 9 are necessary in order to calculate the minimum counterweight required based on retaining a safe percentage on the kingpin. Neglect in providing the required weights can result in a much larger counterweight estimate than would actually be required.

Comment or special instructions: _____