

APPLICATIONS MANUAL



DEXTER AXLE

www.dexteraxle.com



This information is intended as a guide for the proper specification and application of Dexter Axle running gear, associated components and accessories. We have attempted to define some of the terms commonly used in the transportation industry as well as providing descriptions of the various systems used in building a wide variety of trailers.

Dexter offers a full line of trailer axles that can be used in many different applications. When specifying any pre-engineered components such as axles, it is the responsibility of the trailer designer to insure compatibility with the vehicle and all of its sub-systems.

Important Information

The information presented is meant to assist trailer manufacturers in the specification of their running gear components. Dexter Axle does not warrant that the information given constitutes an approved trailer design or application. Dynamic loading, travel requirements unique to the trailer design, unusual service conditions, trailer configurations, unequal load distribution, hitch or coupler arrangements and towing vehicle suspension characteristics can significantly affect the performance of any trailer axle and/or suspension systems. It remains the responsibility of the trailer manufacturer to evaluate, specify and test their trailer/running gear combination before production and to certify it as such. While the information presented at the time of this writing is current, it is subject to change as designs and components evolve over time.

Disclaimer Of Warranty And Limitation Of Liability

All users of this product catalog acknowledge that the information presented is significantly affected by factors within the exclusive knowledge of the user including, among other things, service conditions, trailer configurations, load distributions, hitch and coupler arrangements and tow vehicle suspension characteristics, that the users have independently investigated these factors and have solely relied on those investigations when using this catalog, and that it is the responsibility of the user to adequately specify, evaluate and test its trailer/running gear combinations.

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Load Ratings

The maximum load carrying capacity of any assembly is limited to the lowest load rating of any individual component selected. For instance, the load rating of a pair of wheels may be lower than other axle components selected. If this is the case, the load carrying capacity of the axle assembly is reduced accordingly. As a specific example, if a pair of wheels is rated at 1500 pounds each and is used with other components rated at 4000 pounds per axle, the maximum load capacity is limited to 3000 pounds. If two tires are rated at 1400 pounds each and are used on this assembly, the maximum load carrying capacity is limited to 2800 pounds.

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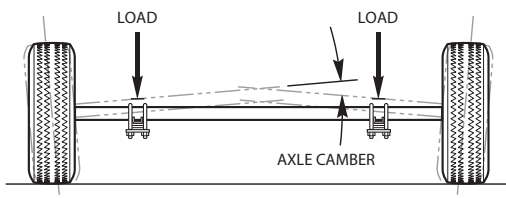


Bump Clearance

Bump is the upward displacement of a wheel center relative to the trailer frame (sprung mass). Clearance is the amount of trailer frame to axle clearance necessary to allow the axle to clear or NOT contact the trailer frame.

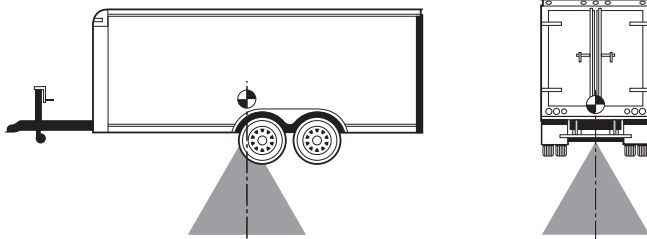
Camber

The angular relationship of the wheel to the road surface in the vertical plane. Axles are typically built with a pre-determined bend in the tube that compensates for the expected deflection under load. Ideally, the tire footprint will contact the road evenly across the width of the tread.



Center Of Gravity

The point at which the entire weight of a body (vehicle) may be considered to be concentrated so that if the vehicle were supported at that point, it would remain in equilibrium. For any vehicle, both the longitudinal and transverse center of gravity must be considered when placing the running gear to establish proper weight distribution.



Ride Performance

The term 'ride' is a general one referring to the vehicle motions of the sprung and unsprung masses caused by the longitudinal road profile.

GAWR - Gross Axle Weight Rating

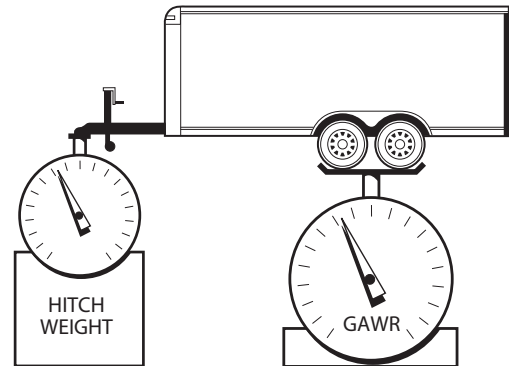
The value specified by the vehicle manufacturer as the load carrying capacity of the axles in a system, as measured at the tire-ground interfaces. This includes the wheels and tires.

For example:

An axle beam may be rated for 6000 lbs., the springs rated for 2500 lbs. each, the wheels rated for 3500 lbs. each, and the tires rated for 3042 lbs. each. The GAWR for this example will be 5000 lbs., limited by the capacity of the springs.

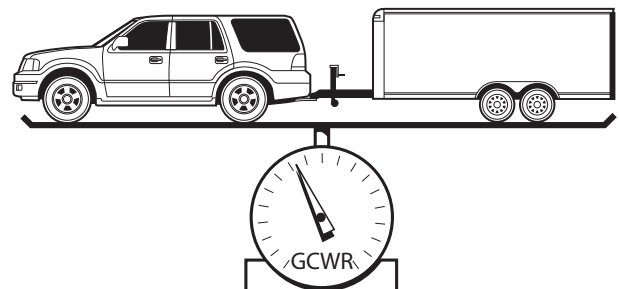
Hitch Weight

The portion of the weight of a trailer that is carried on the towing vehicle through the connection point.



GCWR - Gross Combined Weight Rating

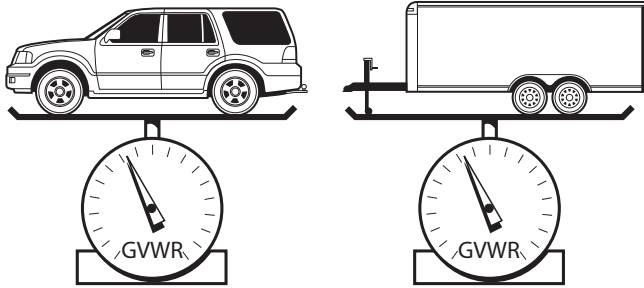
For motorized vehicles, the manufacturer rates the vehicle for towing capability by defining the Gross Vehicle Weight of the vehicle and combining that with the GVW of the vehicle to be towed.





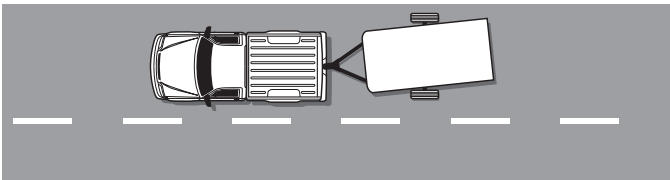
GVWR - Gross Vehicle Weight Rating

The value specified by the manufacturer as the loaded weight of a single vehicle.



Dog-Tracking

The behavior a vehicle will exhibit when the body of the vehicle is skewed relative to the line of travel during operation. This happens when the axles have been mounted to the frame incorrectly, that is, not perpendicular to the centerline of the vehicle. When the unit is towed, the running gear will align itself to the line of travel but the wheel track will be offset from the track of the tow vehicle and the body or frame will appear to be tracking out of line.



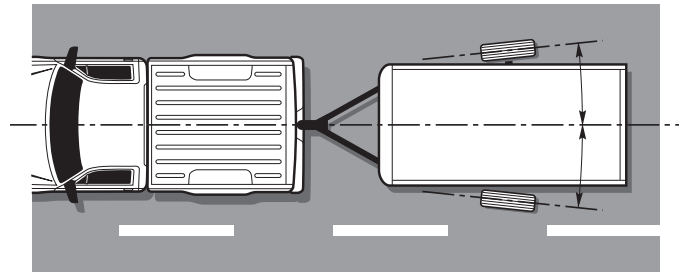
Polar Inertia

The property that can cause a trailer to swing from side to side during operation. One of the causes of this phenomenon can be demonstrated with the following example:

A large travel trailer has the kitchen located at the rear of the coach. The owner has loaded supplies and personal belongings in the rear of the unit. Side forces such as high winds or the bow wave from a passing vehicle may start the swaying. As the rear end swings to the right, the trailer pivots on its running gear and the front end swings to the left, causing the rear end of the tow vehicle to be pulled left. If the driver overcompensates by steering left, the front of the trailer will be forced right which reverses the direction of the trailers' rear end. Too much mass at the ends of the trailer will accentuate the swing of the vehicle and may set up the conditions for side to side sway that gets greater and greater as the driver attempts to get control of the vehicle.

Toe Angle

The plane of rotation of a wheel relative to the centerline of the vehicle.





Trailer design is an extremely broad subject. Covering all the guidelines for the design of every towable vehicle is beyond the scope of this manual. Instead, we have attempted to present some of the more common rules of thumb that will, in most cases, provide a reasonable result when employed in a trailer design.

The following list describes many of the typical designs, grouped according to their intended use.

Recreational Vehicles



Fold Down Camper

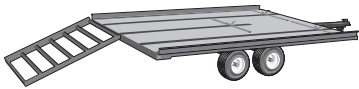


Travel Trailer

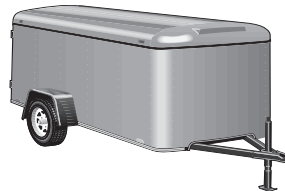


Fifth Wheel Trailer

Utility Trailers



Snowmobile Trailer



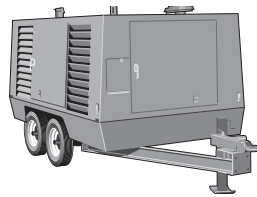
Enclosed Cargo Trailer



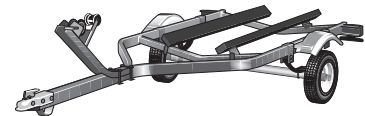
Flatbed Cargo Trailer



Livestock Trailer



Portable Equipment Trailer



Water Craft Trailer

Manufactured Housing



Single Width Home
Double Width Half Unit
Park Model Home
Modular Carrier



Things To Consider When Designing Your Trailer

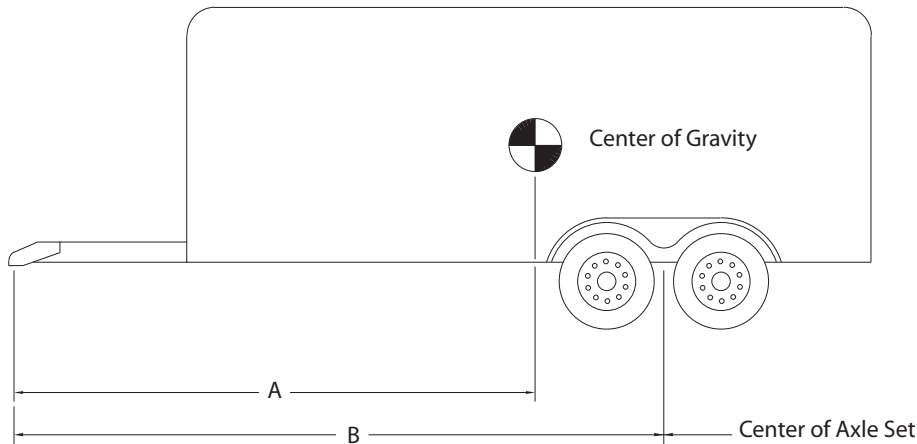
- The load distribution between the hitch and the running gear is determined by placement of the axles in relation to the center of gravity.
- The hitch weight for conventional, bumper type hitches should be 10% to 14% of the gross weight of the vehicle. The remaining 86 to 90% of the load will be carried on the running gear, so make sure that the axles, wheels and tires are properly matched and have sufficient capacity rating to support this load.
- The hitch weight for fifth wheel and gooseneck type hitches should be 15% to 20% of the gross weight of the vehicle. The remaining 80% to 85% of the load will be carried on the running gear, so make sure that the axles, wheels and tires are properly matched and have sufficient capacity rating to support this load.
- Trailer handling may be adversely affected if the load(s) are concentrated at the ends of the vehicle. This condition can occur even when the hitch weight is within the recommended proportion of vehicle weight. Probable causes for this phenomenon may be excessive frame flexure and/or polar inertia.
- Polar inertia and frame flex can impose dynamic loading on the axles and suspension system which may exceed the design loads and result in bending or fatigue failure.
- Excessive frame flexure can affect ride if the natural frequency of the vehicle's structure matches the frequency of the suspension. Once the flex of the frame is in phase with the suspension's vertical movement, the dynamic load input to the suspension will cause it to deflect more than it would under static load conditions. This greater loading of the suspension results in greater rebound which causes greater frame flexing. Now the larger degree of frame flexure is imposed on the suspension which causes an even greater vertical travel, and so on. If this condition exists, damage to the vehicle's structure can occur. Either the structure should be stiffened or the suspension characteristics should be altered to prevent this 'in phase' behavior.
- Uneven side to side loading of a trailer can cause dog-tracking. For double eyed leaf spring and single slipper type springs, the front end of the spring is anchored to the vehicle frame. As the load increases, the spring arch flattens, resulting in a lengthening of the spring. Since the axle is attached near the mid-point of the spring, it will move rearward as the spring deflects. If the springs are unevenly loaded, the axle will be skewed relative to the vehicle centerline and may cause tracking problems.
- A trailer designed to carry a load with a high center of gravity should have a wide enough axle track to prevent or diminish the tendency for the vehicle to tip over on curves or turns with little or no banking of the road surface.
- Trailers equipped with Torflex® axles must be towed in a level attitude to insure even loading of the axles. Out-of-level towing results in higher loads being imposed on the axle at the low portion of the frame and less load on the axle(s) at the high end. This uneven load distribution may cause excessive stress concentrations on the frame structure. Uneven loading of non-equalized suspensions can also affect the ride characteristics by altering the natural frequency of the structure.
- The wheel and tire diameter should be large enough to provide sufficient ground clearance when used with drop spindle type axles. Insufficient clearance may result in the axle components dragging the ground in the event of a flat tire.
- Axles should be spaced to allow at least one (1) inch of clearance between the tires under any loading condition. To determine the proper spacing, find the manufacturer's maximum diameter for the tire and add one inch or more. The result will be the axle center to center dimension. If tire chain clearance is desired, additional clearance may be necessary.
- When designing the attachment system for Torflex® axles on aluminum trailer frames, it is important to understand the compressive stresses imposed by the fasteners against the aluminum surfaces. Yielding in these areas can lead to loosening of the axles and could result in fatigue failure of the axle bracket and tube structure and/or the frame members. If non-metallic materials are to be used between the mating surfaces to prevent galvanic corrosion, the designer must consider the stability of these materials under the high clamp loads. Extrusion of these materials under load may also lead to loosening of the axle attachment.



- Spread axle mounting will lend added support to frame structures but will result in more tire wear and impose higher stresses on the axle components and axle mountings. Increased tire wear usually results from the added side scrubbing that occurs when negotiating sharp turns or corners.
- Wide-spread Torflex® axles will be subjected to higher stresses at the bracket/tube interfaces as a result of frame racking. Racking occurs when the vehicle travels over uneven surfaces and the loads imposed at each wheel are substantially different. If the torsional stiffness of the vehicle structure is relatively low, the areas where the cross members are joined to the main frame rails and the axle bracket/tube welds must withstand the twisting that occurs in these critical regions. Excessive flexing may result in fatigue failures. To reduce the potential for problems due to racking, position the axles closer together.
- Torflex® axles should not be used in situations requiring more than two axles. These axles are non-equalized and may experience momentary overload when traversing uneven operating surfaces such as driveway entries or speed bumps. Torflex® axles can take this momentary overload in a tandem set, however it is not reasonable to expect one axle to carry the load of three or more axles even in a momentary situation.
- Torflex® axle ride performance is at its best when the torsion arm is at or nearest to horizontal when the vehicle is at its rated load. This is due to the geometric relationship of the arm to the direction of loading. Torsion arms operating above the horizontal tend to exhibit a stiffer ride. As an example, for a 3000 lb. wheel load acting perpendicular to a 6" long arm, the torque input to the suspension system is 18,000 inch pounds. For the same wheel load imposed on a 6" long arm at 45 degrees, the torque input to the suspension drops to 12,727 inch pounds. (Torque = $6(.707) \times 3000$, since the sine of 45 is .707).
- Axle capacity will be reduced by at least 50% when used without a suspension system (axles or stubs attached directly to vehicle frame). *This is NOT a recommended configuration as it transfers load directly to the frame rails and is a very harsh ride.*
- Oil lubrication systems for wheel bearings should not be used in applications in cases where the vehicle will be stationary for long periods of time. The oil will drain down to the bottom of the cavity and leave the exposed parts of the bearings subject to corrosion.
- Dual wheels cannot be used as singles unless they are used on hubs that have been specifically designed for that application. The large offset of a dual wheel shifts the load line too far from the hub face or intended load line of most hubs. This condition will result in a serious degradation of the bearing life.
- Dexter recommends that all axles be equipped with brakes. For trailers used in commerce, the trailer axle(s) must be equipped with brakes unless the GAWR of the trailer axle is less than 3000 pounds and the hitch load imposed on the towing vehicle does not exceed 40% of the towing vehicles GVWR. For other details concerning commercial applications, refer to the Federal Motor Carrier Safety Regulations published by the U.S. Department of Transportation.



Determining Dimensional Requirements



Note: "Center of Axle" on a Torflex® axle is defined as the center of spindle.

1. Measure the distance from the center of the hitch to the center of gravity (dim. A).
2. Divide this value by the percentage of the load to be carried by the running gear.
3. The result will be the distance from the center of the hitch back to the center of the axle set (dim. B).

Brake Requirements

Commercial trailers must comply with the requirements of the Federal Motor Carrier Safety Regulations as prescribed by the U.S. Department of Transportation which calls for brakes on each wheel for most applications. Consult the regulations that pertain to the type of trailer being built.

The recommended practice for any trailer design would be to use brakes on all axles. The use of trailer brakes can help prolong the life of the tow vehicle brakes as well as provide for safer operation.

Wheels And Tires

The wheels and tires should be matched in capacity to the axle whenever possible. The Gross Axle Weight Rating of the running gear will be based on the lowest rated component.

Tires are designed to be mounted on specific rim sizes and contours as defined by "The Tire and Rim Association". Mismatching of these vital components is dangerous and can result in serious injuries, catastrophic failure or poor performance and reduced service life.

Tires of greater capacity should never be mounted on wheels of a lower capacity since most end-users will inflate and load them to the rating embossed in the tire. This practice can result in dangerous failure of the wheel which may lead to an accident. Wheels must also be matched to the particular hub and mounting system being used. Wheels are designed to be either hub piloted or stud piloted.

Hub piloted wheels have the center hole machined to a close tolerance and are intended to mate with a hub having a properly sized pilot.

The bolt holes will be bored or stamped straight through the center disc which is designed to be fastened with either flanged nuts or a clamp ring using cone nuts.

Stud piloted wheels have a center hole which provides clearance to the hub nose. The bolt holes feature a tapered seat designed for clamping with properly matched cone nuts. The cone angle of the nut **MUST** match the cone angle around the bolt hole. Failure to properly match these components will result in catastrophic wheel loss.



Axle Types

Torflex® - The Torflex® axle is designed as a completely self-contained axle and suspension system. This trailing arm type torsion axle employs natural rubber cords supporting heat treated inner bars of solid, medium carbon steel. Press-fitted and welded to the ends of these independently floating bars are the high strength steel torsion arm/spindle assemblies. These arms can be specified to a range of starting angles, which allow the designer to tailor the running height of the vehicle.



Leaf spring - These axles utilize high strength steel spindles welded to high strength tubing to form an axle beam. The spindles are usually available in either a straight or drop design to help designers establish the desired frame height or ground clearance. Leaf springs are attached to the axle using u-bolts and can be positioned either under or over the tube. Use under mounted springs (underslung) to lower the frame height and over mounted springs (overslung) to raise the frame. The designer can choose stamped steel hangers of varying heights to allow additional control of the vehicle height.

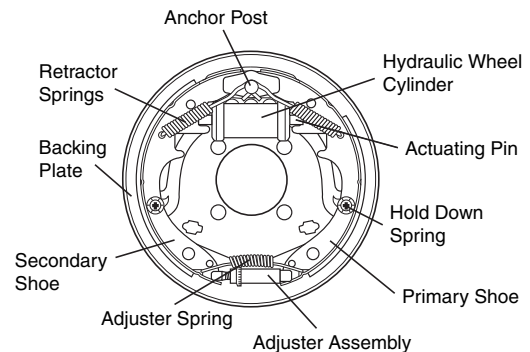
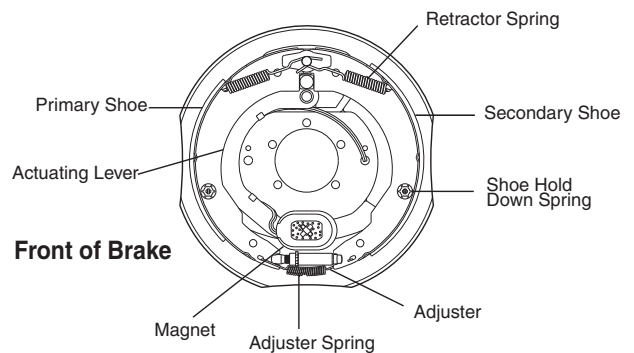


Axle Attachment Systems

Hangers and attaching parts - Most hangers are channel shaped steel stampings, designed to be welded to the underside of the frame rails to provide the attaching points for the leaf springs and their associated parts. The attaching parts are normally provided in kits, which contain all the necessary hardware to properly install the running gear. In the case of multiple axle installations, devices called equalizers are often used to help transfer load from one axle to the other(s) as the vehicle travels over uneven terrain. Not all combinations of equalizers and hangers are suitable. If the equalizer hangers are too short, the spring eye may contact the frame during articulation of the suspension and may result in overloading of the spring.

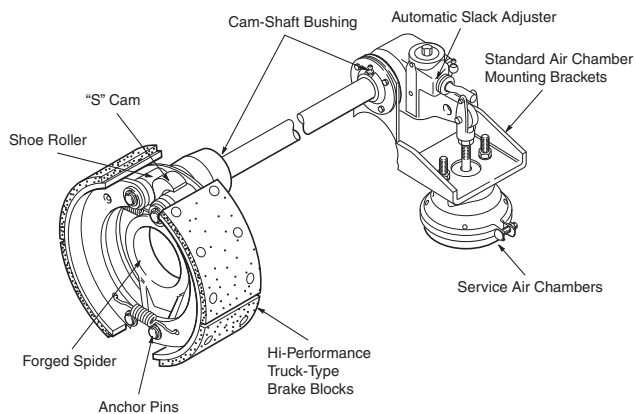
Brake Types

Electric and hydraulic, shoe/drum - Electric brakes are similar to the hydraulic drum brakes used on automobiles and trucks. While those brakes are actuated by hydraulic pressure, generated by the master cylinder to expand the wheel cylinder, electric brakes function by the action of an electromagnet inside the brake drum. When a voltage is sent by the brake controller to the electromagnets, they are attracted to the rotating armature surface of the drum. The sliding friction of the magnets against the armature surface actuates a lever which in turn expands the brake shoes out against the drum surface. This is much like the action that occurs within a hydraulic brake when the wheel cylinder expands. The braking effort is modulated by varying the amount of voltage supplied to the magnets whereas, hydraulic brakes are controlled by the output pressure of the master cylinder.

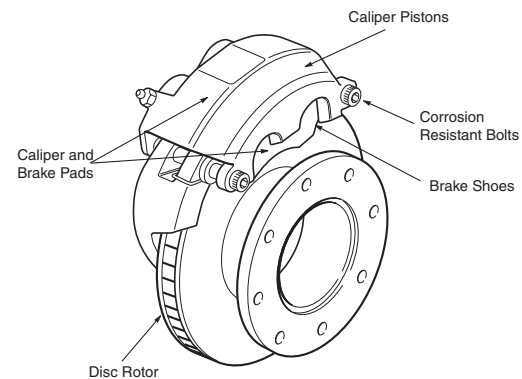




Air brakes, drum type - This type of brake operates by rotating an 's' shaped cam between the non-anchored ends of the brake shoes, causing them to expand outward and exert pressure against the drum surface. The rotation of the cam shaft is accomplished using an air cylinder called a brake chamber, acting on a lever, (the slack adjuster) which also provides a means of adjusting the clearance between the brake shoes and the drum surface. This adjustment compensates for wear and can be done manually or automatically.



Disc brakes - Disc brakes employ a component called a rotor, which takes the place of the drum in a shoe/drum brake. The rotor or disc as it is sometimes called is generally machined from a special grade of cast iron and has integrally cast fins to help dissipate heat. The braking force comes from a clamshell-like structure called the brake caliper, which is attached to the axle. The caliper is positioned to straddle the rotating disc. When hydraulic fluid extends the piston, the caliper grips the rotor to generate the braking effort.



Specifying Axles

The axle capacity is usually determined by subtracting the hitch load from the Gross Vehicle Weight. The remainder will be the load to be carried by the axle(s). When making this calculation, be sure to consider the final load distribution. If the weight is shifted off-center laterally, the load imposed on the wheel(s) on the side closest to the load center will be greater. The load on the heavier side must not exceed one half the rated capacity of the axle(s).

Torflex® axles should be specified in such a way that will position the vertical section of their mounting brackets directly under the most rigid section of the frame members. This will help to ensure proper support of the axle brackets (see illustrations in the Torflex® Installation section).

For applications requiring lower floor or frame heights, drop spindle axles as well as underslung springs on straight spindle axles can be used to achieve the desired height. When Torflex® axles are called for, the starting angle of the torsion arm can be specified to be above the horizontal plane to accomplish the same results.

Leaf spring type axles must have sufficient clearance to the frame to operate properly (see Bump Clearance definition). If the spring hangers are too short, the axle may contact the frame during articulation of the suspension and result in overloading of the axle and possible damage. If the spring hangers are too long and provide too much clearance, the springs may be damaged if excessive loads are encountered and the axle is allowed to move too much. If this condition exists, bump stops should be used to prevent over travel.



Brake Actuation Systems

Electric brake controllers - These devices are used to supply a variable voltage to the electric brakes. The inertial type controller relies on a pendulum or an accelerometer to sense deceleration of the vehicle when the stop light circuit is activated. Hydraulic/electric controllers are tapped into the tow vehicles hydraulic brake lines and sense the pressure in the system when the brakes are applied. A third method of electric brake actuation is the electronic controller that employs a timing device. Triggered by the stop light circuit when the brakes are applied, the controller begins sending a pre-programmed voltage to the trailer brakes. The output can be tailored to ramp up over a prescribed time period and must be synchronized to the rate of deceleration desired.

Electric/hydraulic actuator - Hydraulic brake system actuator that supplies brake fluid pressure to the trailer's hydraulic brakes. The actuator output pressure is proportional to the brake control signal received from a suitable electronic brake controller.

Vacuum boost/hydraulic actuators - Used to control hydraulic brakes, this type actuator operates a hydraulic master cylinder with a vacuum chamber synchronized to the towing vehicle brake system. These systems are typically used on tag axles for motor homes and equipment trailers where the tow vehicle is not equipped with air brakes.

Air boost/hydraulic actuators - Systems of this type are used for equipment and utility type trailers towed by air brake equipped vehicles. The booster is an air cylinder which operates the master cylinder. Braking force is modulated by controlling the air pressure to the booster.

Hydraulic surge coupler - A surge coupler serves a dual function by providing the means for connecting the trailer to the tow vehicle as well as actuating the trailer brakes. A master cylinder is built into the coupler and is operated by the over-running force of the trailer against the tow vehicle.

Hitches

Ball and coupler - Classified by SAE for trailers divided into gross weight categories, this hitch type uses a ball attached to the tow vehicle and a corresponding socket or coupler affixed to the tongue of the trailer.

Class 1 - trailers up to 2000 lbs. GVW

Class 2 - trailers over 2000 lbs. up to 3500 lbs. GVW

Class 3 - trailers over 3500 lbs. up to 5000 lbs. GVW

Class 4 - trailers over 5000 lbs. up to 10,000 lbs. GVW

Pintle hook and lunette eye - A pintle hook is a device which incorporates a latching mechanism to prevent unwanted disconnection of the trailer. The hook shaped part of the system is attached to the towing vehicle and the trailer tongue is fitted with a ring, sometimes called a tow bar eye or lunette eye. SAE lists two Application types of these devices.

Application Type I - used where the vertical hitch load does not exceed 5% of the towed vehicle weight.

Application Type II - used for vertical hitch loads greater than 5% but not exceeding 20% of the towed vehicle weight.

Fifth wheel hitch - For this type of hitch, the tractor or tow vehicle will be outfitted with a mechanism called the fifth wheel. The mating component affixed to the trailer is called the king pin. The load bearing capability of the fifth wheel hitch is normally higher than the ball type hitch. Because the hitch point is located over or slightly forward of the tow vehicles rear axle, the system can carry a greater portion of the trailer weight.

Gooseneck hitch - Similar in nature to the fifth wheel hitch, this type connects to the tow vehicle using a modified form of the ball and coupler concept. The ball portion may be mounted on a plate attached to the tow vehicle and the coupler on the gooseneck of the trailer or these two components can be reversed with the ball on the gooseneck and the inverted coupler attached to the tow vehicle. Both methods are used and offer the weight bearing advantage of the fifth wheel type hitch.



Dexter Axle offers a variety of suspension types and associated components to be used for the attachment of trailer running gear. It is of vital importance that the installer be familiar with the axles' features and characteristics so that they may be oriented correctly at installation. All Dexter axles are directional by nature, that is they must be installed with the front of the axle facing forward and the top facing upward. Attention to this important detail will ensure optimum performance from both the brake and suspension systems.

Hanger Welding Specifications For Leaf Spring Axles

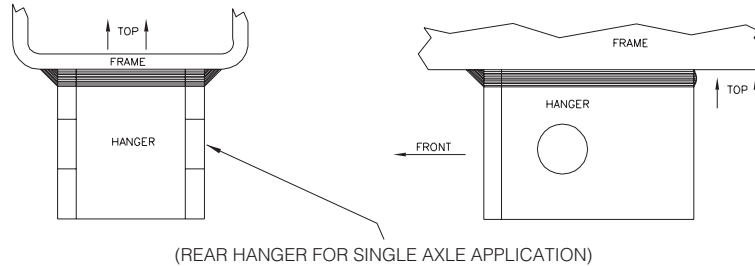
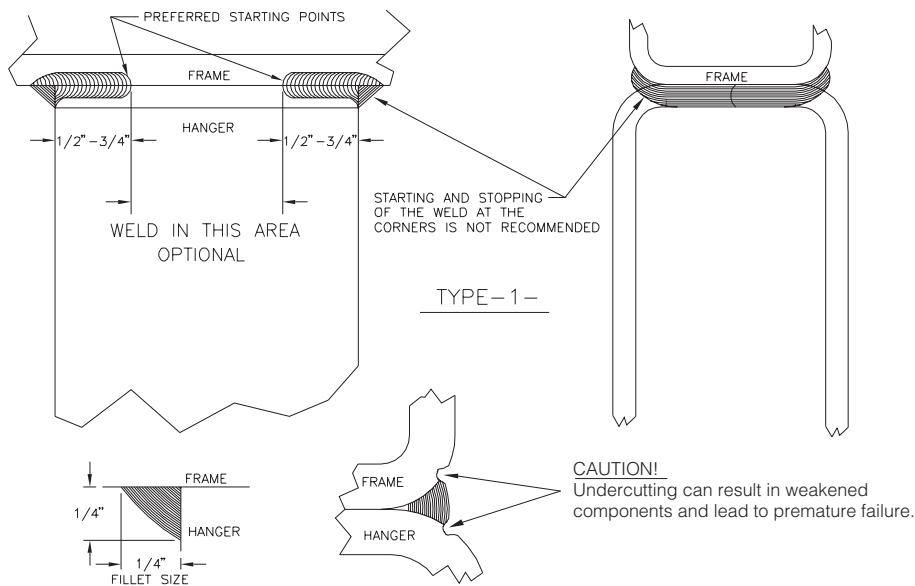


Fig. 1



Installation procedures for leaf spring axles

Most trailer manufacturers have developed their own techniques for the installation of running gear. The sequence that the components are installed is not so important as long as it suits your particular production flow. However, it is essential that these components be attached to the vehicle frame in the proper manner to ensure trouble free performance. Spring eyes and equalizers must be free to rotate. Binding can lead to unsatisfactory ride performance and possible spring failure.



CAUTION

- Over tightening the nuts can lead to fastener failure. The torque specification for the $\frac{7}{16}$ "-20 hex nut used on shouldered shackle bolts is 30 to 50 lbs. ft.
- The nut should not be used to “pull” the shackle bolt into the hanger. Instead, the bolt should be driven into place to allow the serrations to grip the hanger.
- Using an impact wrench without some type of torque limiting device can damage the threads and the serrations.
- Shackle bolts that are free to rotate will severely limit the service life of the hangers.

Spring eyes and equalizers must be free to rotate. Binding can lead to unsatisfactory ride performance and possible spring failure.

Torflex® Axle Installation Procedure

The following instructions describe methods that can be used to attach your Torflex® axles to the vehicle frame.

Step 1: The user must first decide where to place the axle(s) on the trailer. The position of the wheel center relative to the CG (center of gravity) will determine the final axle loading as well as the hitch load.

Step 2: Determine the method of attachment you wish to use. For structural tube type frame rails, refer to Figure A for the recommended attachment. For 'C' channel or 'I' beam type frame, refer to Figure B.

Step 3: Once the method of attachment is decided, the axle(s) must be carefully aligned on the trailer frame. The axle(s) centerline must be perpendicular to the longitudinal centerline of the trailer. See Figure C.

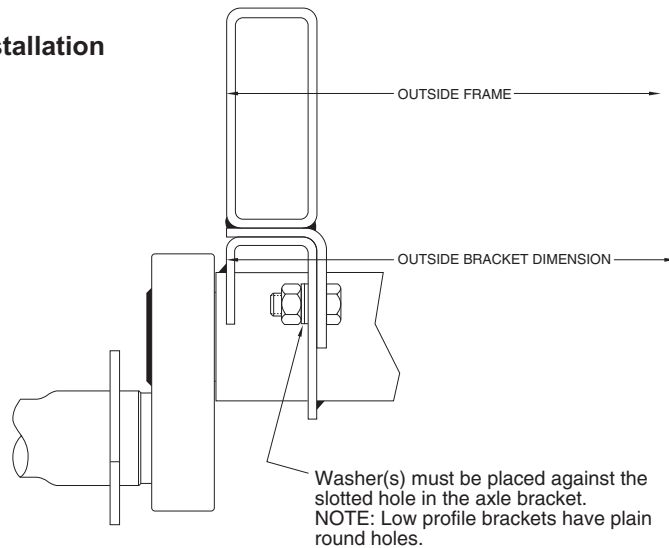
NOTE: Misalignment of the axle(s) can cause poor tracking and accelerated tire wear.

Attachment To Structural Tube Type Frames

1. Dexter Axle recommends the use of side mounting hangers when mounting axles to tubular type frames. These hangers provide a convenient means for bolting the axles in place. All of the necessary components are included in the Side Mount AP kits listed in Chart 1.
2. Refer to Chart 2 to find the mounting bracket dimensions of your axles. This chart shows the dimensions from the wheel center to the bolt holes of the brackets.
3. The preferred way to use the side mount hanger is to pre-assemble the hangers to the axle using the hardware provided in the AP kit. Make sure the hangers are clamped firmly against the top surface of the axle brackets and the bolts are tightened to the torque specifications shown in Chart 1. Position the axle assembly on the frame rails in the desired location and weld the side mount hangers to the frame.
4. Axle bracket position is the distance as measured over the outboard edges of the brackets. This dimension is usually matched to the outside measurement of the frame members but depending on the type of frame may not always be suitable. The preferred arrangement should place the longest vertical section of the axle bracket directly under the most rigid section of the frame member.



**Figure A
Side Mount Installation**



Side mount hangers should be welded to frame with three (3) 1/4" fillet welds, 2 1/2" long on each side of the hanger and a fillet weld on each end. Welds should meet the quality standards of the American Welding Society, D1.1, Structural Welding Code.

Attaching Parts Kits - Torque Specifications (Chart 1)

Axle	AP Kit		Bolt	Torque
Size	Top Mount	Side Mount	Size	Lbs.-FT
#8	A/P-161-00	A/P-165-00	1/2"	70-90
#9	A/P-161-00	A/P-165-00	1/2"	70-90
#10	A/P-148-00	A/P-166-00	5/8"	120-155
#11	A/P-148-00	A/P-167-00	5/8"	120-155
#12	A/P-148-00	A/P-168-00	5/8"	120-155
#13	A/P-148-00	A/P-169-00	5/8"	120-155

Side mount hangers and fasteners for mounting axle are provided in AP (attaching parts) kit shown in Chart 1. Torque fasteners to levels specified in Chart 1.

Attachment to 'C' Channel or 'I' Beam Type Frames

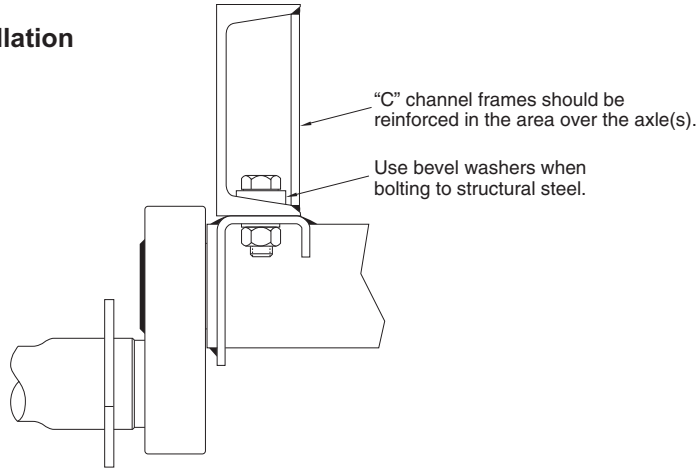
1. Refer to Chart 2 to find the mounting bracket dimensions of your axles. This chart shows the dimensions from the wheel center to the bolt holes of the brackets.
2. Lay out the bolt hole locations on the bottom flanges of the frame rails. Make sure the hole pattern matches the mounting brackets of your axles and is properly oriented to allow proper alignment of the axle(s).
3. An alternate method for determining hole location is to position the axle assembly on the frame rails, align it perpendicular to the trailer centerline, clamp in place and transfer the holes directly from the brackets.
4. Drill the holes through the frame rails and attach the axle using the hardware provided in the AP kit. Tighten the bolts to the torque specified in Chart 1.



CAUTION

- When bolting to structural shapes that have tapered flanges, bevel washers must be used to prevent uneven clamping and bending of the fasteners.

Figure B
Top Mount Installation



CAUTION

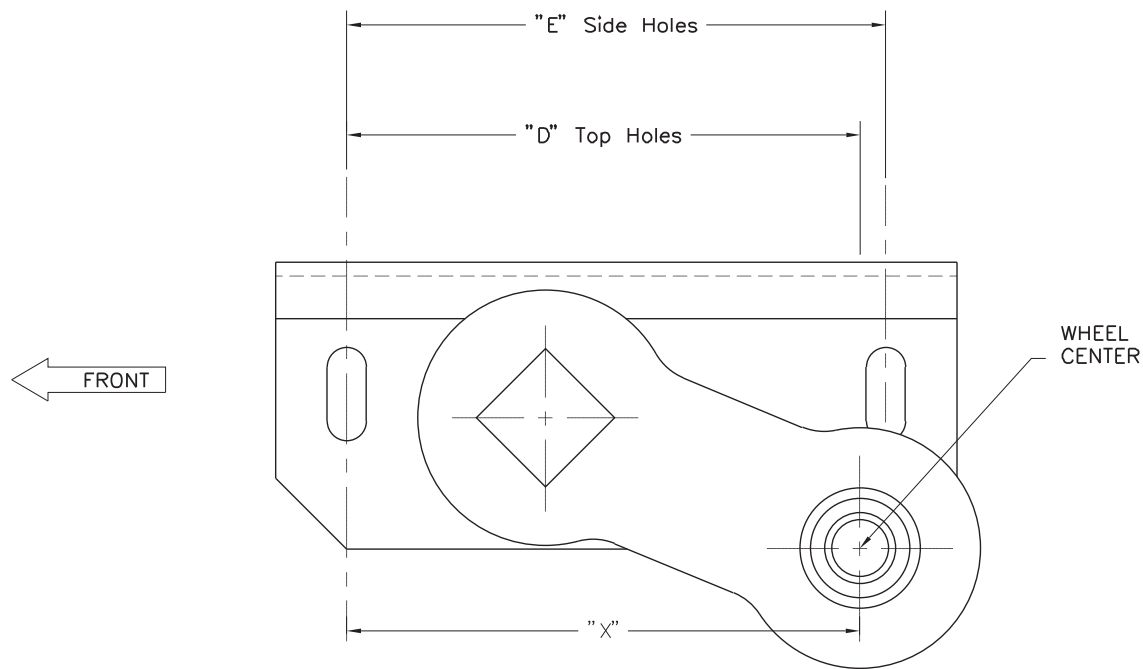
- 'C' channel and 'I' beam type frame sections should be reinforced in the area over the axle mounting brackets. It is recommended that the vertical leg of the axle bracket be positioned directly under the vertical segment or reinforcement of the frame member.

Bracket Dimensions (Chart 2)

Torflex® Axle Size	Mounting Hole To Wheel Center - Dim. X (Inches)												Mounting Hole Spacing		
	Start Angle Of Trailing Arm														
	45° DN		22.5° DN		10° DN		0°		10° UP		22.5° UP		(INCHES)		
No	Full	No	Full	No	Full	No	Full	No	Full	No	Full	No	Full	Dim. D	Dim. E
Load	Load	Load	Load	Load	Load	Load	Load	Load	Load	Load	Load	Load	Load	(Top)	(Side)
#8	5.2	6.1	6.1	6.4	6.3	6.3	6.4	6.1	6.3	5.7	6.1	5.2	7.75	8.00	
#9	6.6	7.9	7.9	8.4	8.3	8.2	8.4	7.9	8.3	7.4	7.9	6.6	7.75	8.00	
#10	6.7	8.0	8.0	8.5	8.4	8.4	8.5	8.0	8.4	7.6	8.0	6.8	8.00	8.00	
#11	7.7	9.0	9.0	9.5	9.4	9.4	9.5	9.0	9.4	8.6	9.0	7.7	9.00	9.50	
#12	7.7	9.0	9.0	9.5	9.4	9.4	9.5	9.0	9.4	8.6	9.0	7.7	9.00	9.50	
#13	7.9	9.2	9.2	9.6	9.5	9.5	9.6	9.2	9.5	8.7	9.2	7.9	10.56	10.56	



Fender Clearance: Allow 3" over the tire at full load



Frames Types

The following illustrations show some of the more common frame types and the preferred method of attachment for Torflex® axles. Figures 1 through 4 deal with side mounted axles while Figures 5 through 7 show the top mounted type. Although Torflex® axles are normally specified by the dimension at the outside or outboard edges of the brackets to match the outside dimension of the frame, some situations may dictate aligning the vertical leg of the bracket with the web or side of the frame member.

Designers should consider the attachment of the running gear carefully when making decisions about frame types. The reliability and structural integrity of the running gear as well as the frame members can be degraded if axles are mounted to the frame in ways that result in excessive flexing of the components. Side mount hangers can add support to the frame while providing a convenient method for running gear attachment. Re-enforcing plates may also be added in the areas where the axles are mounted to provide additional support (see illustrations).



Figure 1



Figure 2



Figure 3

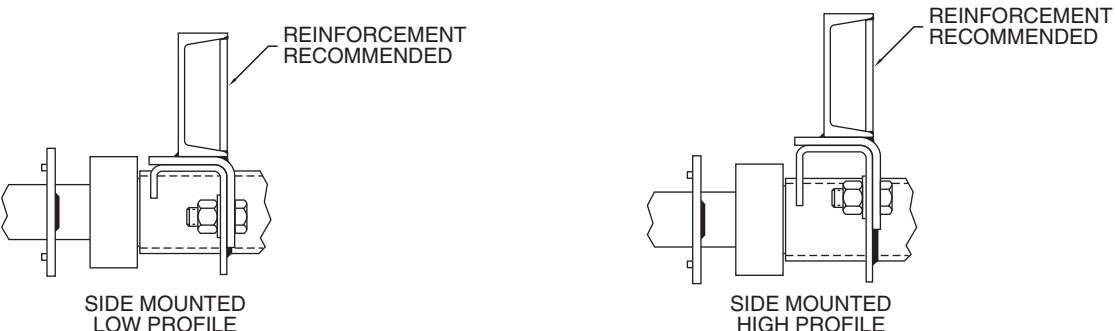




Figure 4

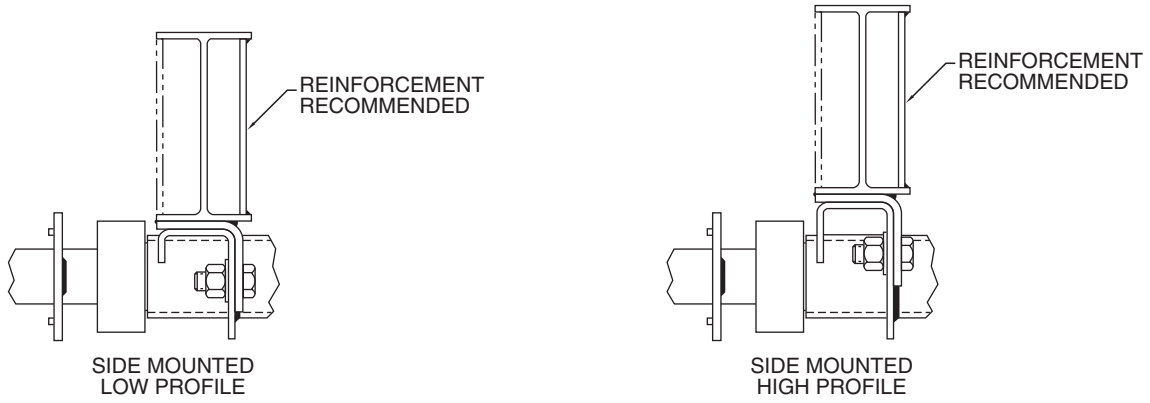


Figure 5

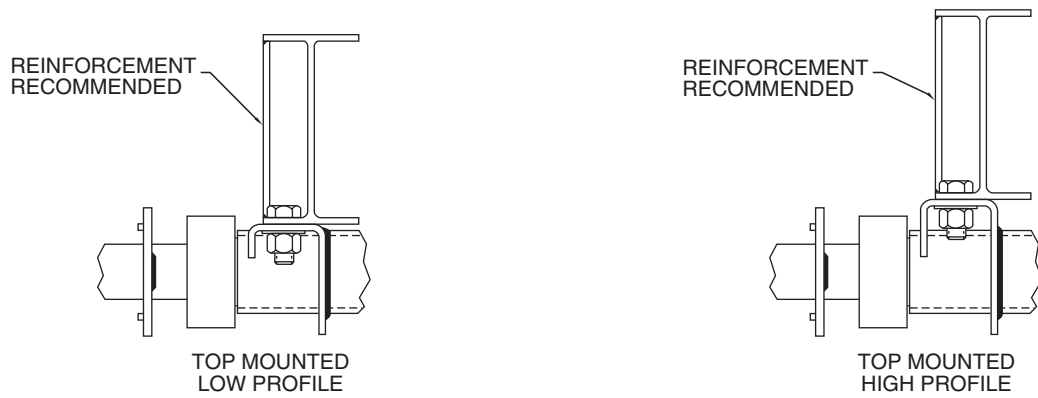


Figure 6

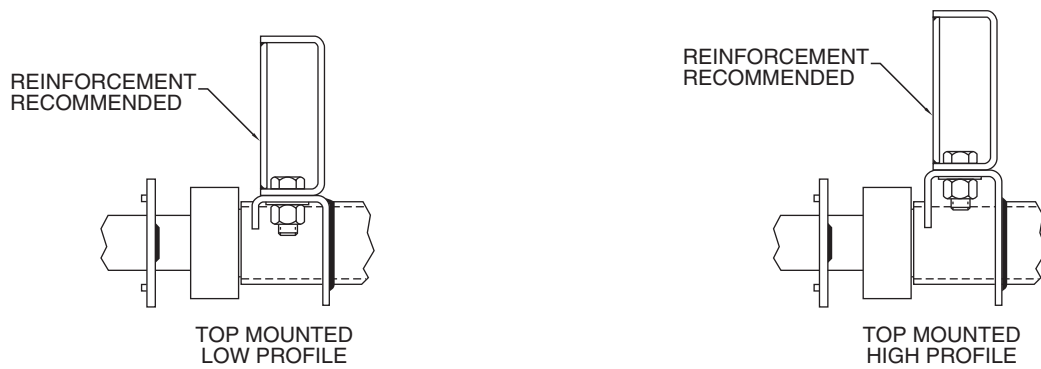
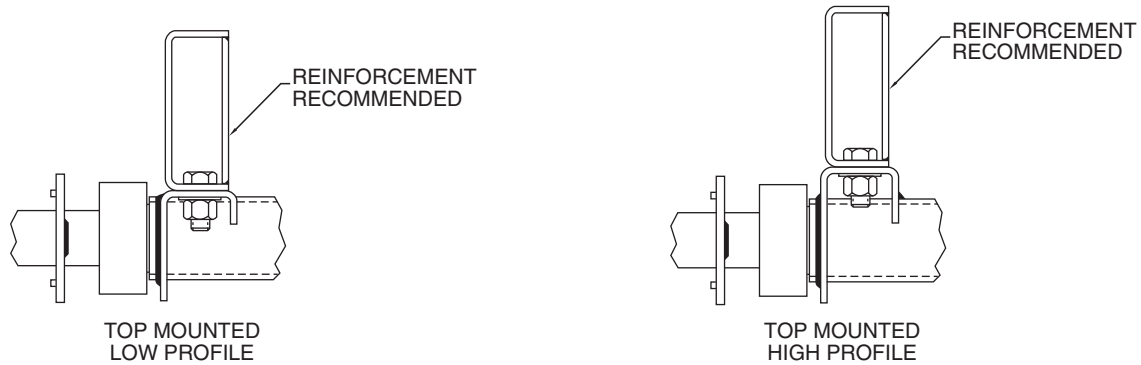




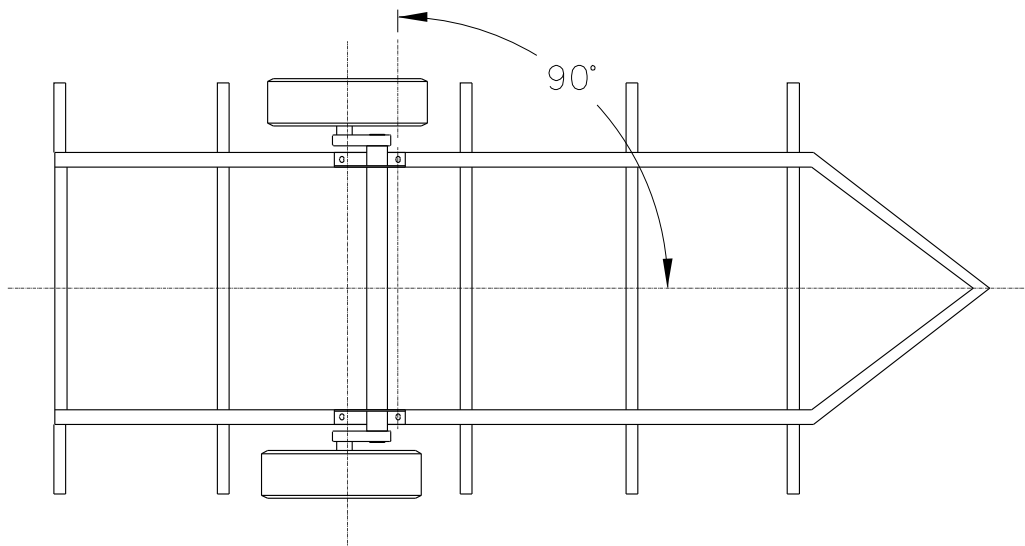
Figure 7



Designers should consider the attachment of the running gear carefully when making decisions about frame types. The reliability and structural integrity of the running gear as well as the frame members can be degraded if axles are mounted to the frame in ways that result in excessive flexing of the components. Side mount hangers can add support to the frame while providing a convenient method for running gear attachment. Re-enforcing plates may also be added in the areas where the axles are mounted to provide additional support (see illustrations).

Axle Alignment

Figure C



To insure proper tracking, the axle must be placed on the frame perpendicular to the centerline of the vehicle. The accuracy must be within plus or minus one half degree. For multiple axle applications, each axle must be parallel with the others within one sixteenth of an inch when measured at the wheel centers.

NOTE: When laying out the position for the axle(s), measuring from the front cross member should only be done if the cross member has been checked for squareness to the frame centerline. Any error in the cross member will be transferred to the axle and can result in poor tracking and excessive tire wear.



WHAT PRODUCTS ARE COVERED

All Dexter trailer axles, suspensions, and brake control systems excluding Dexter 6000 series Manufactured Housing Axles.

LIMITED 2 YEAR WARRANTY

Dexter Axle warrants to the original purchaser that its axles, suspension systems, and E/H hydraulic brake actuators shall be free from defects in material and workmanship for a period of two (2) years from the date of first sale of the trailer incorporating such components.

LIMITED 5 YEAR WARRANTY

Dexter Axle warrants to the original purchaser that its Nev-R-Lube™ bearings and the suspension components only of its Torflex® Axles shall be free from defects in material and workmanship for a period of five (5) years from the date of first sale of the trailer incorporating such components.

LIMITED 7 YEAR WARRANTY

Dexter Axle warrants to the original purchaser that its Predator Series™ electric brake controllers shall be free from defects in material and workmanship for a period of seven (7) years from the date of purchase.

EXCLUSIVE REMEDY

Dexter Axle will, at its option, repair or replace the affected components of any defective axle, repair or replace the entire defective axle, or refund the then-current list price of the axle. In all cases, a reasonable time period must be allowed for warranty repairs to be completed. Allowance will only be made for installation costs specifically approved by Dexter Axle.

WHAT YOU MUST DO

In order to make a claim under these warranties:

1. You must be the original purchaser of the vehicle in which the Spring Suspension Axles or Torflex® Axles were originally installed.
2. You must promptly notify us within the warranty period of any defect, and provide us with the axle serial number and any substantiation which may include, but is not limited to, the return of part(s) that we may reasonably request.
3. The axles or suspensions must have been installed and maintained in accordance with good industry practice and any specific Dexter Axle recommendations, including those specified in Dexter Axle's publication "Operation Maintenance Service Manual."

EXCLUSIONS

These warranties do not extend to or do not cover defects caused by:

1. The connecting of brake wiring to the trailer wiring or trailer wiring to the towing vehicle wiring.
2. The attachment of the running gear to the frame.
3. Hub imbalance, or any damage caused thereby.
4. Parts not supplied by Dexter Axle.
5. Any damage whatever caused by or related to any alteration of the axle including welding supplemental brackets to the axle.

6. Use of an axle on a unit other than the unit to which it was originally mounted.
7. Normal wear and tear.
8. Alignment.
9. Improper installation.
10. Unreasonable use (including failure to provide reasonable and necessary maintenance as specified in Dexter Axle's publication "Operation Maintenance Service Manual" including required maintenance after "Prolonged Storage").
11. Improper wheel nut torque.
12. Cosmetic finish or corrosion.

LIMITATIONS

1. **In all cases, Dexter Axle reserves the right to fully satisfy its obligations under the Limited Warranties by refunding the then-current list price of the defective axle (or, if the axle has been discontinued, of the most nearly comparable current product).**
2. Dexter Axle reserves the right to furnish a substitute or replacement component or product in the event an axle or any component of the axle is discontinued or is otherwise unavailable.
3. These warranties are nontransferable.

GENERAL

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXCEPT THAT OF TITLE, WHETHER WRITTEN, ORAL OR IMPLIED, IN FACT OR IN LAW (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE).

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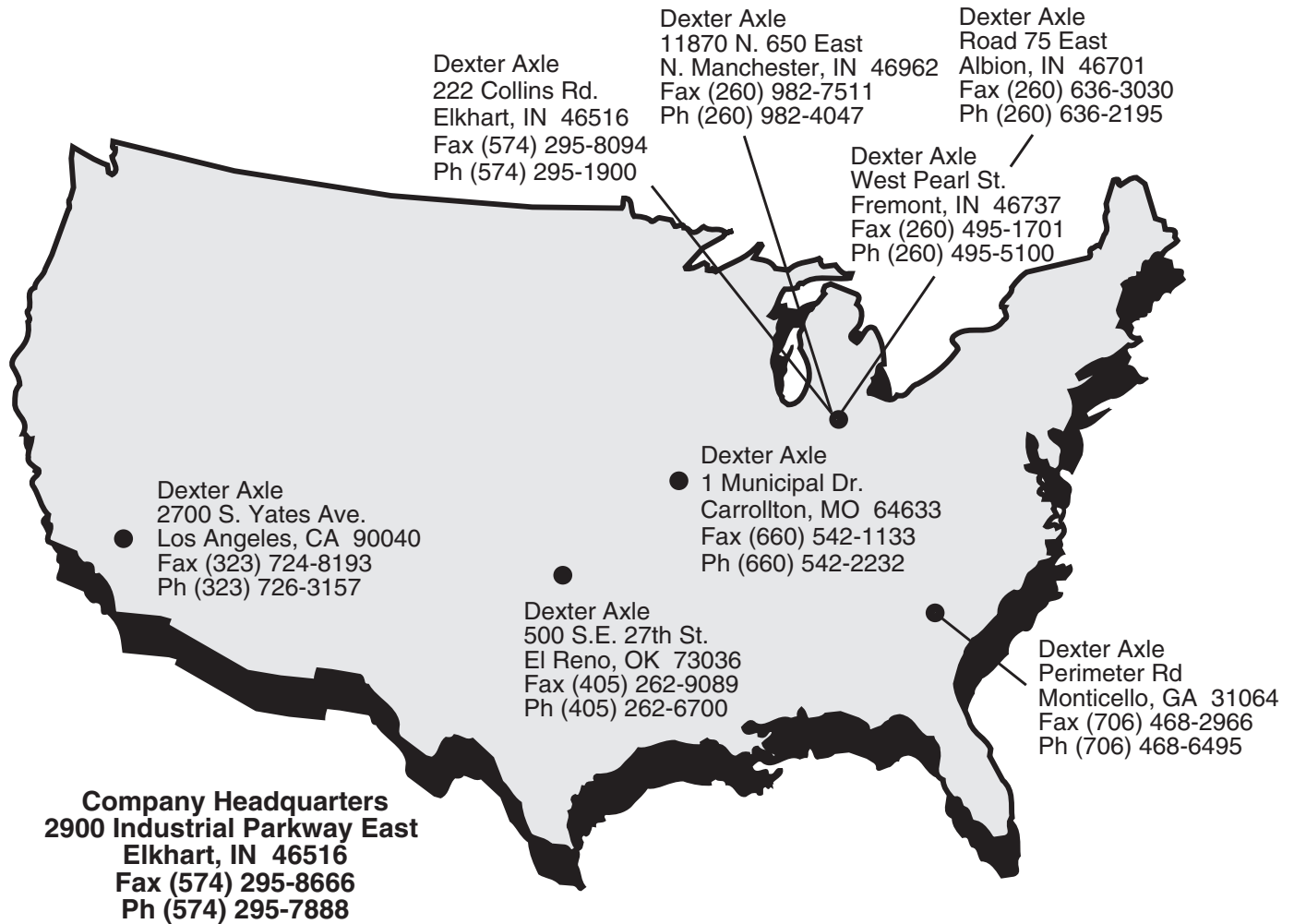
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Inquiries regarding these warranties should be sent to:

Dexter Axle
P.O. Box 250
Elkhart, Indiana 46515

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