NEW

PETERBILT ESSENTIALS

MODULE 8

- Tires
- Wheels

Peterbilt

CLASS PAYS

PETERBILT NEW ESSENTIALS – MODULE 8

Introduction

In this module we will look at various aspects of tires, including tire selection and tread design, and wheel mounting systems.

How To Use New Peterbilt Essentials

1. Print the module and study the information. To print, click the printer icon on your browser. Highlight material that is new to you, or complex.
2. When you are ready to take the online test, click the "Begin" button in the "Test" column for the desired module. When the test is completed, it will automatically be scored and the results will be entered in the Peterbilt training records database.
3. Upon successful completion of all modules, you will receive a personalized certificate.

It is recommended that you complete these training modules in sequence since each succeeding module builds on the previous module.

Tires

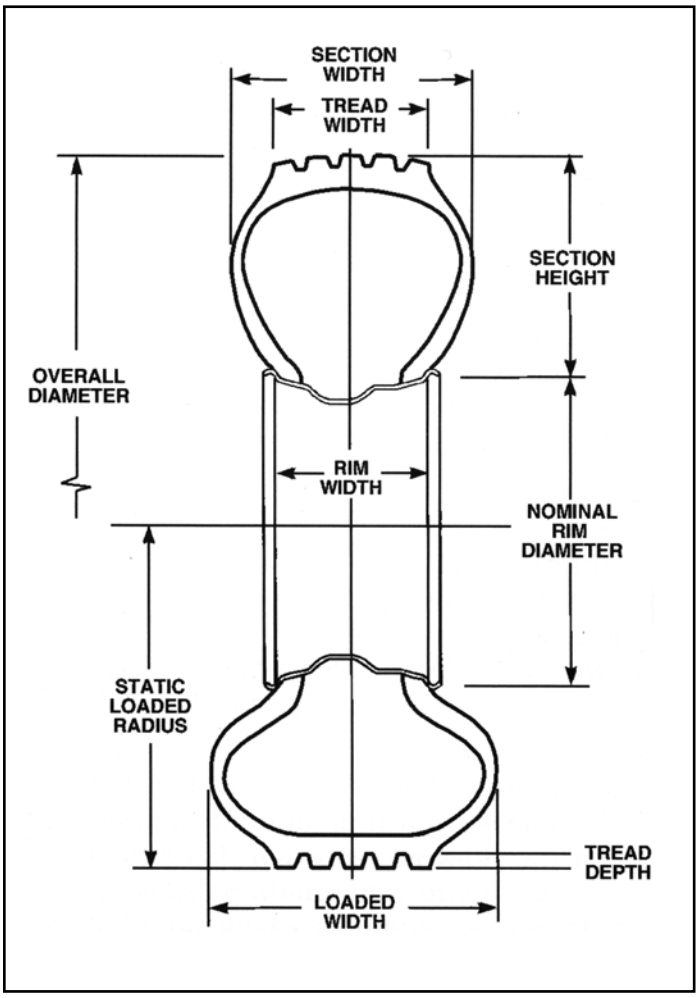
A vehicle demands a lot from its tires. Besides providing rolling traction and a specified weight-carrying capacity, tires must also provide safe handling response and satisfactory service life.

Peterbilt's standard tire manufacturer is Bridgestone, but customers can also specify tires from Michelin and Goodyear.

Tire Nomenclature

To help you understand tire selection we will examine a popular tire size and interpret the meaning of each part of the tire's designation. Let's look at a Bridgestone tire with the designation "295/75R22.5 14-ply."

- **295 = section width.** Section width is the measurement of the cross section of an unladen tire (without weight applied) across the casing only, not including ribs or protrusions. In this example, the width is expressed in millimeters. Some tires may be identified using inches instead of millimeters; for instance, a 11R22.5 tire would have a section width of 11-inches.



Tire Measurements

- **75 = aspect ratio.** Aspect ratio is the section height divided by the section width. (**Section height** is the distance from the bead seat to the tread surface of an unladen tire.) Aspect ratio represents the height of the tire as a percentage in relation to its width. Our Bridgestone tire example would have a section height of 221.25mm (295 x 0.75 = 221.25mm). Tires for which the aspect ratio is listed are commonly referred to as **low-profile** tires; the smaller the aspect ratio number, the lower, or smaller, the tire profile. Truck tires without the aspect ratio (11R22.5) are referred to as standard profile tires.
- **R = radial.** A radial tire design has the cords or plies in the casing laid radially (that is, in a "hoop" around the tire) – as opposed to diagonally, as they are in a cross- or bias-ply tire. It is rare today for a customer to specify something other than a radial tire, because under the same pressure and load conditions, the performance of a tire with radial construction is superior to that of a cross- or bias-ply tire.
- **22.5 = the rim or wheel diameter in inches.** The tire must have the same inside diameter as the wheel's mounting surface diameter.
- **Rim width** – Some tire catalogs (e.g., Bridgestone) show the rim width in the main tire listing. Usually a separate table in the catalog lists alternate acceptable rim widths and special mounting considerations.

This indicator may also designate whether the tire has an inner tube or not. The tire in our example is tubeless. Bridgestone tubeless tire wheel designations always end in .5 (indicating one-half inch). By extension, the designation 12.00R24 would indicate a tube-type tire. Since this rule does not apply to all tire manufacturers, it's essential to refer to a particular manufacturer's data book before identifying a tire as tubeless or tube-type. Most customers specify tubeless tires because they provide a lower overall cost as compared to tube-type tires.

- **14-ply =** the ply rating (PR) which classifies or identifies the tire's weight-carrying capacity. In the past, the weight-carrying capacity of a tire was determined by how many plies were used to make the casing. Technology has now made it possible to get the same strength with fewer cords or plies. As a result, a load range (LR) rating has been established.

The load range is designated by a letter that corresponds to a ply rating. For example, the LR for a 14-ply tire is "G." The LR will also partially determine the tire load limit. Load ranges for different ply ratings are listed in the following table.

LOAD RANGE	PLY RATING		LOAD RANGE	PLY RATING
A	2		G	14
B	4		H	16
C	6		J	18
D	8		L	20
E	10		M	22
F	12		N	24

Load Range/Ply Rating

Low-Profile and Wide-Base Tires

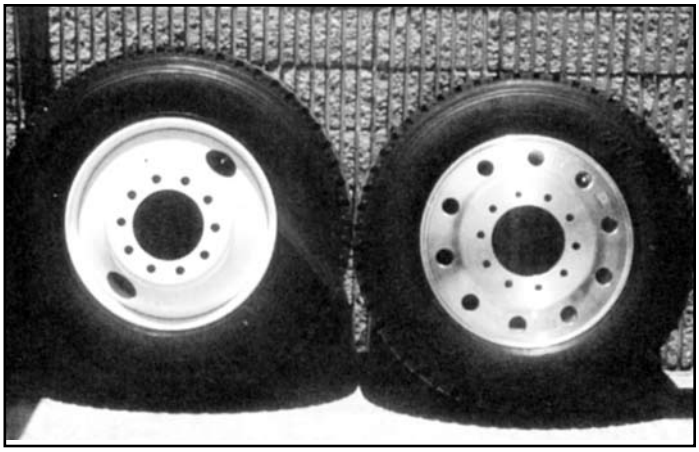
Two terms commonly used in reference to tires are low-profile and wide-base. Low-profile refers to a tire design that has a low aspect ratio and will therefore change the overall diameter of a tire/wheel combination. A low-profile design may result in lower vehicle height, faster steering response, and lighter weight. Wide-base refers to a wider one-tire-per-axle end configuration instead of a dual assembly. A configuration using wide-base singles usually weighs less than a dual assembly configuration with no sacrifice of the other configuration's weight-carrying capacity. This may allow an increase in payload. Wide-base tires are often also used on a vehicle's steer axles in applications such as dump trucks and mixers to increase GAWR.

Tire Selection

The information used to determine tire size is found in the tire manufacturer's tire specification charts. The allowable axle loads and the required inflation pressures to carry these loads are shown in the specification charts for both single and dual mountings at specific inflation pressures in pounds per square inch (psi).

We have already defined tire size, ply rating, and load range. Now we will interpret the other elements found on a tire manufacturer's specification chart, beginning with rim width.

- **Rim Width** – the distance between the rim flanges. There are two critical rim widths as they relate to a specific tire.



Standard (Left) and Low-profile Tire (Right)

Wide-base Rear Tires

1. The width of the rim for which the tires is designed.
2. The smallest rim width for which the tire is approved.

- **Tread Depth** – the distance from the tread surface to the major groove base at the designated measuring point.
- **Overall Diameter** – the diameter of an unladen new tire, measured from opposite outer surfaces.
- **Overall Width** – the measurement of the cross section of an unladen tire, including ribs and protrusions. This is usually the same as section width on radial tires.
- **Tread Width** – the distance across the tread face of an unladen tire.

- **Loaded Radius** – the distance from the center of the axle to the ground of a tire properly inflated for a given load (based on Tire and Rim Association [TRA] or other standardizing organization load and inflation tables). This is often called static loaded radius (SLR).
- **Loaded Width** – the maximum section width of a tire under a load and properly inflated (per TRA or other standardization organization load and inflation tables).
- **Revolutions per Mile (rpm)** – the number of tire revolutions in one mile measured at a speed of 55 mph.
- **Tread depth –** measurement in 1/32 of an inch.

Tread Design

Tread design is another area to consider in the selection of tires. Ribbed tires (tires with circumferential ribs and grooves) are the most effective on wet surfaces and at higher speeds because the tread pattern drains or breaks up the wet contact surface between the tire and the road. Many trucks are mainly used for off-highway applications, and others that are strictly for highway use may often need to travel through snow. A mud and snow tread is available with a lug pattern; this type of tire is very effective at gripping for traction. It is important to note, however, that these tread patterns are only available on drive axles. Many other tread patterns are available on Peterbilt vehicles to suit just about any application or operation. Refer to the tire manufacturer's literature for available tread patterns and approved vehicle location. Most tire manufacturers offer semi-lug tread patterns that can be used at all positions on the vehicle.

Ribbed Tread Design

Mud/Snow Tread with Lug Pattern

Gross axle weight rating (GAWR) is the capacity of the lowest-rated of the following components: tires, wheels, axles, and suspension. Suppose a customer were specifying a vehicle and he wanted to load 12,000 pounds on its front axle. Would 295/75R22.5 14-ply tires be able to carry the load? If your answer is YES, you are correct. The tire load limit at 110 psi is 6,175 pounds. Since there are two tires on the front axle (one on each side), the capacity of the axle would be 12,350 lbs (2 x 6,175 = 12,350). By extension, we can determine that if the same tire were specified for a rear axle with dual tires (two on each axle end), the rating would be 22,700 pounds (5,675 x 4 = 22,700). Note that when the tire is mounted as one of the duals, the tire limit is reduced to provide a margin of safety if one of the tires in a dual were to fail.

This section has provided a brief introduction to the interpretation of tire sizes and ratings, tread pattern and tire profile considerations in the tire selection process. There is considerably more to know about tires to include the following:

- Effects of speed and psi adjustments on carrying capacity
- How to determine whether to specify a low-profile or wide-base over a standard profile tire
- Tire width and tread design

Super Single

Wheels

The wheel is the component onto which the tire is mounted, actually providing the surface that completes and seals the air chamber for tire inflation. Because of this close relationship between the wheels and tires, wheel size must accurately match the size of the tire selected. As you recall, the wheels also help support the vehicle's weight; therefore, they have weight ratings that must be considered when the wheels are specified.

Disc Wheels

A disc wheel is a permanent assembly consisting of a rim and a center disc. Aluminum or steel disc wheels are available in either the pilot-mounting or the ball-seat mounting design. Both wheel mounting systems will be explained later in this module. Peterbilt only offers the pilot-mounting system.

Disc-type Wheels

A wheel is commonly identified by its manufacturer's name, its part number, any pertinent information regarding that particular wheel, its diameter and its width. For example, an Accuride 27406NEPLT 24.5" x 8.25" would be interpreted in the following manner:

Accuride - Manufacturer
27406N - Part Number
E - Coat Perma-Plate (white)
24.5" - Diameter in inches
8.25" - Width in inches

The descriptive characters used after the part number vary from manufacturer to manufacturer, so consult the manufacturer's catalog or data book for information regarding a specific wheel.

Refer to the **Sample Catalog Data** (below) as we examine the catalog information for the wheel in our example and review other information that is included.

- The number of "hand holes" (sometimes called "vent holes") refers to the openings in the disc area of a wheel both for access to the valve stem of the inside dual tire and for chain application. The vent holes on Peterbilt proprietary wheels are a distinctive oval design.
- "Wheel offset" refers to the lateral distance from the disc mating surface (contact surface between the wheels in a dual assembly) to the rim centerline. This dimension is important because it determines how far in or out the wheel/tire assembly sits on the axle. On steer axles, if the wheels are set too far in, they will interfere with frame-mounted components. If so, the axle's stops will need to be set to prevent this; but this in turn will reduce wheel cut and increase turning radius. On the other hand, if the wheels are set too far out, overall vehicle width will be increased and possibly exceed legal limits. Additionally, increasing outboard offset beyond the axle manufacturer's specifications may lower the axle's weight rating.
- The next value is the approximate weight of the wheel assembly in pounds. In this case, the weight is 90 pounds.
- Following the weight specification is the maximum load rating, measured in pounds at a specific maximum inflation pressure (psi). The load is actually the rated capacity used in determining the GAWR and is calculated in the same way as the tire load limit. Dual configurations do not affect the weight-carrying capacity as they do that of tires. So the GAWR for a dual axle would be determined as follows:

7,300	rated capacity
x 4	(wheels per axle)
= 29,200	pound rating

Sample Catalog Data

15° Tubeless Steel Wheel

Stud-Piloted Dual-Mounting Double Cap Nut

10 Hole, 11.25" Bolt Circle, 8.72" Bore

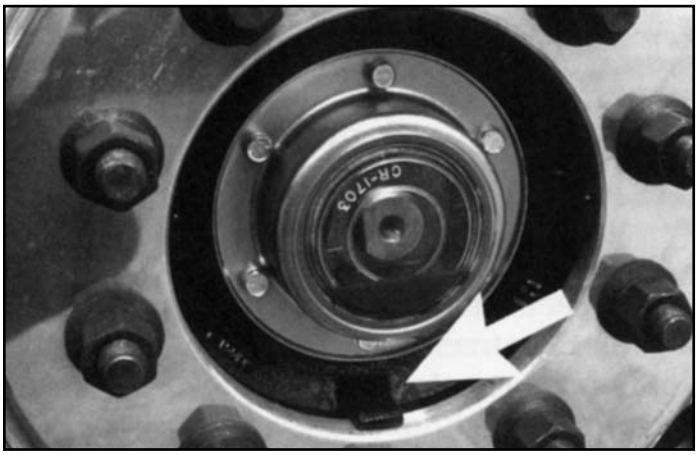
Rim Size	Part Number	Hand Holes	Wheel Offset	Approx. Wt. (lbs.)	Maximum Load & Infl. (lbs-psi)
24.5 x 8.25	27406	2	6.62"	90	7300-120

Wheel Mounting Systems

The information in this section will help you understand the difference between a **hub-piloted mounting system** and a **ball-seat mounting system**.

Hub-piloted Mounting System

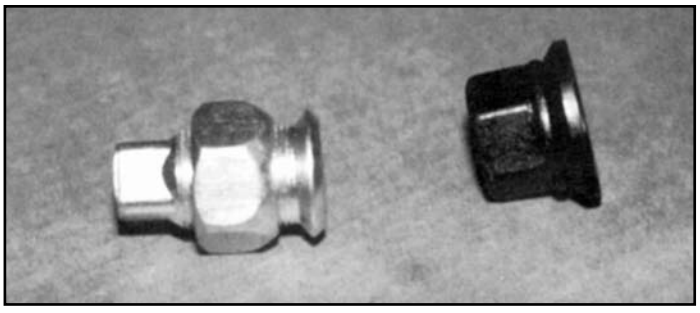
You will often hear a pilot-mount system referred to as a hub-piloted mounting system. With hub-piloted mounting, the wheels are designed to center on the axle hub at the bore of the disc wheel. This is accomplished by close tolerances being maintained between the wheel center and machined surfaces, or tabs, on the hub. Hub-piloted wheels have straight-through bolt holes (with no



Hub-pilot Mounting Tabs (lower center)

countersink surfaces), since the bolt holes serve no other purpose than to afford clearance for the studs.

Hub-pilot-mounted wheels are held securely to the hub by two-piece flange nuts. A two-piece flange nut is a nut and washer combination that allows the nut to rotate while the washer is stationary. The design of these flange nuts provides high clamping force for maximum hub-and-disc contact. On hub-mounted systems, all threads are right-handed.

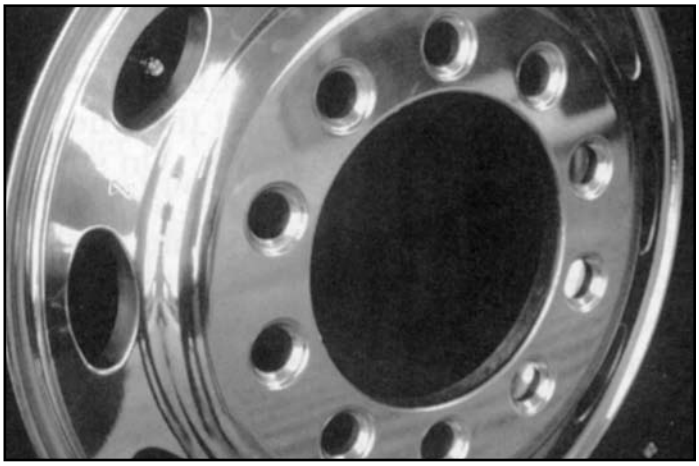


Rounded Ball-seat Type Capnut (Left) and Pilot-mount Two-piece Flange Nut (Right)

Ball-seat Mounting System

In contrast, ball-seat mount wheels (often called stud-mount wheels) are designed to center on the studs of a hub. These wheels have chamfers, or countersinks, at the bolt holes, into which ball-shaped or conical nuts are installed to center the wheel. The center bore of the wheel is only for clearance of the axle end. When dual wheels are mounted in a ball-seat system, an inner capnut is used to mount the inner wheel, and an outer capnut is threaded onto the stud part of the inner capnut to secure the outer wheel. With a stud-mounted system, wheel studs on the right side of the vehicle have right-hand threads, and those on the left side have left-hand threads.

Peterbilt uses a hub-piloted system because it provides more exact centering of the wheel, which results in a smoother ride and better tire wear. The hub-piloted



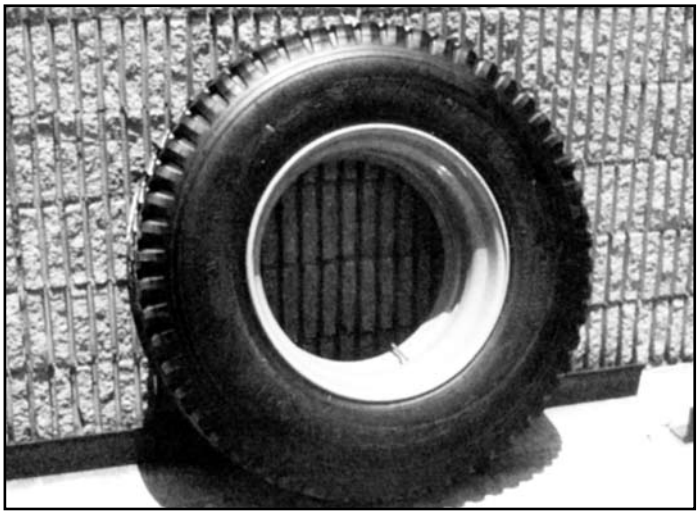
Countersunk Stud Holes on Ball-seat Type Wheel

system also has fewer parts due to the elimination of inner capnuts, and it simplifies installation. To ensure safe operation of the vehicle, hub-pilot and ball-seat parts must not be used together.

Steel Demountable Rim Mounting System

The steel demountable rim system, sometimes referred to as the “cast spoke wheel” system, is quite different from the disc wheel design. In this system, the rim section (to which the tires are mounted and sealed) can be dismounted or removed from the center, or mounting, section. The center section is a cast part of the axle hub; three, five or six spokes extend from the center hub to become the rim/tire mounting locations. Studs are installed at the end of each cast spoke, and hex nuts are tightened

over the studs against clamps to hold the rims in position (the type of clamp used with three-spoke wheel systems has two stud holes). On a “duals” setup, the rims are separated by spacer bands.



Tire Mounted on Steel Demountable Rim

Peterbilt customers can select disc wheels offered by Accuride, Alcoa and Hayes; also available is a Peterbilt proprietary design provided to Peterbilt by Alcoa. Steel demountable rims that are used with cast spoke hubs are not available from Peterbilt.

0Steel Demountable Rim Mounting System (Six-Spoke)