

BUMPER 2 BUMPER

TOTAL VEHICLE ALIGNMENT

A guide created by:
TBS Factoring Service

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...CREATED BY TBS FACTORING SERVICE

With more than 50 years of experience serving motor carriers, [TBS Factoring Service](#) makes trucking easier with technology and services to help drivers get established, stay compliant, find loads and get paid faster. Founded in 2004, TBS Factoring serves thousands of clients nationwide with simple and flexible cash flow solutions.

TBS Factoring anchors a one-stop shop for independent trucking services that also includes [Truckers Bookkeeping Service](#), formed in 1968 to provide independent truckers with permitting, DOT compliance and fuel tax reporting services, and [TBS Insurance Agency](#), founded in 1998 to provide truck insurance nationwide. In 2013, [TBS Capital Funding](#) joined the TBS Family, expanding our service offering to include general factoring. In 2017, [Foxhole Logistics](#) was formed to serve federal, state and local agencies with disaster response solutions.

Based in Oklahoma City and voted one of the best places to work in Oklahoma, the TBS family of companies is driving change for small businesses with its commitment to digital transformation.



LET'S BE FRIENDS





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TOTAL VEHICLE ALIGNMENT

Total vehicle alignment is often overlooked in preventive maintenance programs. Yet, total vehicle alignment plays an essential role in vehicle performance and in lowering operational costs. Nevertheless, industry estimates that 70 to 80 percent of commercial vehicles on the road today are misaligned.

Proper vehicle alignment is when a vehicle and all its tires are traveling in a straight line. Among the ways to knock a vehicle out of alignment are running over potholes, hitting curbs, bumping into concrete parking stops and vehicle wear and tear.

Improper alignment negatively impacts vehicle safety, driver comfort and fuel economy, plus it shortens the life expectancy of tires.

RICH BENEFITS

Total vehicle alignment maintenance and inspection programs pay numerous dividends:

- Extending tire wear for increased tire mileage.
- Enhancing fuel efficiency.
- Decreasing component wear.
- Reducing downtime.
- Improving driver comfort.
- Improving vehicle handling for less driver fatigue.
- Making vehicles safer.



CHAPTER #1

IT'S ABOUT GEOMETRY

A vehicle not in proper alignment is a recipe for a maintenance manager's and truck owner's nightmare. Why? Because misalignment impacts every aspect of operating costs per mile.

Alignment refers to the various angles of steer axle geometry and to the tracking of all axles on a vehicle, including trailers. The objective of proper alignment is to minimize tire wear and maximize predictable vehicle handling and control.

Vehicle alignment settings serve a variety of functions in vehicle operation and affect such things as handling, steerability, stability, performance and safety.

Basically, a vehicle is a composite with the chassis as the foundation. This foundation must be square and solid to support the dynamics of the complete structure.

The chassis includes every wheel, axle, suspension component and frame member. All should be aligned in relation to one another as a whole, instead of only one wheel or one axle independently. Total alignment is a correction of the entire vehicle geometry.

Out-of-alignment occurs when the suspension and steering systems are not operating at their desired angles. When a vehicle is in total alignment, all wheels "agree" on one direction so lateral forces do not counteract.

Often, the difference between a "good" truck and a "bad" truck is simply proper alignment.

WHAT IN THE WORLD IS THAT?

Here are some specific types of uncalled for tread wear caused by misalignment:

- **Feathering** – Tread ribs or blocks are worn smooth/lower on one side and higher/sharper on the other.
- **Toe** – The difference in distance apart, at the front and at the rear, of the steering axle tires when viewed from directly above the truck. An
- **Out-of-spec toe-in** – Fast outside shoulder wear on both steer tires because the tires are closer together in the front than in the rear.
- **Toe-out** – Fast inside shoulder wear on both steer tires because the tires are closer together in the rear than in the front. (Toe settings generally have the greatest effect on truck tire treadwear.)
- **Cupping** – Also known as tire scalloping, occurs because of inconsistent, distinct high and low "cup-like" wear spots, usually around the edge of the tread on one side or the other.

CHAPTER #2



NO GOOD OUTCOMES

Improper vehicle alignment impacts the two largest maintenance expenditures – tires and fuel – the most. Without proper alignment, the tires will scrub across the pavement, increasing rolling resistance. Because of the lateral forces, not only is more horsepower required to move the same load (which directly impacts fuel consumption), but tire life is reduced, resulting in more frequent tire replacement.

Such unnecessary lateral forces not only require more horsepower, but also increase fuel consumption to move the same load. These forces also significantly reduce tire mileage, resulting in more frequent tire replacement.

Vibrations are typically caused by out-of-round tires, driveline issues, loose bearings, balance issues or toe- or drive-axle misalignment.

Performing frequent alignments provides better control over vehicle condition and extends the life of the tires.

ROLLING DOLLARS AWAY

Because tires are a significant financial investment for any truck/fleet owner, it is wise avoid tire issues that cause breakdowns and/or contribute to premature tire wear, which decreases casing life and reduces fuel efficiency.

Among the issues to avoid:

- Underinflating and overinflating tire pressure.
- Improper toe-in or toe-out alignment.
- Alignment issues on trailer axles.
- Using the incorrect tire for the application.
- Mismatching tires.

NO GOOD OUTCOMES (CONTINUED...)



- **Tracking** – All axles must be aligned with the truck’s front axles, otherwise, the steer tires are forced to counter-steer against the direction of the rear axles. While the tractor alignment may be correct, a trailer tracking to the right or left (referred to as dog tracking), leads to irregular trailer tire wear as well as irregular wear on steer and/or drive tires.

- **Camber** – This is the tilt of the tires when viewed from the front of the truck. Positive camber is when the tires are closer together at the bottom (point of road contact), and negative camber is when the tires are closer together at the top. Positive camber causes premature treadwear along the tire’s outside shoulder, and negative camber wears away along the inside shoulder. In a tractor-trailer combination, the drive tires traditionally experience positive camber; trailer tires, negative camber.

- **Caster** – This is the forward or backward slope of a line drawn through the upper and lower steering pivot points when viewed directly from the side of the vehicle. Positive caster is when the line slopes towards the rear of the vehicle at the top and negative caster is when the line slopes towards the front. Caster is normally associated with handling and driveability of the vehicle and not tire wear problems. Negative caster will cause unstable steering, require constant steering corrections and render the vehicle unable to return to straight ahead out of a turn. Positive caster causes hard steering, shimmy and road shock.

THERE’S A VIDEO FOR THAT

A series of instructional videos on commercial truck tire wear, handling, alignment and mechanical issues by alignment specialist Mike Beckett can be found online at: https://www.youtube.com/watch?v=w_fwYeGtZ4w

CHAPTER #3



WHAT ABOUT THE DRIVER?

Improper vehicle alignment also impacts the driver. When a vehicle is not aligned, the driver must constantly correct the steering, usually in one direction all the time. One driver described this as a form of Chinese water torture.

Additionally, a vehicle rattling, shuddering and vibrating along the road can cause an uncomfortable ride that contributes to driver discomfort, muscular fatigue and stress. This tires and frustrates drivers, making them less effective and productive.

Driver fatigue caused by continuously correcting poor alignment can become a factor that impacts safety as well as the driver's attitude. Vehicles that are difficult to handle are a reason for a driver to start looking for work with another company.

Properly aligned vehicles are not only safer to drive; they also make driving easier and more enjoyable.

STEER TIRE WEAR AND DRIVE AXLES

Drive wheels carry three-quarters of all the weight on a truck. If they are not pushing in the direction you want to the vehicle to go, that means the front end is trying to overcome engine power.

Experience and studies have proven that some 70 percent of steer tire wear problems originate from the drive axles.

A vehicle going down the road sideways negates all of the aerodynamic aids added to slice through the air efficiently.

CHAPTER #4



SELECTING A QUALITY COMMERCIAL VEHICLE ALIGNMENT SHOP

Thinking about using a commercial vehicle alignment shop? Be sure to evaluate the provider's ability to perform an accurate total vehicle alignment. So advises the Technology & Maintenance Council (TMC), North America's premier technical society for truck equipment technology and maintenance professionals.

TMC recommends:

- Asking maintenance shops and other truck operators and owners who they use and why.
- Getting references and checking them out.
- Asking truck dealers where they send their vehicles for alignments and why.

HOW DEEP IS IT?

Inspecting tires for early stage irregular wear – an indicator of alignment problems – should to be a part of any regular preventative maintenance practice.

The depth of a tire's tread is one of the most obvious indications of its performance. Tread depth is also a safety issue and therefore subject to government regulation and inspection.

As defined in Federal Motor Carrier Safety Administration (FMCSA) Regulation 393.75, Tires, any tire on the front wheels of a bus, truck or truck tractor must have a tread groove pattern depth of at least 4/32 of an inch when measured at any point on a major tread groove. The measurements are not to be made where tie bars, humps or stone ejectors are located.

The minimum tread depth for any other wheel position is 2/32 of an inch.

SELECTING A QUALITY COMMERCIAL VEHICLE ALIGNMENT SHOP (CONTINUED . . .)

TMC also suggests looking for a commercial vehicle alignment shop that:

- Has ASE (National Institute for Automotive Service Excellence) certifications.
- Offers services that often go together with alignment, such as vibration analysis, balancing, truing and suspension and spring services.
- Makes available value-added services like centering the steering wheel, tire rotation and vehicle pickup and delivery.
- Wants to be a partner and is willing to develop customized specifications for one's operation.



THERE'S AN RP FOR THAT

The Technology & Maintenance Council (TMC) has developed guidelines on total vehicle alignment: Recommended Practice 642B, Total Vehicle Alignment: Recommendations for Maximizing Tire and Alignment Related Component Life.

It contains comprehensive alignment guidelines for medium and heavy duty vehicles.

TMC members have access to the complete Recommended Practices Manual. Non-members can order it on the TMC website – http://www.trucking.org/Technology_Council.aspx – or by phoning the organization at (703) 838-1763.



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