



*Truck & Bus Tyre*

**TECHNICAL MANUAL**

# **MAINTENANCE & CARE**

*About tyre inflation*

*Truck alignment & tyre wear*

*Tyre damage*

# ABOUT TYRE INFLATION

## ONE OF THE MOST IMPORTANT ASPECTS OF TYRE MAINTENANCE IS PROPER INFLATION.

Sufficient inflation is needed to carry the load and avoid damage. Driving with improper inflation (particularly grossly under inflated or over inflated tyres) is dangerous and can cause critical damage or sudden failure of the tyre(s). Proper inflation should be maintained and checked on at least a weekly bases and before long distance drives.

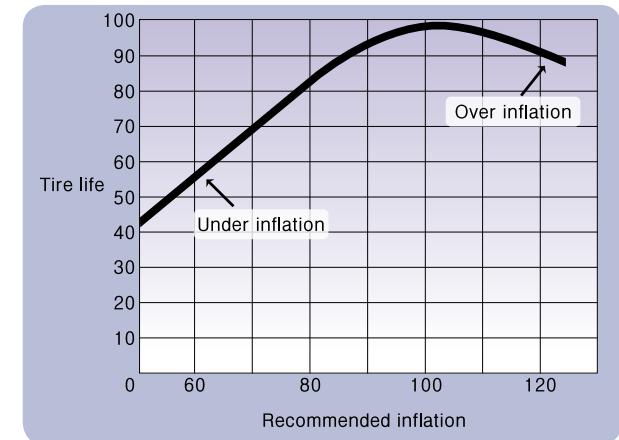
## PROPER INFLATION SHOULD BE MAINTAINED AND CHECKED AT LEAST ONCE A WEEK AND BEFORE A LONG DISTANCE DRIVE.

It is also advisable to take into account axle load and driving conditions when setting inflation pressures. Compensation for heavier loads can be made by increasing inflation pressures, but do not exceed maximum inflation for the tyre or maximum axle load.

## IN THE SPACE OF JUST ONE MONTH, A TYRE CAN LOSE 10 POUNDS OF AIR PRESSURE.

It is important to check your air pressure regularly, to make sure your tyres are neither under- nor over-inflated.

## INFLATION & TYRE LIFE



### UNDER-INFLATION

Is the worst enemy your tyre can have. It causes increased treadwear on the outside edges (or shoulders) of the tyre. It also generates excessive heat, which reduces tyre durability. Finally, it reduces your fuel economy by increasing rolling resistance-soft tyres make your vehicle work harder.

### OVER-INFLATION

Is also detrimental to the tyre. Too much air pressure causes the centre of the tread to bear the majority of the truck's weight, which leads to faster deterioration and uneven wear. Any kind of uneven wear will shorten the lifespan of your tyres.

# T RUCK ALIGNMENT & TYRE WEAR

The two major things that affect tyre wear are :

- Inflation Pressure
- Wheel Alignment

## COMPONENTS OF ALIGNMENT

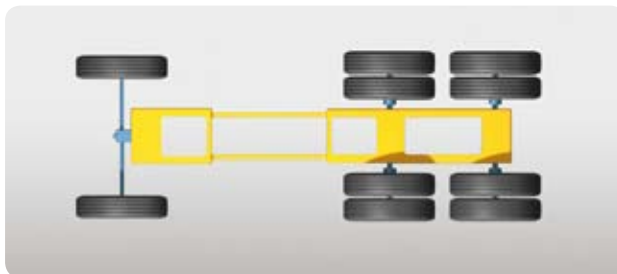
- Toe
- Camber
- Caster
- Ackermann
- Axle Parallelism
  - Thrust Angle
  - Scrub Angle

## TOTAL WHEEL ALIGNMENT

Definition:

- The process whereby the vehicle and all the tyres are travelling in the same direction.
- Steering axle alignment alone is not sufficient.

## ALIGNMENT & WEAR



## CAMBER

The angle that a centre line of the wheel is inclined from the vertical centre line perpendicular to a flat road is called camber angle. If the top of the wheel leans out from the perpendicular than it is positive camber. If the top of the wheel leans in from the perpendicular than it is negative camber.

Camber is meant to compensate for the downward forces of added load. Correct camber settings help the tyre maintain firm even tread contact with the road while the vehicle is travelling under loaded conditions. Often wear at the outside or inside edge of the tyre may indicate incorrect camber setting.

- Camber is the inward or outward tilt of the steering axle tyres when viewed from the front.
- Positive camber is the top of the tyre tilted out.
- Camber becomes more negative as the load increases.

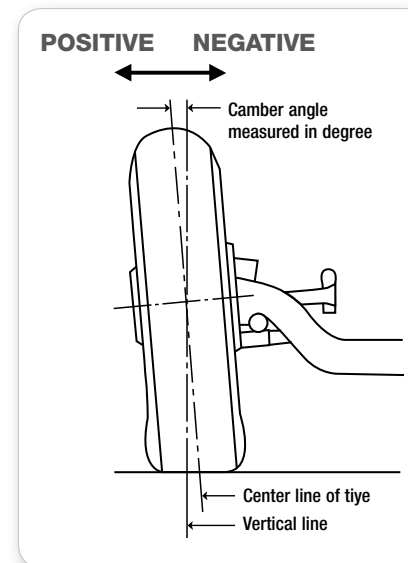


Figure 6.3  
Positive  
camber



Figure 6.3  
Negative  
camber

## TOE

Toe-in refers to the inclination of the wheels of a vehicle so that the pair of front wheels (viewing from the front as per the illustration below) is closer together at the front than at the rear of the wheels.

The opposite is considered toe-out.

The purpose of toe-in is to relieve or counteract some of the force which pulls wheels outward as they roll along the road. Proper toe-in will ensure that the rotation direction and the direction of travel are as similar as possible at driving speed. Insufficient toe-in settings will result in steering instability. If toe-in or toe-out is insufficient or excessive the tyre wear will be effected and appear as feathering at the edges of the tread.

- Toe is the inward or outward pointing of the wheels when viewed from the top of the vehicle.
- The goal is to have zero toe when the vehicle is loaded to its normal operating condition

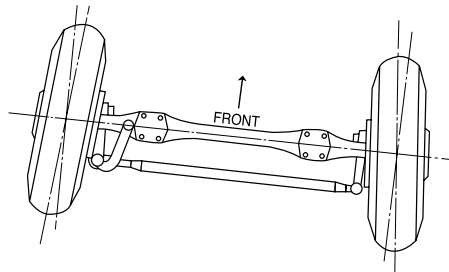


Figure 6.1 Toe-in



Figure 6.2 Toe-out

## CASTER

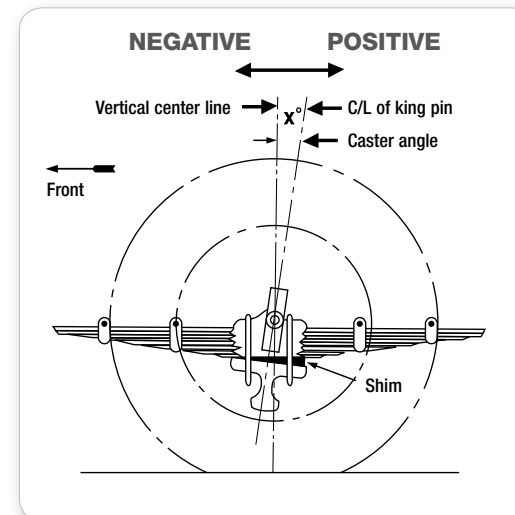
Caster is the condition where the king pin is inclined with the top of the pin angled rearward similar to the front forks of a bicycle. Caster angle is meant to compensate for the resistance which the tyre(s) encounters as a result of drag forces against the road. Caster angle should be the same for both wheels on a given axle or the result will be vibration and abnormal tyre wear.

Too much caster will more than compensate for the amount of drag but it will also create additional difficulty in steering.

Too little caster and steering becomes light but unstable or wanders.

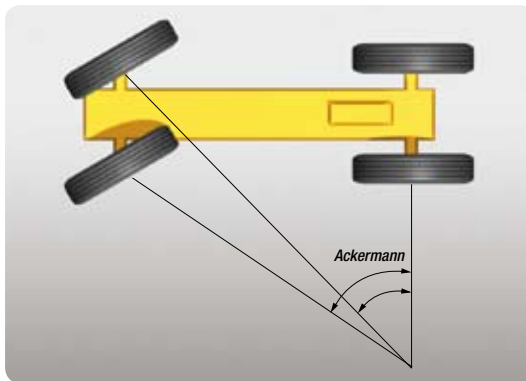
Caster angle should be checked as it can be distorted by impacts on the tyre or by driving in rough conditions.

- Caster is the forward or rearward tilt of the king pin of the steering axle when viewed from the side.
- Caster is generally not considered to have a great effect on tyre wear.



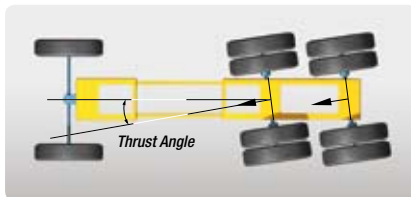
## ACKERMANN

- The Ackermann Principle shows that in any turn the inside tyre needs a sharper turn angle than the outside tyre.
- The difference in turn angles between the tyres is determined by the actual turn angle and the vehicle wheel base.
- Improper Ackermann causes side force, excessive scuffing, and fast or irregular wear.



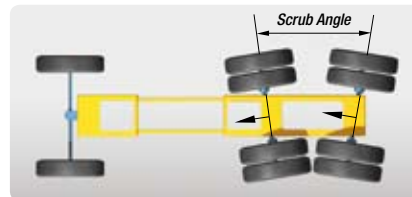
## THRUST ANGLE

- Thrust angle is the difference between the line perpendicular to the axle and vehicle centerline.
- Each drive axle has its own thrust angle.
- The target is to have zero thrust angle.



## TANDEM SCRUB

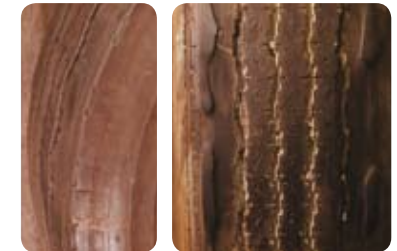
- Tandem scrub is the difference in the thrust angles of the drive axles.
- The target is zero.
- Tandem scrub errors cause constant side force on the steer tyres. This leads to irregular wear.



# A<sup>B</sup>NORMAL TREAD WEAR

Under inflation and over inflation of tyres is the prime cause of tread wear. However there are other conditions that influence tread wear and produce irregular patterns of wear.

## ABNORMAL WEAR



## COMPONENTS OF ALIGNMENT

- Imbalance of tyre or tyre and wheel assembly.
- Improper wheel alignment.
- Braking system problems that may cause wheel lock up or flat spotting.
- Bent or round rims.
- Worn or damaged bearings.
- Broken or worn shock absorbers, springs or steering components.

## DIAGONAL WEAR



## SHOULDER WEAR CAUSED BY WRONG CAMBER OR MISALIGNMENT



# T YRE DAMAGE

With tubeless tyres, it is often possible even with a slow air leak to use the tyre carefully enough to get to a service centre.

Small punctures in the tread area, if detected early enough, can usually be repaired so as to avoid air loss and further problems.

However sufficient loss of air can cause rapid and damaging heat build up within the tyre which may result in tyre failure or separations between the tread and carcass plies.

Care should be taken to avoid road debris, dirt or moisture penetrating any puncture or trapped inside the tyre or between the wheel rim and tyre.

Damaged tyres should always be repaired or replaced at the earliest possible opportunity to avoid further tyre damage, possible tyre failure, vehicle or personal injury.

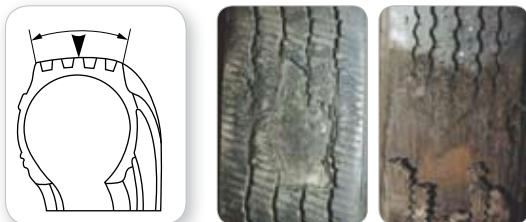
Check for and correct any of the following conditions :

## DAMAGE DUE TO CONTACT WITH THE VEHICLE



- Improper tyre inflation
- Overloading
- Improper vehicle maintenance
- Brake system abnormalities
- Differences of tyres sizes or circumferences on the same axle
- Improper mounting of tyre or wheel
- Improper, worn or damaged valve
- Improper use of tube or flap

## FLAT SPOTTING DUE TO LOCKED BRAKES



## BEAD DAMAGE FROM CURBING



## BURNED BEADS



## RIPPED SIDEWALL



## SIDEWALL DAMAGE DUE TO RUN FLAT OR SEVERE UNDER INFLATION



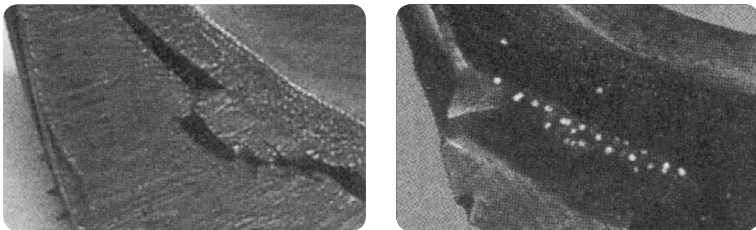
## HEAT CAN DAMAGE TYRES

Under inflation, overloading or excessive speed can cause damage because of heat build up. Tyre parts such as cord, the bonding between carcass, belts and treads can be easily damaged by excessive heat. Most tyre cords lose strength at temperatures above 120°C making the tyre more vulnerable to a failure.

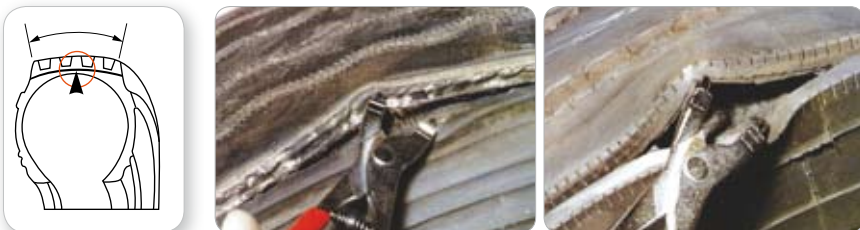
Excessive heat can weaken or damage cords or rubber compounds or cause separation between the plies.

The following pictures show some of the possible damage conditions.

### SHOULDER SECTION DAMAGE OR SEPARATION DUE TO HEAT



### TREAD DAMAGE DUE TO EXCESSIVE HEAT



### TREAD SEPARATION CAUSED BY EXCESSIVE HEAT



## MOISTURE DAMAGE

Moisture inside the tyre or penetrating through to the steel belts of a radial tyre can cause rust damage to steel cord or the rim.

Therefore always :

- ❶ Store tyres indoors in a dry place.
- ❷ Ensure all wheels, flaps, tubes, valves and the inner tyre surface are clean and dry before and during mounting.
- ❸ Use the recommended mounting lubricant on rim and tyre bead during the mounting process.
- ❹ Maintain inflation and keep the valve stem capped or protected so as not to allow moisture to enter the tyre.

