TRUCK AND BUS TYRE | **TECHNICAL MANUAL**

# MAINTENANCE AND CARE

About tyre inflation
Truck alignment and tyre wear
Tyre damage

# About tyre inflation

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

Correct 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).

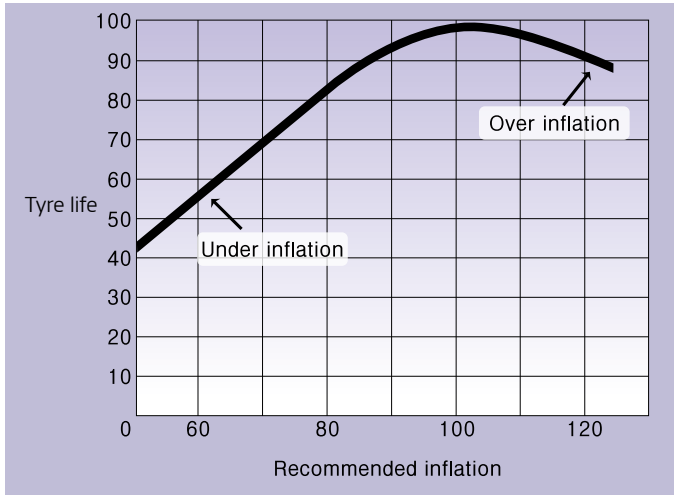
### PROPER INFLATION SHOULD BE MAINTAINED AND CHECKED AT LEAST ONCE A WEEK AS WELL AS BEFORE A LONG DISTANCE DRIVE.

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

### 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 AND TYRE LIFE




### UNDER INFLATION

The worst enemy your tyre can have. It causes increased treadwear on the outside edges (or shoulders) of the tyre and generates excessive heat, reducing tyre durability.
Soft tyres make your vehicle work harder, meaning that fuel efficiency is reduced as there is an increased rolling resistance.

### OVER INFLATION

Is detrimental to the tyre as too much air pressure causes the centre of the tread to bear the majority of the truck's weight. This leads to faster deterioration and uneven wear. Any kind of uneven wear will also shorten the life span of your tyres.

# Truck alignment and tyre wear

The two major things that affect tyre wear are :
- Inflation pressure
- Wheel alignment

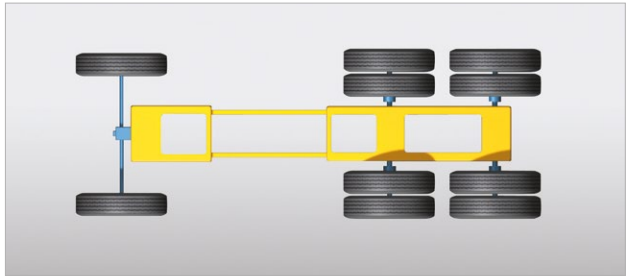
## COMPONENTS OF ALIGNMENT

- 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.

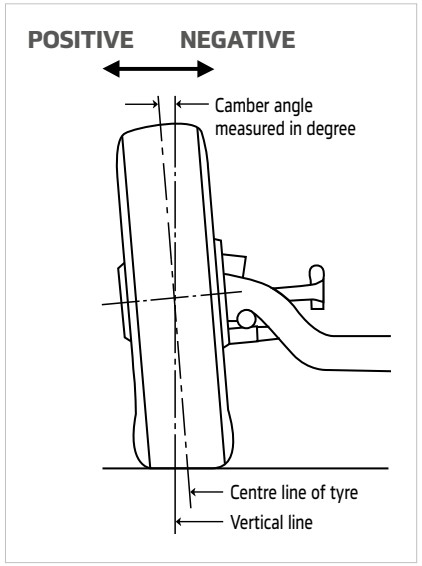
### ALIGNMENT AND WEAR



## CAMBER

- 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.

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 then it is positive camber. If the top of the wheel leans in from the perpendicular then it is negative camber.
Camber is meant to compensate for the downward forces of added loads. Correct camber settings help the tyre maintain a firm and 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.

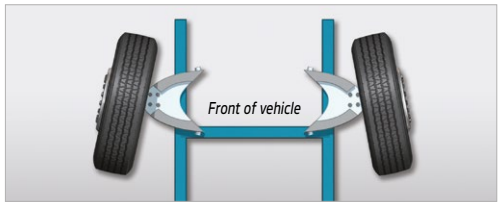



Positive
camber

Negative
camber

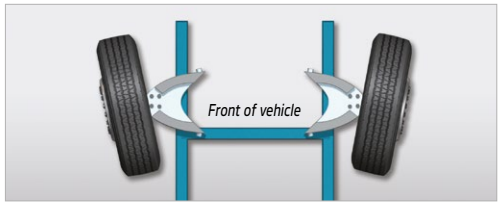
## TOE

- 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.



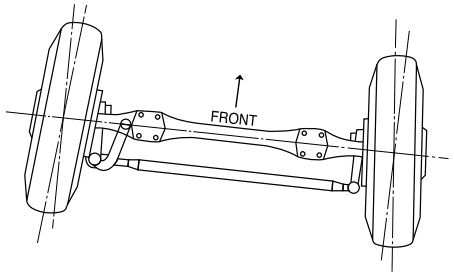

Toe-in refers to the inclination of the wheels of a vehicle so that the pair of front wheels (viewing from the front as per the illustration to the left), are closer together at the front than at the rear of the wheels.

The purpose of toe-in is to relieve or counteract some of the force which pulls wheels outwards as they roll along the road. Correct toe-in will ensure the rotation direction and direction of travel are as similar as possible at driving speed. Insufficient toe-in settings will result in steering instability.




The opposite is considered toe-out, see diagram as per the illustration to the left.

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.



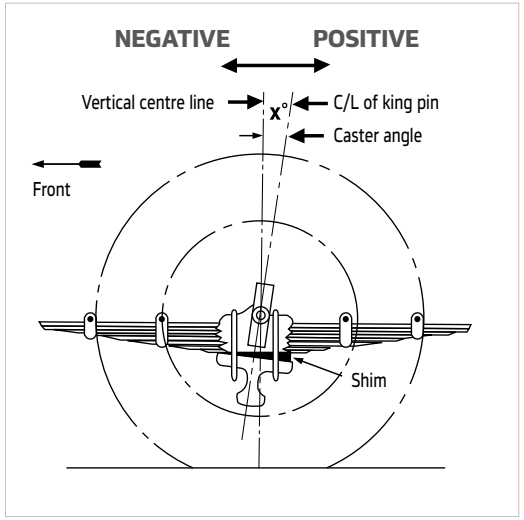

## CASTER

- 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 the tyre wear.

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) encounter(s) 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.

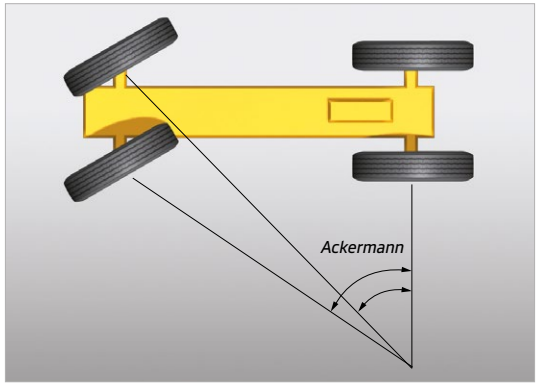
Too much caster will more than compensate for the amount of drag but it will also create additional difficulty in steering.

Too little caster makes steering become lighter but also unstable and can cause it to wonder. The caster angle should be checked as it can be distorted by impacts on the tyre or by driving in rough conditions.



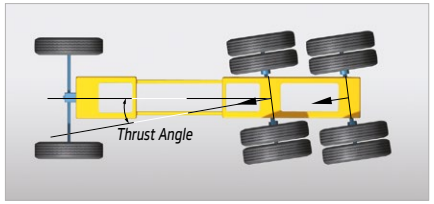
## ACKERMANN

- 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.



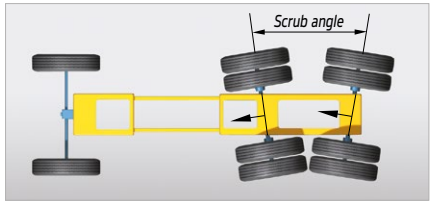

## THRUST ANGLE

- Thrust angle is the difference between the line perpendicular to the axle and vehicle centre line.
- 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.



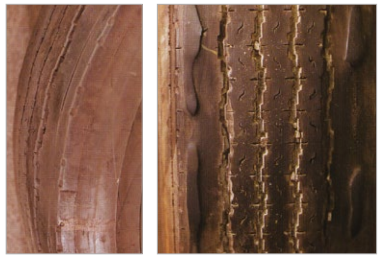

# Abnormal tread wear

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

## COMPONENTS OF ALIGNMENT

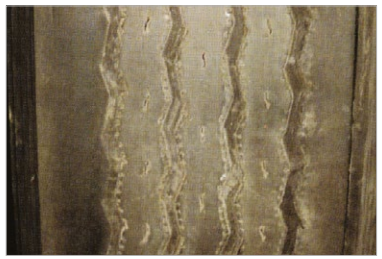
- Imbalance of the tyre or tyre and wheel assembly.
- Improper wheel alignment.
- Breaking system problems that may cause the wheel to lock up or flat spotting.
- Bent or round rims.
- Worn or damaged bearings.
- Broken or worn shock absorbers, springs or steering components.

### ABNORMAL WEAR



### DIAGONAL WEAR

### SHOULDER WEAR CAUSED BY WRONG CAMBER OR MISALIGNMENT



# Tyre 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 as to avoid air loss and further problems.

However sufficient loss of air can cause a rapid heat build up which can damage the tyre.
This may result in tyre failure or separations between the tread and carcass piles.

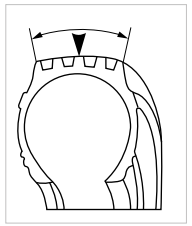
Care should be taken to avoid road debris, dirt or moisture penetrating any puncture or getting trapped inside the tyre, or between the wheel rim and tyre.
Damaged tyres should always be repaired or replaced at the earliest possible opportunity to avoid further tyre damage, possible tyre failure, vehicle or personal injury.

Check for and correct any of the following conditions :

## DAMAGE DUE TO CONTACT WITH THE VEHICLE

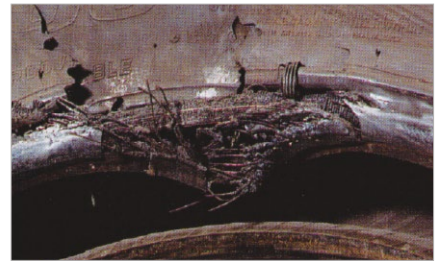
- Improper tyre inflation.
- Overloading.
- Improper vehicle maintenance.
- Brake system abnormalities.
- Differences of tyres sizes or circumferences on the same axle.
- Improper mounting of tyre or wheel.
- Improper, worn or damaged valve.
- Improper use of tube or flap.

## FLAT SPOTTING DUE TO LOCKED BRAKES

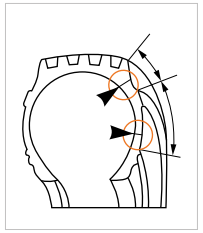


## BEAD DAMAGE FROM CURBING

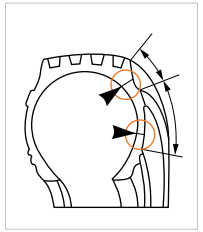
## BURNT BEADS

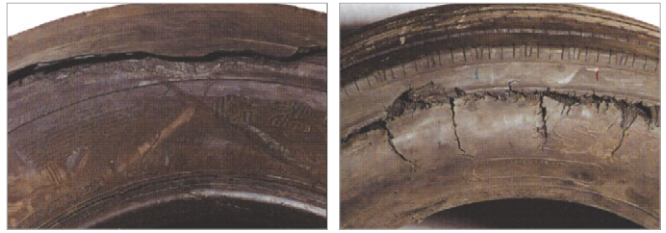


## RIPPED SIDEWALL



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





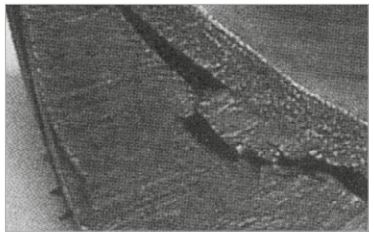
# HEAT CAN DAMAGE TYRES

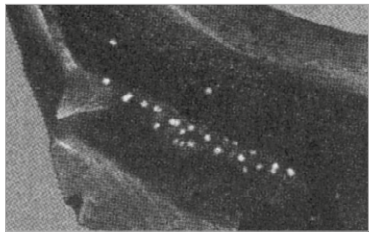
Under inflation, overloading or excessive speed can cause damage because of heat build up. Tyre parts such as cord, the bonding between carcasses, belts and treads can be easily damaged by excessive heat. Most tyre cords lose strength at temperatures above 120°C making the tyre more vulnerable to a failure.

Excessive heat can either weaken or damage cords and rubber compounds or even cause separation between the piles.

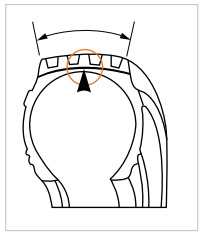
The following pictures show some of the possible damage conditions.

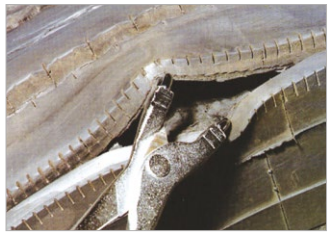
### SHOULDER SECTION DAMAGE OR SEPARATION DUE TO HEAT



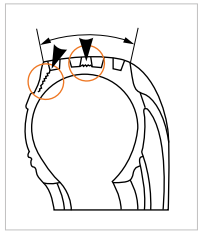


### TREAD DAMAGE DUE TO EXCESSIVE HEAT





### 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 the steel cord or 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 the 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.

# Memo