Tyre Information Booklet

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1. Tyre Maintenance Schedule

	50km After initial delivery.	Daily.	Every two months or 30 000km.	Every six months or 90 000km.
Tighten wheels nuts	◦			
Check inflation		◦		
Remove Debris between tread		◦		
Remove debris between duals		◦		
Measure height and compare to dual match			◦	
Rotate wheels				◦
Wheel alignment				◦

2. Side Wall Markings

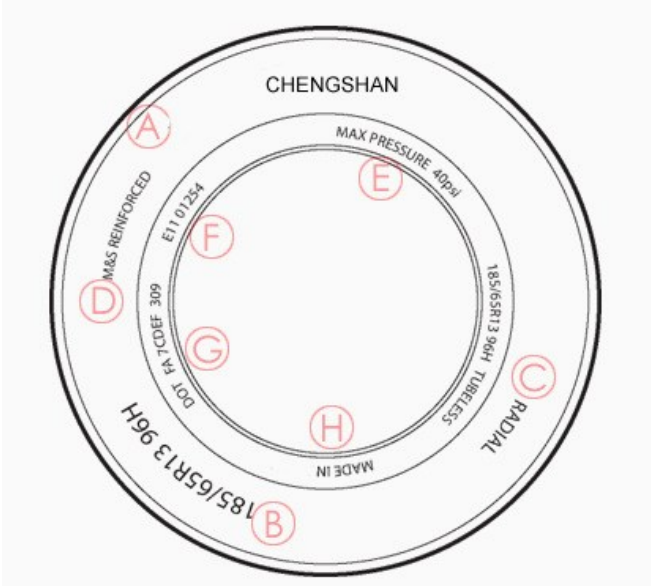
Each tyre has distinctive markings on its side wall. These markings are not only valuable information for the tyre manufacturer or reseller, but can give the buyer or potential buyer all the information they may need to specify the right tyre for the right application. The information gives almost all the information you may require from sizes, date of manufacture, whether they have passed stringent tests and certification, the speed those tyres may travel fully inflated and what loads they may carry.

2.1. Tyre Size

To work out the tyre size, we will use the example of a 315/80R22.5 154/150 M TL tyre. Below is a table illustrating the different meanings.

Marking	Meaning
315	This is the width in mm of the tyre from sidewall to sidewall when it's unstressed and you're looking at it head on (or top-down). This is known as the section width.
80	This is the ratio of the height of the tyre sidewall, (section height), expressed as a percentage of the width. It is known as the aspect ratio. In this case, 80% of 315 is 252mm - the section height.
R	This letter represents the tyre's construction type - in this instance - radials. B represents bias belted. (-) represents diagonal casing construction.
22.5	The corresponding rim's diameter in inches.
154/150	The tyre's load index.
M	The tyre's speed rating (refer to separate table on speed ratings).
TL	Tubeless tyre. TT represents tube tyre and requires a tube.

What about older and imperial tyres, for example a 7.6x15 tyre? Well it's for older vehicles with imperial measurements and crossply tyres. Both measurements are in inches - in this case a 7.6inch tyre designed to fit a 15inch wheel. There is one piece of information missing though - aspect ratio. Aspect ratios only began to be reduced at the end of the 1960s to improve cornering. Previously no aspect ratio was given on radial or crossply tyres. For crossply tyres, the initial number is both the tread width and the sidewall height. So in my example, 7.6x15 denotes a tyre 7.6 inches across with a sidewall height which is also 7.6 inches. After conversion to the newer notation, this is the equivalent to a 195/100 15. This is a 195/100 15 instead of 195/100*R*15 because technically the "R" means radial. If you're trying to get replacement crossply tyres, the "R" won't be in the specification. *However* if you're trying to replace your old crossply tyres with metric radial bias tyres, then the size *does* have the "R" in it. For a converter calculator, please visit http://www.carbibles.com/tyre_bible.html and use the calculator a quarter way through the page.



Key	Description
A	Manufacturers or brand name, and commercial name or identity.
B	Tyre size, construction and speed rating designations. Tubeless designates a tyre which requires no inner tube. See tyre sizes and speed ratings below. DINtype marking also has the load index encoded in it. These go from a load index of 50 (190kg) up to an index of 169 (5800kg).
C	Denotes type of tyre construction.
D	M&S denotes a tyre designed for mud and snow. Reinforced marking only where applicable.
E	Pressure marking requirement.
F	ECE (not EEC) type approval mark and number.
G	North American Dept of Transport compliance symbols and identification numbers.
H	Country of manufacture.

2.2. Other Markings

Also on the sidewall, you might find the following info embossed in the rubber.

2.2.1. The temperature rating

An indicator of how well the tyre withstands heat build-up. "A" is the highest rating; "C" is the lowest.

2.2.2. The traction rating

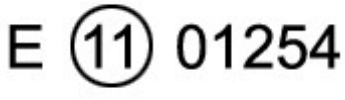
An indicator of how well the tyre is capable of stopping on wet pavement. "A" is the highest rating; "C" is the lowest.

2.2.3. DOT Information

Encoded in the US DOT information (G on the diagram above) is a two-letter code that identifies where the tyre was manufactured in detail. In other words, what factory and in some cases, what city it was manufactured in. It's the first two letters after the 'DOT' .
This two-letter identifier is worth knowing in case you see a tyre recall on the evening news where they tell you a certain factory is recalling tyres. Armed with the two-letter identifier list, you can figure out if you are affected. For a list of these codes, please visit http://www.carbibles.com/tyre_bible.htmland click on the link.

2.2.4. The E-Mark

Item F in the diagram above is the E-mark. All tyres sold in Europe after July 1997 must carry an E-mark. The mark itself is either an upper or lower case "E" followed by a number in a circle or rectangle, followed by a further number.



An "E" (upper case) indicates that the tyre is certified to comply with the dimensional, performance and marking requirements of ECE regulation 30. An "e" (lower case) indicates that the tyre is certified to comply with the dimensional, performance and marking requirements of Directive 92/33/EEC. The number in the circle or rectangle denotes the country code of the government that granted the type approval. 11 is the UK. The last number outside the circle or rectangle is the number of the type approval certificate issued for that particular tyre size and type.

2.2.5. M&S

Identifies Mud and Snow tyres

2.3. Speed Rating

All tyres are rated with a speed letter. This indicates the maximum speed that the tyre can sustain for a ten minute endurance without coming to pieces and destroying itself, your vehicle, the vehicle next to you and anyone else within a suitable radius at the time. Below is a table to indicate the various letters associated with the letters.

Speed Symbol	Max Car Speed Capability		Speed Symbol	Max Car Speed Capability	
	Km/h	MPH		Km/h	MPH
L	120	75	S	180	113
M	130	81	T	190	118
N	140	87	U	200	125
P	150	95	H	210	130
Q	160	100	V	240	150
R	170	105	W	270	168
			Z	240+	150+

2.4. Load Indices

The load index on a tyre is a numerical code associated with the maximum load the tyre can carry. These are generally valid for speed under 210km/h (130mph). Once you get above these speeds, the load-carrying capacity of tyres decreases and you're in highly technical territory the likes of which we will not go into.

The table below gives you most of the Load Index (LI) values you're likely to come across. For the sake of simplicity, if you know your car weighs 2 tons - 2000kg - then assume an even weight on each wheel. 4 wheels at 2000kg =

500kg per wheel. This is a load rating of 84. The engineer in you should add 10% or more for safety's sake. For this example, I'd probably add 20% for a weight capacity of 600kg - a load rating of 90.

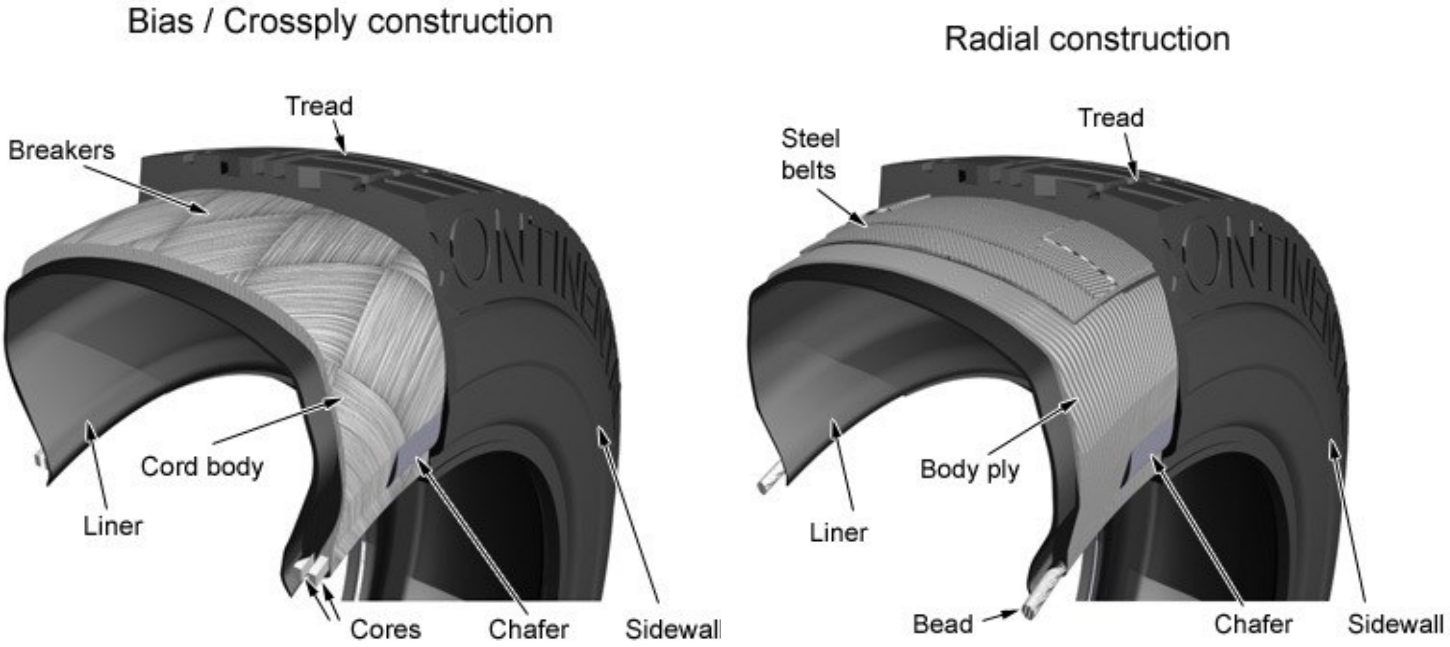
LI kg	LI kg	LI kg	LI kg	LI kg	LI kg
50 190	70 335	90 600	110 1060	130 1900	150 3350
51 195	71 345	91 615	111 1090	131 1950	151 3450
52 200	72 355	92 630	112 1120	132 2000	152 3550
53 206	73 365	93 650	113 1150	133 2060	153 3650
54 212	74 375	94 670	114 1180	134 2120	154 3750
55 218	75 387	95 690	115 1215	135 2180	155 3875
56 224	76 400	96 710	116 1250	136 2240	156 4000
57 230	77 412	97 730	117 1285	137 2300	157 4125
58 236	78 425	98 750	118 1320	138 2360	158 4250
59 243	79 437	99 775	119 1360	139 2430	159 4375
60 250	80 450	100 800	120 1400	140 2500	160 4500
61 257	81 462	101 825	121 1450	141 2575	161 4625
62 265	82 475	102 850	122 1500	142 2650	162 4750
63 272	83 487	103 875	123 1550	143 2725	163 4875

64 280	84 500	104 900	124 1600	144 2800	164 5000
65 290	85 515	105 925	125 1650	145 2900	165 5150
66 300	86 530	106 950	126 1700	146 3000	166 5300
67 307	87 545	107 975	127 1750	147 3075	167 5450
68 315	88 560	108 1000	128 1800	148 3150	168 5600
69 325	89 580	109 1030	129 1850	149 3250	169 5800

For commercial vehicle tyres, i.e. truck and trailer tyres, the load index is usually 2 numbers separated by a slash, e.g. 154/150. The first number is the load index if the vehicle is running with single tyres, whereas the second number is the load index for duals. Load calculations must be worked out with how much the axle group of the trailer will carry and how much the horse will carry.

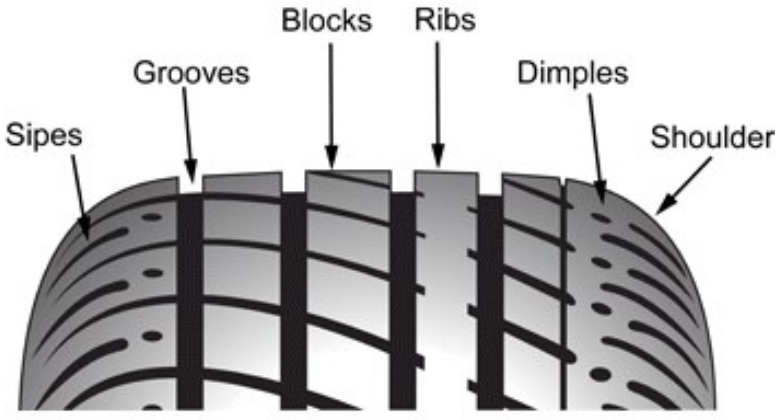
3. Tyre Construction and Tread

All tyres by now should be running on radials.



Cross-ply components	Radial components
The tread consists of specially compounded/vulcanised rubber which can have unique characteristics ranging from wear resistance, cut resistance, heat resistance, low rolling resistance, or any combination of these. The purpose of the tread is to transmit the forces between the rest of the tyre and the ground.	
The sidewall is a protective rubber coating on the outer sides of the tyre. It is designed to resist cutting, scuffing, weather checking, and cracking.	
The chafer protects the bead and body from the chafing (wear from rubbing) where the tyre is in contact with the rim. t r	The chafer of a radial tire acts as a reinforcement It increases the overall stiffness of the bead area, which in turn restricts deflection and deformation and increases the durability of The bead area. It also assists the bead in transforming the torque forces from the rim to the radial ply.
The liner is an integral part of all tubeless pneumatic tires. It covers the inside of the tire from bead to bead and prevents the air from escaping through the tire.	
The bead of a cross-ply tyre consists of bundles of bronze coated high tensile strength steel wire strands which are insulated with rubber. A cross-ply tyre designed for off-road use typically has two or three bundles. A radial on-road tyre normally only has one. The bead is considered the foundation of the tire. It anchors the bead on the rim.	

The cord body is also known as the tyre carcass. It consists of layers of nylon plies. The cord body confines the pressure, which supports the tyre load and absorbs shocks encountered during driving. Each cord in each ply is completely surrounded by resilient rubber. These cords run diagonally to the direction of motion and transmit the forces from the tread down to the bead.	The body ply of a radial tire is made up of a single layer of steel cord wire. The wire runs from bead to bead laterally to the direction of motion (hence the term "radial plies"). The body ply is a primary component restricting the pressure which ultimately carries the load. The body ply also transmits the forces (torque, torsion, etc.) from the belts to the bead and eventually to the rim.
The breakers are also known as belts. They provide protection for the cord body from cutting. They also increase tread stability which resists cutting. Breakers can be made of nylon, aralon, or steel wire.	The belts are layers of steel cord wires located between the tread and the body ply. Off-road tyres can have up to five belts. Road tyres typically have one or two. The steel wire of the belts run diagonally to the direction of motion. The belts increase the rigidity of the tread which increases the cut resistance of the tire. They also transmit the torque forces to the radial ply and restrict tire growth which prevents cutting, cut growth and cracking.



Tyre treads are divided into different sections as seen in the figure below. A proper tread design improves traction, improves handling and increases Durability. It also has a direct effect on ride comfort, noise level and fuel efficiency. Believe it or not, each part of the tread of your tyre has a different name, and a different function and effect on the overall tyre. Your tyres might not have all these features, but here's a rundown of what they look like, what they're called and why the tyre manufacturers spend millions each year fiddling with all this stuff.

Sipes are the small, slit-like grooves in the tread blocks that allow the blocks to flex. This added flexibility increases traction by creating an additional biting edge. Sipes are especially helpful on ice, light snow and loose dirt. **Grooves** create voids for better water channelling on wet road surfaces. Grooves are the most efficient way of channelling water from in front of the tyres to behind it. By designing grooves circumferentially, water has less distance to be channelled.
Blocks are the segments that make up the majority of a tyre's tread. Their primary function is to provide traction.
Ribs are the straight-lined row of blocks that create a circumferential contact "band."
Dimples are the indentations in the tread, normally towards the outer edge of the tyre. They improve cooling.
Shoulders provide continuous contact with the road while manoeuvring. The shoulders wrap slightly over the inner and outer sidewall of a tyre. **The Void Ratio** is the amount of open space in the tread. A low void ratio means a tyre has more rubber is in contact with the road. A high void ratio increases the ability to drain water. Sports, dry-weather and high performance tyres have a low void ratio for grip and traction. Wet-weather and snow tyres have high void ratios.

4. Tyre Age and Wear

4.1. General

Rubber compounds used in modern tyres contain anti-oxidising chemicals that help to slow down the natural aging process of untreated rubber. However, tyres do deteriorate with age

and this increases the risk of tyre failure. Tyre ageing can show in several different ways such as:

- Cracking/crazing on the side wall of the tyre, caused by its flexing
- Distortion of tyre tread
- Deformation of the carcass of the tyre

There will also be a deterioration of the ride quality caused by vibrations through the tyre. This may signify the tyre's performance has been affected by age and should be investigated as soon as possible.

Tyres that have been in storage should not be used if they are over 6 years old, to check the age of the tyre locate the DOT number stamped on the sidewall of the tyre, it will look something like "DOT XXXX 3406" and in this example the tyre was manufactured during the 34th week of 2006. When a tyre has been in regular use, the effects of aging are lessened to a degree, but such tyres should still be replaced after 10 years.

For tyres manufactured before 2000, there is a three digit code. So for example 1 7 8 means it was manufactured in the 17th week of 8th year of the decade. In this case it means 1988. For tyres manufactured in the 90's, the same code holds true but there is a little triangle after the DOT code. So for this example, a tyre manufactured in the 17th week of 1998 would have the code 178△. After 2000, the code was switched to a 4-digit code. Same rules apply, so for example 3 0 0 3 means the tyre was manufactured in the 30th week of 2003.

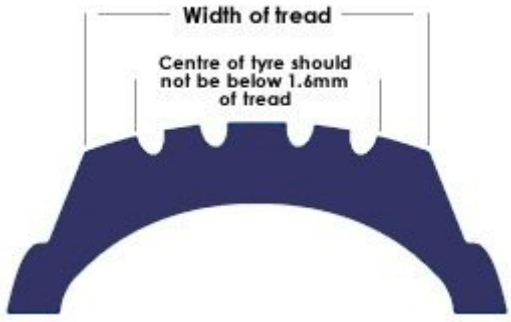
The effects of aging can be brought about prematurely under certain conditions. Tyres fitted as spare wheels or used on caravans and trailers may age prematurely, if tyres on caravans or trailers are not in regular use, then they should be inspected before every journey. Tyres used predominantly in coastal areas will age at a greater rate due to the saline conditions, and several cleaning products may also harm the chemicals in the rubber.

In most circumstances tread depth can be used as a suitable indication of when tyres should be replaced - as tyres generally wear out before their age effects their performance. However, the age of a tyre will affect its safety and increase the risk of failure, and you should inspect tyres for the signs of aging regularly. Please refer to below table for tyre wear.

Remaining Tread Depth	Tyre Wear %
8mm	0%
7mm	15%
6mm	31%
5mm	47%
4mm	62%
3mm	78%
2mm	94%
1.6mm	100%

URGENT - Requires Attention
Caution - Inspect Weekly
Ok - Inspect Monthly

The tread-wear rating - a comparative rating for the useful life of the tire's tread. A tire with a tread-wear rating of 200, for example, could be expected to last twice as long as one with a rating of 100. Tread-wear grades typically range between 60 and 600 in 20-point increments. It is important to consider that this is a relative indicator, and the actual life of a tyre's tread will be affected by quality of road surfaces, type of driving,



correct tyre inflation, proper wheel alignment and other variable factors. In other words, don't think that a tread-wear rating of 100 means a 60,000 kilometre tyre.

4.2. Over/Under Inflation and General Tyre Care

Inflation

Improper and proper inflation will produce the tyre section and ground contact characteristics shown in figure. Tyre inflation should be checked daily while cold. Do not exceed the cold inflation pressures. Tyre inflation should also be checked during road stops to locate air losses. Also, remove any foreign objects jammed between the duals. Do not attempt to adjust the inflation pressure while the tyres are warm. REPAIR ANY LEAKS IMMEDIATELY. All tyres should be equipped with valve caps. Either over inflation or under inflation will cause premature tyre failure. Over inflation weakens the cord body of the tyre by reducing its ability to absorb road shocks. Over inflation will also induce added stresses on the rims and wheels, which can cause failure due to fatigue cracks (see figure).

Result of Over Inflated Tyres

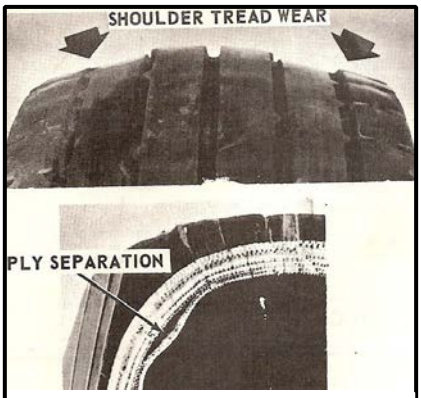
4.2.1. Over Inflation

a. Inflate to correct pressure when tyres are cool.
b. Never “bleed” tyres to relieve excessive pressure build-up when tyres are warm.

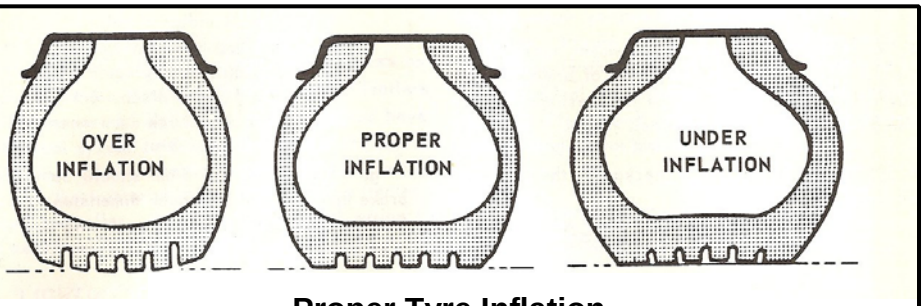
Excessive build-up of air pressure can be due to load, under inflation, speed, or a combination of the three.

4.2.2 . Under Inflation

Under inflation causes rapid wear and premature failure. Under inflation or overloading of tyres on any vehicle at sustained speeds will result in weakening of the tyre cords, which can make the tyre susceptible to further damage or failure even when under normal load and inflation conditions. See figure for an illustration of the result of under inflation and overloading.



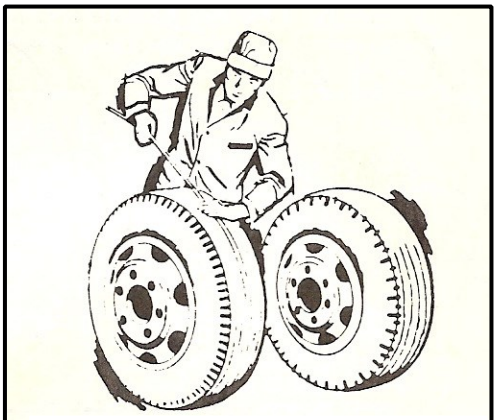
Result of Under Inflated Tyres



Proper Tyre Inflation

4.2.3. Dual Matching

Proper matching of duals by size will result in longer tyre life. Improper matching will cause the larger tyre diameter to carry an overload. This will cause the typical overload tyre difficulties. The smaller diameter tyre will also wear more rapidly due to scuffing.

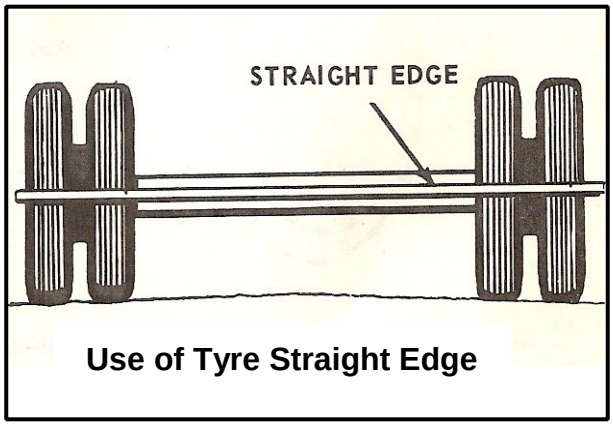


Measuring Tyre with Endless Tape

4.2.4. Size Matching

a. Tyres through 8.25 (8-22.5 tubeless). Tyre differences of not more than 6.35mm in diameter or 19.1mm in circumference are allowed.
b. Tyre size 9.00 (10-22.5 tubeless) and larger. Tyre difference of not more than 12.7mm in diameter or 38.1mm in circumference are allowed.
Note: The smaller of the two tyres should be mounted on the inside.

TYRE MEASUREMENT Measure the circumference of the tyre with an endless tape after being placed on the rim and inflated, but not mounted on the trailer (see figure). A straightedge, square or string gauge can be used to check the tyres mounted on the trailer (see figure). The dimensions between the straight edge and the tyres should not exceed ½ of the allowable difference in diameter.



Use of Tyre Straight Edge

5. General Tyre Inflation

	Dual Pressue at 9000kg (kPa)	Single Pressure at 9000kg (kPa)
245/70R17.5	750	N/A
265/70R19.5	750	N/A
275/70R22.5	650	N/A
295/80R22.5	650	N/A
11R22.5	650	N/A
12R22.5	650	N/A
315/80R22.5	650	N/A
385/65R22.5	N/A	800
425/65R22.5	N/A	650

Guideline only, refer to tyre O.E. for accurate pressures.