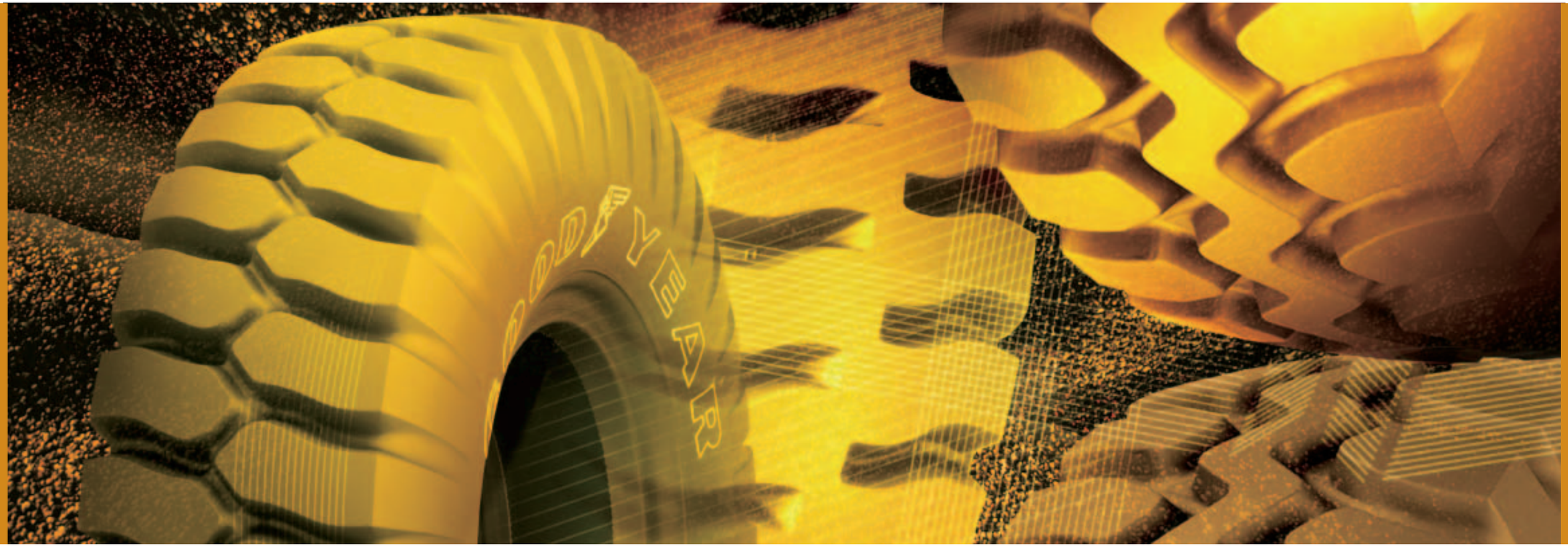

▶ OTR TYRES

TYRE TECHNOLOGY

INNOVATION:

- Tyre terminology
- Rim / wheel information
- Safety instructions

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Produced by Goodyear Europe
114/0206/LUX-ENG

TYRE TECHNOLOGY

TYRE TERMINOLOGY

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Tyre Terminology	2	Valves	11
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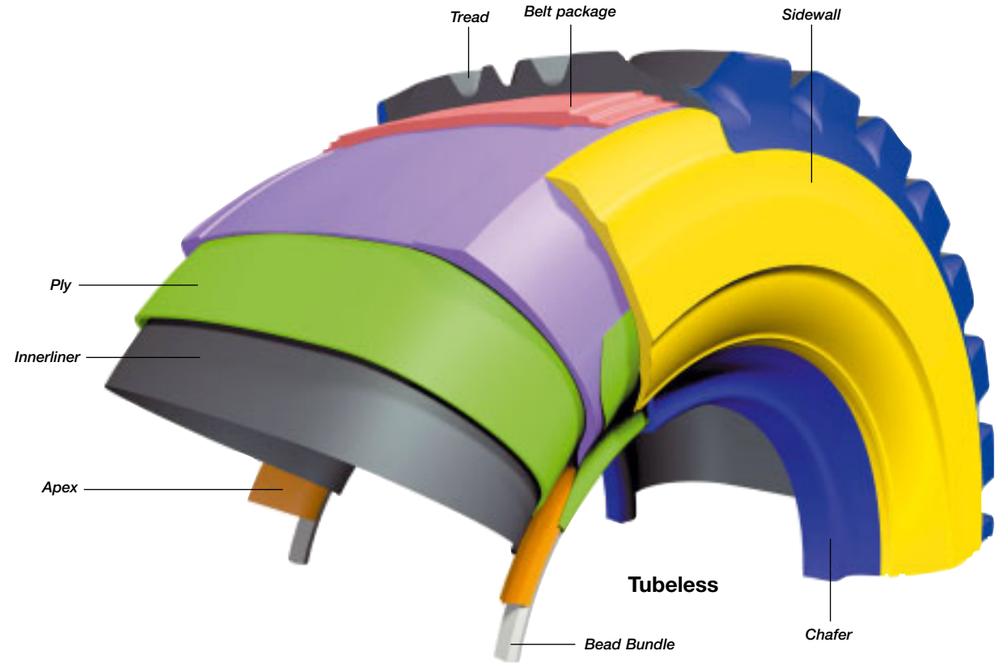
Selecting the Right Tyre	7	Safety Instructions	17

TYRE CONSTRUCTION

The commercially available Earthmover tyre is a composite product, made up from rubber compounds and steel, textile or synthetic reinforcements. The major components of the Goodyear **radial** ply, steel carcass and belt tyre (called Unisteel) are described below.

NOTE: Whilst every care has been taken in the production of this publication, no responsibility can be accepted for any loss or damage arising out of undetected errors or mis-printing which may have occurred.



TYRE TERMINOLOGY

Tread	–	Provides primarily traction and wear and protects the carcass underneath.
Belt package	–	Multiple, low angle, steel cord layers provide strength to the tyre, stabilise the tread and prevent penetrations into carcass.
Sidewall	–	Provides protection for the ply and withstands flexing and weathering.
Ply	–	The radial (90°) ply transmits all load, braking and steering forces between the wheel and the road and withstands the burst loads of the tyre under operating pressure.
Innerliner	–	A layer of rubber in tubeless tyres specially compounded to prevent loss of air.
Bead bundle	–	The steel bead bundle properly seats and seals the tyre on the rim and maintains it in position.
Apex	–	Rubber filler in the bead and lower sidewall area to provide progressive transition from the stiff bead area into the flexible sidewall.
Chafer	–	A layer of hard rubber that resists erosion of the bead zone by the rim flange.

TYRE MARKING

SYMBOL MARKING FOR RADIAL PLY TYRES

Radial earthmover tyres use a simplified symbol (star) marking system as an indication of minimum recommended inflation for a particular tyre load carrying capacity.

	Symbol	Inflation 50 km/h Bar	Inflation 10 km/h Bar
Narrow Base	☆	4.75	5.50
Sizes	☆☆	7.00	8.25
	☆☆☆	7.00	9.50
Wide Base	☆	3.75	5.00
Sizes	☆☆	5.25	6.50
	☆☆☆	–	10.00

Example : Earthmover (cyclic) applications.

SERVICE DESCRIPTION

In addition these tyres are marked with a “Service Description” located near to the tyre size marking. This consists of a code which indicates operating limits of loads and speeds and includes “load indices” for single tyre fitment and “speed symbols” which relate to these indices (e.g. 169A2/152B).

This means that the tyre may be used with the following maximum load/speed combination:

169 = 5800 Kgs at A2 = 10 km/h or

152 = 3550 Kgs at B = 50 km/h

The position of the major tyre markings are as shown:

1 – Tyre section width (mm or inches)

2 – Aspect ratio S.H./S.W.

3 – Radial construction (R=Radial)

4 – Rim diameter (inches)

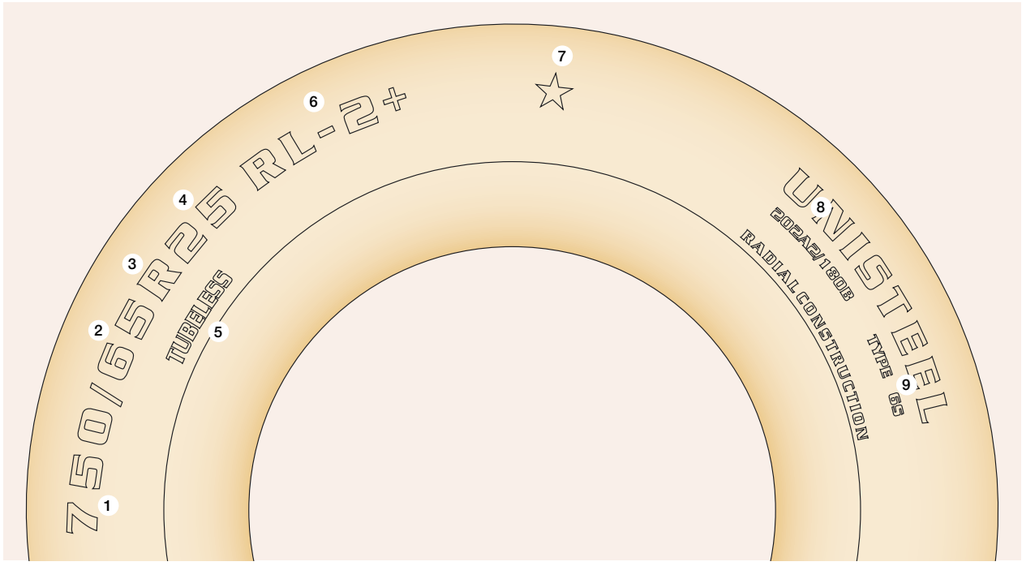
5 – Tubeless

6 – Goodyear tyre name

7 – Star marking

8 – Load Index-Speed Symbol
(Max load per tyre at max. speed – single tyre)

9 – Compound/construction code



THE GOODYEAR TYRE NAMING SYSTEM

All Goodyear Earthmover tyres are identified by a simple three-part name. First, a series of two initials identifies a tread type. Next, (following a dash (-) a number which corresponds to the **NUMERIC** portion of the Industry Code. Finally, a letter identifies the tread design series.

Example:

RL - 4 J	
RL	Tread Type (Other tread types: GP, RT, SG)
4	Industry Code number
J	Design Series

All Goodyear radial earthmover tyres carry the **UNISTEEL** family name to identify their steel carcass construction.

Special compounds and constructions are available for tyre sizes 14.00 and 15.5 and larger. These tyres have an additional customized compound/construction code marked on the tyre sidewall (e.g. Ultra Abrasion Resistant tread/Standard construction = TYPE 6S).

Compound/construction codes

2S	Heat Resistant/Standard construction
4S	Abrasion Resistant/Standard construction
6S	Ultra Abrasion Resistant/Standard construction
6U	Ultra Abrasion Resistant/Heavy Undertread

INDUSTRY CODE REFERENCE

A number following the dash (-) in the tyre name indicates the TRA Industry Code tread type and depth. Thus:

Number	Tread Type	Tread Depth
1	Rib	Standard
2	Rib	Standard
3	Rock	Standard
4	Rock	Deep (1.5 x standard)
5	Rock	Extra Deep (2.5 x standard)
7	Flotation	Standard

In addition, some Goodyear radial earthmover tyres are identified with a plus (+) sign (i.e., RL-2+). These tyres have extra tread depth (1.25 x standard) to provide increased wear/abrasion resistance over standard tyres.

SIZE DEFINITIONS (EXAMPLES)

Listed here are examples of some of the popular size designations for earthmover tyres. With each size is an explanation of what each component of the size describes:

18.00 *Section width in inches*	**R** *R-radial*	**25** *Rim diameter in inches*	Narrow Base	**750** *Section width in mm*	**/65** *Aspect ratio*	**R** *R-radial*	**25** *Rim diameter in inches*	Low Aspect
23.5 *Section width in mm*	**R** *R-radial*	**25** *Rim diameter in inches*	Wide Base	**505** *Section width in mm*	**/95** *Aspect ratio*	**R** *R-radial*	**25** *Rim diameter in inches*	Millimetric

LOAD INDEX AND SPEED SYMBOL

These parameters, established by ETRTO, are the two most important service factors determining tyre performance.

LOAD INDEX

LI	Kg	LI	Kg	LI	Kg	LI	Kg	LI	Kg	LI	Kg	LI	Kg
140	2,500	160	4,500	180	8,000	200	14,000	220	25,000	240	45,000	260	80,000
141	2,575	161	4,625	181	8,250	201	14,500	221	25,750	241	46,250	261	82,500
142	2,650	162	4,750	182	8,500	202	15,000	222	26,500	242	47,500	262	85,000
143	2,725	163	4,875	183	8,750	203	15,500	223	27,250	243	48,750	263	87,500
144	2,800	164	5,000	184	9,000	204	16,000	224	28,000	244	50,000	264	90,000
145	2,900	165	5,150	185	9,250	205	16,500	225	29,000	245	51,500	265	92,500
146	3,000	166	5,300	186	9,500	206	17,000	226	30,000	246	53,000	266	95,000
147	3,075	167	5,450	187	9,750	207	17,500	227	30,750	247	54,500	267	97,500
148	3,150	168	5,600	188	10,000	208	18,000	228	31,500	248	56,000	268	100,000
149	3,250	169	5,800	189	10,300	209	18,500	229	32,500	249	58,000	269	103,000
150	3,350	170	6,000	190	10,600	210	19,000	230	33,500	250	60,000	270	106,000
151	3,450	171	6,150	191	10,900	211	19,500	231	34,500	251	61,500	271	109,000
152	3,550	172	6,300	192	11,200	212	20,000	232	35,500	252	63,000	272	112,000
153	3,650	173	6,500	193	11,500	213	20,600	233	36,500	253	65,000	273	115,000
154	3,750	174	6,700	194	11,800	214	21,200	234	37,500	254	67,000	274	118,000
155	3,875	175	6,900	195	12,150	215	21,800	235	38,750	255	69,000	275	121,000
156	4,000	176	7,100	196	12,500	216	22,400	236	40,000	256	71,000	276	125,000
157	4,125	177	7,300	197	12,850	217	23,000	237	41,250	257	73,000	277	128,000
158	4,250	178	7,500	198	13,200	218	23,600	238	42,500	258	75,000	278	132,500
159	4,375	179	7,750	199	13,600	219	24,300	239	43,750	259	77,500	279	136,000

The LOAD INDEX denotes the maximum load a given tyre can carry at the maximum speed as indicated by the speed symbol.

SPEED SYMBOL

Speed Symbol	Speed (km/h)	Speed Symbol	Speed (km/h)	Speed Symbol	Speed (km/h)	Speed Symbol	Speed (km/h)
A1	5	A5	25	B	50	F	80
A2	10	A6	30	C	60	G	90
A3	15	A7	35	D	65		
A4	20	A8	40	E	70		

The SPEED SYMBOL denotes the maximum speed at which a given tyre can carry the load indicated by the load index.

LOAD CAPACITY VARIATIONS (%) AS A FUNCTION OF SPEED

EARTHMOVING APPLICATIONS

The variation in load carrying capacity with speed of earthmoving equipment tyres in relatively short haul off-the-road conditions is determined by applying the percentages shown for EARTHMOVING APPLICATIONS to the tyre load capacities specified for TRANSPORT (reference speed 50 km/h) at the corresponding inflation pressure.

Earthmoving Applications

Maximum Operating Speed (km/h)	Load Capacity Variation (%)
<16	*
16	+12
20	+10
25	+8
30	+6
35	+4
40	+3
45	+2
50 Transport Reference Speed (Symbol B)	0
	Radial
55	-2
60	-6
65	-12
>65	*

** Consult your local Goodyear representative.*

INDUSTRIAL APPLICATIONS

The variation in load carrying capacity with speed of earthmoving equipment tyres on Industrial vehicles used in a work cycle to pick-up and relocate materials is determined by applying the percentage shown for INDUSTRIAL APPLICATIONS to the tyre load capacities specified for LOADING (reference speed 10 km/h) at the corresponding inflation pressure.

INDUSTRIAL APPLICATIONS comprise vehicles such as counterbalanced fork-lift trucks, container handlers, straddle carriers, aircraft tow tractors, mobile crushers, log stackers etc.

Industrial Applications

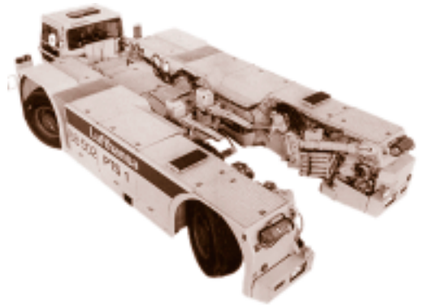
Maximum Operating Speed (3) (km/h)	Load Capacity Variation (%)	
	Off-the-Road	Hard Improved Surfaces (1) (2)
Static	+60	+80
1	+30	+60
5	+13	+45
10 Loading Reference Speed (Symbol A2)	0	+35
15	-7	+30
20	-12	+27
25	-15	+25
>25	*	*

** Consult your local Goodyear representative.*

(1) To obtain the maximum permissible loads on fork-lift truck STEERING WHEELS, multiply the above loads by 0.8.

(2) Inflation pressures as in the 'Loading' (10 km/h) tables x 1.2.

(3) For speeds >1 km/h (creep), interpolations are permitted.



HIGHWAY USE

The variation in load carrying capacity with speed of earthmoving equipment tyres for use on the HIGHWAY at speeds other than the reference speed of 70 km/h (Speed Symbol E) is determined by applying the percentages in the table below without any change in inflation pressure.

Highway Use

Maximum Operating Speed (3) (km/h)	Load Capacity Variation (%)
30	+30
40	+24
50	+18
60	+12
70 (Reference Speed)	0
80	-18
90	-30
100	-40

Note: For all load capacity variation calculations loads are to be rounded off as follows:

Upto 4999kg, to the nearest 25kg
5000 to 9999kg, to the nearest 50kg
10000kg and above, to the nearest 100kg

For stationary service conditions, specified loads for LOADING service may be increased up to 60% with no increase in inflation pressure. In the case of special equipment with a high centre of gravity, please contact your local Goodyear representative.

Consult rim and wheel manufacturers for confirmation of the strength of rim/wheel for the intended service.

SELECTING THE RIGHT TYRE

TON KILOMETRE PER HOUR (TKPH)

Tyres on OTR vehicles generate and build-up heat. The TKPH formula (average tyre load multiplied by average tyre speed), calculates the rate of work tyres can perform and stay within a safe temperature range under correct deflected (load/inflation) conditions.

TKPH Job Rate = Average Tyre Load (metric tons) X * Average Shift Speed (km/h)

** Note: Mines using computer dispatch systems must use Average Hourly Speed rather than Average Shift Speed.*

$$\text{Average Tyre Load} = \frac{\text{Empty Tyre Load + Loaded Tyre Load}}{2}$$

Average Tyre Load must be obtained for tyres on each axle of a vehicle.

The Average Shift Speed is found by: $\frac{\text{RTD X NTS}}{\text{HW}}$

where **RTD** = Round Trip Distance in kilometres
NTS = Number of Trips Per Shift
HW = Number of Hours Worked

The number of hours worked is the actual number of vehicle operation hours. It is calculated from the time the vehicle first moves until the shift finishes.

The **TKPH Job Rate** must be known for each wheel position. Tyre selection can then be based on:

- A size and ply rating which will not be overloaded.
- A type or design with a TKPH rating equal to the job requirement.

SAMPLE TKPH CALCULATION:

Conditions:

- Empty vehicle tyre load = 9,000 kilograms (9.0 tons)
- Loaded vehicle tyre load = 15,000 kilograms (15.0 tons)
- Number of Hours Worked = 8.0 hours
- The shift hauls 15 loads
- Each haul is 14 kilometres, round trip

$$\text{Average Tyre Load} = \frac{\text{9 Tons + 15 Tons}}{2} = \frac{\text{24 Tons}}{2} = \text{12 Tons}$$

$$\text{Average Shift Speed} = \frac{\text{14 Kilometres Trip x 15 Trips Shift}}{\text{8.0 Hours Worked Per Shift}}$$

$$\text{Average Shift Speed} = \frac{\text{210 Kilometres}}{\text{8.0 Hours}} = \text{26.25 km/h}$$

TKPH Job Rate = 12.0 Tons x 26.25 km/h = 315 TKPH

CONCLUSION:

To avoid heat problems tyres must have a TKPH rating of 315 or higher.

If the tyres on the machine are rated less than 315, one of the following corrective actions must be taken to prevent premature tyre failure:

- reduce speed
- reduce load
- change to tyres with a higher TKPH rating
- re-route the machine (where possible)

Note: Each tyre position on the machine must be calculated and considered. Position with highest average tyre load should be used.

FORMULA LIMITATION:

Tests have shown that the TKPH formula does not apply:

- When tyres are loaded 20% above their capacity.
- On hauls of more than 32 kilometres.

For haul lengths in excess of 32 kilometres one way, consult a Goodyear OTR representative.

For correct usage of the TKPH formula, the average speed must be based on total mileage covered from "the start of the first shift to the end of the last shift".

Note: The latest compound type ratings for use in the TKPH/WCF calculations are available from your local Goodyear OTR sales or service department.

THE WORK CAPABILITY FACTOR (WCF)

Goodyear dozer and loader tyres are designed for dig and load service. They are normally selected from the TRA 5 mph/10 km/h tables. Tyre heat build-up in this type of operation is not a factor.

New operational techniques, however, sometimes uses dozers and loaders as transport machines. When the haul distance exceeds 15 meters, the operation is termed "load and carry". This type of service involves speeds above 10 km/h. Longer hauls and rapid work cycles also are common.

Dozer and loader tyres are thicker and stronger than other OTR designs. Heat will build up faster in these designs.

Tyre heat build-up is a function of work the tyre is doing.

The Work Capability Factor (WCF) provides a way to select tyres that can handle the work under correct deflected (load/inflation) conditions.

The formula to determine a machine's WCF requirement focuses on its front wheels. These carry substantially more weight.

WCF = Average Tyre Load (metric tons) X Max. Average Speed (km/h)

$$\text{Average Tyre Load} = \frac{\text{Empty Tyre Load + Loaded Tyre Load}}{2}$$

Tyre load data should be the actual loads, if possible. If these are not known, the manufacturer's specifications can be used.

Max. Average Speed = Round Trip (KM) x Maximum Cycles Per Hour

SAMPLE WCF CALCULATION:

Conditions :

- Empty vehicle tyre load = 14.0 metric tons
- Loaded vehicle tyre load = 28.0 metric tons
- Maximum cycles per hour = 35
- Each haul is 250 metres (.25 kilometres), round trip

$$\text{Average Tyre Load} = \frac{\text{14 Tons + 28 Tons}}{2} = \frac{\text{42 Tons}}{2} = \text{21 Tons}$$

Max. Avg. Speed = **.25 Kilometres Trip x 35 Cycles = 8.75 km/h**

WCF = 21.0 Tons x 8.75 km/h = 183.75 = 184

CONCLUSION:

To avoid heat problems tyres must have a WCF of 184 or higher.

If the tyres on the machine are rated less than 184:

- reduce speed
- reduce load
- change to tyres with a higher WCF

FORMULA LIMITATION:

Tests have shown that the WCF formula does not apply:

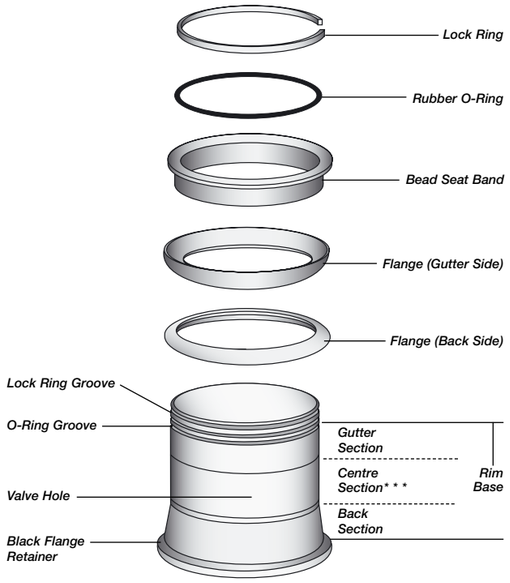
- When tyres are loaded more than 15% above their rated capacity.
- On hauls of more than 600 meters.

For haul lengths in excess of 600 meters one way, consult a Goodyear OTR representative.

For correct usage of the WCF formula, the average speed must be based on total mileage covered "in one hour of continuous operation".

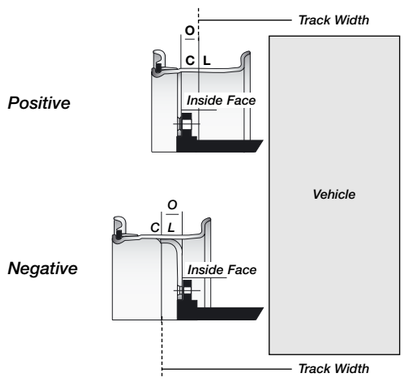
Note: The latest compound type ratings for use in the TKPH/WCF calculations are available from your local Goodyear OTR sales or service department.

NOMENCLATURE – FIVE PIECE RIM ASSEMBLY (5%)



* * * Not in all earthmover rims.

All wheels have a given **offset (O)** which does not only provide for the necessary brake drum space, but which also determines track width, kingpin offset, handling characteristics and wheel bearing load. On dual assemblies, it also influences the dual spacing.



NOTE: Rim diameters can only be accurately measured by means of a special ball tape.

Tyre fitters and mechanics must therefore pay attention that:

a. specific vehicles are fitted with the correct offset wheels.
b. wheels with different offsets are not mixed up on the same axle.

Wheel offsets can be positive, negative or zero. The offset is defined as the distance from the wheel centre to the inside face of the disc (against the hub) and is called positive whenever this inside face is located outside of the centreline, negative when located inside, zero when matching the centreline exactly.

For earthmover tyres, there are essentially **4 basic rim types** available on the market (basically all 5° taper):

a. one-piece tubeless drop centre rims
b. multi-piece tubeless semi-drop centre rims
c. multi-piece tubeless flat base rims
d. multi-piece tube-type flat base rims

1-PIECE TUBELESS DROP CENTRE

(24", 25" ETC...) symmetric and asymmetric rims for construction machines and mobile cranes.

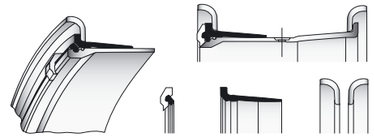
3-PIECE SEMI-DROP CENTRE RIMS

(Mainly 20", 24", 25") rims for tubeless TG (Tractor-Grader) and EM-wide base tyres as well as narrow base mobile crane applications.

5-PIECE TUBELESS RIMS

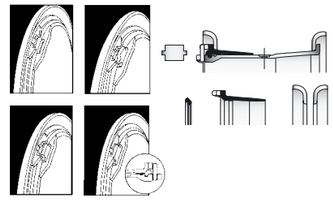
SMALL DRIVER

Rim for tubeless EM- and EM-wide base tyres with small driver.



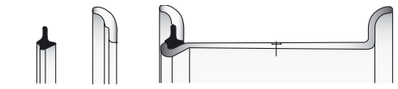
LARGE DRIVER

Rim for tubeless EM- and EM-wide base tyres with large driver.



3-PIECE TUBE-TYPE RIMS

(Mainly 20", 24") rims for tube-type on-and-off-the-road applications.

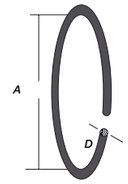


CHECK YOUR RIMS WHEN YOU CHANGE YOUR TYRES....Every experienced tyre user knows that the RIGHT tyre, used for the RIGHT job, can make a big difference in tyre life and operating efficiency.

THE SAME THING IS EQUALLY TRUE OF RIMS
If you make a tyre change to get MORE efficiency for a certain type of work - and fail to match the new tyres with the right rims -- you may actually LOSE efficiency...plus maintenance time and replacement money.

RUBBER SEALING "O" RINGS FOR TUBELESS RIMS

Nominal Rim Dia.	Basic Rim Type	Part No.	Sealing Ring Dia. A	Cross Section (in) D	Cross Section (mm) D
20"	JM	OR20JM	19.125	.230	5.8
21"	T	OR21T	19.250	.260	6.6
25"	T	OR25T	23.250	.260	6.6
20"	TG	OR220TG	18.250	.260	6.6
24"	TG	OR224TG	22.000	.260	6.6
25"	STN-HTN	OR325T	22.438	.385	9.8
29"	HTS-HTHM	OR329T	26.250	.385	9.8
33"	HTHM-RW	OR333T	30.125	.385	9.8
35"	HTS-HTHM	OR335T	32.125	.385	9.8
39"	HTS-HTHM	OR339T	36.125	.385	9.8
49"	HTHM-RW	OR349T	45.125	.385	9.8
51"	HTS-HTHM	OR351T	47.125	.385	9.8
51"	HDT	OR451T	46.000	.500	12.7
57"	HDT	OR457T	51.625	.500	12.7



When mounting or remounting a tyre, only use new O-Rings.

ARCTIC "O" RINGS
Specifically compounded "O" rings for sub-zero temperatures. Engineered to function and create seal at -65° Fahrenheit. "O" rings are further identified with a green band around section circumference close to part number. Add "A" to part number for Arctic "O" ring (for example: OR335TA).

TUBES AND FLAPS

Only Use Radial Type Tubes and Flaps in Radial Tyres (see special marking on tubes or flaps).
Preferably fit a new tube and a new flap when mounting a new tyre.

TUBES

A tube too large will be liable to buckling, and to early failure.
A tube too small will be stretched excessively, leading to reduced rub resistance, and poorer air retention.
In an emergency, a small tube is better than a large tube, since the failure mode is less likely to be catastrophic.
In case of necessity, a tube may be reused, if,

- There is no apparent damage and
- If the tube has not grown excessively during the first life.

FLAPS

The flap is designed to:

- Protect the tube from the roughness of the rim
- To prevent the tube being pinched by the component parts of multi-pieced rims
- To prevent the tube being pushed through the valve slot.

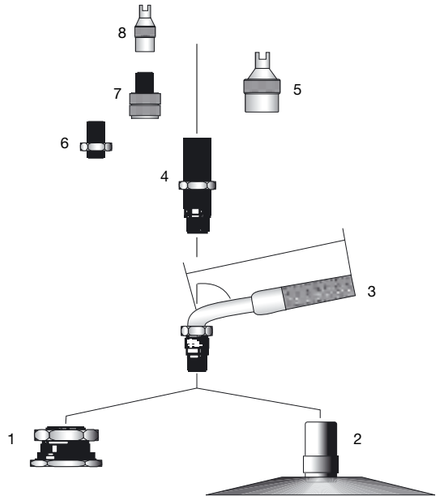
As a rule we can say that flaps are necessary for any rim which has a valve slot as against a valve hole.

Note: The fitment of tubes to "tubeless" tyres is not recommended.

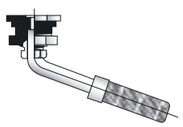
VALVES

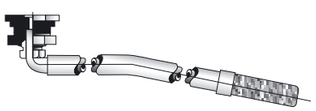
In the majority of Off-the-road tyre applications one piece screw on Metal Valves are used.

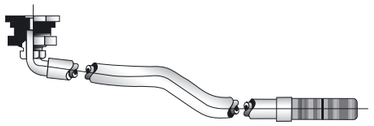
1 EM – metal valve base for TL tyres
2 EM – rubber valve base for tubes
3 EM – valve stem bent 80°
4 EM – valve stem straight
5 EM – valve cap with stem remover
6 EM – valve adaptor (fits on valve core threads)
7 EM – valve adaptor (fits over valve cap threads)
8 EM – small valve cap with stem remover



Valves for payloader, compactors, MPT and implement tyre applications are either rubber or metal and may be straight or bent. Bent valves, normally of the swivel type, are generally supplied with the required bent form, and may be single, double or triple bent.


Single bend


Double bend


Triple bend

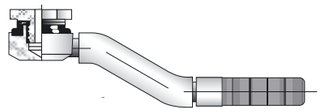
LARGE BORE AND SUPER LARGE BORE VALVES

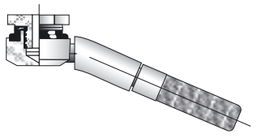
The Large Bore and Super Bore valve systems are evolutions from the basic system of a standard bore. The Large Bore and Super Bore systems are of a heavier construction with enlarged chambers for greater flow rate characteristics to assure minimum down time and resistance to abuse.

The Large Bore valve is able to pass up to THREE times the amount of air of a standard bore valve. Super Large Bore, with an even larger air chamber, passes up to SEVEN times more air than a Large Bore Valve. These valves are extensively used to reduce the cost of down time during inflation/deflation.

TURRET TYPE VALVES

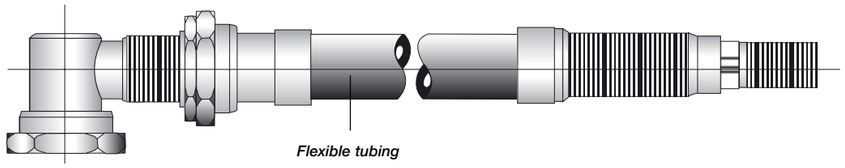
Turret type valves may be required where there is insufficient clearance for the standard swivel valve, such as in wheels accommodating planetary drive gear.


Double bend


Single bend

FLEXIBLE TUBELESS VALVES

Flexible swivel valves have a very low valve height above the rim and may also be fitted to tubeless applications where space is critical.


Flexible tubing

VALVES

EXTENSIONS

In order to facilitate valve access it may be necessary to fit a valve extension. Normally the position of the valve to be accessed will determine the type of extension (rigid, flexible or bendable) required.

Rigid Brass

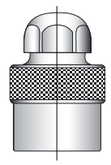
Bendable

Flexible

VALVE CAPS

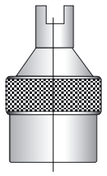
Valves must **always** be fitted with a valve cap.

The valve cap is the primary air seal. Valve caps are always made of metal and have a rubber sealing ring. Plastic dust caps are not suitable for field service.



Hex Valve Cap

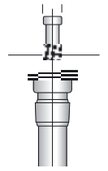
Dome Cap



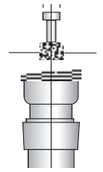
Dome Cap

VALVE CORES

The valve core is present to allow the internal air pressure to be measured and changed. Valve cores are available in two versions.



C1 Standard Core



C2 Large Bore
Super Large Bore

TUBES, FLAPS AND VALVES FOR RADIAL OFF THE ROAD TYRES

Narrow Base Tyre Size	Rim	Tube Size	Flap Size*	Angle Valve* *
16.00-24/25	11.25	16.00-24/25 Truck	24/25F9.6	J1175 C
18.00-25	13.00	18.00-24/25 Truck	24/25F10.6	J1175 C
18.00-33	13.00	18.00-32/33 Truck	33F8.9	J1176 D
21.00-25	15.00	21.00-24/25 Truck	24/25F12.4	J1179 B
21.00-35	15.00	21.00-35 Truck	35F12.0	J1175 C

Wide Base Tyre Size	Rim	Tube Size	Flap Size*	Angle Valve* *
20.5-25	17.00	20.5-25 Truck	25F14.9	J1175 C
23.5-25	19.50	23.5-25 Truck	25F19.8	J1175 C
26.5-25	22.00	26.5-25 Truck	25F21.6	J1175 C

** Flap width specified is minimum flap width. Flap width is measured on rim side of flap.*

Example: 24-9.0
24 = Nominal Diameter
9.0 = Flap width

** * Valve J1014 is standard straight valve on all EM tubes 16.00 and up. Angle Valve shown is most commonly used.*

TUBES, FLAPS AND VALVES FOR GRADER TYRES

Tyres Using Semi-Drop Centre Rims Tyre Size	Rim	Tube Size	Valve No.	Flap Size
14.00-24T G	8.00T G	13.00/14-24 GR	220 A	24-10.0RG

Tubes, Flaps and Valves for Sand Tyres Tyre Size	Rim	Tube Size	Valve No.	Flap Size
18.00-25 DT	10.00 W	18.00-24/25 Truck	J1175 C	24/25F10.5
21.00-25 DT	15.00	21.00-24/25 Truck	J1179 B	24/25F13.0
29.5-25 DT	25.00	29.5-25 Truck	J1175 C	25F23.1

Radial tyres must be fitted with radial type tubes and flaps.

LIQUID BALLASTING

BALLASTED TYRES

Increasing the load on the drive axle offers many advantages:

- Improved traction
- Increased drawbar pull
- Less slippage
- Less pressure loss
- Less tread wear
- Less bounce
- Less fuel consumption

The simplest way to add weight is to partially fill the tyres with liquid. No less than 75% of the tyre's volume should be filled with liquid. A 100% fill can cause an unsafe pressure rise under load.

A solution of calcium chloride and water is recommended for liquid filling. It offers:

- Additional weight (up to 50%) over plain water
- It is not harmful to rubber
- It is plentiful and low in cost
- It is an effective antifreeze solution

SPECIAL CONSIDERATIONS FOR BALLASTED TYRES

Before adding ballast, tyres must be seated with air. Inflate:

- Grader tyres = 3.5 Bar
- Tyres less than 29" in diameter = 5.25 Bar
- Tyres 29" and larger in diameter = 6.25 Bar

After seating, exhaust air and add ballast. Tubes filled with calcium chloride must be equipped with special sealed-in base valves. These prevent separation of the rubber valve base and valve metal.

Tubeless tyres can be ballasted. Calcium chloride solution will not harm rims if a minimum of 75% fill is used.

A corrosion-proof gauge should be used to check inflation pressures. The valve must be in the highest position when pressure is checked. This gives the most accurate reading.

MIXING THE CALCIUM CHLORIDE SOLUTION

The amount of calcium chloride needed to prevent freezing varies with the temperature.

Sp. Gravity @ 18° C	$CaCl_2$/Water Kg/L	Freezes Below °C
1.000	0.00	0
1.050	.08	- 6
1.100	.18	-14
1.150	.28	-23
1.218	.42	-34
1.250	.50	-41

The amount of $CaCl_2$/Water needed for earthmover tyres can be easily calculated. The volume of the tyre must be known. Then use the formula:

$$\frac{3/4 \text{ Vol. (in cu. cm)}}{1167} = \text{Litres Water}$$

The 1167 divisor is established by:

Volume of Litre Water = 1000 cu. cm

Swell Factor = 167 cu. cm

Volume of 1 Litre H_2O + .42 kg. $CaCl_2$ = 1167 cu. cm

Swell factors will vary with the amount of $CaCl_2$ added. Other swell factors are available from any Goodyear OTR Sales or Service office.

Weight can be found by:

$$\frac{\text{Weight of Water = Litres x 1} + \text{Weight of } CaCl_2 \text{ = Litres x .42}}{\text{Ballast Weight in Kilograms}}$$

SAFETY INSTRUCTIONS

Before performing any services on off-the-road tyres, read and understand all safety precautions.

GENERAL

- Do not mount or demount tyres without proper training.
- Follow all procedures and safety instructions exactly.
- Do not be careless or take chances.
- If you are uncertain about proper mating of parts, consult an expert.
- Always stand clear of a tyre/rim assembly that is being deflated or inflated.
- Use a clip-on chuck. Use inflation hose long enough to stand to side of tyre. Do not stand in front or back of tyre assembly.
- Confirm that the correct components are used and that the new components are of the same size and type.
- Never, under any circumstances, attempt to rework, weld, heat or braze any rim components that are cracked, broken or damaged.
- Never hammer on rims or other components while tyre is fully or partially inflated.
- If necessary to tap components together, mallets with faces of:
  - rubber
  - lead
  - plastic
  - brass
- Never introduce a flammable substance into a tyre before, during, or after mounting

DEMOUNTING

Before removing any rim or wheel component (i.e., nuts or rim clamps):

DO

- exhaust all air from a single tyre
- exhaust all air from both tyres of a dual assembly
- remove valve core completely to assure all air is exhausted from tyre
- remove both cores from dual assembly
- run a piece of wire through stem to be sure it's not plugged
- use approved eye protector
- use mechanical aids when removing heavy rim components

INSPECTION

- Clean and repaint rims to stop corrosion and facilitate mounting and component checks.
- Clean dirt and rust from lock ring and gutter to ensure proper seating.
- Check and replace all rim components which are cracked, badly worn, severely rusted or damaged in any way.
- Don't reinflate a tyre that has been run flat until you inspect the tyre, tube, flap, rim and wheel assembly.
- Double check the side ring, flange bead seat, lock ring and O-ring to ensure they are secure in the gutter before inflation.

SAFETY INSTRUCTIONS

An earthmover tyre contains enough energy to raise a 1380 kg car

26m off the ground!

- *Inflate tyres in a safety cage.*
- *Replace weak or damaged parts.*
- *Replace all severely rusted rims.*
- *Check for excessive side ring play and ring butting.*
- *Double check tyre and rim before inflating.*
- *Always deflate tyres prior to dismounting.*
- *Inspect wheel nuts and clamps periodically.*

MOUNTING AND INFLATION

- Double check to be sure all components are properly seated before inflating.
- Inflate in a safety cage. Use safety chains or equivalent restraining devices during inflation.
- Don't inflate tyre before all components are properly in place.
- Place in safety cage or use chain sling and inflate to approximately .5 BAR. Recheck components for proper assembly.
- If assembly is not proper, deflate and correct.
- If assembly is proper at approximately .5 BAR, inflate fully to seat tyre.
- Completely deflate tyre (both tube-type and tubeless).
- Reinflate to recommended operating pressure.
- Stand clear when using a steel cable or chain sling.
- Inflate off-the-road tyre/rim assemblies with nitrogen instead of air where recommended by the vehicle manufacturer.
- Inflate to same level of pressure as you would with air.
- Inflating with nitrogen should be done only by trained personnel using proper equipment.
  This includes:
  - an appropriate relief valve
  - a pressure regulator set for no more than 1.5 BAR over desired inflation
  - a remote control clip-on chuck. Personnel to stand clear of tyre/rim assembly during inflation

OPERATION

- Use recommended rim for tyre. Check Goodyear catalogue for proper tyre/rim matching.
- Don't overload or overinflate tyre/rim assemblies.
- Check your rim manufacturer if special operating conditions are required.
- Never run a vehicle on one tyre of a dual assembly.
- Never use a tube in a tubeless tyre where the rim assembly is suspected of leaking.
- Always inspect rims and wheels for damage during tyre checks.
  - Never add or remove an attachment to a rim without approval from the manufacturer.
  - Never modify a rim without approval from the manufacturer.
- If vehicle wheels have been designed/or altered to contain wheel coolant, never operate vehicle without coolant.
- Always use the mix and amount of coolant recommended by the manufacturer.
- Don't let the brakes become overheated.
- Carefully follow manufacturer's recommendations for operating and maintenance.
- Clear the area if excessive brake heat is suspected. Warnings include:
  - the smell of burning rubber
  - the smell of hot brakes
- Wait at least one hour before approaching machine.

SERVICING TYRE AND RIM ON MACHINE

- Block tyre and wheel on opposite side of machine before placing jack in position.
- Put hardwood blocks under jack.
- Use blocks regardless of how hard or firm ground appears to be.
- Always crib up a vehicle with blocks just in case the jack slips.
- Before loosening nuts or clamps, always secure a tyre/rim assembly with:
  - a sling
  - tyre handler
  - other support equipment
- Deflate and examine to determine the reason for improper fit. Look for distortion or components not properly locked or seated.
- Replace cracked, broken or damaged parts with parts of the same size, type and make. Consult rim manufacturer concerning proper component replacement.

An exploding earthmover tyre can throw a 7.25 kg bowling ball

more than 4.8 kilometres

- *Don't try to remove tyre from rim before completely deflating.*
- *Don't seat rings by hammering while tyre is inflated.*
- *Don't inflate tyre before all side and lock rings are in place.*
- *Don't let anyone mount or dismount tyres without proper training.*
- *Don't use water-suspended lubricants with tubeless tyres.*
- *Don't use petroleum oil or grease on tyre beads or rims.*