

## SAFETY PRECAUTIONS CONCERNING MOUNTING, DEMOUNTING AND OPERATION

### WARNING

Tire and rim servicing can be dangerous, and should be performed only by trained personnel using proper tools and procedures. Failure to comply with these procedures may result in faulty positioning of the tire and/or rim, and cause the assembly to burst with explosive force, sufficient to cause serious physical injury or death.

### DEMOUNTING

#### 1. BEFORE DEMOUNTING

- Always exhaust all air from a single tire and from both tires of a dual assembly prior to removing any wheel components such as nuts and rim clamps.
- A broken rim part under pressure can blow apart and cause serious injury or death.
- Make sure to remove valve core to exhaust all air from the tire. Remove both cores from a dual assembly. (When you remove the wheel lugs, if the tire is still under pressure, the assembly may fly apart.)
- Check the valve stem by running a piece of wire through the stem to make sure it is not plugged. (Foreign material may clog the valve stem during deflation or ice may form as the air leaves the tire, clogging the valve stem.)

#### 2. DURING DEMOUNTING

- Demounting tools apply pressure to rim flanges to unseat tire beads, and keep your fingers clear. Always stand to one side and hold the tool with one hand when you apply hydraulic pressure. (If the tool slips off, it can fly with enough force to cause serious injury or death.)
- Do not use tools in the vicinity of the flange butt weld.

#### 3. AFTER DEMOUNTING

- Clean rims and repaint to stop detrimental effects of corrosion and facilitate checking and tire mounting. Be very careful to clean all dirt and rust from the lock ring and gutter. This is important to secure the lock ring in its proper position. A filter on the air inflation equipment to remove the moisture from the air line helps prevent corrosion. The filter should be checked periodically to see that it is working properly. (Parts must be clean for a proper fit - particularly the gutter section which holds the lock ring in its proper position.)

### MOUNTING

#### 1. BEFORE MOUNTING

- Check rim components for cracks. Replace all cracked, badly worn, damaged and severely rusted component with new parts of the same size and type. When a component is in doubt, replace it. (Parts that are cracked, damaged or excessively corroded are weakened. Bent or repaired parts may not engage properly.)
- Do not, under any circumstance, attempt to rework, weld, heat or braze any rim component that is cracked, broken or damaged. Replace with a new part that is not cracked, broken or damaged and which is of the same size and type. (Heating may weaken a part to extent that it is unable to withstand forces of inflation or operation.)
- Check type of rim and make sure all parts of such rim are being assembled properly. Follow instruction manual of rim or ask your distributor if you have any doubts. (Mismatched parts may appear to fit, but when the tire is inflated they may fly apart with explosive force.)
- Mixing parts of one type rim with those of another is potentially dangerous. Always check rim with manufacturer for approval.
- Remove rust, dirt and other foreign matter from the rim surface, particularly on the bead seats and O-ring slot.
- Clean the inside of the tire.
- Make sure tube and flap are correct and not damaged for tube type tires.
- Always prepare a new O-ring for tubeless tires.
- Do not reinflate a tire that has been run flat or has been run

at 80% or less of its recommended operating pressure, or when there is obvious or suspected damage to the tire or wheel components. (Components may have been damaged or dislocated during the time the tire was run flat or seriously under-inflated.)

#### 2. DURING MOUNTING AND INFLATION

- Do not try to seat rings or other components by hammering while tire is inflated or partially inflated.
- Double check to make sure all components are properly seated prior to inflation.
- Do not inflate tire before all components are properly in place. Place in safety cage or use a restraining device and inflate to approximately 0.35 kg/cm<sup>2</sup> (5 psi), recheck components for proper assembly. Observe that O-ring does not roll out of its groove. If assembly is not performed properly, deflate and correct. Never hammer or an inflated on partially inflated tire/rim assembly. If assembly is correct at approximately 0.35 kg/cm<sup>2</sup> (5 psi), continue to inflate fully to seat the tire beads.
- Never sit or stand in front of a tire and rim assembly that is being inflated. Always use a clip-on chuck with a sufficient length of hose to permit the person inflating the tire to stand clear of the potential trajectory of the wheel components, and use an in-line valve with gauge or a pressure regulator preset to a desired value when inflating a tire. When a tire is in a restraining device, do not lean any part of your body or equipment on or against the restraining device. (If parts are improperly installed they may fly apart with explosive force.)
- Never attempt to weld on an inflated tire/rim assembly or on a rim assembly with a deflated tire. (Heat from welding will cause a sudden, drastic increase in pressure, resulting in an explosion with the force of a bomb. Deflated tires can catch fire inside the air chamber.)

#### 3. AFTER INFLATION

- Make sure no air leakage can be suspected, especially in tubeless tires.

### OPERATION

- Do not use under-inflated tires.
- Do not bleed or reduce air pressure to compensate for the increase in pressure resulting from operation.
- Do not use under-size rims. Use recommended rim for the tire.
- Do not overload or over-inflate tire/rim assemblies. Check for adequate rim strength if special operating conditions are required. (Excessive overload can cause damage to the tire and rim assembly.)
- Never run a vehicle on one tire of a dual assembly. (The carrying capacity of the single tire and rim is dangerously exceeded, and operating a vehicle in this manner can result in damage to the rim and tire or cause a tire fire.)
- Never use a tube in a tubeless tire/rim assembly where the rim is suspected of air leakage. (Loss of air pressure through fatigue cracks or other fractures in a tubeless rim warns you of a potential rim failure. This safety feature is lost when tubes are used with leaking rims. Continued use may cause the rim to burst with explosive force.)
- Always inspect rims and wheels for damage during tire checks. (Early detection of potential rim failure may prevent serious injury.)
- Never add or remove an attachment or otherwise modify a rim (Especially by heating, welding or brazing) unless the tire has been removed and approval has been received from the rim manufacturer. (Modification or heating of a rim or one of its parts may weaken it so that it cannot withstand forces created by inflation or operation.)
- Never mount bias tire and radial tire on the same axle. Follow vehicle manufacturer's recommendation.
- Never use tire under unintended service conditions for the tire. Please consult YOKOHAMA if vehicle operation requires specialized tire fitment.

Specifications subject to change without notice.

# OFF-THE-ROAD TIRES HANDBOOK



## GET YOUR JOB DONE ANYWHERE IN THE WORLD

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TRA Classification of OFF-THE-ROAD TIRES

YOKOHAMA OFF-THE-ROAD TIRES are classified as follows by the Tire and Rim Association (TRA).

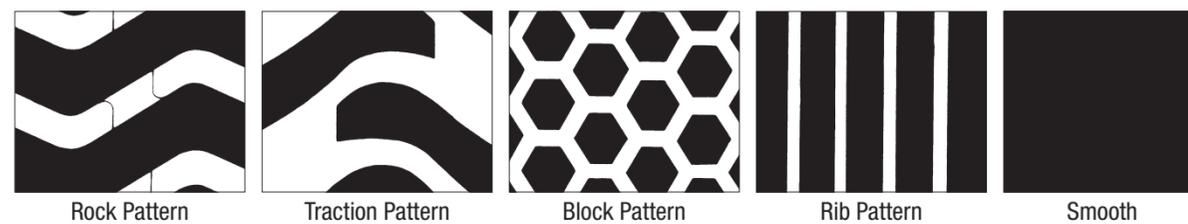
Vehicles	TRA Code	Tire Type	Vehicles image
Earthmover	E-3	Regular Tread	
	E-4	Deep Tread	
Subterranean Haulage	SH-3	Regular Tread	
	SH-4	Deep Tread	
Loader & Dozer	L-2	Traction Regular Tread	
	L-3	Regular Tread	
	L-4	Deep Tread	
	L-5	Extra Deep Tread	
	L-4S	Smooth Deep Tread	
	L-5S	Smooth Extra Deep Tread	
Grader	G-2	Traction Regular Tread	
	G-3	Regular Tread	
Compactor	C-1	Smooth Tread	
Mobile Crane	-	-	
Industrial	IND-3	Regular Tread	
	IND-4	Deep Tread	
	IND-5	Extra Deep Tread	

Caution: Never replace a tire mounted on a vehicle with any tire designed for a different type of vehicle. For example, you should never place an earthmover tire on a loader.

Tread Pattern

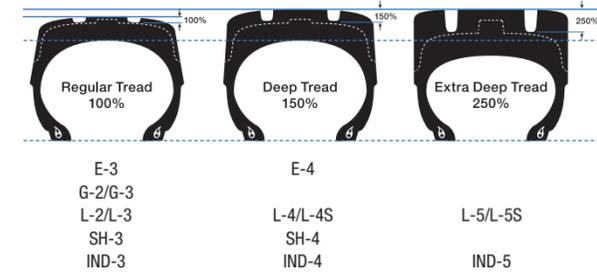
The tread pattern is designed to produce varying degrees of traction, cut resistance, flotation, wear and heat resistance. Selection of the proper OFF-THE-ROAD TIRES depends on the job and the conditions.

For example, different tread patterns are used to produce maximum traction or flotation on sand, mud and rock. There are five basic tread patterns: rock, traction, block, rib and smooth.



Tread Thickness

According to the Tire and Rim Association (TRA), there are three general classifications for tread thickness for OFF-THE-ROAD TIRES : regular, deep and extra deep. Deep and extra deep are 1.5 and 2.5 times thicker than regular, respectively. The thicker treads have greater cut and wear resistance.



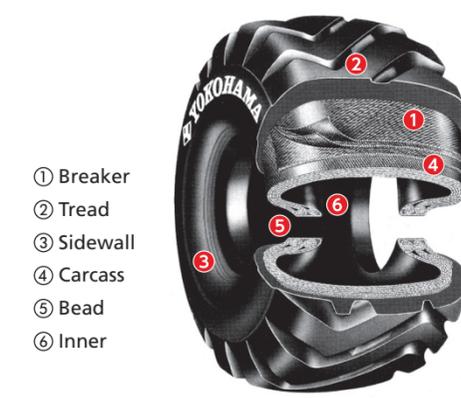
Although thicker treads give greater wear and cut resistance, they also generate and retain more heat. Accordingly, work conditions for thick tread tires should be thoroughly evaluated to prevent heat separation and other heat related damage. Deep and extra deep tread tires have almost the same overall diameter which is larger than regular tread tires. When replacing regular tread tires with deep or extra deep tread tires, the larger overall diameters of the thicker tread tires should be taken into consideration.

Construction of OFF-THE-ROAD TIRES

Structural Diagram of OFF-THE-ROAD RADIAL TIRES



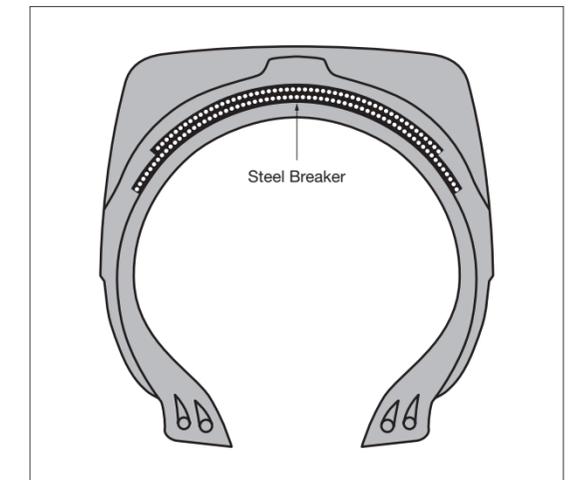
Structural Diagram of OFF-THE-ROAD BIAS TIRES



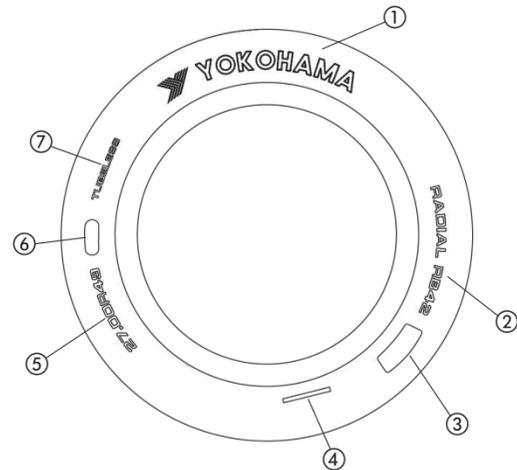
Steel Breakers(Bias Tires)

The steel breaker tire has steel cord breakers that give it very high cut resistance. It is specially useful where sharp rock is a problem, and is applicable to loader, dozer, dump truck and occasionally earthmover type tires. The adhesiveness between the steel cord and rubber is, however, more susceptible to heat damage than that of nylon cord and rubber. Accordingly, steel breaker tires should not be subjected to conditions where heat generation is great. Because of the difficulty involved in retreading steel breaker tires, they should not be used for jobs where more easily retreaded tires can be used.

Steel Breaker Diagram



## ■ Tire Marking(Radial)

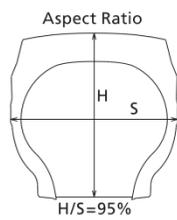


- ① Brand Name
- ② Tread Pattern Name
- ③ Tire Specification Code
- ④ Serial Number
- ⑤ Tire Sizer
- ⑥ Star Mark / Load Index & Speed Symbol
- ⑦ Tubeless or Tube Type

## ■ Size Identification and Aspect Ratio

### Narrow Base Tires

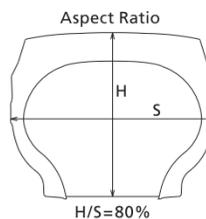
**27.00 R 49 ☆☆ (Radial)**  
 ☆☆ Star Mark  
 27.00 Rim Diameter (inches)  
 R Radial Construction  
 49 Section Width (inches)



**27.00-49 48PR (Bias)**  
 48PR Ply Rating  
 27.00 Rim Diameter (inches)  
 49 Section Width (inches)

### Wide Base Tires

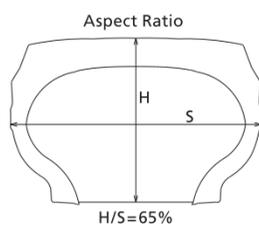
**29.5 R 25 ☆☆ (Radial)**  
 ☆☆ Star Mark  
 29.5 Rim Diameter (inches)  
 R Radial Construction  
 25 Section Width (inches)



**29.5-25 34PR (Bias)**  
 34PR Ply Rating  
 29.5 Rim Diameter (inches)  
 25 Section Width (inches)

### Super Wide Base Tires

**750/65 R 25 ☆ (Radial)**  
 ☆ Star Mark  
 750 Rim Diameter (inches)  
 R Radial Construction  
 65 Aspect Ratio (65%)  
 25 Section Width (mm)



**45/65-45 58PR (Bias)**  
 58PR Ply Rating  
 45 Rim Diameter (inches)  
 65 Aspect Ratio (65%)  
 45 Section Width (inches)

### Other Tires

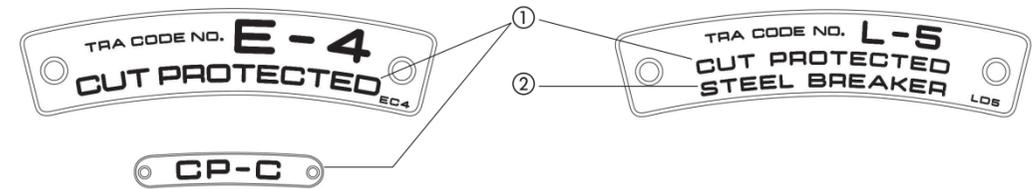
**445/95 R 25 174 F (Radial)**  
 F Speed Symbol  
 445 Rim Diameter (inches)  
 R Radial Construction  
 95 Aspect Ratio (95%)  
 174 Section Width (mm)

**42x17-20 10PR (Bias)**  
 10PR Ply Rating  
 42 Rim Diameter (inches)  
 17 Section Width (inches)  
 20 Overall Diameter (inches)

Widths of narrow and wide base tires of the same diameter are shown below:

Narrow Base Tires	Wide Base Tires
13.00	15.5
14.00	17.5
16.00	20.5
18.00	23.5
21.00	26.5
24.00	29.5
27.00	33.5
30.00	37.5

## ■ Tire Specification Code



### ① Tire Specification Code

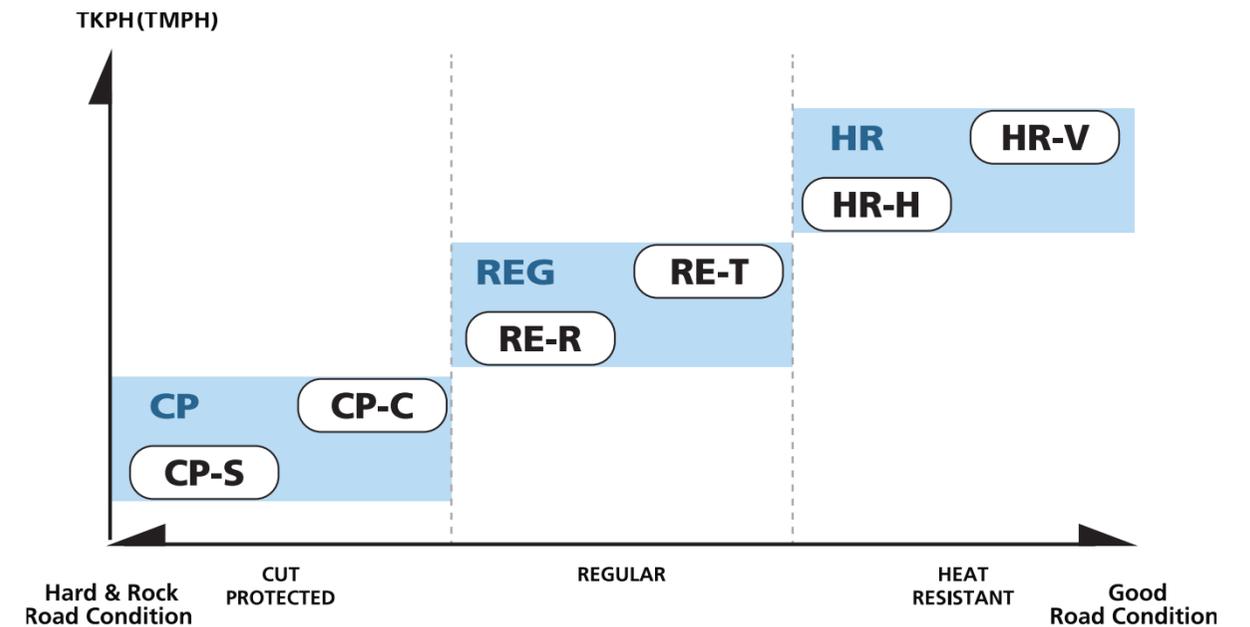
Code Type I	Specification
CUT PROTECTED	Cut Resistance Type
REGULAR	Regular (Standard) Type
HEAT RESISTANT	Heat Resistance Type

### ② Special Code

Code	Specification
FOR SDC RIM	Semi-Drop Center Rim Use Only
STEEL BREAKER	Steel Breaker For Bias Tires
WIDE STEEL BREAKER	Wide Steel Breaker For Bias Tires

Code Type II	Specification
CP-S	Special Cut Resistance Type
CP-C	Cut Resistance Type
RE-R	Regular (Standard) Type
RE-T	Regular (Standard) Type With Heat Resistant
HR-H	Heat Resistance Type
HR-V	Special Heat Resistance Type

### Positioning Map of Tire Specification Code

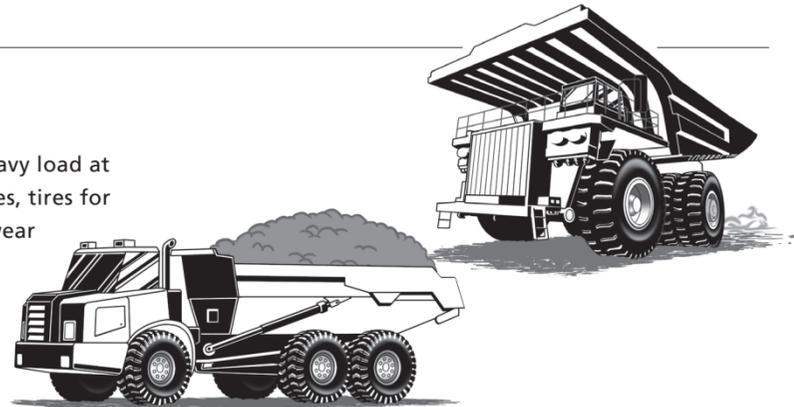


## ■Tires by Type of Vehicle

YOKOHAMA OFF-THE-ROAD TIRES are also classified by type of vehicle and application suitable for usage.

### Dump Trucks (TRA Codes E-3, E-4)

Since dump trucks must travel under heavy load at high speeds over relatively long distances, tires for dump trucks must have high heat and wear resistance. High resistance to cuts is sometimes also necessary.



### Scrapers (TRA Codes E-3)

Scraper tires, of which the wide base type is most common, should have the same properties as those for dump trucks. Superior flotation and traction are also occasionally required.



### Subterranean Haulage Trucks (TRA Code SH-3 and SH-4)

Subterranean Haulage trucks run on narrow and poor road surfaces. In addition, it is difficult to change vehicle sizes larger, so they are used under high speeds and high loads conditions for efficient haulage. Therefore, the tires must have cut and heat resistance, and durability.

### Front-End Loaders (TRA Codes L-2, L-3, L-4, L-5, L-4S and L-5S)

Since front-end loaders operate on rough ground, cut and wear resistance are vital and the tires must provide stability for the loader body. Flotation and traction properties may also be necessary, depending on the working conditions. In certain cases, such as the wet and rough conditions of underground mines, the L-4S and L-5S with smooth treads are used because of their high wear and cut resistant properties.



### Tire Dozers (TRA Codes L-2, L-3, L-4 and L-5)

Since a dozer is used not only for dozing and leveling, but sometimes for pushing a motor scraper, tires with better traction than loader tires are necessary. Other requirements vary widely depending on job conditions.

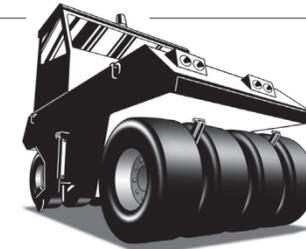


### Motor Graders (TRA Codes G-2 and G-3)

The motor grader, which is used for road leveling, clearing and snow removal, needs tires that provide high traction and directional stability. Other characteristics depend on job requirements.

### Tire Rollers (TRA Code C-1)

Tire rollers use wide tread tires that uniformly distribute weight because of their primary use in compacting road surfaces.

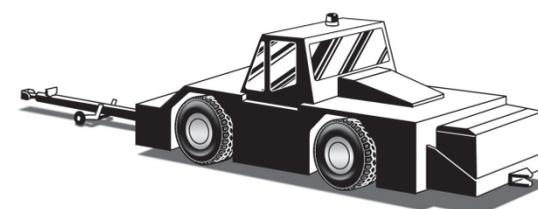
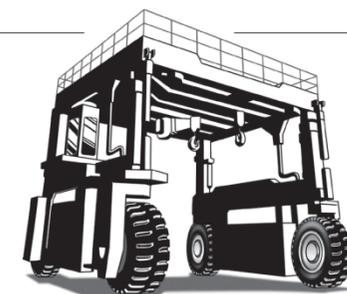


### Straddle Carriers (TRA Code IND-3 and IND-4)

Straddle carriers are special vehicles that are mainly used at seaport areas to carry ocean-going freight containers. These tires require extra heavy-duty performance, and wear and heat resistance, because straddle carriers operate continuously and turn frequently.

### Rubber Tired Gantry Crane(RTG) (TRA Codes IND-3 and IND-4)

Rubber tired gantry cranes are special cranes mainly used to load and unload containers at seaport areas. These tires require abrasion resistance and durability.



### Towing Tractors (TRA Code IND-3)

Towing tractors are used to move large aircraft. Thus, these tires mainly require extra traction.

## Load Index

The Load Index is a international numerical code associated with the maximum load a tire can carry at the speed indicated by its Speed Symbol under service specified conditions.

LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg
0	45	50	190	100	800	150	3350	200	14000	250	60000
1	46.2	51	195	101	825	151	3450	201	14500	251	61500
2	47.5	52	200	102	850	152	3550	202	15000	252	63000
3	48.7	53	206	103	875	153	3650	203	15500	253	65000
4	50	54	212	104	900	154	3750	204	16000	254	67000
5	51.5	55	218	105	925	155	3875	205	16500	255	69000
6	53	56	224	106	950	156	4000	206	17000	256	71000
7	54.5	57	230	107	975	157	4125	207	17500	257	73000
8	56	58	236	108	1000	158	4250	208	18000	258	75000
9	58	59	243	109	1030	159	4375	209	18500	259	77500
10	60	60	250	110	1060	160	4500	210	19000	260	80000
11	61.5	61	257	111	1090	161	4625	211	19500	261	82500
12	63	62	265	112	1120	162	4750	212	20000	262	85000
13	65	63	272	113	1150	163	4875	213	20600	263	87500
14	67	64	280	114	1180	164	5000	214	21200	264	90000
15	69	65	290	115	1215	165	5150	215	21800	265	92500
16	71	66	300	116	1250	166	5300	216	22400	266	95000
17	73	67	307	117	1285	167	5450	217	23000	267	97500
18	75	68	315	118	1320	168	5600	218	23600	268	100000
19	77.5	69	325	119	1360	169	5800	219	24300	269	103000
20	80	70	335	120	1400	170	6000	220	25000	270	106000
21	82.5	71	345	121	1450	171	6150	221	25750	271	109000
22	85	72	355	122	1500	172	6300	222	26500	272	112000
23	87.5	73	365	123	1550	173	6500	223	27250	273	115000
24	90	74	375	124	1600	174	6700	224	28000	274	118000
25	92.5	75	387	125	1650	175	6900	225	29000	275	121500
26	95	76	400	126	1700	176	7100	226	30000	276	125000
27	97	77	412	127	1750	177	7300	227	30750	277	128500
28	100	78	425	128	1800	178	7500	228	31500	278	132000
29	103	79	437	129	1850	179	7750	229	32500	279	136000
30	106	80	450	130	1900	180	8000	230	33500		
31	109	81	462	131	1950	181	8250	231	34500		
32	112	82	475	132	2000	182	8500	232	35500		
33	115	83	487	133	2060	183	8750	233	36500		
34	118	84	500	134	2120	184	9000	234	37500		
35	121	85	515	135	2180	185	9250	235	38750		
36	125	86	530	136	2240	186	9500	236	40000		
37	128	87	545	137	2300	187	9750	237	41250		
38	132	88	560	138	2360	188	10000	238	42500		
39	136	89	580	139	2430	189	10300	239	43750		
40	140	90	600	140	2500	190	10600	240	45000		
41	145	91	615	141	2575	191	10900	241	46250		
42	150	92	630	142	2650	192	11200	242	47500		
43	155	93	650	143	2725	193	11500	243	48750		
44	160	94	670	144	2800	194	11800	244	50000		
45	165	95	690	145	2900	195	12150	245	51500		
46	170	96	710	146	3000	196	12500	246	53000		
47	175	97	730	147	3075	197	12850	247	54500		
48	180	98	750	148	3150	198	13200	248	56000		
49	185	99	775	149	3250	199	13600	249	58000		

## Speed Symbol

The Speed Symbol indicates the speed at which the tire can carry a load corresponding to its Load Index under service specified conditions.

Speed Symbol	Speed (km/h)
A1	5
A2	10
A3	15
A4	20
A5	25
A6	30
A7	35
A8	40

Speed Symbol	Speed (km/h)
B	50
C	60
D	65
E	70
F	80
G	90

## Conversion Table: Star Mark to Ply Rating

Loader			Earthmover			Grader		
Tire Size	Star Mark*	Ply Rating	Tire Size	Star Mark*	Ply Rating	Tire Size	Star Mark*	Ply Rating
17.5R25	☆	UP TO 16 PR	17.5R25	☆☆	UP TO 22 PR	14.00R24	☆	UP TO 16 PR
20.5R25	☆	UP TO 20 PR	20.5R25	☆☆	UP TO 28 PR	17.5R25	☆	UP TO 20 PR
23.5R25	☆	UP TO 24 PR	23.5R25	☆☆	UP TO 32 PR	20.5R25	☆	UP TO 20 PR
26.5R25	☆	UP TO 26 PR	26.5R25	☆☆	UP TO 36 PR			
29.5R25	☆	UP TO 28 PR	29.5R25	☆☆	UP TO 40 PR			
			14.00R25	☆☆☆	UP TO 32 PR			
			16.00R25	☆☆	UP TO 32 PR			
18.00R25	☆☆	UP TO 36 PR	18.00R33	☆☆	UP TO 36 PR			
			24.00R35	☆☆	UP TO 48 PR			
			27.00R49	☆☆	UP TO 56 PR			
			33.00R51	☆☆	UP TO 66 PR			

\*Star Mark: The load capacity of a tire is indicated by the Star Mark in case of radial tire.

Radial : Application

Earthmover

Tire Size	Star Mark	TRA Code / Pattern											
		E-3			E-4			E-4					
		RT31	RT32	RB31	RL31	RT41	RL45	RB41	RB42	RB42A	RL42	RL47	RL47A
		Type											
		T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L
14.00R25NHS	☆☆☆							●					
16.00R25	☆☆							●					
18.00R33	☆☆							●	●	●			
24.00R35	☆☆							●	●	●			
27.00R49	☆☆							●					●
33.00R51	☆☆							●				●	
17.5R25	☆☆			●	●								
20.5R25	☆☆	●		●	●								
23.5R25	☆☆	●		●	●								
750/65R25	☆☆	●											
26.5R25	☆☆	●		●		●	●						
29.5R25	☆☆			●		●	●						
37.25R35	☆☆	●	●										

\* : L-3+, Tread Depth 125% level



NHS : Not for highway service  
T/L : Tubeless Type

Radial : Application

Loader & Dozer

Tire Size	Star Mark	TRA Code / Pattern									
		L-3		L-4		L-5		L-5S		L-2	
		RT31	RB31	RL31	RT41	RL45	RL51	RL52	R69	MYX S01	
		Type									
		T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L	T/L
18.00R25	☆☆								●		
17.5R25	☆		●	●				●		●	
20.5R25	☆	●	●	●				●			●
23.5R25	☆	●	●	●	●		●				
750/65R25	☆	●									
26.5R25	☆	●	●		●	●		●			
29.5R25	☆		●		●	●		●			
875/65R29	☆				●						

\* : L-3+, Tread Depth 125% level



T/L : Tubeless Type

## Radial : Application

### Grader

Tire Size	Star Mark	TRA Code / Pattern			
		G-2	G-2		G-2
		RT21	* MYX S01		RS02
					
		Type			
		T/L	T/L		T/L
14.00R24TG	☆	●			●
17.5R25	☆		●		
20.5R25	☆			●	

\* : The tread design for both 17.5R25 and 20.5R25 are slightly different.

### Mobile Crane

Tire Size	Star Mark L/SS	Pattern				
		RB01		RB03		RS01
						
		Type				
		T/T	T/L	T/T	T/L	T/L
14.00R24NHS	☆☆☆	●				
325/95R24	161E			●		
385/95R25	170E		●		●	●
385/95R25	170F		●		●	
445/95R25	177E		●			
445/95R25	174F		●			
505/95R25	183E		●			
525/80R25	176F				●	

### Industrial

Tire Size	Star Mark L/SS	TRA Code / Pattern		
		IND-4	IND-4	IND-4
		RL43	RR41	RR42
				
		Type		
		T/T	T/L	T/L
14.00R24NHS	☆☆☆	●		
16.00R25	☆☆☆		●	
16.00R25	202A5			●
480/95R25	206A5			●

TG : Tractor-Grade tire. Not for highway service.  
 NHS : Not for highway service  
 T/T : Tube Type  
 T/L : Tubeless Type







Radial : Technical Data

TRA Code : IND

Tire Size	Pattern	Star Mark LI/SS	Type T/T T/L	TRA Code or Application	Inflated Dimensions				Static Loaded Radius		Static Loaded Width		Groove Depth		TKPH	TMPH	Spec	Tube Size	Rim Size Flange Height	Tire Size	Pattern	Star Mark LI/SS	kPa psi	Tire Load Limits at Various Speeds											
					Overall Diameter		Overall Width		mm	inch	mm	inch	mm	1/32										km/h	0	Creep	5	10	15	20	25				
					mm	inch	mm	inch	mm	inch	mm	inch	mm	inch										mph	Stationary	Creep	3	5	10	12	15	20	25		
14.00R24NHS	RL43	☆☆☆	○	-	IND-4	1379	54.3	375 (365)	14.8 (14.4)	610	24.0	431 (421)	17.0 (16.6)	48.0	61	-	-	-	14.00R24	10.00W (9.00V)	14.00R24NHS	RL43	☆☆☆	1000	145	Load Wheel	km/h	0	Creep	5	10	15	20	25	
																											mph	Stationary	Creep	3	5	10	12	15	
																											kg	18000	16000	14500	13500	13000	12700	12500	
																											lbs	39700	35300	32000	29800	28700	28000	27600	
																											km/h	0	Creep	5	10	15	20	25	
																											mph	Stationary	Creep	3	5	10	12	15	
kg	14400	12800	11600	10800	10400	10200	10000																												
lbs	31700	28200	25600	23800	22900	22500	22000																												
16.00R25	RR41	☆☆☆	-	○	IND-4	1499	59.0	423	16.7	656	25.8	497	19.6	52.4	66	-	-	-	-	11.25-2.0	16.00R25	RR41	☆☆☆	1000	145	Steer Wheel	km/h	0	Creep	5	10	15	20	25	
																											mph	Stationary	Creep	3	5	10	12	15	
																											kg	22300	19800	18000	16700	16100	15700	15500	
	lbs	49200	43700	39700	36800	35500	34600	34200																											
	RR42	202A5	-	○	IND-4	1490	58.7	428	16.9	660	26.0	498	19.6	50	63	-	-	-	-	-	11.25-2.0	16.00R25	RR42	202A5	1000	145	Steer Wheel	km/h	0	Creep	5	10	20	25	35
																												mph	Stationary	Creep	3	5	12	15	22
kg																												16500	16500	16500	16500	15000	15000	13875	
lbs	36400	36400	36400	36400	33100	33100	30600																												
480/95R25	RR42	206A5	-	○	IND-4	1555	61.2	473	18.6	681	26.8	542	21.3	50	63	-	-	-	-	13.00-2.5	480/95R25	RR42	206A5	1000	145	Steer Wheel	km/h	0	Creep	5	10	20	25	35	
																											mph	Stationary	Creep	3	5	12	15	22	
																											kg	18700	18700	18700	18700	17000	17000	15725	
																											lbs	41200	41200	41200	41200	37500	37500	34700	

Application  
Technical Data  
Radial  
Appendix

NHS : Not for highway service  
• Type T/T : Tube Type T/L : Tubeless Type

• PSI × 0.0703 = kg/cm<sup>2</sup> POUND × 0.4536 = kg PSI × 6.895 = kPa

## ■Appendix(Radial)

### Haulage Service (OFF-THE-ROAD for Dump Trucks & Scrapers)

50 KPH (30 MPH) Maximum Speed Distance: Up to 4 km (2.5 miles) one way

- NOTES 1. Bold face figures denote maximum load for symbols shown.  
 2. For 65 km/h (40 mph) maximum speed, the loads must be reduced 12% with no change in inflation pressure.  
 3. When haul length exceeds 4 km one way, consult your YOKOHAMA service representative.

### Slow Speed Service (OFF-THE-ROAD for Loaders & Dozers)

10 KPH (5 MPH) Maximum speed Distance: Up to 76 m (250 feet) one way

- NOTES 1. Bold face figures denote maximum load for symbols shown.  
 2. On front tires for front end loaders, it is permissible to increase inflation pressure up to 100 kPa (15 psi) above that shown in the table with no increase in load.  
 3. For tire load limits at various speeds:

Max. Speed	% Load Change From 5 MPH Table
Stationary	+60%
Creep	+30%
4 km/h (2 1/2 mph)	+15%
10 km/h (5 mph)	No Change
15 km/h (10 mph)	-13%
25 km/h (15 mph)	-20%

4. Creep  
 This is movement of equipment at very slow speed (not over 60 m (200 feet) in 30 minutes). During creep motion, loads on the tires are very high and consideration must be given to the type of surface over which the equipment is traveling.

### Tractor & Grader Service (OFF-THE-ROAD)

40 KPH (25 MPH) Maximum speed Distance: Unlimited

- NOTES 1. Bold face figures denote maximum load for symbols shown.  
 2. For maintenance work on established highways, inflation pressures may be increased 50% if desired with no increase in loads.  
 3. For slope and ditching service, inflation pressures should be increased 15 psi (100 kPa) with no increase in load rating. For extreme conditions, consult tire and rim manufacturers for additional recommended operating requirements.  
 4. For tire load limits at various speeds with no increase in inflation pressure:

Max. Speed	% Change To Loads In Table
40 km/h (25 mph)	No Change
50 km/h (30 mph)	-9%
60 km/h (35 mph)	-18%
65 km/h (40 mph)	-27%

### Highway Service (OFF-THE-ROAD for Mobile / Wheeled Cranes)

Size Conversion Table

Metric	Inch
325/95R24	12.00R24
385/95R24,25	14.00R24,25
445/95R25	16.00R25
505/95R25	18.00R25
525/80R25	20.5R25

NOTES: Bold face figures denote maximum load for symbols shown.

### Industrial Service (OFF-THE-ROAD for Smooth Floors & Runways Use)

- NOTES 1. Industrial Vehicle  
 Consists of usage on vehicles such as counterbalanced lift trucks, container handlers, straddle carriers, aircraft tow tractors, log stackers and rough terrain trucks.  
 2. Smooth Floors and Runways  
 These are defined as paved or protected operating surfaces which are free of undulations, obstructions or discontinuities.  
 3. Creep  
 This is movement of equipment at very slow speed (not over 60 m (200 feet) in 30 minutes). During creep motion, loads on the tires are very high and consideration must be given to the type of surface over which the equipment is traveling.

Check maximum air pressure requirements of rims and wheels to ensure ability to accommodate correct air pressure of tire.

■ Bias : Application

Earthmover

Tire Size	TRA Code / Pattern					
	E-3		E-4		E-4	
	Y67	Y565	Y523	Y523U	Y567	Y67E
Ply Rating & Type						
	T/T	T/L	T/L	T/L	T/L	T/L
10.00-20NHS	14 <sup>†</sup> ,24 <sup>†</sup>					
11.00-20NHS	14					
12.00-20NHS	16,18 <sup>†</sup> ,24 <sup>†</sup> ,28 <sup>§</sup>					
14.00-20NHS	32					
12.00-24NHS	16					
14.00-24NHS	20,24,28					
14.00-25NHS	24 <sup>§</sup>	20 <sup>†</sup> ,24				
16.00-25	24 <sup>†</sup> ,28	24 <sup>†</sup> ,28 <sup>†</sup> ,32		24,28		
18.00-25	32	32		32		
18.00-33		32		32		
21.00-35				36 <sup>†</sup> ,40		
24.00-35				36,42 <sup>†</sup> ,48		
24.00-49				42		
27.00-49				48 <sup>†</sup>		
33.00-51				58	50 <sup>†</sup> ,58	
36.00-51		66		50,58		
40.00-57				68,76	68	
20.5-27		28				
23.5-25		32				
26.5-25		26				
29.5-25		28,34,36				
29.5-29		28,34				34s
33.25-29		26,32 <sup>†</sup>				
29.5-35		34				
33.25-35		32,38				
37.25-35		30,36 <sup>†</sup>				
37.5-39		44,52 <sup>†</sup>				

†: Both nylon breaker construction and steel breaker construction available  
 §: Steel breaker construction only



NHS : Not for highway service  
 T/T : Tube Type T/L : Tubeless Type

■ Bias : Application

Loader & Dozer

Tire Size	TRA Code / Pattern									
	L-2		L-2		L-3		L-3		L-3	
	Y103	Y548	Y67	Y526K	Y575					
Ply Rating & Type										
	T/T	T/L	T/T	T/L	T/T	T/L	T/T	T/L	T/T	T/L
12.5/70-16		6		6						
10-16.5NHS	4	4,6								
13.5-20	14									
42x17-20	10									
17.5/65-20		10		10						
16.9-24	10	10,12	10	10,12	10 <sup>†</sup>	10 <sup>†</sup>				
18.4-24	10	10		10						
12.00-24NHS					16,20					
13.00-24TG						16s				
13.00-24NHS					18					
14.00-24TG	12	12			12,16	12 <sup>†</sup> ,16				
14.00-24NHS					24					
15.5-25	12	12			12	12				
17.5-25	12,16	12,16	12,16	12,16	12 <sup>†</sup> ,16	12 <sup>†</sup> ,16			12	12,16
20.5-25		12,16	12,16	12,16,20	12,16,20	12,16,20	16,20	16 <sup>†</sup> ,20	12,16,20	12,16,20
23.5-25		16			12,16,24	16 <sup>†</sup> ,20,24	16s,20	16 <sup>†</sup> ,20 <sup>†</sup>	16,20	16,20,24
26.5-25					24	16,20,24,26,28			20	16,20,24,28
29.5-25						22,28,38				22 <sup>†</sup> ,28,34 <sup>§</sup>

†: Both nylon breaker construction and steel breaker construction available  
 §: Steel breaker construction only



TG : Tractor-Grade tire. Not for highway service. T/T : Tube Type T/L : Tubeless Type  
 NHS : Not for highway service

■ Bias : Application

Loader & Dozer

Tire Size	TRA Code / Pattern					
	L-2		L-3		L-3	
	Y580H	Y581H	Y582H	Y583H		
Ply Rating & Type						
	T/T	T/L	T/L	T/T	T/L	T/L
13.00-24	10,12	10,12			12	
14.00-24TG	12♦	12♦		16♦	12♦,16♦	
17.5/65-20		10	10			
16.9-24		10,12	10,12		10	
18.4-24		10				
17.5-25		12♦	12		12,16	12,16
20.5-25					12,16	12,16
23.5-25					16	

♦ : Both loader and grader use available

■ Bias : Application

Loader & Dozer

Tire Size	TRA Code / Pattern					
	L-4S		L-5S		L-5S	
	Y69U	Y69	Y69K	Y69U		
Ply Rating & Type						
	T/T	T/T	T/L	T/L	T/T	T/L
12.00-20NHS					22 <sup>S</sup>	
12.00-24NHS	16 <sup>S</sup>	16,20			16 <sup>S</sup>	
14.00-24NHS		20,24				
18.00-25		28	24,28,32	28 <sup>S</sup> ,32		28 <sup>S</sup> ,32 <sup>S</sup>
17.5-25			16,20,24,28			20 <sup>S</sup> ,28 <sup>S</sup>
20.5-25			16,28			
23.5-25		28	20			
26.5-25			28,32,36	32,36		28 <sup>S</sup> ,32 <sup>S</sup>
29.5-29				34,40 <sup>4</sup>		
35/65-33				42 <sup>S</sup>		

\* : Both nylon breaker construction and steel breaker construction available  
<sup>S</sup> : Steel breaker construction only

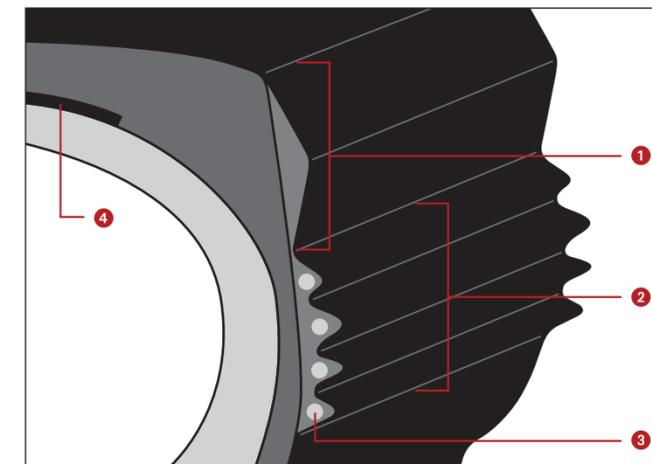
Loader & Dozer

Tire Size	TRA Code / Pattern					
	L-4	L-4	L-5	L-5	L-5	L-5
	Y67E	Y545	Y524	**Y524	**Y524Z	Y525
Ply Rating & Type						
	T/L	T/L	T/L	T/L	T/L	T/T
12.00-24NHS						20
17.5-25	12					
20.5-25				12,16,20		
23.5-25		16 <sup>4</sup> ,20 <sup>4</sup> ,24	16,20,24			
26.5-25		20,24,26,32		20,24,26,28,32 <sup>4</sup>		
29.5-25		22,28		22,28 <sup>4</sup>		
29.5-29	28		28,34 <sup>S</sup>			
35/65-33		24 <sup>S</sup> ,30 <sup>S</sup> ,36 <sup>S</sup> ,42 <sup>S</sup>		24 <sup>S</sup> ,30 <sup>S</sup> ,36 <sup>S</sup> ,42 <sup>S</sup> ,48 <sup>S</sup>	36 <sup>S</sup> ,42 <sup>S</sup>	
40/65-39				36 <sup>S</sup> ,56 <sup>S</sup>		
45/65-45		58s		46 <sup>S</sup> ,58 <sup>S</sup>	38 <sup>S</sup> ,58 <sup>S</sup>	

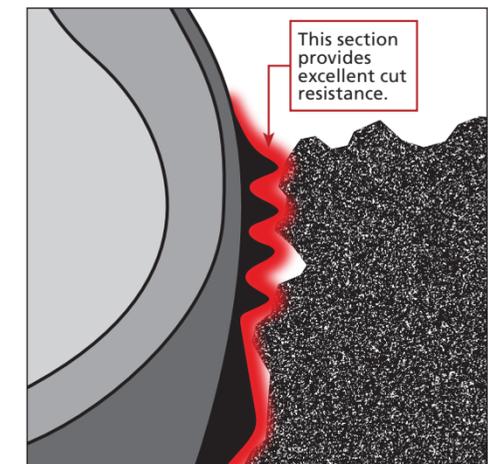
\*\* Y524 with side protector

<sup>4</sup> : Both nylon breaker construction and steel breaker construction available  
<sup>S</sup> : Steel breaker construction only

Special Construction of Y69U



- 1 Buttress Shoulder Profile
- 2 Special Reinforcement (Wavy Side +ZEON Super Composite)
- 3 ZEON Super Composite
- 4 Steel Breaker Construction



This section provides excellent cut resistance.

NHS : Not for highway service  
T/T : Tube Type T/L : Tubeless Type

NHS : Not for highway service  
T/T : Tube Type T/L : Tubeless Type

■ Bias : Application

Grader

Tire Size	TRA Code / Pattern					
	G-2		G-2		G-3	
	Y103		Y548	Y581H	Y67	
						
Ply Rating & Type						
T/T	T/L	T/T	T/T	T/T	T/L	
11.00-20	12					
12.00-24TG	12					
13.00-24TG	10,12	10,12		12	12	
14.00-24TG	10,12,14,16,20	10,12,16	10,12,14,16,20	12,14,16,20	16	16
16.00-24TG	12				12,16	
17.5-25		12				

Tire Roller

Tire Size	TRA Code / Pattern
	C-1
	Y69
	
Ply Rating & Type	
T/T	
7.50-16NHS	6
9.00-20NHS	10
11.00-20NHS	14
14/70-20NHS	12
15.0-20NHS	16

TG : Tractor-Grade tire. Not for highway service.  
 NHS : Not for highway service  
 T/T : Tube Type T/L : Tubeless Type

■ Bias : Application

Industrial

Tire Size	TRA Code / Pattern										
	IND-3	IND-3	IND-3	IND-3	IND-3	IND-3	IND-4	IND-4	IND-4	IND-4	
	Y92	Y67	Y69	Y69PS	Y505	Y573	Y523	Y523U	Y69	Y505E	
											
Ply Rating & Type											
T/T	T/T	T/L	T/T	T/T	T/L	T/T	T/L	T/L	T/L	T/L	
11.00-20NHS		16 <sup>‡</sup> ,18									
12.00-20NHS		18,20								20	
12.00-24NHS		20		18		20			20	20	
13.00-24NHS		18,20									
14.00-24NHS	24,28	24,28	28			28	28				
14.00-25NHS			24 <sup>‡</sup>								
16.00-25		28	28,32,36		28,32	28,32			36		
18.00-25		36	36,40						36,40	40	
21.00-25			36,40							40	
24.00-29			42								
18.00-33									36,40 <sup>‡</sup>	40	40
21.00-35			40								
24.00-35			42,48						42		
27.00-49									42		
33.00-51									58		
36.00-51									58,72		
40.00-57									68 <sup>§</sup> ,76		
17.5-25								36			
29.5-25			34								
29.5-29			40								
33.25-35			44								
37.5-39			60								

‡ : Both nylon breaker construction and steel breaker construction available  
 § : Steel breaker construction only

NHS : Not for highway service  
 T/T : Tube Type T/L : Tubeless Type

■ Bias : Technical Data

TRA Code : E,L,G

Tire Size	Pattern	Ply Rating	Type			TRA Code	Inflated Dimensions				Static Loaded Radius		Static Loaded Width		Groove Depth		TKPH	TMPH	Spec	Tube Size	Rim Size Flange Height	Tire Size	Pattern	Application Max Speed km/h mph	Tire Load Limits at Various Cold Inflation Pressures																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
			T/T	SB	T/L		mm	inch	mm	inch	mm	inch	mm	inch	mm	1/32									mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
12.5/70-16	Y103	6	-	-	-	L-2	860	33.9	316	12.4	389	15.3	329	13.0	21.7	27	-	-	-	-	10LB	12.5/70-16	Y103 Y548	Loader & Dozer	PR	(6)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
	Y548		855	33.7	321		12.6	388	15.3	337	13.3	21.8	27	-	-	-	-	-	-	-	-				-	10	kPa	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
*10-16.5NHS	Y103	4	-	○	-	L-2	772	30.4	275	10.8	350	13.8	286	11.3	18.8	24	-	-	-	-	10-16.5	8.25	*10-16.5NHS	Y103	Loader & Dozer	PR	(4)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		6	-	-	-																					○	10	kPa	210	240	280	310	350	390	430	470	510	550	590	630	670	710	750	790	830	870	910	950	990	1030	1070	1110	1150	1190	1230	1270	1310	1350	1390	1430	1470	1510	1550	1590	1630	1670	1710	1750	1790	1830	1870	1910	1950	1990	2030	2070	2110	2150	2190	2230	2270	2310	2350	2390	2430	2470	2510	2550	2590	2630	2670	2710	2750	2790	2830	2870	2910	2950	2990	3030	3070	3110	3150	3190	3230	3270	3310	3350	3390	3430	3470	3510	3550	3590	3630	3670	3710	3750	3790	3830	3870	3910	3950	3990	4030	4070	4110	4150	4190	4230	4270	4310	4350	4390	4430	4470	4510	4550	4590	4630	4670	4710	4750	4790	4830	4870	4910	4950	4990	5030	5070	5110	5150	5190	5230	5270	5310	5350	5390	5430	5470	5510	5550	5590	5630	5670	5710	5750	5790	5830	5870	5910	5950	5990	6030	6070	6110	6150	6190	6230	6270	6310	6350	6390	6430	6470	6510	6550	6590	6630	6670	6710	6750	6790	6830	6870	6910	6950	6990	7030	7070	7110	7150	7190	7230	7270	7310	7350	7390	7430	7470	7510	7550	7590	7630	7670	7710	7750	7790	7830	7870	7910	7950	7990	8030	8070	8110	8150	8190	8230	8270	8310	8350	8390	8430	8470	8510	8550	8590	8630	8670	8710	8750	8790	8830	8870	8910	8950	8990	9030	9070	9110	9150	9190	9230	9270	9310	9350	9390	9430	9470	9510	9550	9590	9630	9670	9710	9750	9790	9830	9870	9910	9950	9990	10030	10070	10110	10150	10190	10230	10270	10310	10350	10390	10430	10470	10510	10550	10590	10630	10670	10710	10750	10790	10830	10870	10910	10950	10990	11030	11070	11110	11150	11190	11230	11270	11310	11350	11390	11430	11470	11510	11550	11590	11630	11670	11710	11750	11790	11830	11870	11910	11950	11990	12030	12070	12110	12150	12190	12230	12270	12310	12350	12390	12430	12470	12510	12550	12590	12630	12670	12710	12750	12790	12830	12870	12910	12950	12990	13030	13070	13110	13150	13190	13230	13270	13310	13350	13390	13430	13470	13510	13550	13590	13630	13670	13710	13750	13790	13830	13870	13910	13950	13990	14030	14070	14110	14150	14190	14230	14270	14310	14350	14390	14430	14470	14510	14550	14590	14630	14670	14710	14750	14790	14830	14870	14910	14950	14990	15030	15070	15110	15150	15190	15230	15270	15310	15350	15390	15430	15470	15510	15550	15590	15630	15670	15710	15750	15790	15830	15870	15910	15950	15990	16030	16070	16110	16150	16190	16230	16270	16310	16350	16390	16430	16470	16510	16550	16590	16630	16670	16710	16750	16790	16830	16870	16910	16950	16990	17030	17070	17110	17150	17190	17230	17270	17310	17350	17390	17430	17470	17510	17550	17590	17630	17670	17710	17750	17790	17830	17870	17910	17950	17990	18030	18070	18110	18150	18190	18230	18270	18310	18350	18390	18430	18470	18510	18550	18590	18630	18670	18710	18750	18790	18830	18870	18910	18950	18990	19030	19070	19110	19150	19190	19230	19270	19310	19350	19390	19430	19470	19510	19550	19590	19630	19670	19710	19750	19790	19830	19870	19910	19950	19990	20030	20070	20110	20150	20190	20230	20270	20310	20350	20390	20430	20470	20510	20550	20590	20630	20670	20710	20750	20790	20830	20870	20910	20950	20990	21030	21070	21110	21150	21190	21230	21270	21310	21350	21390	21430	21470	21510	21550	21590	21630	21670	21710	21750	21790	21830	21870	21910	21950	21990	22030	22070	22110	22150	22190	22230	22270	22310	22350	22390	22430	22470	22510	22550	22590	22630	22670	22710	22750	22790	22830	22870	22910	22950	22990	23030	23070	23110	23150	23190	23230	23270	23310	23350	23390	23430	23470	23510	23550	23590	23630	23670	23710	23750	23790	23830	23870	23910	23950	23990	24030	24070	24110	24150	24190	24230	24270	24310	24350	24390	24430	24470	24510	24550	24590	24630	24670	24710	24750	24790	24830	24870	24910	24950	24990	25030	25070	25110	25150	25190	25230	25270	25310	25350	25390	25430	25470	25510	25550	25590	25630	25670	25710	25750	25790	25830	25870	25910	25950	25990	26030	26070	26110	26150	26190	26230	26270	26310	26350	26390	26430	26470	26510	26550	26590	26630	26670	26710	26750	26790	26830	26870	26910	26950	26990	27030	27070	27110	27150	27190	27230	27270	27310	27350	27390	27430	27470	27510	27550	27590	27630	27670	27710	27750	27790	27830	27870	27910	27950	27990	28030	28070	28110	28150	28190	28230	28270	28310	28350	28390	28430	28470	28510	28550	28590	28630	28670	28710	28750	28790	28830	28870	28910	28950	28990	29030	29070	29110	29150	29190	29230	29270	29310	29350	29390	29430	29470	29510	29550	29590	29630	29670	29710	29750	29790	29830	29870	29910	29950	29990	30030	30070	30110	30150	30190	30230	30270	30310	30350	30390	30430	30470	30510	30550	30590	30630	30670	30710	30750	30790	30830	30870	30910	30950	30990	31030	31070	31110	31150	31190	31230	31270	31310	31350	31390	31430	31470	31510	31550	31590	31630	31670	31710	31750	31790	31830	31870	31910	31950	31990	32030	32070	32110	32150	32190	32230	32270	32310	32350	32390	32430	32470	32510	32550	32590	32630	32670	32710	32750	32790	32830	32870	32910	32950	32990	33030	33070	33110	33150	33190	33230	33270	33310	33350	33390	33430	33470	33510	33550	33590	33630	33670	33710	33750	33790	33830	33870	33910	33950	33990	34030	34070	34110	34150	34190	34230	34270	34310	34350	34390	34430	34470	34510	34550	34590	34630	34670	34710	34750	34790	34830	34870	34910	34950	34990	35030	35070	35110	35150	35190	35230	35270	35310	35350	35390	35430	35470	35510	35550	35590	35630	35670	35710	35750	35790	35830	35870	35910	35950	35990	36030	36070	36110	36150	36190	36230	36270	36310	36350	36390	36430	36470	36510	36550	36590	36630	36670	36710	36750	36790	36830	36870	36910	36950	36990	37030	37070	37110	37150	37190	37230	37270	37310	37350	37390	37430	37470	37510	37550	37590	37630	37670	37710	37750	37790	37830	37870	37910	37950	37990	38030	38070	38110	38150	38190	38230	38270	38310	38350	38390	38430	38470	38510	38550	38590	38630	38670	38710	38750	38790	38830	38870	38910	38950

■ Bias : Technical Data

TRA Code : E,L,G

Tire Size	Pattern	Ply Rating	Type				TRA Code	Inflated Dimensions				Static Loaded Radius		Static Loaded Width		Groove Depth		TKPH	TMPH	Spec	Tube Size	Rim Size Flange Height	Tire Size	Pattern	Application Max Speed km/h mph	Tire Load Limits at Various Cold Inflation Pressures																											
			T/T	T/L	SB	-		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch									mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch														
			-	-	-	-		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch									mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch														
10.00-20	Y67	14	○	○	-	-	E-3	1060	41.7	280	11.0	498	19.6	295	11.6	20.4	26	-	-	-	10.00-20	7.50V	10.00-20	Y67	Earthmover	PR	(14) (24)																										
		24	○	○	-	-																				kPa	260	280	300	325	350	375	400	425	450	475	500	530	560	590	620	650	680	710	740	770	800						
11.00-20	Y103	12	-	○	-	-	G-2	1107	43.0	303	12.0	508	19.7	321	12.7	21.9	28	-	-	-	11.00-20	8.00V	11.00-20	Y103	Grader	PR	(10) (12)																										
																										kPa	140	160	180	200	220	240	260	280	300	325	350	375	400	425	450	475	500	530	560	590	620	650	680	710	740	770	800
																										psi	20	23	26	29	32	35	38	41	44	47	51	54	58	62	65	69	73	77	81	85	89	93	97	101	105	109	113
	Y67	14	-	○	-	-	E-3	1100	43.3	295	11.6	510	20.1	310	12.2	24.9	31	-	-	-	11.00-20	8.00V	11.00-20	Y67	Earthmover	PR	(14)																										
																										kPa	260	280	300	325	350	375	400	425	450	475	500	530	560	590	620	650	680	710	740	770	800	830	860	890	920		
																										psi	38	41	44	47	51	54	58	62	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125	129	133	137
12.00-20NHS	Y67	16	○	○	-	-	E-3	1135	44.7	325	12.8	533	21.0	340	13.4	25.5	32	-	-	-	12.00-20	8.50V	12.00-20NHS	Y67	Earthmover	PR	(16) (18) (24) (28)																										
		18	○	○	-	-																				kPa	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900							
		24	○	○	-	-																				psi	62	65	69	73	76	80	83	87	91	94	98	102	105	109	112	116	119	123	126	130	134	138	142				
	Y69U	22	○	-	-	-	L5-S	1180	46.5	326	12.8	557	21.9	344	13.5	25.7	32	-	-	-	12.00-20	8.50V	12.00-20NHS	Y69U	Loader & Dozer	PR	(18) (22)																										
																										kPa	750	775	800	825	850	875	900	925	950	975	1000	1025	1050	1075	1100	1125	1150	1175	1200	1225	1250	1275	1300				
																										psi	109	112	116	120	123	127	131	134	138	141	145	149	153	157	161	165	169	173	177	181	185	189	193	197	201	205	209
14.00-20NHS	Y67	32	-	○	-	-	E-3	1250	49.2	386	15.2	583	23.0	401	15.8	27.5	35	-	-	-	14.00-20	10.00WI	14.00-20NHS	Y67	Earthmover	PR	(32)																										
																										kPa	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025	1050	1075	1100		
12.00-24TG	Y103	12	-	○	-	-	G-2	1223	48.1	312	12.3	561	22.1	342	13.5	26.8	34	-	-	-	12.00-24TG	8.00TG	12.00-24TG	Y103	Grader	PR	(12)																										
																										kPa	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700			
																										psi	18	22	25	29	33	36	40	44	47	51	54	58	62	65	69	73	76	80	83	87	91	94	98	102	105	109	
	Y67	16	-	○	-	-	L-3	1230	48.4	305	12.0	575	22.6	330	13.0	26.4	33	-	-	-	11.00/12.00-24	8.50V	12.00-24NHS	Y67	Earthmover	PR	(16) (20)																										
																										kPa	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800					
																										psi	40	44	47	51	54	58	62	65	69	73	76	80	83	87	91	94	98	102	105	109	112	116	119	123	126		
Y525	20	-	○	-	-	L-5	1280	50.4	330	13.0	596	23.5	360	14.2	26.4	33	-	-	-	11.00/12.00-24	8.50V	12.00-24NHS	Y67	Earthmover	PR	(16) (20)																											
																									kPa	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800						
																									psi	40	44	47	51	54	58	62	65	69	73	76	80	83	87	91	94	98	102	105	109	112	116	119	123	126			
Y69	20	-	○	-	-	L-5S	1280	50.4	333	13.1	604	23.8	356	14.0	26.4	33	-	-	-	11.00/12.00-24	8.50V	12.00-24NHS	Y67	Earthmover	PR	(16) (20)																											
																									kPa	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000						
																									psi	69	73	76	80	83	87	91	94	98	102	105	109	112	116	119	123	126	130	134	138	142	145	149	153	157			
Y69U	16	○	-	-	-	L-4S	1254	49.4	328	12.9	590	23.2	348	13.7	26.4	33	-	-	-	11.00/12.00-24	8.50V	12.00-24NHS	Y69U	Loader & Dozer	PR	(16) (20)																											
																									kPa	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000						
																									psi	69	73	76	80	83	87	91	94	98	102	105	109	112	116	119	123	126	130	134	138	142	145	149	153	157			
13.00-24TG	Y103	10	-	○	-	○	G-2	1280	50.4	345	13.6	576	22.7	383	15.1	27.0	34	-	-	-	13.00-24/25	8.00TG	13.00-24TG	Y103	Grader	PR	(10) (12)																										
																										kPa	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675				
																										psi	18	22	25	29	33	36	40	44	47	51	54	58	62	65	69	73	76	80	83	87	91	94	98	102	105	109	
	Y580H	10	-	○	-	-	G-2	1280	50.4	345	13.6	591	23.3	371	14.6	27.0	34	-	-	-	13.00-24/25	8.00TG	13.00-24TG	Y580H	Grader	PR	(10) (12)																										
																										kPa	1700	1900	2060	2240	2360	2500	2650	2725	2800	2900	3000	3075	3150	3250	3350	3450	3550	3650	3750	3850	3950	4000					
																										psi	245	275	295	320	335	355	375	390	405	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570		
Y67	12	-	○	-	-	G-3	1280	50.4	334	13.1	586	23.1	358	14.1	27.9	35	-	-	-	13.00-24/25	8.00TG	13.00-24TG	Y67	Loader & Dozer	PR	(12) (16) (18)																											
																									kPa	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900						
																									psi	54	58	62	65	69	73	76	80	83	87	91	94	98	102	105	109	112	116	119	123	126	130	134	138				
Y582H	12	-	-	-	-	G-3	1280	50.4	334	13.1	597	23.5	365	14.4	27.9	35	-	-	-	13.00-24/25	8.00TG	13.00-24TG	Y582H	Loader & Dozer	PR	(12) (16) (18)																											
																									kPa	5000	5225	5415	5600	5800	5975	6150	6180	6340	6500	6655	6810	6965	7120	7275	7430	7585	7740	7895	8050	8205							
																									psi	725	750	780	800	840	855	875	885	910	930	950	965	985	1000	1020	1040	1060											









■ Bias : Technical Data

TRA Code : E,L,G

Tire Size	Pattern	Ply Rating	Type			TRA Code	Inflated Dimensions				Static Loaded Radius		Static Loaded Width		Groove Depth		TKPH	TMPH	Spec	Tube Size	Rim Size Flange Height	Tire Size	Pattern	Application Max Speed km/h mph	Tire Load Limits at Various Cold Inflation Pressures															
			T/T	T/L	SB		mm	inch	mm	inch	mm	inch	mm	1/32	mm	inch									mm	inch	mm	inch	mm	inch	mm	inch	mm	inch						
			-	-	-																														mm	inch	mm	inch	mm	inch
26.5-29	Y67	26	-	-	-	E-3	1834	72.2	691	27.2	829	32.6	723	28.5	40.8	51	182	125	REG	-	22.00-3.0	26.5-29	Y67	Earthmover	50	PR	(26)													
																										kPa	175	200	225	250	275	300	325							
																										psi	25	29	33	36	40	44	47							
																										kg	7100	7750	8250	8750	9250	9750	10300							
lbs	15700	17100	18200	19300	20400	21500	22700																																	
29.5-29	Y67	28	-	-	-	E-3	1947	76.7	768	30.2	876	34.5	806	31.7	49.6	62	197	135	REG	-	25.00-3.5	29.5-29	Y67	Earthmover	50	PR	(28)													
																										kPa	175	200	225	250	275	300	325	350	375	400				
																										psi	25	29	33	36	40	44	47	51	54	58				
																										kg	8500	9250	10000	10600	11200	11800	12150	12850	13200	14000				
	lbs	18700	20400	22000	23400	24700	26000	26800	28300	29100	30900																													
	Y67E	34	-	-	-	E-4	2024	79.7	772	30.4	914	36.0	825	32.5	49.6	99	-	-	-	CP	-	25.00-3.5	29.5-29	Y67E	Earthmover	30	PR	(34)												
																											kPa	175	200	225	250	275	300	325	350	375	400			
																											psi	25	29	33	36	40	44	47	51	54	58			
																											kg	8500	9250	10000	10600	11200	11800	12150	12850	13200	14000			
	lbs	18700	20400	22000	23400	24700	26000	26800	28300	29100	30900																													
	Y524	28	-	-	-	L-5	2040	80.3	771	30.4	914	36.0	831	32.7	106.3	134	-	-	-	-	-	25.00-3.5	29.5-29	Y67E	Loader & Dozer	10	PR	(28)												
																											kPa	300	325	350	375	400	425	450	475	500	525	625		
psi																											44	47	51	54	58	62	65	69	73	76	91			
kg																											15500	16000	17000	17500	18000	19000	19500	20000	20600	21200	23600			
lbs	34200	35300	37500	38600	39700	41900	43000	44100	45400	46700	52000																													
Y69K	34	-	-	-	L-5S	2019	79.5	782	30.8	938	36.9	820	32.3	107.7	136	-	-	-	-	-	25.00-3.5	29.5-29	Y69K	Loader & Dozer	5	PR	(34)													
																										kPa	300	325	350	375	400	425	450	475	500	525	625			
																										psi	44	47	51	54	58	62	65	69	73	76	91			
																										kg	15500	16000	17000	17500	18000	19000	19500	20000	20600	21200	23600			
lbs	34200	35300	37500	38600	39700	41900	43000	44100	45400	46700	52000																													
33.25-29	Y67	26	-	-	-	E-3	2069	81.5	833	32.8	924	36.4	873	34.4	45.8	58	212	145	CP	-	27.00-3.5	33.25-29	Y67	Earthmover	50	PR	(26)													
																										kPa	175	200	225	250	275	300	325							
																										psi	25	29	33	36	40	44	47							
																										kg	10300	11200	12150	12850	13600	14000	15000							
lbs	22700	24700	26800	28300	30000	30900	33100																																	
29.5-35	Y67	34	-	-	-	E-3	2120	83.5	776	30.6	965	38.0	819	32.2	39.5	50	248	170	REG	-	25.00-3.5	29.5-35	Y67	Earthmover	50	PR	(34)													
																										kPa	175	200	225	250	275	300	325	350	375	400				
																										psi	25	29	33	36	40	44	47	51	54	58				
																										kg	9250	10000	10900	11500	12150	12850	13600	14000	14500	15000				
lbs	20400	22050	24050	25400	26800	28300	30000	30900	32000	33100																														
33.25-35	Y67	32	-	-	-	E-3	2248	88.5	853	33.6	1003	39.5	898	35.4	47.1	59	226	155	CP	-	27.00-3.5	33.25-35	Y67	Earthmover	50	PR	(32)													
																										kPa	175	200	225	250	275	300	325	350	375	400				
																										psi	25	29	33	36	40	44	47	51	54	58				
																										kg	11200	12150	12850	14000	14500	15500	16000	17000	17500	18000				
lbs	24700	26800	28300	30900	32000	34200	35300	37500	38600	39700																														
37.25-35	Y67	30	-	-	-	E-3	2398	94.4	967	38.1	1060	41.7	1010	39.8	50.6	64	277	190	CP	-	27.00-3.5	37.25-35	Y67	Earthmover	50	PR	(36)													
																										kPa	175	200	225	250	275	300	325							
																										psi	25	29	33	36	40	44	47							
																										kg	13600	14500	15500	16500	17500	18500	19500							
lbs	30000	32000	34200	36400	38600	40800	43000																																	
37.5-39	Y67	44	-	-	-	E-3	2507	98.7	930	36.6	1137	44.8	1015	40.0	53.8	68	321	220	CP	-	32.00-4.5	37.5-39	Y67	Earthmover	50	PR	(44)													
																										kPa	200	225	250	275	300	325	350	375	400	425	450	475		
																										psi	29	33	36	40	44	47	51	54	58	62	65	69		
																										kg	16000	17500	18500	19500	20600	21200	22400	23000	24300	25000	25750	26500		
lbs	35300	38600	40800	43000	45400	46700	49400	50700	53600	55100	56800	58400																												
35/65-33	Y545	24	-	-	-	L-4	2083	82.0	902	35.5	952	37.5	925	36.4	62.8	79	-	-	-	-	28.00-3.5	35/65-33	Y545	Loader & Dozer	10	PR	(24)													
																										kPa	350	375	400	425	450	475	500	525	625	725				
																										psi	51	54	58	62	65	69	73	76	91	105				
																										kg	19000	19500	20000	21200	21800	22400	23000	23600	26500	28000				
	lbs	41900	43000	44100	46700	48100	49400	50700	52000	58400	61700																													
	Y524	30	-	-	-	L-5	2075	81.7	900	35.4	952	37.5	933	36.7	96.2	121	-	-	-	-	-	28.00-3.5	35/65-33	Y524	Loader & Dozer	5	PR	(30)												
																											kPa	350	375	400	425	450	475	500	525	625	725			
																											psi	51	54	58	62	65	69	73	76	91	105			
																											kg	19000	19500	20000	21200	21800	22400	23000	23600	26500	28000			
	lbs	41900	43000	44100	46700	48100	49400	50700	52000	58400	61700																													
	Y524Z	36	-	-	-	L-5	2075	81.7	900	35.4	952	37.5	933	36.7	96.2	121	-	-	-	-	-	28.00-3.5	35/65-33	Y524Z	Loader & Dozer	5	PR	(36)												
																											kPa	350	375	400	425	450	475	500	525	625	725			
psi																											51	54	58	62	65	69	73	76	91	105				
kg																											19000	19500	20000	21200	21800	22400	23000	23600	26500	28000				
lbs	41900	43000	44100	46700	48100	49400	50700	52000	58400	61700																														
Y69K	42	-	-	-	L-5S	2070	81.5	904	35.6	967	38.1	926	36.5	96.2	121	-	-	-	-	-	28.00-3.5	35/65-33	Y69K	Loader & Dozer	5	PR	(36)													
																										kPa	350	375	400	425	450	475	500	525	625	725				
																										psi	51	54	58	62	65	69	73	76	91	105				
																										kg	19000	19500	20000	21200	21800	22400	23000	23600	26500	28000				
lbs	41900	43000	44100	46700	48100	49400	50700	52000	58400	61700																														
40/65-39	Y524	36	-	-	-	L-5	2404	94.6	1025	40.4	1169	46.0	1067	42.0	105.7	133	-	-	-	-	32.00-4.0																			



■ Bias : Technical Data

TRA Code : IND

(kg)

Tire Size	Pattern	Ply Rating	Type				TRA Code	Inflated Dimensions				Static Loaded Radius		Static Loaded Width		Groove Depth		Tube Size	Rim Size Flange Height	Tire Size	Pattern	Industrial PR	for Smooth Floors & Runways Use									
			T/T	SB	T/L	SB		Overall Diameter		Overall Width		mm	inch	mm	inch	mm	1/32						I.P.(kPa)	0 km/h (0 mph)	Creep	4 km/h (2.5 mph)	10 km/h (5 mph)	15 km/h (10 mph)	20 km/h (12 mph)	25 km/h (15 mph)		
			-	-	-	-		mm	inch	mm	inch	mm	inch	mm	inch	mm	mm						mm	mm	mm	mm	mm	mm	mm	mm		
16.00-25	Y67	28	-	○	-	○	IND-3	1490	58.7	448	17.6	668	26.3	488	19.2	34.3	43	16.00-24/25	11.25-2.0	16.00-25	Y67 Y69PS Y523	28	900	20700	18400	16700	15550	14950	14600	14400		
		32	-	-	-	○		1470	57.9	424	16.4	658	25.9	457	18.0	43.8	55	16.00-24/25				32	1000	22500	20000	18100	16900	16300	15900	15600		
	36	-	-	-	○	1540	60.6	443	17.4	724	28.5	467	18.4	59.3	75	-	36	1000				24500	21800	19700	18400	17700	17300	17000				
	36	-	○	-	○	1620	63.8	514	20.2	722	28.4	551	21.7	38.5	49	18.00-25	32	900				27000	24000	21750	20250	19500	19050	18750				
18.00-25	Y67	40	-	-	-	○	IND-3	1652	65.0	517	20.4	772	30.4	541	21.3	61.3	77	-	13.00-2.5	18.00-25	Y67 Y523 Y69 Y505E	36	1000	28800	25600	23200	21600	20800	20300	20000		
		40	-	-	-	○		1651	65.0	540	21.2	748	29.4	557	21.9	58.7	74					36	1000	30600	27200	24700	23000	22100	21600	21300		
	36	-	-	-	○	1670	65.7	522	20.6	741	29.2	564	22.2	64.0	81	40	1000					30600	27200	24700	23000	22100	21600	21300				
	40	-	-	-	○	1778	70.0	598	23.5	772	30.4	639	25.2	40.6	51	-	15.00-3.0					21.00-25	Y67 Y69	36	870	34200	30400	27550	25650	24700	24150	23750
21.00-25	Y67	40	-	-	-	○	IND-4	1779	70.0	601	23.7	798	31.4	640	25.2	56.2	71	-	15.00-3.0	21.00-25	Y67 Y69	40	990	37100	32950	29850	27800	26800	26150	25750		
		42	-	-	-	○		1970	77.6	643	25.3	830	32.7	738	29.1	43.7	55					-	17.00-3.5	24.00-29	Y67	42	900	47700	42400	38450	35800	34450
	36	-	-	-	○	1865	73.4	530	20.9	869	34.2	542	21.3	56.2	71	-	13.00-2.5					18.00-33	Y523 Y523U Y69	36	1000	33300	29600	26850	25000	24050	23500	23150
	40	-	-	-	○	1882	74.1	525	20.7	874	34.4	545	21.5	67.0	84									40	1000	35500	31500	28600	26600	25600	25000	24600
40	-	-	-	○	1868	73.5	514	20.2	843	33.2	565	22.2	58.7	74	21.00-35			Y67	40	990	43750			38900	35250	32800	31600	30850	30400			
40	-	-	-	○	2004	78.9	580	22.8	935	36.8	622	24.5	42.0	53	-			15.00-3.0	24.00-35	Y67	42			900	52200	46400	42050	39150	37700	36850	36250	
24.00-35	Y67	48	-	-	-	○	IND-3	2140	84.3	672	26.5	952	37.5	726	28.6	48.3	61	-	17.00-3.5	24.00-35	Y67 Y523	42	1000	55350	49200	44600	41500	40000	39050	38450		
		42	-	-	-	○		2170	85.4	673	26.5	960	37.8	743	29.3	64.6	81					27.00-49	Y523	42	810	72000	64000	58000	54000	52000	50800	50000
27.00-49	Y523	42	-	-	-	○	IND-4	2671	105.2	757	29.8	1170	46.1	862	33.9	71.3	90	-	19.50-4.0	33.00-51	Y523	58	900	110700	98400	89200	83050	79950	78100	76900		
33.00-51	Y523	58	-	-	-	○	IND-4	3056	120.3	934	36.8	1414	55.7	983	38.7	82.7	104	-	24.00-5.0	36.00-51	Y523	58	810	127800	113600	102950	95850	92300	90150	88750		
36.00-51	Y523	72	-	-	-	○	IND-4	3198	125.9	1040	40.9	1379	54.3	1150	45.3	92.2	116	-	26.00-5.0	36.00-51	Y523	72	1000	144000	128000	116000	108000	104000	101600	100000		
		68	-	-	-	○		3584	141.1	1143	45.0	1567	61.7	1271	50.0	92.8	117					-	29.00-6.0	40.00-57	Y523	68	870	166500	148000	134150	124900	120250
40.00-57	Y523	76	-	-	-	○	IND-4	3584	141.1	1143	45.0	1567	61.7	1271	50.0	92.8	117	-	29.00-6.0	40.00-57	Y523	76	960	180000	160000	145000	135000	130000	127000	125000		

(kg)

Tire Size	Pattern	Ply Rating	Type				TRA Code	Inflated Dimensions				Static Loaded Radius		Static Loaded Width		Groove Depth		Tube Size	Rim Size Flange Height	Tire Size	Pattern	Industrial PR	for Smooth Floors & Runways Use							
			T/T	SB	T/L	SB		Overall Diameter		Overall Width		mm	inch	mm	inch	mm	1/32						I.P.(kPa)	0 km/h (0 mph)	Creep	4 km/h (2.5 mph)	10 km/h (5 mph)	15 km/h (10 mph)	20 km/h (12 mph)	25 km/h (15 mph)
			-	-	-	-		mm	inch	mm	inch	mm	inch	mm	inch	mm	mm						mm	mm	mm	mm	mm	mm	mm	mm
17.5-25	Y573	36	-	-	-	○	IND-3	1362	53.6	442	17.4	613	24.1	456	18.0	14.0	18	-	14.00-1.5	17.5-25	Y573	36	1000	18550	16500	14950	13900	13400	13100	12900
29.5-25	Y67	34	-	-	-	○	IND-3	1876	73.9	765	30.1	*-	*-	*-	*-	49.6	62	-	25.00-3.5	29.5-25	Y67	34	630	36000	32000	29000	27000	26000	25400	25000
29.5-29	Y67	40	-	-	-	○	IND-3	1970	77.6	780	30.7	860	33.9	820	32.3	49.6	62	-	25.00-3.5	29.5-29	Y67	40	750	42500	37800	34200	31900	30700	30000	29500
33.25-35	Y67	44	-	-	-	○	IND-3	2278	89.7	854	33.6	990	39.0	923	36.3	47.1	59	-	27.00-3.5	33.25-35	Y67	44	720	55350	49200	44600	41500	40000	39050	38450
37.5-39	Y67	60	-	-	-	○	IND-3	2536	99.8	960	37.8	*-	*-	*-	*-	53.8	68	-	32.00-4.5	37.5-39	Y67	60	900	81000	72000	65300	60800	58500	57200	56300

\* Not fixed yet and YOKOHAMA will inform when available.

- Type
- Specification Code
- T/T : Tube Type
- CP : Cut Protected
- CP-S : Cut Protected-S
- CP-C : Cut Protected-C
- T/L : Tubeless Type
- REG : Regular
- RE-R : Regular-R
- RE-T : Regular-T
- SB : Steel breaker construction
- HR : Heat Resistant
- HR-H : Heat Resistant-H
- HR-V : Heat Resistant-V

• PSI × 0.0703 = kg/cm<sup>2</sup> POUND × 0.4536 = kg PSI × 6.895 = kPa

## ■Appendix(Bias)

### Haulage Service (OFF-THE-ROAD for Dump Trucks & Scrapers)

50 KPH (30 MPH) Maximum Speed Distance: Up to 4 km (2.5 miles) one way

#### Narrow Base Bias Ply Tires

- NOTES 1. Figures in parentheses denote ply rating for which bold face loads and inflations are maximum.  
2. For 65 km/h (40 mph) maximum speed, the loads must be reduced 15% with no change in inflation pressure.  
3. When haul length exceeds 4 km one way, consult your YOKOHAMA service representative.

#### Wide Base Bias Ply Tires

- NOTES 1. Figure in parentheses denote ply rating for which bold face loads and inflations are maximum.  
2. For 65 km/h (40 mph) maximum speed, the loads must be reduced 17% with no change in inflation pressure.  
3. When haul length exceeds 4 km one way, consult your YOKOHAMA service representative.

### Slow Speed Service (OFF-THE-ROAD for Loaders & Dozers)

10 KPH (5 MPH) Maximum Speed Distance: Up to 76 meters (250 feet) one way

#### Narrow Base Bias Ply Tires

#### 65 Series Bias Ply Tires

#### Wide Base Bias Ply Tires

- NOTES 1. Figures in parentheses denote ply rating for which bold face loads and inflations are maximum.  
2. On front tires for front end loaders, it is permissible to increase inflation pressure up to 15 psi that shown in the table with no increase in load.  
3. For tire load limits at various speeds:

Max. Speed	% Load Change From 5 MPH Table
Stationary	+60%
Creep	+30%
4 km/h (2 1/2 mph)	+15%
10 km/h (5 mph)	No Change
15 km/h (10 mph)	-13%
25 km/h (15 mph)	-20%

#### ETC Bias Ply Tires(10-16.5, 13.5-20, 16.9-24, 18.4-24)

- NOTES 1. Figures in parentheses denote ply rating for which load and inflation pressure are maximum.  
2. Consult your YOKOHAMA service representative for data concerning front end loaders or shovels used in load and carry service.  
3. It is permissible to increase inflation pressure up to 15 psi that shown in table with no increase of load.  
4. For tire load limits at various speeds:

Max. Speed	% Load Change From 5 MPH Table
Stationary	+60%
Creep	+30%
4 km/h (2 1/2 mph)	+15%
10 km/h (5 mph)	No Change
15 km/h (10 mph)	-13%
25 km/h (15 mph)	-20%

### Tractor and Grader Service (OFF-THE-ROAD for Motor Graders)

40 KPH (25 MPH) Maximum Speed Distance: Unlimited

#### Narrow Base Bias Ply Tires

#### Wide Base Bias Ply Tires

- NOTES 1. Figures in parentheses denote ply rating for which loads and inflation pressure are maximum.  
2. For maintenance work on established highways, inflation pressure may be increased 50% if desired with no increase in load.  
3. For tire load limits at various speeds with no increase in inflation pressure:

Max. Speed	% Load Change From Table
40 km/h (25 mph)	No Change
50 km/h (30 mph)	-9%
60 km/h (35 mph)	-18%
65 km/h (40 mph)	-27%

### Compactor Vehicle Service (OFF-THE-ROAD for Tire Rollers)

10 KPH (5 MPH) Maximum Speed

### Industrial Service (OFF-THE-ROAD for Smooth Floors & Runways Use)

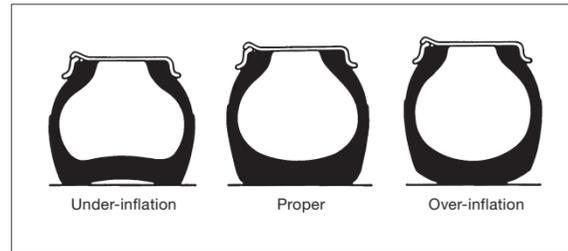
- NOTES 1. Industrial Vehicle  
Consists of usage on vehicles such as counterbalanced lift trucks, container handlers, straddle carriers, aircraft tow tractors, log stackers and rough terrain trucks.  
2. Smooth Floors and Runways  
These are defined as paved or protected operating surfaces which are free of undulations, obstructions or discontinuities.  
3. Creep  
This is movement of equipment at very slow speed (not over 60 m (200feet) in 30 minutes). During creep motion, loads on the tires are very high and consideration must be given to the type of surface over which the equipment is traveling.

Check maximum air pressure requirements of rims and wheels to ensure ability to accommodate correct air pressure of tire.  
For steer wheel loads on lift trucks, multiply the load by 0.8.

**OFF-THE-ROAD TIRES** are very expensive, therefore it is very important to use them under proper conditions. It cannot be overemphasized to have a good maintenance program for obtaining the best tire performance.

## ■ Inflation Pressure

Proper inflation pressure is essential to get the best performance from tires. Optimum traction, flotation, and load endurance can only be obtained if the proper inflation pressure is maintained. Both over-inflation and under-inflation shorten tire life and can result in tire failures. Proper inflation pressure depends on the vehicle, ground conditions, load, speed, and other factors.



### Under-inflation

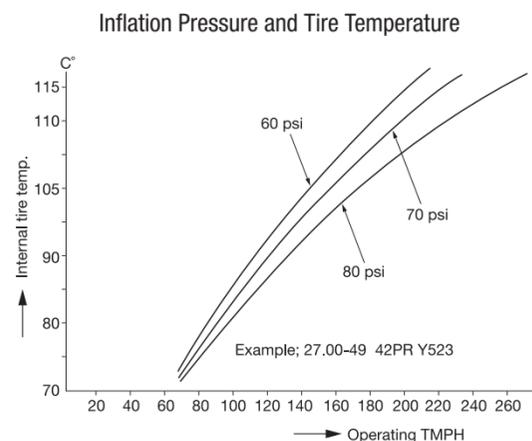
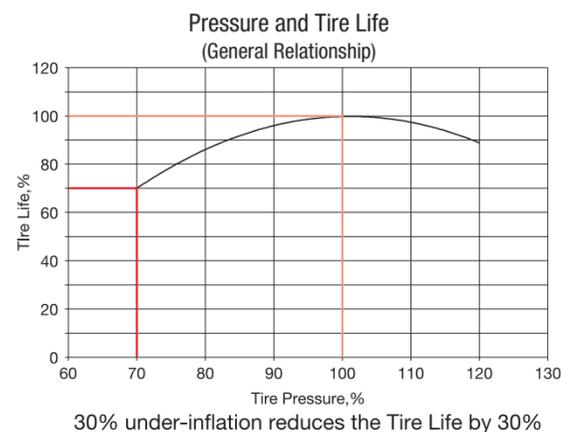
- Excessive heat generation from increased deflection may cause separation.
- Excessive tire deflection causes cords to fatigue.
- Rapid wear due to excessive tread movement against road surface.
- Sidewalls are more susceptible to cutting and rupture.
- Radial cracks can form in the upper sidewall.
- Cracks in the inner liner can occur.

### Over-inflation

- Increased ground contact pressure at centerline results in rapid wear there.
- Reduced protection of cords against shocks may lead to impact breaks.
- Excessive pressure is exerted on the beads, increasing the potential for bead burst.
- Riding comfort deteriorates leading to driver fatigue.
- Tire slippage due to reduced traction causes wear issues.
- Tendency for the tire to be cut is increased.

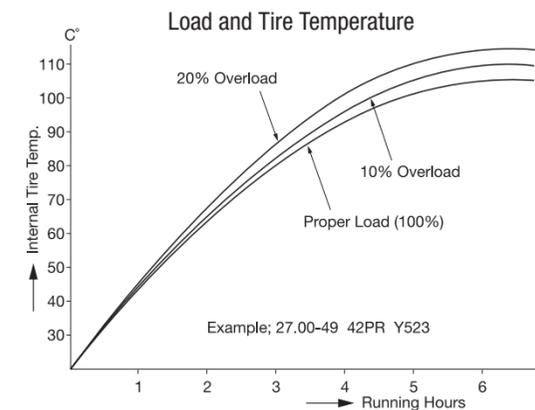
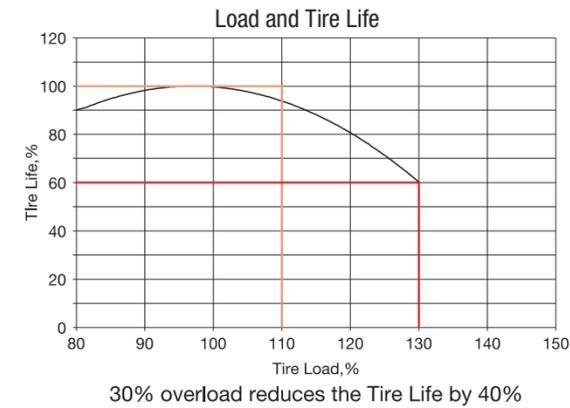
### Caution:

- In the course of operation, the air pressure rises in correlation to air temperature. The amount of increase varies depending on operation. This is extremely important in continuous operations. If heat generated results in an air pressure rise of 25% in bias tires, the cold inflation pressure should be checked. If heat generated results in an air pressure rise of 20% in radial tires, the cold inflation pressure should be checked. If cold inflation pressure is accurate, travel speed and/or load must be reduced. Otherwise, overheating may cause separations. Tires should not be bled to compensate for the increase in pressure.
- Valves should always be capped. This keeps mud and dust out of the valve core and protects the air seal.



## ■ Load

Overloading shortens tire life and increases the chance of early tire failure. For the best tire performance, the maximum recommended load should not be exceeded. If the load exceeds the specified capacity of the tire, a tire with a higher ply rating should be used.



### Results of Overloading

- Excessive heat generation causes separation.
- Excessive tire deflection causes broken cords.
- Rapid wear due to excessive tread movement against road surface.
- Bead failure due to excessive bead movement.
- Risk of bursting due to increased cord tension.

## ■ Speed

Excessive traveling speeds produce abnormally high internal temperatures in tires. A vehicle has two speed limitations: the actual maximum speed that the vehicle can attain and the average operating speed that the vehicle can sustain. The average sustainable operating speed is limited by the tires' Ton-Kilometer-Per-Hour (TKPH) rating (refer to page 56).

### Speed and Load Relation (according to TRA)

The load capacity of a tire is influenced by the maximum speed of the vehicle as follows:

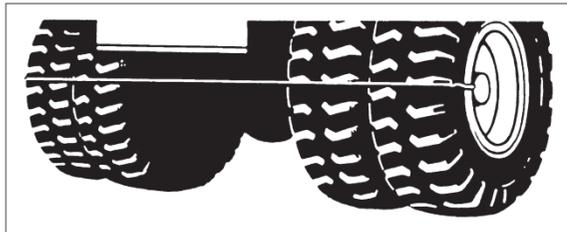
Vehicle	Maximum Speed	Variation In Load Capacity	
		Bias Tire	Radial Tire
Loaders and Dozers	Stationary	160%	160%
	Creep	130%	130%
	2 1/2 mph (4 km/h)	115%	115%
	5 mph (10 km/h)	100%	100%
	10 mph (15 km/h)	87%	87%
	15 mph (25 km/h)	80%	80%

Vehicle	Maximum Speed	Variation In Load Capacity	
		Bias Tire	Radial Tire
Dump Trucks and Scrapers	30 mph (50 km/h)	100%	100%
	40 mph (65 km/h)	Narrow Base 85% Wide Base 83%	Narrow Base 88% Wide Base 88%

## ■ Proper Matching of Dual-Tires

It is essential that dual-tires have the same overall diameter. Otherwise, the one with the larger diameter will carry most of the load and will be prone to damage and wear. If the difference in outer diameters is extremely large, the smaller tire slips and scrapes along the ground, causing the center of the tread to wear quickly. Naturally, the larger tire will be prone to excessive heat generation from overloading.

The allowable difference in dual-tire pair diameters is shown in the table blow.



In no case should a difference in diameters be corrected by adjusting inflation pressure.

Size	Bias Tolerance				Radial Tolerance			
	Diameter		Circumference		Diameter		Circumference	
	mm	in	mm	in	mm	in	mm	in
8.25*20NHS	8	0.3	25	1.0	6	0.2	19	0.7
9.00*20NHS	9	0.4	28	1.1	7	0.3	22	0.9
10.00*20NHS	10	0.4	31	1.2	7	0.3	22	0.9
11.00*20NHS	10	0.4	31	1.2	7	0.3	22	0.9
12.00*20NHS	11	0.4	35	1.4	8	0.3	25	1.0
12.00*24/25NHS	11	0.4	35	1.4	8	0.3	25	1.0
13.00*24/25NHS	12	0.5	38	1.5	9	0.4	28	1.1
14.00*20NHS	13	0.5	41	1.6	9	0.4	28	1.1
14.00*24/25NHS	13	0.5	41	1.6	9	0.4	28	1.1
16.00*25	15	0.6	47	1.9	11	0.4	35	1.4
18.00*25	17	0.7	53	2.1	12	0.5	38	1.5
18.00*33	17	0.7	53	2.1	12	0.5	38	1.5
21.00*25	20	0.8	63	2.5	14	0.6	44	1.7
21.00*35	20	0.8	63	2.5	14	0.6	44	1.7
24.00*35	22	0.9	69	2.7	15	0.6	47	1.9
24.00*49	22	0.9	69	2.7	15	0.6	47	1.9
27.00*49	25	1.0	79	3.1	18	0.7	57	2.2
33.00*51	30	1.2	94	3.7	21	0.8	66	2.6
36.00*51	33	1.3	104	4.1	23	0.9	72	2.8
40.00*57	36	1.4	113	4.4	26	1.0	82	3.2

NOTES: NHS is not for highway service.

### Caution:

- Radial tires should never be matched with bias tires.
- It is recommended to match tires from the same manufacturer.

### Diameter Measuring Methods

- Use a 1-inch x 2-inch wooden stud.
- Use a rubber cord across the dual tires.
- Use a steel tape to measure the circumference of each tire.

## ■ Road Surface Maintenance

The maintenance of road surfaces is one of the most important factors in determining the life of a tire. Bumps, check holes, rocks and so on cut and wear tires. Even bursting can result. Of particular importance is the maintenance of loading and dumping areas because the chances of damage at these places are great. Road and ground conditions there have a large effect on the productivity of the vehicles.



Good Condition



Poor Condition

## ■ Tire Problems and Major Causes

Any aberrations causing tire problems should be promptly repaired. The following is a list of tire problems and causes

Tire Problems	Overload	High Speed Travel	Slippage	Over Inflation	Under Inflation	Excess Braking	Poor Road Condition	Poor Vehicle Maintenance	Poor Rim
1. Tread cuts and snags	○	○	○	○	○		○		
2. Uneven, rapid tread wear	○	○	○	○	○	○	○	○	
3. Cracked and broken tread	○		○	○		○	○	○	
4. Sidewall cuts and snags	○				○		○		
5. Tread separation	○	○		○	○			○	
6. Ply separation	○	○		○	○			○	
7. Bead failure	○		○	○	○	○		○	○
8. Inner liner failure	○	○			○				○
9. Impact breaks	○	○		○			○		



Tread Separation



Sidewall Cut



Heat Separation

## ■ Instructions for Operations

Even if tires and roads are properly maintained, tire life can be seriously shortened by improper use. The following are musts for maximum efficiency.

### General:

- Avoid abrupt starts and stops.
- Do not operate on road shoulders.
- Reduce speed on turns.
- Do not turn wheels while stationary.
- Do not spin tires.
- Maintain proper inflation pressure.
- Remove any objects, such as rocks which get stuck in the tread or between dual tires.
- Check tires, rims and valves regularly for any abnormalities.
- Repair any damaged tires immediately.
- Avoid rocks at loading and dumping areas.
- Avoid running over oil or grease spills.

### Loader Operating:

- Keep loading areas clear of rocks and other obstacles.
- Avoid spilling load around the tires.
- Avoid over-loading.
- Load to the center of the dump truck's decks.

### Motor Scraper Operating:

- Prevent tires from slipping when loading.
- Avoid cornering when the pusher is in operation.

### Operating under Ambient Temperatures below -40°C:

- Consult THE YOKOHAMA RUBBER CO., LTD.

## ■ Tire Appearance Check-up

In order to prevent tire troubles, it is helpful to make routine visual check-ups of the tire, rim, valve, inflation pressure, etc. Make inspections for the following and carry out any procedure recommended.

### Tire Tread:

- Remove foreign matter from the tread. Repair any damage reaching the carcass.
- If separation exists, remove tire and examine if repair is necessary.
- If damage reached carcass, remove tire and repair.
- If cuts or chips reach carcass, repair.
- Cracks in tread groove may be source of air leakage; check inflation pressure.
- Uneven wear may be caused by improper inflation pressure. Rotate tires if necessary.
- Damage from contact with vehicle should be avoided. Alter body parts if possible. Repair any tire damage if necessary.
- Oil or grease on tire should be washed off.

### Shoulder and Sidewall:

- Repair any cuts reaching the carcass.
- Identify cause of cracks e.g. from under-inflation, overloading, ozone or cut growth and repair if necessary.
- Wash off oil or grease spots.

### Valve:

- Replace valve or valve parts if leakage exists from valve core, deflection of stem or extension.
- Ensure valve cap is in position.

### Dual Tires:

- Remove any foreign object stuck between duals.
- Repair stone ejector if bent or out of position.

### Inflation Pressure:

- Adjust if not proper.
- Detect location and repair if leakage exists.

### Rim:

- Replace if deformation or cracks exist.

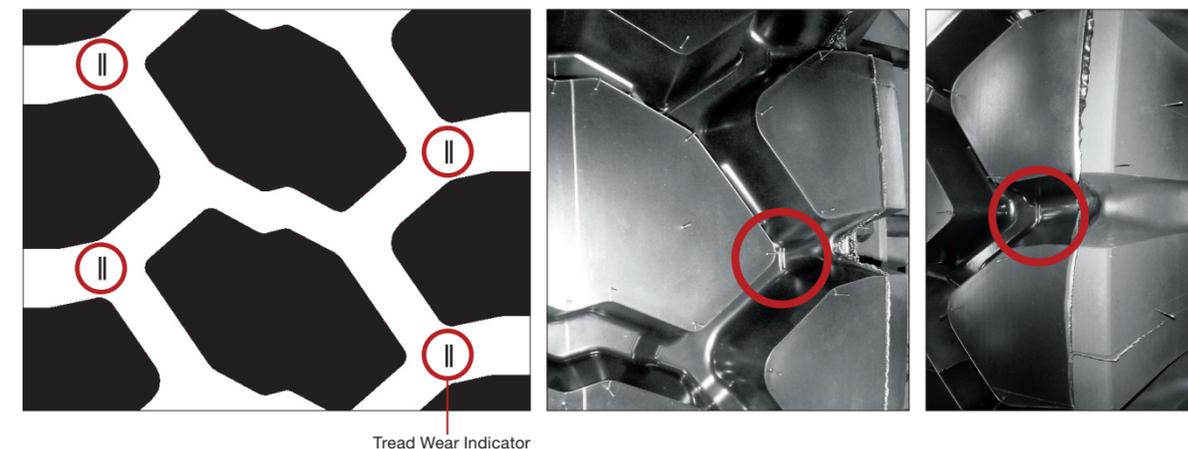
## ■ Measuring Tread Wear

Tread wear can be determined by comparing the remaining groove depth with that of a new tire. There are special marks indicating where the groove depth should be measured for most YOKOHAMA OFF-THE-ROAD TIRES. For rock or traction patterns, the indicators are located one-fourth of the tread width from the shoulders. Rib pattern tires don't have indicators. The tread depth of rib pattern tires should be measured at the locations specified below.

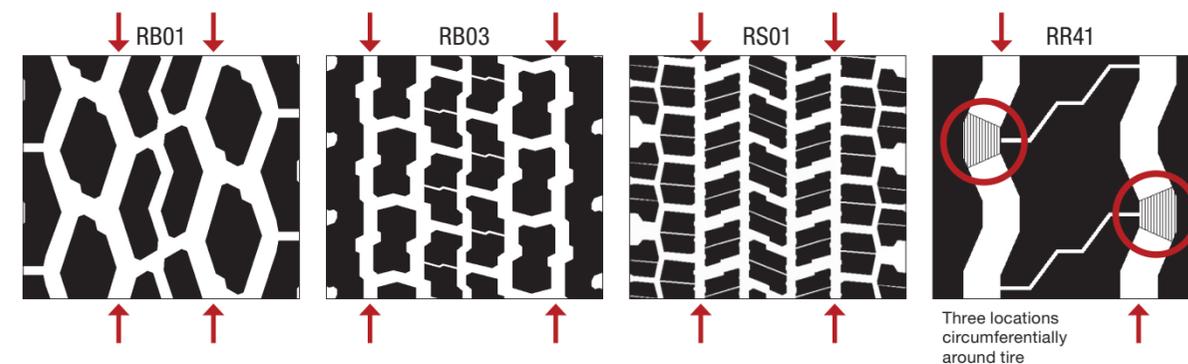
The average of the figures obtained by measuring the groove depths for both the inside and outside of the tire should be used.

### ① Normal

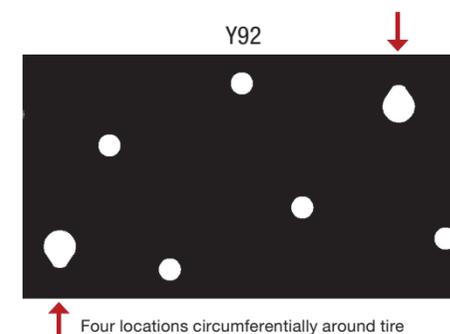
Example of tread wear indicators for typical OFF-THE-ROAD TIRES.



### ② Rib Pattern Tires

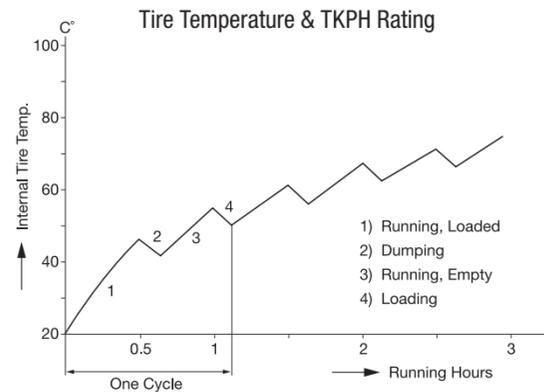


### ③ Tires with unique tread wear indicator locations



## ■ Ton-Kilometer-Per-Hour (Ton-Mile-Per-Hour)

Rating materials and adhesives used in tires are especially vulnerable to damage from high temperatures which limit the amount and type of usage for tires. This is especially true for OFF-THE-ROAD TIRES for dump trucks and scrapers where high internal temperatures are not uncommon, because rapid dissipation of heat is hindered by the thick tire construction. Various conditions also influence the limits of use for OFF-THE-ROAD TIRES. TKPH is the measure of usage that normally indicates the limits of use under average working conditions.



### Operating TKPH

Operating TKPH is computed to compare actual use with the tire's TKPH rating. The operating TKPH is calculated in the following manner by observation and measurement of actual operation.

$$\text{Operating TKPH} = (\text{average tire load in metric tons}) \times (\text{average speed in kilometers per hour})$$

Where,

$$\text{Average tire load} = 1/2 [(\text{load on tire when vehicle is empty}) + (\text{load on tire when vehicle is laden})]$$

$$\text{Average speed} = (\text{round trip distance}) \times (\text{number of trips per shift}) \div (\text{total hours of operation per shift}^*)$$

\* Exclude for calculation between shifts

For actual computation and reference this data should be collected:

- Vehicle empty:
  - Load on front axle ÷ number of tires = \_\_\_tons/tire
  - Load on rear axle ÷ number of tires = \_\_\_tons/tire
- Vehicle loaded:
  - Load on front axle ÷ number of tires = \_\_\_tons/tire
  - Load on rear axle ÷ number of tires = \_\_\_tons/tire
- Payload = \_\_\_ tons
- Round trip distance = \_\_\_kilometers
- Number of trips per day = \_\_\_times
- Number of shifts per day hours of each shift
  - Number of shifts \_\_\_times
  - Hours per shift \_\_\_hours
  - (including inspection \_\_\_hours, lunch \_\_\_hours and rest\_\_\_hours.)
- Actual maximum speed in operation \_\_\_kilometers/hour
- Ambient temperature High \_\_\_°C/Average\_\_\_°C

### Use of TKPH Rating

With the formula described above, the operating TKPH required for a particular job can be computed and OFF-THE-ROAD TIRES which satisfy the requirement can be selected. Operating TKPH should always be less than the tire's TKPH rating. The real factor limiting tire usage is heat. TKPH measurements and ratings are only tools used to construct guidelines so that tires do not overheat. As previously started, these guidelines are constructed assuming average operating conditions. Under some conditions it is possible for more heat to be generated than would normally be expected at a given operating TKPH level. This should be kept in mind when operating TKPH approaches the tire's TKPH rating to prevent heat damage.

### TMPH (Ton-Mile-Per-Hour)

Care should be taken when converting from TKPH, since TMPH uses the short ton (2,000 lbs) and mileage (1 km = 0.621 miles) and TKPH uses the metric ton (2,204.6 lbs or 1.1023 short tons). To convert TKPH to TMPH, divide TKPH by 1.459 (TMPH = TKPH ÷ 1.459).

### Adjusting TKPH for Ambient Temperature

Materials, reinforcements and adhesives used in tires are vulnerable to damage from high temperatures which limit the amount and type of usage for tire. This is especially true for OFF-THE-ROAD TIRES for dump trucks and scrapers where high internal temperatures are common, because heat dissipation is hindered by the thick tire constructions. Various conditions also influence the limits of use for OFF-THE-ROAD TIRES. The "Operating TKPH" is the measure of work required from an OFF-THE-ROAD TIRE under specific conditions. The Operating TKPH should not exceed the tire's rated TKPH.

Operating TKPH is adjusted in the following manner by observation and measurement of actual operation.

$$\text{Adjusted Operating TKPH} = K_t \times K_g \times \text{Operating TKPH}$$

$K_t$  : adjustment coefficient for temperature

$K_g$  : adjustment coefficient for grade

$K_t$  : adjustment coefficient for temperature

The TKPH tire ratings are based on an ambient temperature of 38°C (100°F). The Operating TKPH must be adjusted to compensate for a reduced or increased rate of heat dissipation to the ambient air.

**For Bias Tires with maximum yearly temperature exceeding 38°C (100°F):**

$$K_t = \frac{77}{77 + (38 - T_c)}$$

$K_t$  = adjustment coefficient for temperature  
 $T_c$  = maximum yearly temperature in centigrade  
 $T_c = (5 \div 9) \times (T_f - 32)$   
 $T_f$  = maximum yearly temperature in fahrenheit

**For Bias Tires with maximum yearly temperature less than 38°C (100°F):**

$$K_t = \frac{77}{77 + \frac{1}{2} \times (38 - T_c)}$$

**For Radial Tires with maximum yearly temperature exceeding 38°C (100°F):**

$$K_t = \frac{55}{55 + (38 - T_c)}$$

**For Radial Tires with maximum yearly temperature less than 38°C (100°F):**

$$K_t = \frac{55}{55 + \frac{1}{2} \times (38 - T_c)}$$

$K_g$  : adjustment coefficient for grade

The grade of a haul road transfers load from one axel to the other of a typical haul truck. Use the chart on the following slide to determine  $K_g$  in the case of downhill loaded drive.

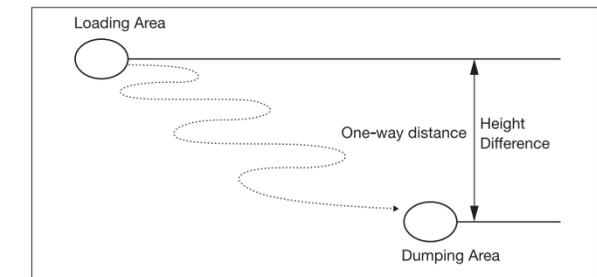
Mines should be designed so that the maximum grade does not exceed 10%.

### Adjustment Coefficient for Grade

Grade	Front $K_g$	Rear $K_g$
-1%	1.01	1.00
-2%	1.02	0.99
-3%	1.02	0.98
-4%	1.03	0.98
-5%	1.04	0.97
-6%	1.05	0.97
-7%	1.06	0.96
-8%	1.06	0.96
-9%	1.07	0.95
-10%	1.08	0.95

-1%: Downhill 1%

### How to get grade ?



$$\text{Grade} = \text{Height Difference}^* \div \text{One-way distance}$$

\* Dumping Area Altitude – Loading Area Altitude

### How to get the Height difference?

1. Hearing from customer
2. V-Box study
  - Consult THE YOKOHAMA RUBBER CO.,LTD.

### TKPH of Steel Breaker Tires

A TKPH rating is not given for steel breaker tires. However, the TKPH capability can be estimated by multiplying the TKPH rating of a comparable tire of standard construction by 0.7.

## Load-and-Carry Operation of Front-End Loaders

In loading and grading operations with loaders and dozers, tire heat does not pose a large problem because the average operating speed is very low compared with dump trucks and scrapers. However, for load-and-carry operations the average operating speed is higher and tire temperature may become an important factor. This is especially important for the L-5 and L-5S tires which have a very thick tread. In this case, operation must be limited by the following charts. If the use of L-5 tires is too limiting, L-4 tires are an alternative.

### Load & Carry Guidelines for Bias Tires

TRA Code	Air Pressure for Front Tires	Maximum One Way Distance	Average Work day Speed		
			~29"	~33"	~45"
L-3	Standard A.P. +100kPa (+15psi)	610m (2000ft.)	11km/h (7 mph)	—	—
L-4		244m (800ft.)	9km/h (6 mph)	7km/h (4 mph)	5km/h (3 mph)
* L-5		76m (250ft.)	7km/h (4 mph)	5km/h (3 mph)	3km/h (2 mph)

\* When tires designed for dig and load vehicles are used in load-and-carry operations, the haul distance must be limited to 76 meters one way and maximum speed to 10kph (5 mph)

### Speed & Load Recommendations for Load & Carry Operations

Max. Speed	% Load Change From 5MPH Table
10km/h ( 5 mph)	No Change
15km/h (10 mph)	-13%
25km/h (15 mph)	-20%

## Protecting Tires on Vehicle in Highway Drive-Away

Because of the special extra-heavy construction of OFF-THE-ROAD TIRES, special precautions must be observed to protect these expensive tires when the vehicle is driven on the highway for delivery, or moved by an operator to a new job site. If the precautions are not observed, excessive tire heat may develop and the tire may fail prematurely. Always consult the vehicle or tire manufacturer for specific information before starting out on a trip. Vehicles in transit should be accompanied by responsible personnel in a pilot car to enforce the following precautions and maintain a check on equipment. This is good insurance for a large investment. The following precautions apply to tires on all vehicles in transit, driven or towed. Check the following guidelines and consult YOKOHAMA.

### Load and Pressure

- Empty vehicles before starting.
- Instructions for use of drive-away tables:
  - 1) Determine the load each tire will carry.
  - 2) Using the table, select the inflation pressure shown for the load determined. This is the pressure required for drive-away service.
  - 3) Ignore tire ply rating when determining drive-away load and pressure conditions.
- Check inflation pressure before starting out each day and adjust to pressure recommended for highway drive-away by vehicle manufacturer.
- Do not drive or tow vehicles using tires with 'dry ballast' in highway drive-away.
- Do not reduce inflation pressure by bleeding tires during highway drive-away. During highway drive-away pressure build-up in tires is normal.

### Maximum Highway Speed

#### Regular Tread Tires (E-3)

Narrow Base 50 kph (30 mph)  
Wide Base 30 kph (20 mph)

- Average operating speed (Running Distance ÷ (Running Hours + Stop Hours)) should be under the speed obtained by the following equation:

$$\text{Speed} = \frac{\text{Tire TKPH}}{\text{Tire Load (M-Ton)}} \times 0.8$$

0.8 is a safety coefficient.

- Where narrow base and wide base tires are mixed on a vehicle, use the guidelines specified for wide base tires.

#### Deep Tread (E-4) & Special Compound Tires

- Do not drive vehicles equipped with deep tread (E-4) and special compound tires over the highway unless the proposed trip is reviewed and approved by qualified YOKOHAMA personnel.

#### Extra Deep Tread Tires

- Do not under any circumstances move extra deep tread tires over the highway.

### Operation Mode

YOKOHAMA recommends the following mode of operation:

- Stop for a 30-minute cooling period after each 2 hours of sustained operation.
- A one-hour minimum stop period should be observed after every four hours of operation.

Driving	Stop	Driving	Stop	Driving	Stop
2H	0.5H	2H	1.0H	2H	0.5H

The following is an example for driving a vehicle on the highway for delivery:

- 1) Vehicle model: YOKO 155 (155 m-ton)
- 2) Tire size: 36.00-51 66PR E-3
- 3) Temperature: 10°C~38°C (50°F~100°F)
- 4) Tire load: Empty before starting, load on front tire 29.5 m-ton (32.5 s-ton)
- 5) Inflation pressure: 515 kPa (75 psi)
- 6) Maximum speed: 50 kph (30 mph)
- 7) Average speed:

YOKOHAMA Pattern Code	TRA Code	Tire Spec	Ton-Mileage		Average Speed	
			TMPH	TKPH	MPH	KPH
Y565	E-3	RE-T	500	730	12.31	19.80
		HR-V	600	875	14.77	23.73

#### 8) Recommended Operation Mode:

2H Driving	0.5H Stop	2H Driving	1H Stop	2H Driving	0.5H Stop	2H Driving	1H Stop
Speed (V)		Speed (V)		Speed (V)		Speed (V)	

YOKOHAMA Pattern Code	TRA Code	Tire Spec	*Speed (V)	
			MPH	KPH
Y565	E-3	RE-T	16.92	27.22
		HR-V	20.31	32.63

$$\begin{aligned} \text{*Speed} &= \text{Average Speed} \times \frac{\text{Driving Hours} + \text{Stop Hours}}{\text{Driving Hours}} \\ &= \text{Average Speed} \times (5.5 \div 4) \end{aligned}$$

■ Protecting Tires on Vehicle in Highway Drive-Away

Load and Inflation Pressure Table for Transit (as recommended by the TRA)

Narrow Base Earthmover Tires in Drive-Away Service Only

50 KPH (30 MPH) Maximum speed

Tire Size Designation	Tire Load Limits at Various Cold Inflation Pressures																
	Radial Ply																
	kPa	240	275	310	345	380	415	450	485	515	550	585	620	655	690	725	760
	psi	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Tire Size Designation	Diagonal Ply																
	kPa	170	205	240	275	310	345	380	415	450	485	515	550	585	620	655	690
	psi	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
	kg	2440	2710	2970	3220	3450	3650	3880	4080	4260	4470	4630	4810	4990	5170	5350	5490
16.00*25	lbs	5380	5980	6550	7100	7600	8050	8550	9000	9400	9850	10200	10600	11000	11400	11800	12100
	kg	3150	3520	3860	4150	4450	4720	4990	5260	5530	5760	5990	6210	6440	6670	6890	7120
18.00*25	lbs	6950	7750	8500	9150	9800	10400	11000	11600	12200	12700	13200	13700	14200	14700	15200	15700
	kg	4060	4330	4940	5350	5720	6080	6440	6760	7120	7440	7710	8030	8300	8570	8890	9160
21.00*25	lbs	8950	9550	10900	11800	12600	13400	14200	14900	15700	16400	17000	17700	18300	18900	19600	20200
	kg	5260	5850	6400	6890	7390	7890	8350	8750	9160	9570	9980	10390	10750	11110	11480	11790
24.00*25(**)	lbs	11600	12900	14100	15200	16300	17400	18400	19300	20200	21100	22000	22900	23700	24500	25300	26000
	kg	5620	6260	6850	7390	7940	8440	8940	9390	9840	10250	10700	11110	11520	11880	12290	12660
24.00*29	lbs	12400	13800	15100	16300	17500	18600	19700	20700	21700	22600	23600	24500	25400	26200	27100	27900
	kg	3650	4080	4470	4810	5170	5490	5810	6120	6400	6670	6990	7210	7480	7760	7980	8260
18.00*33	lbs	10600	9000	9850	10600	11400	12100	12800	13500	14100	14700	15400	15900	16500	17100	17600	18200
	kg	7350	8210	8980	9710	10390	11070	11700	12290	12880	13470	14020	14560	15060	15600	16100	16600
27.00*33(**)	lbs	16200	18100	19800	21400	22900	24400	25800	27100	28400	29700	30900	32100	33200	34400	35500	36600
	kg	9070	10070	11020	11930	12790	13610	14380	15100	15830	16560	17240	17870	18550	19140	19780	20370
30.00*33(**)	lbs	20000	22200	24300	26300	28200	30000	31700	33300	34900	36500	38000	39400	40900	42200	43600	44900
	kg	4810	5350	5850	6350	6800	7210	7670	8030	8440	8800	9160	9530	9840	10210	10520	10840
21.00*35	lbs	10600	11800	12900	14000	15000	15900	16900	17700	18600	19400	20200	21000	21700	22500	23200	23900
	kg	6170	6850	7530	8120	8710	9250	9800	10300	10800	11250	11700	12160	12610	13060	13470	13880
24.00*35	lbs	13600	15100	16600	17900	19200	20400	21600	22700	23800	24800	25800	26800	27800	28800	29700	30600
	kg	6890	7670	8390	9070	9710	10300	10890	11480	12020	12560	13060	13560	14060	14560	15010	15470
24.00*43(**)	lbs	15200	16900	18500	20000	21400	22700	24000	25300	26500	27700	28800	29900	31000	32100	33100	34100
	kg	4630	5170	5620	6080	6530	6940	7350	7710	8070	8440	8800	9160	9480	9800	10120	10430
18.00*49(**)	lbs	10200	11400	12400	13400	14400	15300	16200	17000	17800	18600	19400	20200	20900	21600	22300	23000
	kg	5850	6490	7120	7710	8260	8750	9250	9750	10210	10660	11110	11520	11930	12340	12750	13150
21.00*49(**)	lbs	12900	14300	15700	17000	18200	19300	20400	21500	22500	23500	24500	25400	26300	27200	28100	29000
	kg	7390	8210	9030	9750	10430	11110	11750	12340	12930	13520	14060	14610	15150	15650	16150	16650
24.00*49	lbs	16300	18100	19900	21500	23000	24500	25900	27200	28500	29800	31000	32200	33400	34500	35600	36700
	kg	9070	10070	11020	11930	12790	13610	14380	15100	15830	16560	17240	17870	18550	19190	19780	20370
27.00*49	lbs	20000	22200	24300	26300	28200	30000	31700	33300	34900	36500	38000	39400	40900	42300	43600	44900
	kg	11200	12470	13650	14740	15830	16830	17780	18730	19600	20500	21320	22140	22950	23720	24490	25220
30.00*51	lbs	24700	27500	30100	32500	34900	37100	39200	41300	43200	45200	47000	48800	50600	52300	54000	55600
	kg	12970	14470	15830	17100	18330	19500	20590	21680	22730	23720	24720	25630	26580	27440	28350	29260
33.00*51	lbs	28600	31900	34900	37700	40400	43000	45400	47800	50100	52300	54500	56500	58600	60500	62500	64500
	kg	15830	17600	19280	20820	22320	23720	25080	26400	27670	28800	30160	31300	32430	33570	34470	35610
36.00*51	lbs	34900	38800	42500	45900	49200	52300	55300	58200	61000	63500	66500	69000	71500	74000	76000	78500
	kg	20190	22500	24590	26580	28580	30390	31980	33790	35380	36970	38330	39920	41280	42640	44230	45360
40.00*57	lbs	44500	49600	54200	58600	63000	67000	70500	74500	78000	81500	84500	88000	91000	94000	97500	100000

\* Tire size designation will include "R" (Radial Ply) or "-" (Diagonal or Bias Ply)

\*\*Not available from THE YOKOHAMA RUBBER CO.,LTD.

NOTES: Figures are subjected to change without prior notice.

Wide Base Earthmover Tires in Drive-Away Service Only

50 KPH (30 MPH) Maximum speed

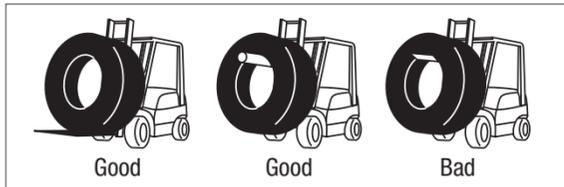
Tire Size Designation	Tire Load Limits at Various Cold Inflation Pressures																
	Radial Ply																
	kPa	240	275	310	345	380	415	450	485	515	550	585	620	655	690	725	760
	psi	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Tire Size Designation	Diagonal Ply																
	kPa	170	205	240	275	310	345	380	415	450	485	515	550	585	620	655	690
	psi	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
	kg	1700	1890	2060	2230	2390	2540	2690	2840	2970	3080	3220	3360	3470	3580	3700	3810
15.5*25	lbs	3740	4160	4540	4920	5260	5600	5920	6250	6550	6800	7100	7400	7650	7900	8150	8400
	kg	2020	2250	2470	2670	2860	3040	3220	3380	3540	3700	3860	3990	4150	4290	4420	4540
17.5*25	lbs	4460	4960	5440	5880	6300	6700	7100	7450	7800	8150	8500	8800	9150	9450	9750	10000
	kg	2700	3020	3290	3560	3810	4060	4290	4510	4720	4940	5130	5350	5530	5720	5900	6080
20.5*25	lbs	5960	6650	7250	7850	8400	8950	9450	9950	10400	10900	11300	11800	12200	12600	13000	13400
	kg	3450	3830	4200	4540	4850	5170	5490	5760	6030	6310	6580	6800	7080	7300	7530	7760
23.5*25	lbs	7600	8450	9250	10000	10700	11400	12100	12700	13300	13900	14500	15000	15600	16100	16600	17100
	kg	4330	4810	5260	5720	6120	6490	6890	7260	7580	7940	8260	8570	8890	9160	9480	9750
26.5*25	lbs	9550	10600	11600	12600	13500	14300	15200	16000	16700	17500	18200	18900	19600	20200	20900	21500
	kg	5220	5810	6350	6890	7390	7850	8300	8710	9160	9530	9930	10340	10700	11070	11430	11750
29.5*25	lbs	11500	12800	14000	15200	16300	17300	18300	19200	20200	21000	21900	22800	23600	24400	25200	25900
	kg	4630	5170	5620	6080	6530	6940	7350	7710	8120	8480	8800	9160	9480	9800	10120	10430
26.5*29	lbs	10200	11400	12400	13400	14400	15300	16200	17000	17900	18700	19400	20200	20900	21600	22300	23000
	kg	5580	6210	6760	7350	7850	8350	8850	9300	9750	10160	10570	10980	11390	11790	12160	12520
29.5*29	lbs	12300	13700	14900	16200	17300	18400	19500	20500	21500	22400	23300	24200	25100	26000	26800	27600
	kg	6850	7620	8350	9030	9660	10300	10890	11430	12020	12520	13060	13560	14020	14520	14970	15420
33.25*29	lbs	15100	16800	18400	19900	21300	22700	24000	25200	26500	27600	28800	29900	30900	32000	33000	34000
	kg	7480	8350	9120	9840	10570	11250	11880	12470	13110	13650	14240	14790	15330	15830	16330	16830
33.5*33(**)	lbs	16500	18400	20100	21700	23300	24800	26200	27500	28900	30100	31400	32600	33800	34900	36000	37100
	kg	8980	10020	10980	11840	12700	13520	14290	15010	15740							

## ■ Handling of Tires

Improper handling of tires can lead to damage, especially to the beads. Therefore, it is necessary to prevent excess pressure from being exerted on the beads.

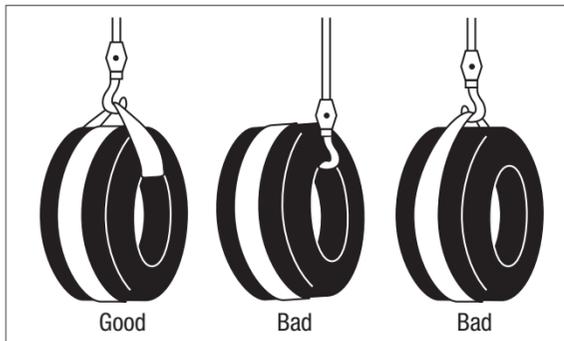
### When using a forklift to lift a tire:

- Lay the tire vertically across the fork, or
- Use a round fork at least six-inches in diameter.
- Do not insert a flat type fork within the tire.



### When lifting tires by crane:

- Use a wide nylon or rubber sling.
- Do not hook the tire beads.
- Do not use a rope sling.



## ■ Safety Precautions for Demounting

### Safety Precautions

#### WARNING

Tire and rim servicing can be dangerous, and should be performed only by trained personnel using proper tools and procedures. Failure to comply with these procedures may result in faulty positioning of the tire and/or rim, and cause the assembly to burst with explosive force, sufficient to cause serious physical injury or death.

### Demounting

#### 1. Before Demounting

- Always exhaust all air from a single tire and from both tires of a dual assembly prior to removing any wheel components such as nuts and rim clamps.
- A broken rim part under pressure can blow apart and cause serious injury or death.
- Make sure to remove valve core to exhaust all air from the tire. Remove both cores from a dual assembly. (When you remove the wheel lugs, if the tire is still under pressure, the assembly may fly apart.)
- Check the valve stem by running a piece of wire through the stem to make sure it is not plugged. (Foreign material may clog the valve stem during deflation or ice may form as the air leaves the tire, clogging the valve stem.)

#### 2. During Demounting

- Demounting tools apply pressure to rim flanges to unseat tire beads, and keep your fingers clear. Always stand to one side and hold the tool with one hand when you apply hydraulic pressure. (If the tool slips off, it can fly with enough force to cause serious injury or death.)
- Do not use tools in the vicinity of the flange butt weld.

#### 3. After Demounting

- Clean rims and repaint to stop detrimental effects of corrosion and facilitate checking and tire mounting. Be very careful to clean all dirt and rust from the lock ring and gutter. This is important to secure the lock ring in its proper position. A filter on the air inflation equipment to remove the moisture from the air line helps prevent corrosion. The filter should be checked periodically to see that it is working properly. (Parts must be clean for a proper fit - particularly the gutter section which holds the lock ring in its proper position.)

## ■ Safety Precautions for Mounting

### Mounting

#### 1. Before Mounting

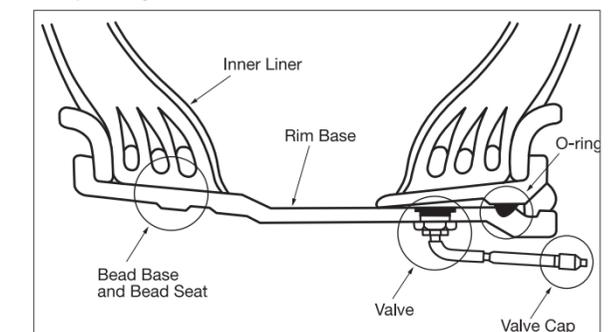
- Check rim components for cracks. Replace all cracked, badly worn, damaged and severely rusted components with new parts of the same size and type. When a component is in doubt, replace it. (Parts that are cracked, damaged or excessively corroded are weakened. Bent or repaired parts may not engage properly.)
- Do not, under any circumstance, attempt to rework, weld, heat or braze any rim component that is cracked, broken or damaged. Replace with a new part that is not cracked, broken or damaged and which is of the same size and type. (Heating may weaken a part to extent that it is unable to withstand forces of inflation or operation.)
- Check type of rim and make sure all parts of such rim are being assembled properly. Follow instruction manual of rim or ask your distributor if you have any doubts. (Mismatched parts may appear to fit, but when the tire is inflated they may fly apart with explosive force.)
- Mixing parts of one type rim with those of another is potentially dangerous. Always check rim with manufacturer for approval.
- Remove rust, dirt and other foreign matter from the rim surface, particularly on the bead seats and O-ring slot.
- Clean the inside of the tire
- Make sure tube and flap are correct and not damaged for tube type tires.
- Always prepare a new O-ring for tubeless tires.
- Do not reinflate a tire that has been run flat or has been run at 80% or less of its recommended operating pressure, or when there is obvious or suspected damage to the tire or wheel components. (Components may have been damaged or dislocated during the time the tire was run flat or seriously under-inflated.)

#### 2. During Mounting and Inflation

- Do not try to seat rings or other components by hammering while tire is inflated or partially inflated
- Double check to make sure all components are properly seated prior to inflation.
- Do not inflate tire before all components are properly in place. Place in safety cage or use a restraining device and inflate to approximately 0.35 kg/cm<sup>2</sup> (5 psi), recheck components for proper assembly. Observe that O-ring does not roll out of its groove. If assembly is not performed properly, deflate and correct. Never hammer on an inflated or partially inflated tire/rim assembly. If assembly is correct at approximately 0.35 kg/cm<sup>2</sup> (5 psi), continue to inflate fully to seat the tire beads.
- Never sit or stand in front of a tire and rim assembly that is being inflated. Always use a clip-on chuck with a sufficient length of hose to permit the person inflating the tire to stand clear of the potential trajectory of the wheel components, and use an in-line valve with gauge or a pressure regulator preset to a desired value when inflating a tire. When a tire is in a restraining device, do not lean any part of your body or equipment on or against the restraining device. (If parts are improperly installed they may fly apart with explosive force.)
- Never attempt to weld on an inflated tire/rim assembly or on a rim assembly with a deflated tire. (Heat from welding will cause a sudden, drastic increase in pressure, resulting in an explosion with the force of a bomb. Deflated tires can catch fire inside the air chamber.)

#### 3. After Inflation

- Make sure no air leakage can be suspected, especially in tubeless tires.



## ■ Safety Precautions for Operation

### Operation

- Do not use under-inflated tires.
- Do not bleed or reduce air pressure to compensate for the increase in pressure resulting from operation.
- Do not use under-size rims. Use recommended rim for the tire.
- Do not overload or over-inflate tire/rim assemblies. Check for adequate rim strength if special operating conditions are required. (Excessive overload can cause damage to the tire and rim assembly.)
- Never run a vehicle on one tire of a dual assembly. (The carrying capacity of the single tire and rim is dangerously exceeded, and operating a vehicle in this manner can result in damage to the rim and tire or cause a tire fire.)
- Never use a tube in a tubeless tire/rim assembly where the rim is suspected of air leakage. (Loss of air pressure through fatigue cracks or other fractures in a tubeless rim warns you of a potential rim failure. This safety feature is lost when tubes are used with leaking rims. Continued use may cause the rim to burst with explosive force.)
- Always inspect rims and wheels for damage during tire checks. (Early detection of potential rim failure may prevent serious injury.)
- Never add or remove an attachment or otherwise modify a rim (Especially by heating, welding or brazing) unless the tire has been removed and approval has been received from the rim manufacturer. (Modification or heating of a rim or one of its parts may weaken it so that it cannot withstand forces created by inflation or operation.)
- Never mount bias tire and radial tire on the same axle. Follow vehicle manufacturer's recommendation.
- Never use tire under unintended service conditions for the tire. Please consult YOKOHAMA if vehicle operation requires specialized tire fitment.

### Tools for Mounting and Demounting Tires

The following are all portable tools, and can be used both horizontally and vertically.



Hydraulic tire remover (tire push type) and bead wedges. Commonly used for 25 inch rims.



Hydraulic tire remover (tire push type) in operation



Hydraulic tire remover (rim flange push type). Commonly used for 33 inch or larger rims.



Hydraulic tire remover (rim flange push type) in operation



Tire handler

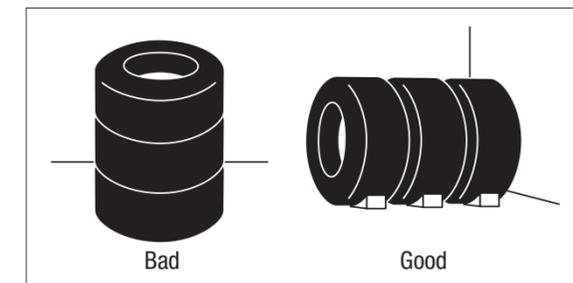
## ■ Tire Storage

In general, tires should be removed from the rim, cleaned, and stored in a cool, dry room. They should be stored in an upright position, not horizontally, so that the proper space between the beads will be maintained. Make sure that the tire is not deformed by any external pressure exerted on it.

Avoid the following when storing tires:

- Direct sunlight.
- Ozone.
- Oil and grease.
- High temperatures and humidity.

If tires must be stored outside, cover them with a tarpaulin for protection. If a vehicle is stored with tires mounted, rest the vehicle on blocks to relieve the load on the tires. Deflate the tires and cover them. Rotate the tires once a month to prevent permanent deformation, if the vehicle cannot be rested on blocks.



## ■ How to Reduce Tire Costs

Select the proper tire for the job:

- Tire size.
- Ply rating.
- Tire specification.

Maintain a tire record

- Keep a tire card for each tire.
- Analyze scrap tires.

Carry out good tire maintenance:

- Perform regular inflation pressure checks.
- Regularly inspect tire appearance.
- Ensure proper matching of dual tires.
- Prevent oil saturation.
- Prevent high temperature and humidity.
- Prevent wavy condition.
- Keep haul road, loading and dumping area clean.
- Provide good drainage.

Maintain good job conditions:

- Do not overload.
- Avoid excessive speed.
- Train operator.

■ Tubes and Flaps

Tube type tires employ tubes to retain air under pressure within the carcass. The flap is a liner which is placed between the rim and tube to protect the tube from damage by the rim and beads. The size of the tube and flap are usually indicated by the size of tire for which they can be used, without regard for the ply rating. For example, a 23.5-25 size tube or flap can be used with a tire of 23.5 inch width and a diameter of 25 inches. Some tubes and flaps can be used for more than one size of tire. For example, a size 13.00-24 and 13.00-25.

Storage of Tubes and Flaps

Tubes and flaps should be cleaned and all of the air expelled before storage. They should always be stored in a dry, cool place. The tubes should be packed lightly when storing to prevent the metal valve stems from causing damage.

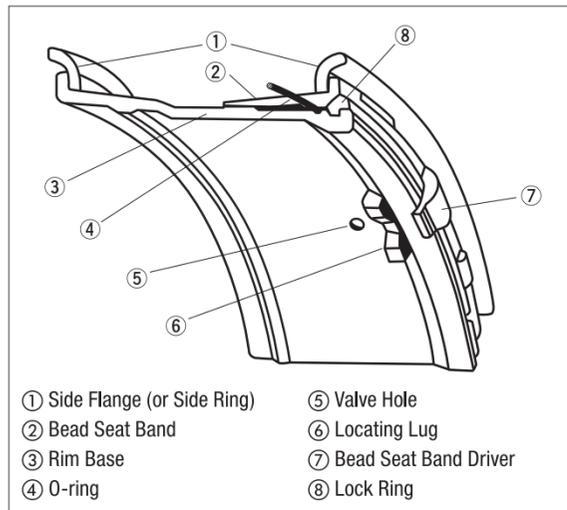
Valves for Tube Type Tires

The type of valve used for a tube type tire depends on the type of rim it is mounted to. Therefore, when purchasing tubes, proper attention should be given to the valve type.

■ Rims

Normally, a rim is composed of a rim base, two side flanges (or side rings), bead seat band and lock ring. On some smaller size rims, parts may be joined. For tubeless tires, an O-ring is also used.

Rim Construction Diagram



Rim Identification

Rims are normally identified by a three-part code consisting of rim width (inches), flange shape (alphabetical) and rim diameter (inches). A flat base rim example would be: 9.00 V x 24. This follows the nomenclature of tire size with the addition of the flange identification, in this case.

The code for full tapered bead seat rims does not indicate the flange shape, but some indicate flange height in inches. An example would be 17.00 x 25 - 2.0, where 2.0 is the flange height in inches.

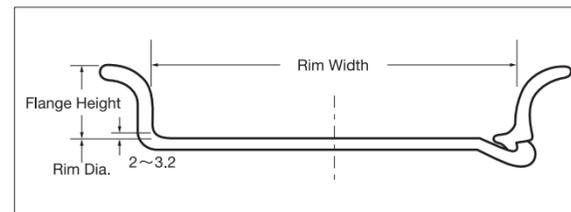
Type of Rims

Tires can function properly only when they are mounted on the right rim. There are four basic types of rims for OFF-THE-ROAD TIRES: flat base, full tapered bead seat, semi-drop center and drop center.

Flat Base Type Rims

There are two sub-classifications of interchangeable flat base type rims as shown below. A tire which fits on one kind of flat base rim will fit on all flat base rims of the same width and diameter. These rims are used for relatively small tube type OFF-THE-ROAD TIRES.

Flat Base Rim/5° Flat Base Rim

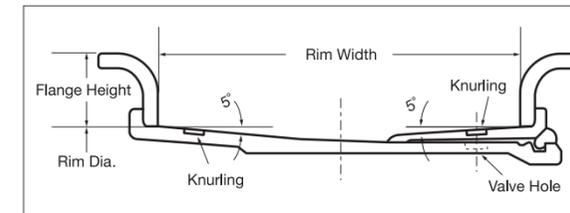


Rim Size		Tire Size	
Flat Base Rim	5° Flat Base Rim	Standard	Alternative
6.50T	6.5	8.25-20	9.00-20
7.00T	7.0	9.00-20	10.00-20
7.50V(VM)	7.5	10.00-20	11.00-20
8.00V	8.0	11.00-20	12.00-20,24
8.50V(VM)	8.5	12.00-20,24	13.00-24
9.00V	9.0	13.00-24	12.00-20,24, 14.00-20,24
10.00W(W)	—	14.00-20,24, R24	13.00-24

Full Tapered Bead Seat Rims

Most large-wheeled construction machinery employ full tapered bead seat rims. These rims have a 5° taper in the bead seat which strengthens the rim/bead binding. Additionally, a fine groove called "knurling" lines the bead surface to prevent further slippage. Flat base rims have a looser fit and some slippage may occur under quick acceleration if used on the same large-wheeled vehicle. Almost all rims with diameters over 25" are full tapered bead seat types. Wide base variations are also available.

Full Tapered Bead Seat Rim

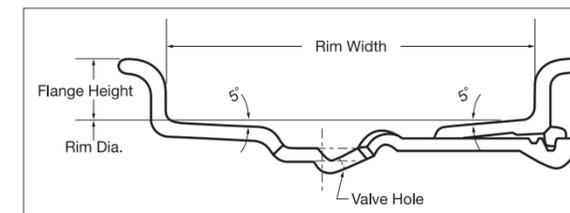


Narrow Base		Wide Base	
Rim Size	Tire Size	Rim Size	Tire Size
8.50	12.00-25, 13.00-25	12.00	15.5-25
10.00	14.00-25	14.00	17.5-25, 17.5R25
11.25	16.00-25, 16.00R25	17.00	20.5-25, 20.5R25
13.00	18.00-25, 33, 18.00R33	19.50	23.5-25, 23.5R25
15.00	21.00-25, 35	22.00	26.5-25, 26.5R25
17.00	24.00-25, 29, 35, 49	25.00	29.5-25, 29, 35, 29.5R25
19.50	27.00-49	27.00	33.25-35
22.00	27.00-33, 30.00-51	28.00	33.5-33, 39, 35/65-33
24.00	33.00-51	31.00	37.25-35
26.00	36.00-51	32.00	37.5-33, 39, 51, 40/65-39
29.00	40.00-57	36.00	45/65-45

Semi-Drop Center Rims (SDC)

This rim has a 5°-inclined bead seat and a depressed center. It is abbreviated as the "SDC" rim. Most SDC rims for OFF-THE-ROAD TIRES have diameters of 20" or 24". They are used on graders and loaders, and are identified by the marking on the tire sidewall: "For SDC RIM" or "For SDC RIMS".

Semi-Drop Center Rim

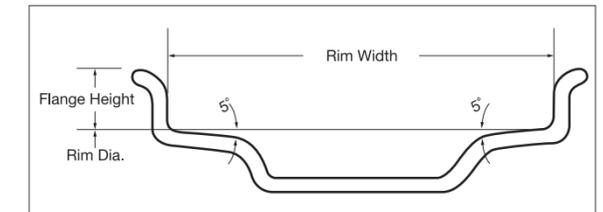


Rim Size	Tire Size	Rim Size	Tire Size
8.00TG	12.00-20, 24	11.00TG	14/70-20
	13.00-24	14.00TG	42x17-20
	14.00-24, 14.00R24	12.00SDC	15.5-25
10.00VA	13.00-24	14.00SDC	17.5-25, 17.5R25
	14.00-24, 14.00R24		
	16.00-24		

Drop Center Rims (DC)

The drop center rim also has a 5°-inclined bead seat, but with a deeply depressed center (dropped rim center) section for easier tire mounting. Most DC rims are used on small loaders.

Drop Center Rim



Rim Size	Tire Size	Rim Size	Tire Size	
7JA	23x8.50-12	11LB	14.0/65-15	
	27x8.50-15	W13	15.5/60-18	
	27x9.50-15		15.5/70-18,20	
8-1/2JA	10.0/70-12	W14L	17.5/65-20	
W10L	12.5/65-18	W15L	16.9-24, 28, 30	
10LB	12.5/70-16	W16L	18.4-24	
			12.00DC*	15.5-25
			13.00DC*	15.5-25, 17.5-25, R25
			14.00DC*	17.5-25, R25

\* Bias-12PR max. Radial-one star max

Caution with Wheel Use

Wheel defects such as cracks or corrosion can lead to air leakage, causing among other dangers, deteriorated traction and braking performance. Service life of the tire will degrade, also. More importantly, safe operation of the vehicle will be jeopardized.

- Do not use wheels with defects such as corrosion or cracks.
- Do not use rims for tubeless application that have been welded, have rust or have air leakage.
- Do not use wheels with cracks, breakage or rust erosion on the nut seat of the wheel.
- Do not use wheels if packing gutters are deformed by rust.
- Do not re-use O-rings.

Valves

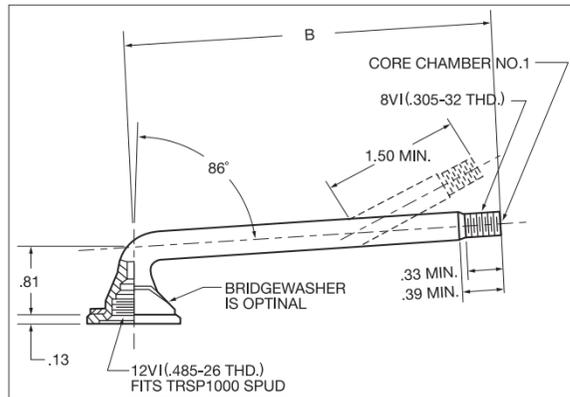
Valves for OFF-THE-ROAD TIRES are of two types, tube or rim valves and are available in three makes: standard bore, large bore and air/water. Tube valves are for tube type tires and rim valves are for tubeless type tires.

Tube Valves

(1) Standard Bore Tube Valves

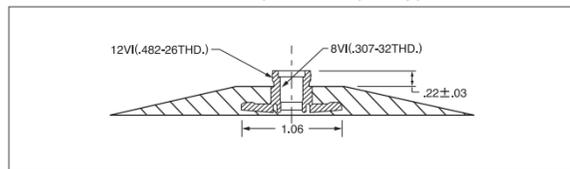
This valve has an opening to accommodate a standard valve core. This type of valve is mainly used for tires smaller than 14.00-24.

Screw-on Standard Bore Tube Valve

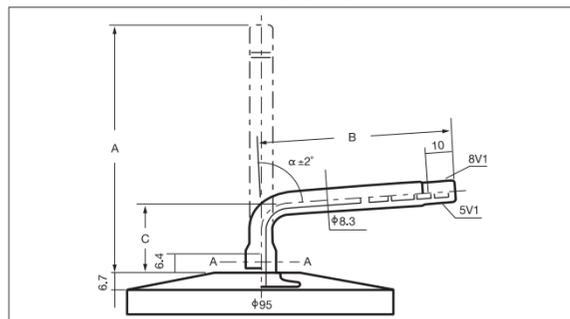


Valve No.	TR1075A	TR1077A	TR1078A	TR1175A	TR1177A	TR1179A
Size	3.0 (76)	4.1 (105)	5.0 (127)	4.5 (115)	3.7 (95)	5.6 (142)

TRSP1000 Spud Air-Liquid Type



Rubber Base Valve

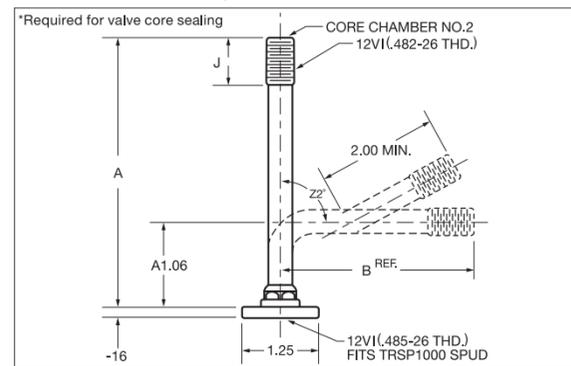


Valve No.	TR76A	TR77A	TR78A	TR175A	TR177A	TR179A	JS1	JS179	JS75	JS179A
A (mm)	4.1 (105)	4.9 (124)	5.7 (146)	5.2 (134)	4.5 (114)	6.3 (160)	3.1 (79.5)	6.5 (164)	3.5 (89.5)	6.3 (161)
B (mm)	3.4 (86)	4.1 (105)	5.1 (127)	4.5 (115)	3.7 (95)	5.4 (141)	2.4 (60)	5.2 (133)	2.8 (70)	5.4 (137)
C (mm)	0.9 (24)	0.9 (24)	0.9 (24)	0.9 (24)	0.9 (24)	0.9 (24)	0.9 (24)	1.4 (36)	0.9 (24)	1.1 (29)
α (°)	86	86	86	86	86	86	82	86	82	86

(2) Large Bore Tube Valves

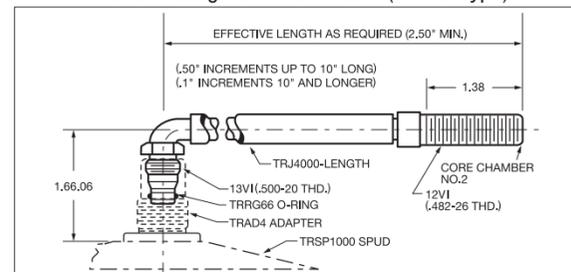
More air is required to fill larger tires. To decrease the filling time, a large bore valve can be utilized due to its increased internal diameter. This type of valve is used for wide base and narrow base tires with tread widths larger than 15.5 and 16.00, respectively. The large bore valve is also called a "jumbo valve", for which the third letter of its part number stands for.

Screw-On Large Bore Convertible Tube Valve



Valve No.	A	A1	B (Ref.)	J	Z
TRJ1014A	1.91 (41)	—	—	1.44 (37)	—
TRJ1076A	4.16 (105)	—	—	0.75 (19)	—
TRJ1076D	—	2.06 (52)	2.31 (59)	0.75 (19)	90
TRJ1076E	—	1.38 (35)	3.00 (76)	0.75 (19)	88
TRJ1175A	5.28 (134)	—	—	0.75 (19)	—
TRJ1175C	—	1.38 (35)	4.13 (105)	0.75 (19)	88
TRJ1178A	5.78 (147)	—	—	0.75 (19)	—
TRJ1078B	—	1.38 (35)	4.62 (117)	0.75 (19)	82
TRJ1179A	6.41 (163)	—	—	0.75 (19)	—
TRJ1179B	—	1.38 (35)	5.25 (134)	0.75 (19)	88
JSJ1175	—	1.22 (31)	4.13 (105)	0.63 (16)	88
JSJ1175B	—	1.22 (31)	4.13 (105)	0.63 (16)	80
JSJ1078S	—	4.70 (121)	1.18 (30)	0.75 (19)	84

TRJ4000 Large Bore Tube Valve (Swivel Type)

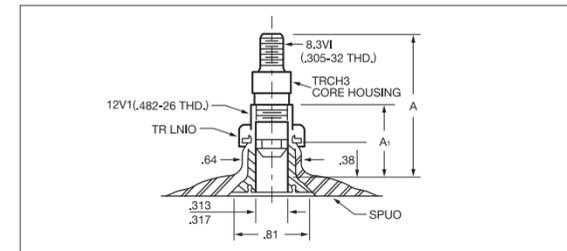


\*Stems are specified as TRJ4000-Length. Example: For an effective length of 9.50", the stem number is TRJ4000-9.50. Recommended torque at installation: 70-80 inch-pounds. Valve core: TRC2

(3) Air/Water Tube Valves

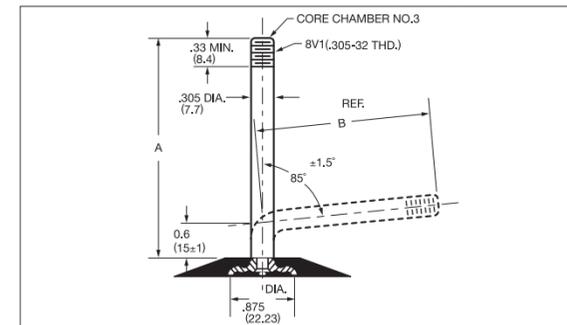
A liquid compound (normally a calcium chloride solution) can be injected into a tube with this valve. Two types are available, the TR218A and TR220A.

Air-Liquid Type



Valve No.	A <sub>1</sub>	A
TR218A	0.81 (20.6)	1.63 (41.1)
TR220A	1.19 (30.2)	2.00 (50.7)

Convertible Tube Valve Air-Liquid Type



Valve No.	A	B (Ref)
440	3.35 (85)	3.0 (75)
441	4.13 (105)	3.7 (95)
442	4.53 (115)	4.1 (105)
443	4.92 (125)	4.5 (115)
444	5.51 (140)	5.1 (130)
445	6.10 (155)	5.7 (145)

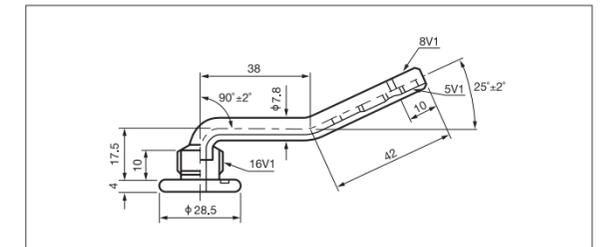
Valve Core: TRCa (short core only)

Rim Valves

(1) Standard Bore Rim Valves

This is the rim valve counterpart to the standard bore tube valve explained on the opposite page.

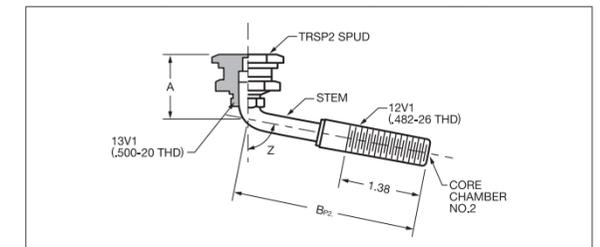
TR503A Dimension



(2) Large Bore Rim Valves

This is a rim valve with a large valve core, corresponding to the large bore tube valve. There are three types available.

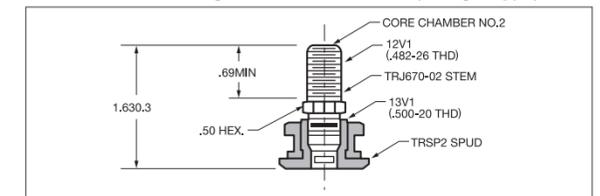
Large Bore Tubless Valve (Swivel Type)



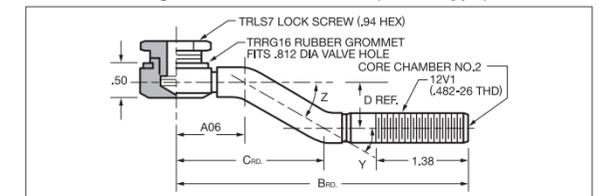
Valve No.	*TR Stem No.	A	B	Z°
TRJ650-03	J650-02	1.08	3.12	80

\* Recommended torque at installation: 70-80 inch-pound

TRJ670-03 Large Bore Tubeless Valve (Straight Type)



Large Bore Tubeless Valve (Turret Type)



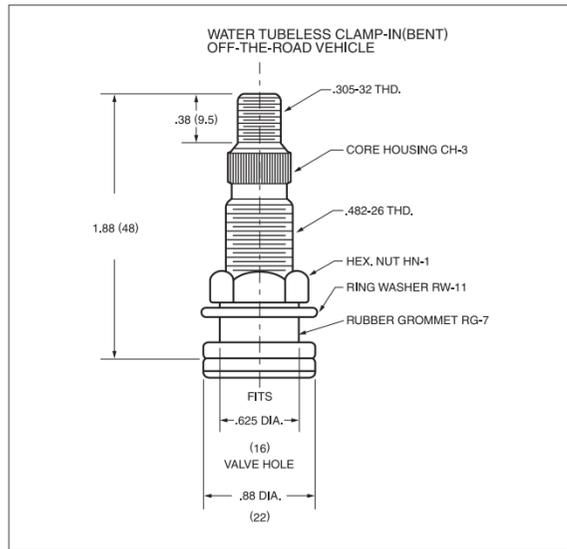
Valve No.	A	B	C	D	Y°	Z°
TRJ690	1.25	4.69	2.31	0.56	28	28

**Rim Valves**

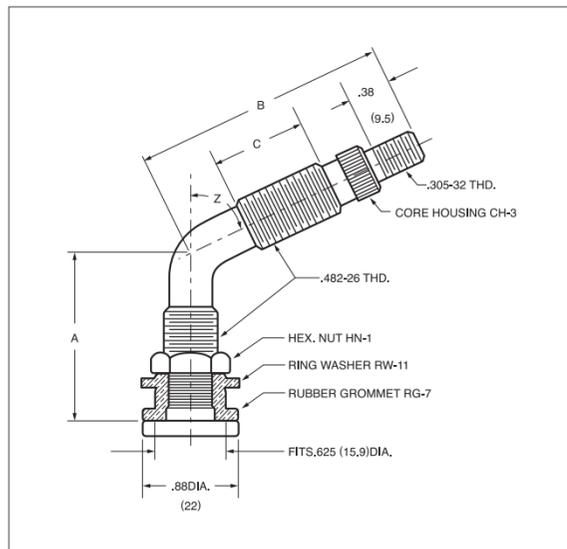
**(3) Air/Water Rim Valves**

This is a rim valve with a core housing, corresponding to its tube valve type explained previously. There are four types of these valves available: TR618A, TR621A, TR622A and TR623A.

**TR618A Dimensions**



**TR621A, TR622A and TR623A Dimensions**

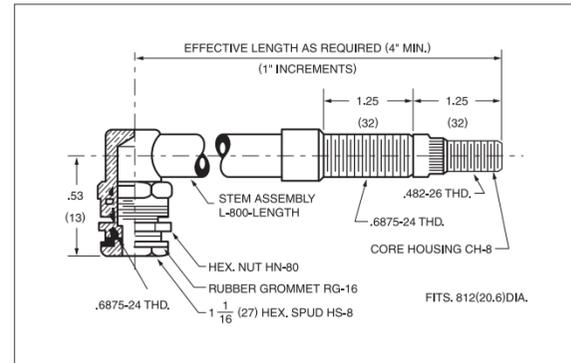


Valve No.	A	B	C	Z
TR621A	1.53 (39)	2.97 (75)	1.59 (40)	65°
TR622A	1.75 (44)	4.53 (115)	1.84 (47)	65°
TR623A	1.53 (39)	2.25 (57)	0.88 (22)	65°

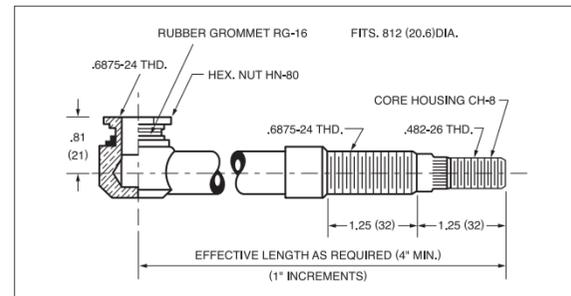
**(4) Super Large Bore Rim Valves**

Super large bore rim valves have an internal diameter 50% larger than large bore valves which makes air inflation easier and faster.

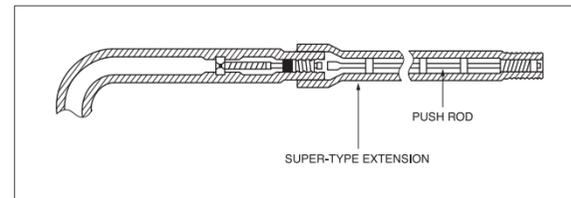
**TRL850 Length (Swivel Type) Dimensions**



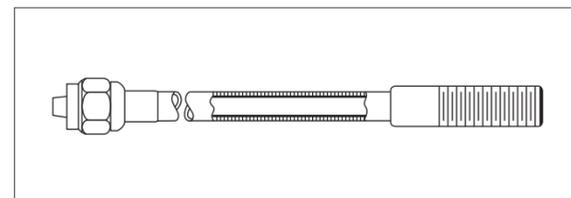
**TRL890 Length (Turret Type) Dimensions**



**Extension**



**Semi-flexible Extension**



Type	Number	Overall Length	Effective Length	Thred Length
SUPER TYPE EXTENSION	3605	55	38	25
	3607	75	58	36
	3610	100	83	36
	3612	120	103	36
	3613	133	116	36
	3616	165	148	36
	3620	200	183	36

**(5) Caution with Tubeless Air Valves**

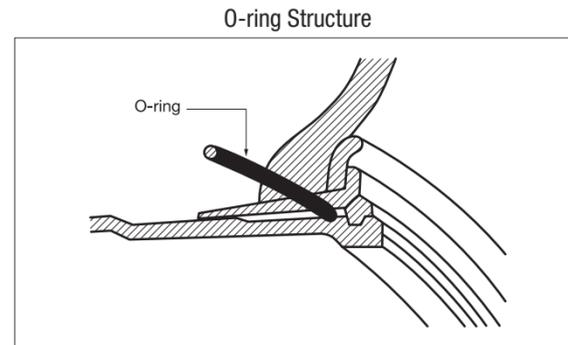
Whenever the tubeless tire is demounted and changed, the tubeless air valve (rim valve) must be replaced with a new one, regardless of appearance.

Valve Classification by Rim Type			
Type of Rim	Tire Width	Tube Type	Tubeless
FLAT BASE TYPE	14.00 and Under 16.00 and Over	Standard Bore Tube Valve Large Bore Tube Valve	Standard Bore Rim Valve Large Bore Rim Valve
FULL TAPERED	14.00 and Under 16.00 and Over 15.5 and Over	Standard Bore Tube Valve Large Bore Tube Valve Large Bore Tube Valve	Standard Bore Rim Valve Large Bore Rim Valve Large/Super Large Bore Rim Valve
SEMI-DROP CENTER	All Sizes	Standard Bore Tube Valve Air/Water Tube Valve	Air/Water Rim Valve
DROP CENTER	All Sizes	Air/Water Tube Valve	Air/Water Rim Valve

NOTES: Valves for inside dual-pair tire are equipped with a supplemental valve extension to facilitate air inflation. The extension is made of brass which is apt to nicks, scratches and dents. Care is required when (de)mounting, and storage should be in a clean, moisture free area.

## ■ O-rings

Rims for tubeless OFF-THE-ROAD TIRES require the use of an O-ring. Also referred to as a "seal ring" or "gasket", the O-ring forms an air-tight seal between separate parts of the rim. It must be used properly. It is very important to note that even if rim diameters are the same, different size O-rings may be necessary depending on the type of rim used.



O-ring No.	Rim	Tire	Section Diameter		Inside Circumference	
			mm	inch	mm	inch
OR224TG	24" SDC	24" rim diameter	6.7	0.26	1768	69.61
OR225T	25" SDC	14.00-25 and under	6.7	0.26	1802	70.94
	25" TB	17.5-25 and under 20.5-25(use 17.00×25-1.7 rim)				
OR325T	25" TB	16.00-25 and over 20.5-25(use 17.00×25-2.0 rim)and over	9.8	0.39	1800	71.06
OR329T	29" TB	29" rim diameter	9.8	0.39	2127	83.74
OR333T	33" TB	33" rim diameter	9.8	0.39	2447	96.34
OR335T	35" TB	35" rim diameter	9.8	0.39	2560	100.79
OR339T	39" TB	39" rim diameter	9.8	0.39	2868	112.91
OR345T	45" TB	45" rim diameter	9.8	0.39	3311	130.35
OR349T	49" TB	49" rim diameter	9.8	0.39	3572	140.63
OR451T	51" TB	51" rim diameter	12.7	0.5	3666	144.33
OR457T	57" TB	57" rim diameter	12.7	0.5	4103	161.54

SDC: semi-drop center rim TB: tapered bead seat rim

### O-ring identification

**OR 3 25 T**

- Type of rim (Full tapered bead seat rim)
- Rim diameter (Bead diameter in inches)
- Cross section diameter O-ring (in eighths of an inch)
- Indicates that the ring is for OFF-THE-ROAD TIRES

### Caution with O-rings

- Do not use used or damaged O-rings.
- Clean rim and then lubricate with vegetable oil before mounting the O-ring.
- Take caution not to damage O-ring with tire lever. Avoid twisting.
- Keep spare O-rings on hand for emergencies. A 20% backup rate is recommended.

■Combination Tables

OFF-THE-ROAD TIRES, Tube, Flap and O-ring Combination Table

Tire Size	Tube Size	Valve Size		Flap Size	O-ring Size
		Tube Valve	Rim Valve		
12.5/70-16	—	—	TR575,TR415	—	—
10-16.5	10-16.5	TR15	TR575	—	—
17.5/65-20	17.5/65-20	TR218A	TR618A	—	—
14/70-20	14/70-20	TR179A	—	14/70-20	—
13.5-20	13.5-20	TR78A	—	13.5-20	—
15.0-20	15.0-20	TJ179W	—	15.0-20	—
42×17-20	42×17-20	TR179A	—	42×17-20	—
16.9-24	16.9-24	TR218A	TR618A	—	—
18.4-24	18.4-24	TR218A	TR618A	—	—
750/65R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
15.5-25	15.5-25	JSJ1175B,JSJ1175	TRJ650,TRJ670,TRJ690	15.5/17.5-25	OR225T
17.5R25	—	—	TRJ650,TRJ670,TRJ690	—	OR225T
17.5-25	17.5-25	JSJ1175B,JSJ1175	TRJ650,TRJ670,TRJ690	15.5/17.5-25	OR225T
20.5R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T/OR225T
20.5-25	20.5-25	JSJ1175B,JSJ1175	TRJ650,TRJ670,TRJ690	20.5-25	OR325T/OR225T
23.5R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
23.5-25	23.5-25	JSJ1175B,JSJ1175	TRJ650,TRJ670,TRJ690	23.5-25	OR325T
26.5R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
26.5-25	26.5-25	JSJ1175	TRJ650,TRJ670,TRJ690	26.5-25	OR325T
29.5R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
29.5-25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
875/65R29	—	—	TRJ650,TRJ670,TRJ690	—	OR329T
26.5-29	—	—	TRJ650,TRJ670,TRJ690	—	OR329T
29.5-29	—	—	TRJ650,TRJ670,TRJ690	—	OR329T
33.25-29	—	—	TRJ650,TRJ670,TRJ690	—	OR329T
35/65-33	—	—	TRJ650,TRJ670,TRJ690	—	OR333T
29.5-35	—	—	TRJ650,TRJ670,TRJ690	—	OR335T
33.25-35	—	—	TRJ650,TRJ670,TRJ690	—	OR335T
37.25R35	—	—	TRJ650,TRJ670,TRJ690	—	OR335T
37.25-35	—	—	TRJ650,TRJ670,TRJ690	—	OR335T
37.5-39	—	—	TRJ650,TRJ670,TRJ690	—	OR339T
40/65-39	—	—	TRJ650,TRJ670,TRJ690	—	OR339T
45/65-45	—	—	TRJ650,TRJ670,TRJ690	—	OR345T
325/95R24	325/95(R)24	TR77A,TR78A,JS179	—	325/95R24	—
385/95R25	—	—	TRJ650	—	OR225T
445/95R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
480/95R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
505/95R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
525/80R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T

OFF-THE-ROAD TIRES, Tube, Flap and O-ring Combination Table

Tire Size	Tube Size	Valve Size		Flap Size	O-ring Size
		Tube Valve	Rim Valve		
9.00-20	9.00-20	TR175A,TR76A	—	8.25/9.00(R)20	—
10.00-20	11.1/10.00(R)20	TR78A,TR76A	—	10.00/11.1(R)20	—
11.00-20	11.00-20	TR78A,TR76A	—	11.00/12.00(R)20	—
12.00-20	12.00-20	TR78A,TR76A	—	11.00/12.00(R)20	—
14.00-20	14.00-20	TR179A,JS179	—	13/80,13.00/14.00/15.0(R)20	—
12.00-24	11.00/12.00(R)24	TR78A,TR77A	TR618A,TR503A	10.00/11.00/12.00-24	—
13.00-24	13.00-24/25	TR77A,JS179A	TR618A,TR503A	13.00/14.00-24/25	OR224TG
14.00R24	14.00(R)24/25	JS179	TR618A	13.00/14.00-24/25	OR224TG
14.00-24	14.00-24/25	TR77A,TR175A,TR179A	TR618A,TR503A	13.00/14.00-24/25	OR224TG
16.00-24	16.00-24/25	JSJ1175B,JSJ1175	TR618A,TR503A	16.00/18.00-24/25	OR224TG
14.00R25	14.00-24/25	TR77A,TR175A,TR179A	TR508,TR650	13.00/14.00-24/25	OR225T
14.00-25	14.00-24/25	TR77A,TR175A,TR179A	TR508,TR650	13.00/14.00-24/25	OR225T
16.00R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
16.00-25	16.00-24/25	JSJ1175B,JSJ1175	TRJ650,TRJ670,TRJ690	16.00/18.00-24/25	OR325T
18.00R25	—	—	TRJ650,TRJ670,TRJ690	—	OR325T
18.00-25	18.00-24/25	JSJ1175B,JSJ1175C	TRJ650,TRJ670,TRJ690	16.00/18.00-24/25	OR325T
21.00-25	21.00-24/25	JSJ1175	TRJ650,TRJ670,TRJ690	21.00-24/25*15.5/17.5-25	OR325T
24.00-25	24.00-25	JSJ1175	TRJ650,TRJ670,TRJ690	20.5/24.00-25	OR325T
24.00-29	—	—	TRJ650,TRJ670,TRJ690	—	OR329T
18.00R33	—	—	TRJ650,TRJ670,TRJ690	—	OR333T
18.00-33	—	—	TRJ650,TRJ670,TRJ690	—	OR333T
21.00-35	—	—	TRJ650,TRJ670,TRJ690	—	OR335T
24.00R35	—	—	TRJ650,TRJ670,TRJ690	—	OR335T
24.00-35	—	—	TRJ650,TRJ670,TRJ690	—	OR335T
24.00-49	—	—	TRJ650,TRJ670,TRJ690	—	OR349T
27.00R49	—	—	TRJ650,TRJ670,TRJ690	—	OR349T
27.00-49	—	—	TRJ650,TRJ670,TRJ690	—	OR349T
30.00-51	—	—	TRJ650,TRJ670,TRJ690	—	OR451T
33.00R51	—	—	TRJ650,TRJ670,TRJ690	—	OR451T
33.00-51	—	—	TRJ650,TRJ670,TRJ690	—	OR451T
36.00-51	—	—	TRJ650,TRJ670,TRJ690	—	OR451T
40.00-57	—	—	TRL870,TRL850	—	OR457T

The valve sizes for tubes and rims shown in tables (p.74-75) correspond with the conventional standards of TRA,JATMA, etc.

## ■ Earthmover Data

### Formulas and Rules

The following are useful formulas and rules of thumb:

- Production, hourly = Load (BCY)/Cycles × Cycles/hr  
= Load (BM<sup>3</sup>)/Cycles × Cycles/hr
- Load factor (L.F.) =  $\frac{\text{Bank cubic yards (BCY)}}{\text{Loose cubic yards (LCY)}}$
- Load factor (L.F.) =  $\frac{\text{Bank cubic meters (BM}^3\text{)}}{\text{Loose cubic meters (LM}^3\text{)}}$
- Load factor (L.F.) =  $\frac{100\%}{100\% + \% \text{ of swell}}$
- Load (bank measure) = Loose cubic yards (LCY) × L.F.  
= Loose cubic meters (LM<sup>3</sup>) × L.F.
- Shrinkage factor (S.F.) =  $\frac{\text{Compacted cubic yards (CCY)}}{\text{Bank cubic yards (BCY)}}$
- Shrinkage factor (S.F.) =  $\frac{\text{Compacted cubic meters (CM}^3\text{)}}{\text{Bank cubic meters (BM}^3\text{)}}$
- Density = Weight/Unit volume
- Load (bank measure) =  $\frac{\text{Weight of Load}}{\text{Bank density}}$
- Rolling resistance factor = 40 lbs/ton + (30 lbs/ton/inch × inches)  
= 20 kg/ton + (15 kg/ton/2.5 cm × cm)
- Rolling resistance = 2% of GVW\* + 1.5% of GVW × inch of tire penetration  
= 2% of GVW + 0.6% of GVW × cm of tire penetration  
\*GVW = Gross Vehicle Weight
- Grade resistance factor (GR factor) = 20 lbs/ton × % of grade  
= 10 kg/ton × % of grade
- Grade resistance = GR factor (lbs/ton) × GVW (tons)  
= GR factor (kg/ton) × GVW (tons)
- Grade resistance = 1% of GVW × % of grade
- Total resistance = Rolling resistance (lbs or kg) + Grade resistance (lbs or kg)
- Rolling Resistance (%) = 2% + 1.5% per inch of tire penetration  
= 2% + 0.6% per cm of tire penetration

- Grade (%) = % of grade
- Effective grade (%) = PR (%) + GR (%)
- Usable pull (traction limitation) = Coefficient of traction × Weight on drivers  
= Coefficient of traction × (Total weight × % on drivers)
- Pull required = Rolling resistance + Grade resistance  
= Total resistance
- Total cycle time = Fixed time + Variable time
- Fixed time: Refer to respective machine production section.
- Variable time = Total haul time + Total return time
- Travel time =  $\frac{\text{Distance (ft)}}{\text{Speed (ft/min)}}$
- Travel time =  $\frac{\text{Distance (m)}}{\text{Speed (m/min)}}$
- Cycles per hour =  $\frac{60 \text{ minutes}}{\text{Total cycle time (minutes)}}$
- Adjusted productivity = Hourly productivity × Efficiency factor
- No. of units requires =  $\frac{\text{Hourly production required}}{\text{Unit hourly production}}$
- No. of scrapers a pusher will load =  $\frac{\text{Scraper cycle time}}{\text{Unit hourly production}}$

Earthmover Data

Typical Rolling Resistance Factors

Road Surface	lbs/ton	(kg/ton)
A roadway of hard, smooth, stabilized surface without penetration under load, watered, maintained:	40	(20)
A firm, smooth rolling roadway with dirt or light surface flexing slightly under or undulating, maintained fairly regularly, watered:	65	(35)
Snow packed:	50	(25)
Snow loose:	90	(45)
A dirt roadway, rutted, flexing under load, little if any maintenance, no water, 1" (25 mm) or more tire penetration:	100	(50)
Rutted dirt roadway, soft under travel, no maintenance, no stabilization, 4" (100 mm) to 6" (150 mm) tire penetration:	150	(75)
Loose sand or gravel:	200	(100)
Soft, muddy, rutted roadway, no maintenance:	200 to 400	(100 to 200)

Various tire sizes and inflation pressures will greatly reduce or increase the above figures. The quantities given are sufficiently accurate for estimating purposes when specific information on performance of particular equipment on given soil conditions is not available. See other Earthmoving Data Section tables for additional information.

Approximate Coefficient of Traction Factors

Road Surface	Traction Factors	
	Rubber Tires	Tracks
Concrete	.90	.45
Dry clay loam	.55	.90
Wet clay loam	.45	.70
Rutted clay loam	.40	.70
Dry sand	.20	.30
Wet sand	.40	.50
Quarry pit	.65	.55
Loose gravel road	.36	.50
Packed snow	.20	.25
Ice	.12	.12*
Firm earth	.55	.90
Loose earth	.45	.60
Stockpiled coal	.45	.60

\*Semi-skeleton shoes = .27

Material\* Swell Percentage & Load Factors

Materials	Swell %	Load Factor (%)
Cinders	45	69
Clay, dry or wet	40	72
Clay and gravel dry or wet	40	72
Coal, anthracite or bituminous	35	74
Earth, loam and dry or wet	25	80
Gravel, dry	12	89
wet	11	89
Gypsum	74	57
Hardpan	50	67
Limestone	67	60
Rock, well blasted	65	60
Sand, dry or wet	12	89
Sandstone	54	65
Shale and soft rock	65	60
Slag, bank	23	81
Slate	65	60
Trap rock	65	61

\*Varies with moisture content, grain, size, degree of compactness, etc. Tests must be made to determine exact material characteristic.

Swell-Voids-Load Factor Table

Swell (%)	Voids (%)	Load Factor
5	4.8	.952
10	9.1	.909
15	13.0	.870
20	16.7	.833
25	20.0	.800
30	23.1	.769
35	25.9	.741
40	28.6	.714
45	31.0	.690
50	33.3	.667
55	35.5	.645
60	37.5	.625
65	39.4	.606
70	41.2	.588
75	42.9	.571
80	44.4	.556
85	45.9	.541
90	47.4	.526
95	48.7	.513
100	50.0	.500

Swell-Voids-Load Factor Table

Load Factor (%)	Voids (%)	Swell (%)
95	5	5.3
90	10	11.1
85	15	17.6
80	20	25.0
75	25	33.3
70	30	42.9
65	35	53.8
60	40	66.7
55	45	81.8
50	50	100.0

Conversion Tables

Metric to Standard (UK, US, etc.)

Multiply Metric Unit	by	to Obtain English Unit
Kilometer (km)	0.6214	Mile
Meter (m)	1.0936	Yard
Centimeter (cm)	0.0328	Foot
Millimeter (mm)	0.03937	Inch
Square Kilometer (km <sup>2</sup> )	0.3861	Square Mile
Hectare (Ha)	2.471	Acre
Square meter (m <sup>2</sup> )	10.76	Square foot
Square centimeter (cm <sup>2</sup> )	0.1550	Square inch
Cubic meter (m <sup>3</sup> )	1.308	Cubic yard
kilograms/cubic meter (kg/m <sup>3</sup> )	1.686	Pounds/cubic yard
Liter (l or ltr.)	0.2642	Gallon (US)
Liter (l or ltr.)	61.02	Cubic inch
Imperial gallon	1.20	US gallon
Kilometer per hour (kph)	0.621	MPH
Cubic centimeter (cm <sup>3</sup> )	0.0338	Fluid ounce
Metric tonne (t)	0.984	Long ton
Metric tonne (t)	1.102	Short ton
Kilogram (kg)	2.205	Pound, avdp.
Gram (g or gr.)	0.0353	Ounce, avdp.
Calorie, Kilo (C or Cal.)	3.968	BTU
Kilogram-meter (kgm)	7.233	Foot-pound
Meter-kilogram (m-kg)	7.233	Pound-foot
Metric horsepower (CV)	0.9863	HP
kg/square centimeter (kgs./cm <sup>2</sup> )	14.225	Pounds/square inch
kilopascal (kPa)	0.14503	Pounds/square inch

1 km = 1,000 m 1 m = 100 cm 1 cm = 10 mm 1 km<sup>2</sup> = 100 Ha  
 1 Ha = 10,000 m<sup>2</sup> 1 m<sup>2</sup> = 10,000 cm<sup>2</sup> 1 cm<sup>2</sup> = 100 mm<sup>2</sup>  
 1 m<sup>3</sup> = 1,000 liters 1 liters = 1,000 cm<sup>3</sup>  
 1 metric ton = 1,000 kg 1 quintal = 100 kg 1 kg = 1,000 g  
 1 Cal = 427 kgm = 0.0016 CVH = 0.00116 KWH  
 1 kg/cm<sup>2</sup> = 98.066 kPa Torque unit: 1 CV = 75 kgm/sec  
 1 kg/cm<sup>2</sup> = 0.97 atmosph 1 bar = 100 kPa

Standard (UK, US, etc.) to Metric

Multiply English Unit	by	to Obtain Metric Unit
Mile, statute (M)	1.609	Kilometer
Foot (ft)	0.3048	Meter
	30.48	Centimeter
Inch (in., ")	0.025	Meter
Square mile (mile <sup>2</sup> )	2.590	Square kilometer
Acre	0.4047	Hectare
Square foot (ft <sup>2</sup> )	0.0929	Square meter
Square inch (in <sup>2</sup> )	6.452	Square centimeter
Cubic yard (yd <sup>3</sup> )	0.765	Cubic meter
Cubic foot (ft <sup>3</sup> )	0.0283	Cubic meter
Pound/cubic yard (lbs/yd <sup>3</sup> )	0.5933	Kilogram/cubic meter
US gallon (US gal)	3.785	Liter
US gallon	0.833	Imperial gallon
MPH	1.61	Kilometer per hour
TMPH	1.459	TKPH
Cubic inch (in <sup>3</sup> )	0.016	Liter
Fluid ounce (fl oz)	29.57	Cubic centimeter
Long ton (lg ton)	1.016	Metric tonne
Short ton (sh ton)	0.907	Metric tonne
Pound (lb)	0.4536	Kilogram
Ounce (oz)	28.35	Gram
BTU	0.2520	Kilogram-calorie
Foot-pound (ft-lb)	0.1383	Kilogram-meter
Horse power (HP)	1.014	Metric horsepower
Pound/square inch (PSI)	0.0703	Kg/square centimeter
Pound/square inch (PSI)	6.895	Kilopascal

1 mile = 1,760 yds 1 yd = 3 ft 1 ft = 12 in 1 sq mile = 640 acres  
 1 acre = 43,560 sq ft 1 sq ft = 144 sq in 1 cu ft = 7.48 gal  
 1 gal = 231 cu in = 4 quarts liq 1 quart = 32 fl oz 1 fl oz = 1.80 cu in  
 1 sh ton = 2,000 lbs 1 lg ton = 2,240 lbs 1 lb = 16 oz, avdp.  
 1 BTU = 778 ft lb = 0.000393 HPH = 0.000293 KWH  
 1 HP = 550 ft lb/sec 1 atmosph = 14.7 psi

Inches to Millimeters

in/32	mm	in/32	mm	in/32	mm	in/32	mm
1	0.8	21	16.7	41	32.5	105	83.3
2	1.6	22	17.5	42	33.3	110	87.3
3	2.4	23	18.3	43	34.1	115	91.3
4	3.2	24	19.1	44	34.9	120	95.3
5	4.0	25	19.8	45	35.7	125	99.2
6	4.8	26	20.6	46	36.5	130	103.2
7	5.6	27	21.4	47	37.3	135	107.2
8	6.4	28	22.2	48	38.1	140	111.1
9	7.1	29	23.0	49	38.9	145	115.1
10	8.0	30	23.8	50	39.7	150	119.1
11	8.7	31	24.6	55	43.7	155	123.0
12	9.5	32	25.4	60	47.6	160	127.0
13	10.3	33	26.2	65	51.6	165	131.0
14	11.1	34	27.0	70	55.6	170	134.9
15	11.9	35	27.8	75	59.5	175	138.9
16	12.7	36	28.6	80	63.5	180	142.9
17	13.5	37	29.4	85	67.5	185	146.9
18	14.3	38	30.2	90	71.4	190	150.8
19	15.1	39	31.0	95	75.4	195	154.8
20	15.9	40	31.8	100	79.4	200	158.8

Millimeters to Inches

mm	in/32	mm	in/32	mm	in/32	mm	in/32
1	1	21	27	41	52	105	132
2	3	22	28	42	53	110	139
3	4	23	29	43	54	115	145
4	5	24	30	44	55	120	151
5	6	25	32	45	57	125	158
6	8	26	33	46	58	130	164
7	9	27	34	47	59	135	170
8	10	28	35	48	61	140	176
9	11	29	37	49	62	145	183
10	13	30	38	50	63	150	189
11	14	31	39	55	69		
12	15	32	40	60	76		
13	16	33	42	65	82		
14	18	34	43	70	88		
15	19	35	44	75	95		
16	20	36	45	80	101		
17	21	37	47	85	107		
18	23	38	48	90	113		
19	24	39	49	95	120		
20	25	40	50	100	126		

Conversion Tables

Pounds to Kilograms

lbs	kg	lbs	kg	lbs	kg	lbs	kg
1	0.5	220	99.8	800	362.9	4200	1905.1
10	4.5	240	108.9	900	408.2	4400	1995.8
20	9.1	260	117.9	1000	453.6	4600	2086.6
30	13.6	280	127.0	1100	499.0	4800	2177.3
40	18.1	300	136.1	1300	589.7	5000	2268.0
50	22.7	320	145.2	1400	635.0	5200	2358.7
60	27.2	340	154.2	1500	680.4	5400	2449.4
70	31.8	360	163.3	1600	725.8	5600	2540.2
80	36.3	380	172.4	1700	771.1	5800	2630.9
90	40.8	400	181.4	1800	816.5	6000	2721.6
100	45.4	420	190.5	1900	861.8	7000	3175.2
110	49.9	440	199.6	2000	907.2	8000	3628.8
120	54.4	460	208.7	2200	997.9	9000	4082.4
130	59.0	480	217.7	2400	1088.6	10000	4536.0
140	63.5	500	226.8	2600	1179.4	11000	4989.6
150	68.0	520	235.9	2800	1270.1	12000	5443.2
160	72.6	540	244.9	3000	1360.8	13000	5896.8
170	77.1	560	254.0	3200	1451.5	14000	6350.4
180	81.6	580	263.1	3400	1542.2	15000	6804.0
190	86.2	600	272.2	3600	1633.0	16000	7257.6
200	90.7	700	317.5	3800	1723.7	17000	7711.2
		4000	1814.4	18000	8164.8	19000	8618.4
				20000	9072.0		

Kilograms to Pounds

kg	lbs	kg	lbs	kg	lbs	kg	lbs
1	2	110	243	450	992	2100	4630
5	11	120	265	500	1102	2200	4850
10	22	130	287	550	1213	2300	5071
15	33	140	309	600	1323	2400	5291
20	44	150	331	650	1433	2500	5512
25	55	160	353	700	1543	2600	5732
30	66	170	375	750	1654	2700	5952
35	77	180	397	800	1764	2800	6173
40	88	190	419	850	1874	2900	6393
45	99	200	441	900	1984	3000	6614
50	110	210	463	950	2094	3500	7716
55	121	220	485	1000	2205	4000	8818
60	132	230	507	1100	2425	4500	9921
65	143	240	529	1200	2646	5000	11023
70	154	250	551	1300	2866	5500	12125
75	165	260	573	1400	3086	6000	13228
80	176	270	595	1500	3307	6500	14330
85	187	280	617	1600	3527	7000	15432
90	198	290	639	1700	3748	7500	16535
95	209	300	661	1800	3968	8000	17637
100	221	350	772	1900	4189	8500	18739
		400	882	2000	4409	9000	19841
						9500	20944
						10000	22046

Miles Per Hour to Kilometers Per Hour

mph	kph	mph	kph	mph	kph	mph	kph
1	1.61	16	25.74	31	49.88	46	74.01
2	3.22	17	27.35	32	51.49	47	75.62
3	4.83	18	28.96	33	53.10	48	77.23
4	6.44	19	30.57	34	54.71	49	78.84
5	8.05	20	32.18	35	56.32	50	80.45
6	9.65	21	33.79	36	57.92		
7	11.26	22	35.40	37	59.53		
8	12.87	23	37.01	38	61.14		
9	14.48	24	38.62	39	62.75		
10	16.09	25	40.23	40	64.36		
11	17.70	26	41.83	41	65.97		
12	19.31	27	43.44	42	67.58		
13	20.92	28	45.05	43	69.19		
14	22.53	29	46.66	44	70.80		
15	24.14	30	48.27	45	72.41		

Kilometers Per Hour to Miles Per Hour

kph	mph	kph	mph	kph	mph	kph	mph
1	0.62	26	16.16	51	31.70	76	47.23
2	1.24	27	16.78	52	32.32	77	47.86
3	1.86	28	17.40	53	32.94	78	48.48
4	2.49	29	18.02	54	33.56	79	49.10
5	3.11	30	18.65	55	34.18	80	49.72
6	3.73	31	19.27	56	34.80	81	50.34
7	4.35	32	19.89	57	35.43	82	50.96
8	4.97	33	20.51	58	36.05	83	51.58
9	5.59	34	21.13	59	36.67	84	52.21
10	6.22	35	21.75	60	37.29	85	52.83
11	6.84	36	22.37	61	37.91	86	53.45
12	7.46	37	23.00	62	38.53	87	54.07
13	8.08	38	23.62	63	39.15	88	54.69
14	8.70	39	24.24	64	39.78	89	55.31
15	9.32	40	24.86	65	40.40	90	55.94
16	9.94	41	25.48	66	41.02	91	56.56
17	10.57	42	26.10	67	41.64	92	57.18
18	11.19	43	26.72	68	42.26	93	57.80
19	11.81	44	27.35	69	42.88	94	58.42
20	12.43	45	27.97	70	43.51	95	59.04
21	13.05	46	28.59	71	44.13	96	59.66
22	13.67	47	29.21	72	44.75	97	60.29
23	14.29	48	29.83	73	45.37	98	60.91
24	14.92	49	30.45	74	45.99	99	61.53
25	15.54	50	31.08	75	46.61	100	62.15

Grade in Degrees to Grade in Percent

Grade in Degrees	Grade in Percent	Grade in Degrees	Grade in Percent
1°	1.8%	11°	19.4%
2°	3.5%	12°	21.3%
3°	5.2%	13°	23.1%
4°	7.0%	14°	24.9%
5°	8.8%	15°	26.8%
6°	10.5%	16°	28.7%
7°	12.3%	17°	30.6%
8°	14.0%	18°	32.5%
9°	15.8%	19°	34.4%
10°	17.6%	20°	36.4%

Inflation Pressure (kg/cm<sup>2</sup> to lbs/in<sup>2</sup>)

kg/cm <sup>2</sup>	lbs/in <sup>2</sup>						
0.1	1	2.6	37	5.1	72	7.6	108
0.2	3	2.7	38	5.2	74	7.7	109
0.3	4	2.8	40	5.3	75	7.8	111
0.4	6	2.9	41	5.4	77	7.9	112
0.5	7	3.0	43	5.5	78	8.0	114
0.6	9	3.1	44	5.6	80	8.1	115
0.7	10	3.2	45	5.7	81	8.2	116
0.8	11	3.3	47	5.8	82	8.3	118
0.9	13	3.4	48	5.9	84	8.4	119
1.0	14	3.5	50	6.0	85	8.5	121
1.1	16	3.6	51	6.1	87	8.6	122
1.2	17	3.7	53	6.2	88	8.7	124
1.3	18	3.8	54	6.3	89	8.8	125
1.4	20	3.9	55	6.4	91	8.9	126
1.5	21	4.0	57	6.5	92	9.0	128
1.6	23	4.1	58	6.6	94	9.1	129
1.7	24	4.2	60	6.7	95	9.2	131
1.8	26	4.3	61	6.8	97	9.3	132
1.9	27	4.4	62	6.9	98	9.4	133
2.0	28	4.5	64	7.0	99	9.5	135
2.1	30	4.6	65	7.1	101	9.6	136
2.2	31	4.7	67	7.2	102	9.7	138
2.3	33	4.8	68	7.3	104	9.8	139
2.4	34	4.9	70	7.4	105	9.9	141
2.5	36	5.0	71	7.5	107	10.0	142

Temperature (Centigrade to Fahrenheit)

°C	°F	°C	°F	°C	°F	°C	°F
-19	-2.2	+26	+78.8	+71	+159.8	+116	+240.8
-18	-0.4	27	80.6	72	161.6	117	242.6
-17	+1.4	28	82.4	73	163.4	118	244.4
-16	3.2	29	84.2	74	165.2	119	246.2
-15	5.0	30	86.0	75	167.0	120	248.0
-14	6.8	31	87.8	76	168.8	121	249.8
-13	8.6	32	89.6	77	170.6	122	251.6
-12	10.4	33	91.4	78	172.4	123	253.4
-11	12.2	34	93.2	79	174.2	124	255.2
-10	14.0	35	95.0	80	176.0	125	257.0
-9	15.8	36	96.8	81	177.8	126	258.8
-8	17.6	37	98.6	82	179.6	127	260.6
-7	19.4	38	100.4	83	181.4	128	262.4
-6	21.2	39	102.2	84	183.2	129	264.2
-5	23.0	40	104.0	85	185.0	130	266.0
-4	24.8	41	105.8	86	186.8	131	267.8
-3	26.6	42	107.6	87	188.6	132	269.6
-2	28.4	43	109.4	88	190.4	133	271.4
-1	30.2	44	111.2	89	192.2	134	273.2
0	32.0	45	113.0	90	194.0	135	275.0
+1	33.8	46	114.8	91	195.8	136	276.8
2	35.6	47	116.6	92	197.6	137	278.6
3	37.5	48	118.4	93	199.4	138	280.4
4	39.2	49	120.2	94	201.2	139	282.2
5	41.0	50	122.0	95	203.0	140	284.0
6	42.8	51	123.8	96	204.8	141	285.8
7	44.6	52	125.6	97	206.6	142	287.6
8	46.4	53	127.4	98	208.4	143	289.4
9	48.2	54	129.2	99	210.2	144	291.2
10	50.0	55	131.0	100	212.0	145	293.0
11	51.8	56	132.8	101	213.8	146	294.8
12	53.6	57	134.6	102	215.6	147	296.6
13	55.4	58	136.4	103	217.4	148	298.4
14	57.2	59	138.2	104	219.2	149	300.2
15	59.0	60	140.0	105	221.0	150	302.0
16	60.8	61	141.8	106	222.8		
17	62.6	62	143.6	107	224.6		
18	64.4	63	145.4	108	226.4		
19	66.2	64	147.2	109	228.2		
20	68.0	65					