

Physics and the “Internet-Truth”

Unfortunately the Internet has one bad side effect. If a wrong statement is copied and pasted often enough it becomes the truth and very difficult to correct. The interesting aspect is that there's a huge set of myths distributed around trailers in North America which I want to address here.

Please! Do not just copy and paste from here. Do your own research and after you found out that I am correct then post your own version of it. I am confident that you will find reliable sources (= not newsgroups but scientific ones) which confirm it or you have your own ability “to do the math” if you have the education in that field.

Trailer tires have to be always inflated to the pressure shown on the side wall. Partially **WRONG!**

The sidewall states what pressure is required for the tire to carry the specified load. If you don't need the full capacity of the tire you can deflate it and it will run better, provide more “suspension” and wear more uniform. Contact your tire manufacturer (Goodyear has data on their website) and provide them with the real load you have to carry. Then they can give you the required tire pressure for this load.

However, this applies to radial tires **ONLY!** Bias ply tires are the worst solution for higher speeds and running them at the highest possible pressure reduces the “walking” of the webbing. They are over-rated at 65mph (max) to start with and if you want to go faster than ~45mph the highest possible pressure is the best to keep them cooler.

Unfortunately even larger tire sales places distribute the wrong info and post it on their websites. Shame on them.

The Goodyear table (may not be applicable to a different tire manufacturer!):

Tire Size	Max Speed Rating (MPH)	Inflation Pressure - PSI										
		15	20	25	30	35	40	45	50	55	60	65
ST175/80R13	65	670	795	905	1000	1100(B)	1190	1270	1360(C)			
ST185/80R13	65	740	870	990	1100	1200(B)	1300	1400	1480(C)			
ST205/75R14	65	860	1030	1170	1300	1430(B)	1530	1640	1760(C)			
ST215/75R14	65	953	1110	1270	1410	1520(B)	1660	1790	1870(C)			
ST205/75R15	65	905	1070	1220	1360	1480(B)	1610	1720	1820(C)			
ST225/75R15	65	1060	1260	1430	1600	1760	1880	2020	2150(C)	2270	2380	2540(D)
ST235/80R16	65			1720	1920	2090	2270	2430	2600	2730	2870	3000(D)

or the same table from Maxxis (<http://www.maxxis.com/trailer/trailer-tire-loadinflation-chart>):

TIRE LOAD LIMITS [LBS] AT VARIOUS COLD INFLATION PRESSURES [PSI]
FOR ST TRAILER TIRES USED IN NORMAL HIGHWAY SERVICE

Tire Size	Max Speed Rating [MPH]	Inflation Pressure - PSI											
		25	30	35	40	45	50	55	60	65	70	75	80
ST205/75R14	65	1170	1300	1430(B)	1530	1640	1760(C)						
ST205/75R15	65	1220	1360	1480(B)	1610	1720	1820(C)	1940	2040	2150(D)			
ST215/75R14	65	1270	1410	1520(B)	1660	1790	1870(C)						
ST225/75R15	65	1430	1600	1760(B)	1880	2020	2150(C)	2270	2380	2540(D)	2620	2720	2830(E)
ST175/80R13	65	905	1000	1100(B)	1190	1270	1360(C)						
ST185/80R13	65	990	1100	1200(B)	1300	1400	1480(C)						
ST235/80R16	65	1720	1920	2090(B)	2270	2430	2600(C)	2730	2870	3000(D)	3130	3260	3420(E)

NEVER inflate the cold tire to more than the rated max value on the side wall! The table may show more than allowed. Take note of the max speed rating too! Only an LT tire would allow you to go higher.....

Only use ST tires on trailers. Wrong again!

The argument is that ST tires have stronger side walls which isn't true to start with unless we talk about "P" tires. For these you have to reduce the load capacity by 9% and if that rating is sufficient for your trailer they are suited too and make for the softest ride. Unfortunately "P" tires have low ratings to start with which means they are only suited for small trailers. "LT" tires have the side stability already included and if an LT tire has sufficient load capacity it makes for a good trailer tire. Some ST tires are even identical in internal construction to LT tires and the only difference is that the ST labeled one is rated for higher pressure which increases the load capacity significantly. In other words: ST tires can carry more load as they are used at much higher pressure which makes them stiffer. As they don't carry people their safety requirements (in US and Canada), blow out amongst many others, are lower which makes them what?? (hint, not higher quality).

One exception are trailer tires for extreme loads. These bias ply tires are designed to hold very high pressure and due to the way the reinforcement is designed they can handle loads regular tires won't be able to handle. The disadvantage is that they aren't good in handling higher speeds. They are more for slow moving equipment than for highway use. Bias ply tires also have a problem when the trailer isn't moved for quite some time. They develop a flat area which makes the tire "jump" for quite some time (the square tire joke). When running at higher speeds their webbing is flexing a lot and generates heat which is the number one killer of tires.

One last point. If you can choose between two tires with all parameters identical but the pressure for the rated load take the one with the lower pressure required. It has the better sidewall construction.

Trailer wheels don't have to be balanced. WRONG!

Sure, if you have bias ply tires it's not worth the effort as they change shape all the time and will never run round but every radial tire will run smoother and shake your load on the trailer less if the wheels are balanced. If you don't have a super high weight trailer and can get radial tires for the load rating you need go radial and have them balanced. Now, the "professionals" at my tire place still believe that trailer tires don't need balancing but they do it on demand. I'm fine with that.

Tongue weight has to be 10% of the trailer weight. WRONG!

Trailer tongue weight is a design parameter for trailers and not a "Physics constant" as people may want you to believe. Trailers need a certain amount of tongue weight to make them run stable. As higher the tongue weight is as lousier the design can be. The commonly used 8-10% for single axle and 5-7% for tandem and more axles in North America is simply what was decided in evolution to build the cheapest possible trailers. In a lot of cases trailer "manufacturers" won't be even able to calculate the design and at 10% they somehow work. I always got the blank stare (deer in a headlight) when I asked for the stability calculations when I was shopping for a utility trailer.

Required tongue weight is simplified a function of track width, suspension parameters, tire parameters and tongue length. If you have a trailer which was designed for 10% tongue weight and you extend the tongue there's no reason to move the load forward to get back to the 10%. You could actually move it further back as the increased length of the tongue provides more stability. As a rule of thumb and not really applicable everywhere and over a wide range (so take it with a big grain of salt!): If you increase tongue length by 10% and change nothing on the trailer your tongue weight goes down by 10%. However, the stability goes up by another ~5%. As a practical example... your trailer has a required tongue weight of 350lbs for a single axle 3500lbs trailer. By extending the

tongue by 10% the tongue weight will go down to 315lbs but you can move your load backwards to have a tongue weight of 297.5lbs and the same stability as you had before. Just to make sure: tongue length is the distance from the axle to the coupler!

There's more than tongue length to a good trailer stability design (like larger wheels are better and diagonal supports to prevent twisting or the entire suspension system) but as a rule of thumb the above works OK. There are many areas in the world where trailers have to be designed for stability at $<2.5\%$ tongue weight and it's not rocket science but simple physics.

A real negative effect of high tongue weight is that the stability of the vehicle-trailer combo gets worse as more tongue weight you have. On uneven surfaces (like bumps) a high tongue weight trailer either pushes the tail of the vehicle down even more but can also lift the same amount upwards which can really screw things up.

If you have a $<3500\#$ trailer without a folding tongue just add an additional 4ft folding length and the trailer will be as short as before for storage but you gain a lot for towing it.....

If you have surge brakes you shouldn't lube the ball/coupler. WRONG; now, where does this come from??

Whoever has dreamed up this fairy tale must have smoked some really good stuff! Surge brakes are activated by pushing onto the vehicle hitch and grease inside the coupler and/or the ball has zero impact on this function..... Lube/grease on the hitch ball prevents that the coupler wears heavy on the ball and make it fail over time. It's nasty and if you get your pants to close it leaves bad markings but it helps. You can tow without but then you may have to install a new hitch-ball sooner.

The only explanation for these myths I can find is that North American and even more so US trailers are following a completely different set of laws of Physics then elsewhere in the world. Might be dangerous to use them elsewhere when the laws of Physics all of a sudden change. Well, it must be! All trailers exported with new boats from the US to Europe have trailers specifically designed for that market with much tougher technical requirements (are there any in the US?) and the ones shipped with used boats can't be registered.....

This work is licensed under a [Creative Commons Attribution-ShareAlike 3.0 Unported License](https://creativecommons.org/licenses/by-sa/3.0/).