How does Bridgestone stay in the groove

For thousands of years, a well-dug moat was the best defense against an outsider disrupting your smooth-running castle.

Severe shoulder cupping is one of the biggest reasons fleets are forced to pull steer tires from service prematurely. If the shoulder wear spreads into the main ribs and the tread depth in the first groove measures 4/32˝ – regardless of the depth anywhere else on the tread – an Out-of-Service violation could be issued.

Bridgestone's Defense Groove structure works like a moat keeping shoulder wear at bay. Let's find out how it works.

Tell us about this small groove.

Its fundamental job is to help prevent the initiation and spread of shoulder edge wear.

But, before we go into that, let's explain why the Defense Groove design is even needed.

All tires are subject to irregular wear, but it's much more noticeable on slow wearing tires, like you'd find on tractor-trailers that run ultra-long distance.

Irregular wear is often the result of uneven pressure. The closer you are to the edge of a rib or shoulder, the less pressure there tends to be. The pressure differences may be tiny, but over tens of thousands of miles, these tiny differences can cause shoulder edge wear. It's not the fault of the tire; it's simply the nature of things.

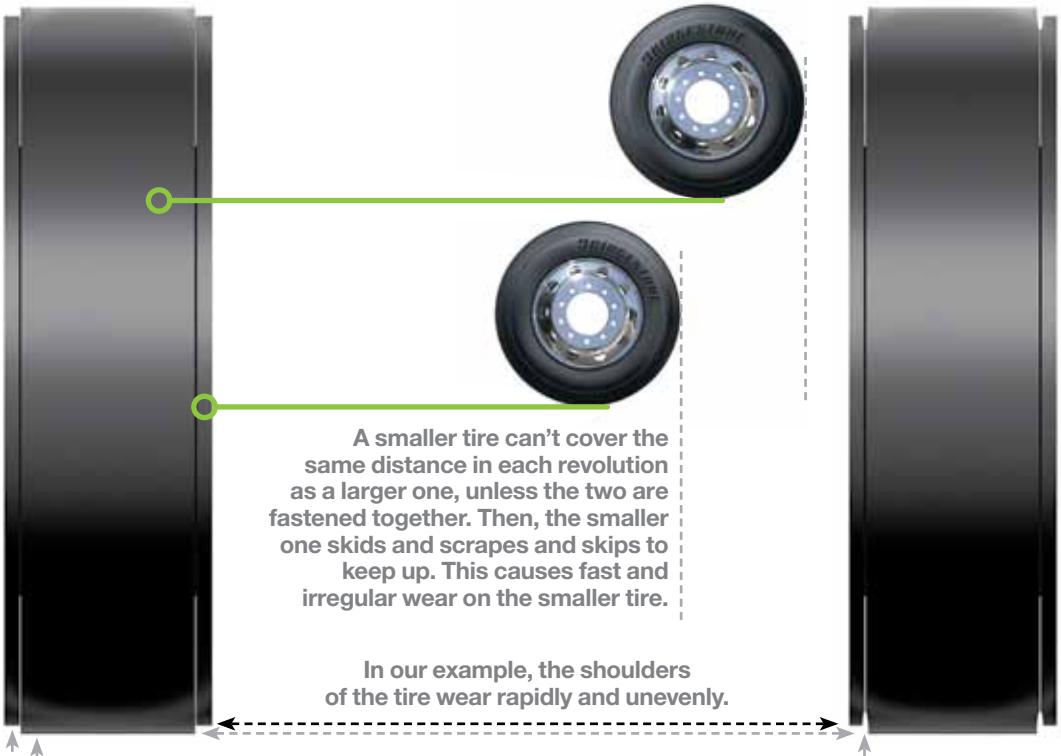
What does the edge wear look like?

On a solid shoulder rib tire, it's a small depression, generally just about the width of your finger, give or take a bit, wearing evenly and at the same rate as the rest of the ribs and grooves.

Most likely, however, the depression widens, marching closer to the main ribs.

The Defense Groove creates a fence, controlling the movement of this depression, so irregular wear cannot spread over to the ribs. It's easier to understand how a Defense Groove design works if you visualize it as a rib or a fence, rather than an empty groove.

Because it's filled with compressed air, a tire's tread tends to have a slightly curved shape. When it's pressed against the road, contact pressure is high in the center and less near the shoulders.



That's a bit like having two tires with smaller diameters fastened to the sides of a larger tire.

A smaller tire can't cover the same distance in each revolution as a larger one, unless the two are fastened together. Then, the smaller one skids and scrapes and skips to keep up. This causes fast and irregular wear on the smaller tire.

In our example, the shoulders of the tire wear rapidly and unevenly.

A Defense Groove design creates a sort of "moat" between the shoulders and center of the tread. The shoulders may wear rapidly, but the wear can't easily jump across the "moat" to spread to the center of the tread.

How so?

The Defense Groove design creates a narrow rib along the shoulder of the tire. The pressure is less here, and the rib wears more rapidly than the shoulder rib beside it.

This increases the pressure from the pavement at the very edge of the shoulder rib, helping to equalize pressure across the entire rib – just what we need to promote even wear – to equalize pressure.

As the tire wears, the defense "rib" wears more rapidly than the shoulder rib, continuing to equalize the pressure on the shoulder rib edge.

Why wouldn't it wear slower?

Consider this: imagine a dual assembly but one tire has a smaller diameter than the other. Because it has a smaller diameter, the smaller tire doesn't press against the pavement as hard and because it has a smaller circumference (as a result of its smaller diameter), it takes more revolutions to cover the same distance. Since both tires are bolted together, they have to make an identical number of revolutions to cover a given stretch of road.

The only way the smaller tire can do that is to slip and skid as the larger tire drags it along. The big tire wears out the smaller tire, while the smaller tire acts as a brake on the larger tire.

Like the shoulder?

Exactly. The closer you are to the edge of the shoulder, the less pressure there tends to be. The Defense Groove design creates a narrow rib – much like the smaller tire – along the shoulder of the tire. In a sense it sacrifices itself to protect the rib next to it for continued irregular wear protection.

Why isn't this feature found on all rib tires?

Tires built for metro, pickup-and-delivery and other short hauls are rarely affected by shoulder irregular wear. Let's face it, turning and maneuvering simply scrubs off most irregular wear that develops.

That's why a Defense Groove design isn't found on all rib tires. It depends on the application.

For example, let's say a long-distance steer tire is mounted by mistake on a truck normally reserved for pick up and delivery. The Defense Groove design may be torn away fairly quickly due to curbing, running over debris and even scrubbing. Again, it's not the fault of the mis-mounted tire; it's the brutal work environment and another reason why P&D tires are specially built.

That's why the Defense Groove feature is an essential irregular-wear-fighting structure for rib radials used in long-distance hauling. Without it, many steer and trailer tires wouldn't be able to log quite as many miles.

Is the Defense Groove feature found on trailer tires?

Some of Bridgestone's rib tires are all-position radials, which means they're suitable for both steer and trailer axle positions. Others are engineered as steer tires while others are built as free-rolling trailer tires.

As long as the tires remain on a long-distance or regional hauling schedule, the Defense Groove structure does a terrific job fighting the initiation and spread of shoulder wear – whether it's on a steer, all-position or trailer radial. TA

The Defense Groove structure does a great job of fighting shoulder wear in long-distance and regional driving, but can be severely damaged in urban hauling. Here you can see a big chunk of the Defense Groove structure was torn away when the tire was run up and down a curb.