

[Back to Main](#) | [Back to Introduction](#)

Anatomy of a Tire

- 1. [Typical Materials Composition of a Tire](#)
- 2. [Typical tire compositions by Weight](#)¹⁾
- 3. [Rubber weight by tire component](#)
- 4. [Examples of Rubber Compounds for Tire](#)
- 5. [Steel Tire Cord Analysis](#)

1. Typical Materials Composition of a Tire

This table lists the typical types of materials used to manufacture tires.
Typical Composition of a Tire
Synthetic Rubber
Natural Rubber
Sulfur and sulfur compounds
Silica
Phenolic resin
Oil: aromatic, naphthenic, paraffinic
Fabric: Polyester, Nylon, Etc.
Petroleum waxes
Pigments: zinc oxide, titanium dioxide, etc.
Carbon black
Fatty acids
Inert materials
Steel Wire

2. Typical tire compositions by Weight¹⁾

This lists the major classes of materials used to manufacture tires by the percentage of the total weight of the finished tire that each material class represents.

Passenger Tire

Natural rubber	14 %
Synthetic rubber	27%
Carbon black	28%
Steel	14 - 15%
Fabric, fillers, accelerators,antiozonants, etc.	16 - 17%
Average weight:	New 25 lbs, Scrap 20 lbs.

Truck Tire

Natural rubber	27 %
Synthetic rubber	14%
Carbon black	28%
Steel	14 - 15%
Fabric, fillers, accelerators,antiozonants, etc.	16 - 17%
Average weight:	New 120 lbs., Scrap 100 lbs.

3. Rubber weight by tire component²⁾

A tire is manufactured from several separate components, such as tread, innerliner, beads, belts, etc. This table shows which components account for the rubber used to make the tire.

RUBBER PERCENT BY WEIGHT IN A NEW RADIAL PASSENGER TIRE

TREAD	32.6%
BASE	1.7%
SIDEWALL	21.9%
BEAD APEX	5.0%
BEAD INSULATION	1.2%
FABRIC INSULATION	11.8%
INSULATION OF STEEL CORD	9.5%
INNERLINER	12.4%
UNDERCUSHION	3.9%
	100.0%

4. Examples of Rubber Compounds for Tire^{2),3)}

These examples are chosen to show a diversity of the tire compounds which make it difficult to reuse these into new tire materials. Each manufactures have developed their own compounds for paticular usage.

	Tread (PHR)	Base (PHR)	Sidewall (PHR)	Innerliner (PHR)
Natural Rubber	50.0	100.0	75.0	
Styrene-Butadiene Rubber	50.0		25.0	
Isobutylene-Isoprene Rubber				100.0
Carbon Black (Grade N110)	50.0	15.0	20.0	
Carbon Black (Grade N330)		25.0	35.0	
Carbon Black (Grade N765)				50.0
Processing Oil	7.5	5.0	5.0	3.0
Antioxidant	1.0	0.75	1.0	1.0
Antioxidant Wax			2.0	
Stearic Acid	2.0	4.0	3.0	1.5
Zinc Oxidant	5.0	5.0	5.0	5.0
Accelerator (High)		1.0	0.7	
Accelerator (Middle)	1.25			0.4
Accelerator (Low)				0.4
Sulfur	2.5	3.0	2.8	2.0

*PHR = Per Hundred Rubber
*Carbon grade = ASTM grading : Particle size and structure of carbon are different.

5. Steel Tire Cord Analysis¹⁾

ASTM 1070 Steel Tire Wire

There are approximately 2.5 pounds of steel belts and bead wire in a passenger car tire. This material is made from high carbon steel with a nominal tensile strength of 2,750 MN/m2 and the following typical composition:

	STEEL BELTS	BEAD WIRE
Carbon	0.67 - 0.73%	0.60% min.
Manganese	0.40 - 0.70%	0.40 - 0.70%
Silicon	0.15 - 0.03%	0.15 - 0.30%
Phosphorus	0.03% max.	0.04% max.
Sulfur	0.03% max.	0.04% max.
Copper	Trace	Trace
Chromium	Trace	Trace
Nickel	Trace	Trace
COATING	66% Copper 34% Zinc	98% Brass 2% Tin

References

- 1. [Scrap Tire Management Council](#)
- 2. James E. Mark, Burak Erman, Frederick R. Eirich. "Science and Technology of Rubber" 1994 Academic Press Inc.
- 3. G. Alliger, I. J. Sjöthun. "Vulcanization of Elastomers" 1963 Reinhold Publishing Co.

[Back to Top](#) | [Go to Next](#)