

Typical Materials Composition of a Tyre

This table lists the typical types of materials used to manufacture tyres.
Typical Composition of a Tyre
Synthetic Rubber
Natural Rubber
Sulphur and sulphur 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

Typical tyre compositions by Weight

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 Tyre

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 Tyre

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.

Rubber weight by tire component

A tyre is manufactured from several separate components, such as tread, inner liner, beads, belts, etc.

This table shows which components account for the rubber used to make the tyre.

RUBBER PERCENT BY WEIGHT IN A NEW RADIAL PASSENGER TYRE

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	<u>3.9%</u>
	100.0%

Examples of Rubber Compounds for Tyre

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

	Tread (PHR)	Base (PHR)	Sidewall (PHR)	Inner liner (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
Sulphur	2.5	3.0	2.8	2.0

*PHR = Per Hundred Rubber

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

Steel Tyre Cord Analysis

ASTM 1070 Steel Tire Wire

There are approximately 2.5 pounds of steel belts and bead wire in a passenger car tyre. 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.
Sulphur	0.03% max.	0.04% max.
Copper	Trace	Trace
Chromium	Trace	Trace
Nickel	Trace	Trace
COATING	66% Copper 34% Zinc	98% Brass 2% Tin

Source: <http://www.p2pays.org/ref/11/10504/html/intro/tire.htm#3>.