Standardization of Tyres,Tubes Wheel Rims and Suspension systems

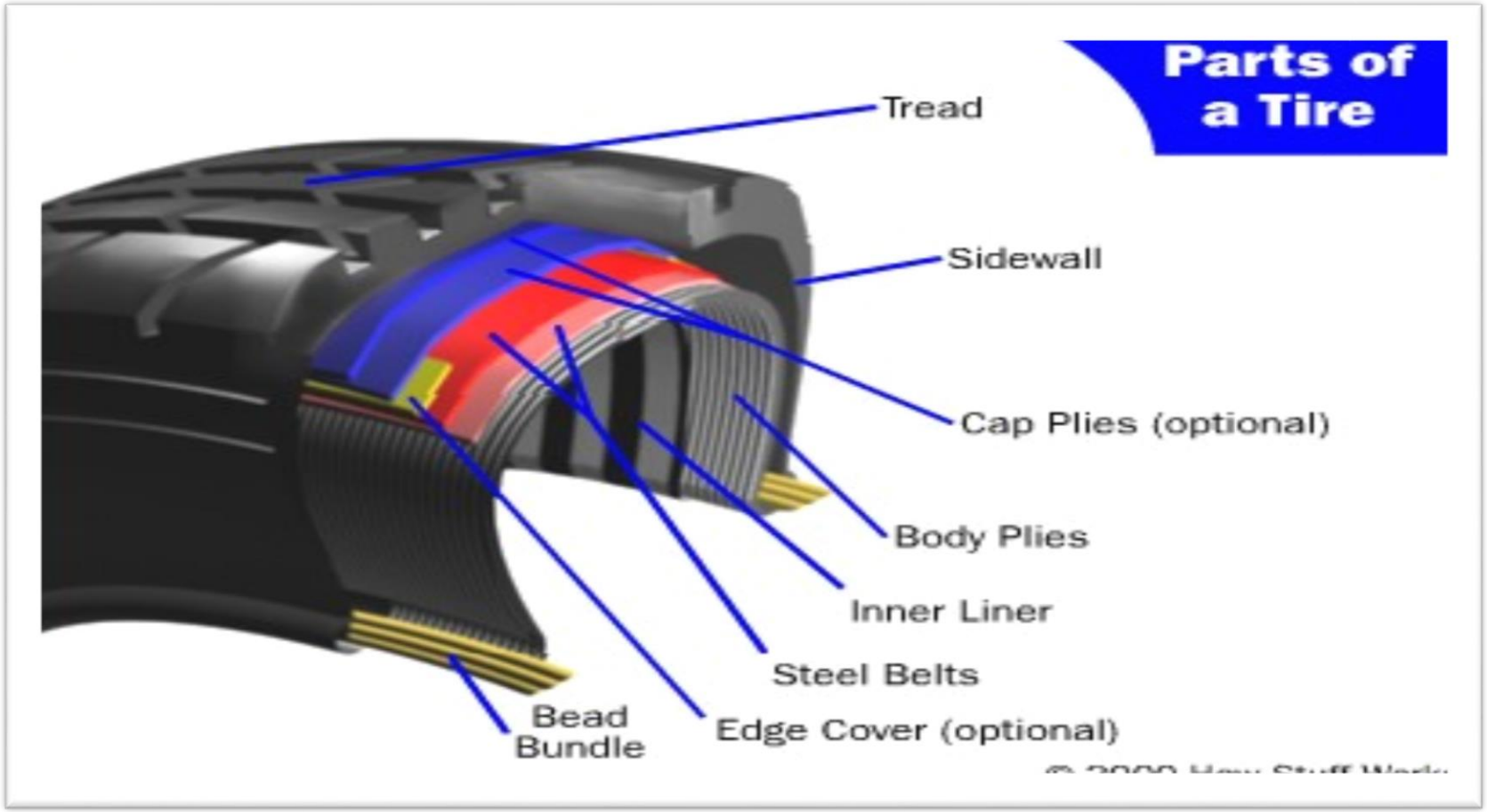
R.R.Singh
Head,TED, BIS

Vehicle Wheel

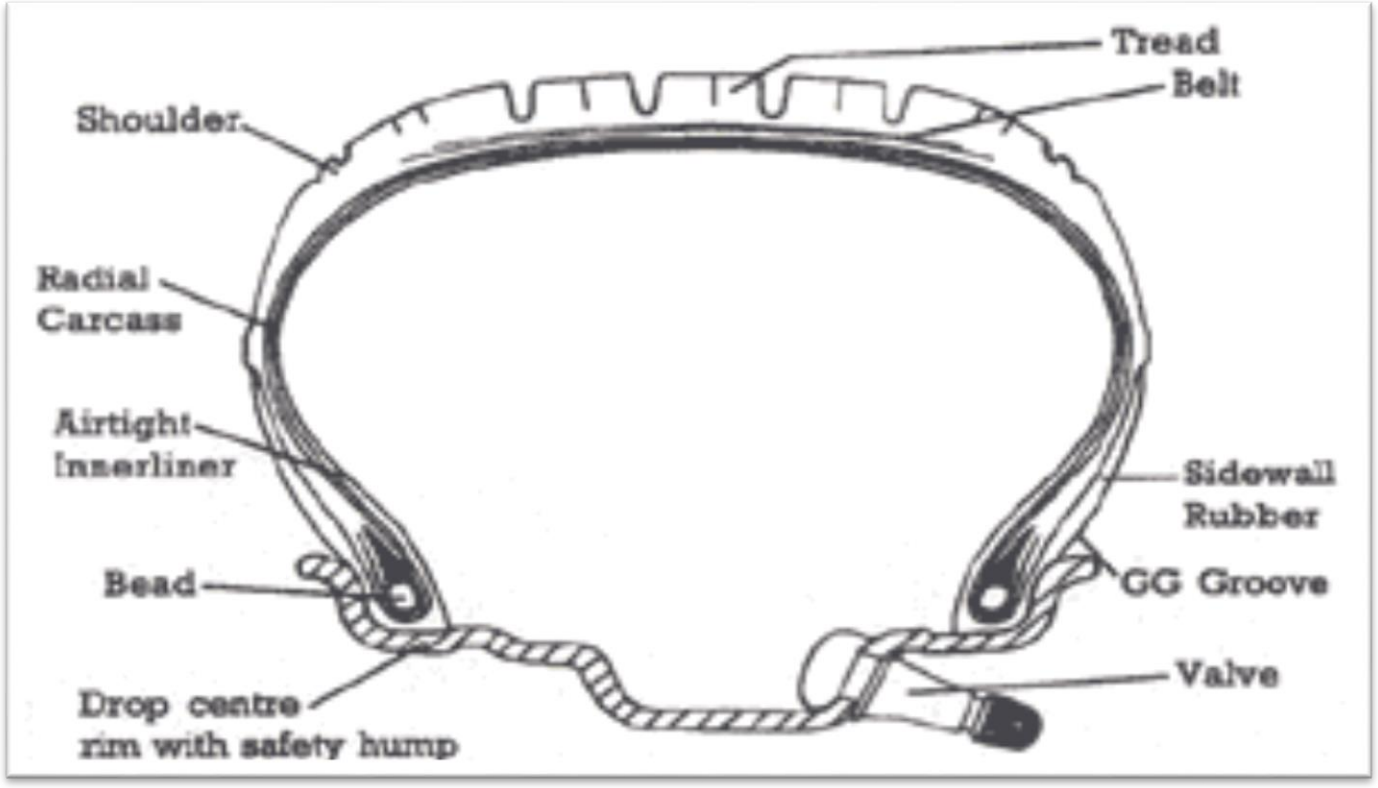
- **Rim**
- **Tyre**
- **Tube**

Typical Automotive Wheel

PARTS OF A TYRE



TUBELESS TYRES



BASIC OVERVIEW OF TYRE BUILDING

- **Rubber (Natural and Synthetic) - 38%**
- **Fillers Carbon black, silica, carbon chalk) - 30%**
- **Reinforcing materials (steel, rayon, nylon) - 16%**
- **Plasticizers (oils and resins) - 10%**
- **Chemicals for vulcanization (sulphur, zinc oxide, various chemicals) - 4%**
- **Chemicals as antioxidents to counter ozone effects and material fatigue - 1%**
- **Miscellaneous - 1%**

FUNCTIONS OF WHEELS

- **To support the weight of the vehicle by exchanging vertical forces with the road surface.**
- **To exchange with the road surface longitudinal and side forces which are able to move the vehicle and control it’s path.**

STANDARDIZATION OF TYRES

- **National Standards**
- **International Standards**

National Standards

- **IS Specifications formulated under the aegis of BIS**
- **AIS formulated under the aegis of AISC**

INTERNATIONAL STANDARDS/REGULATIONS ON TYRES

- **ISO Standards**
- **FMVSS (Federal Motor Vehicle Safety Standards)**
- **ETRTO (European Tyre and Rim Technical Organisation)**
- **JATMA (Japan Automobile Tyre Manufacturers Association)**
- **UNECE Regulations etc.**

ISO Standards on Tyres

- **ISO 10191 : 1995 - Passenger car tyres - Verifying tyre capabilities - Laboratory test methods**
- **ISO 10231:2003 - Motorcycle tyres -- Test methods for verifying tyre capabilities**
- **ISO 10454 : 1993 - Truck and bus tyres - Verifying tyre capabilities - Laboratory test methods**

TESTS ARE INCLUDED IN THE ISO STANDARDS ON TYRES

- I) TYRE MARKING
- II) TYRE DIMENSIONS
- III) TYRE STRENGTH TEST
- IV) ENDURANCE TEST
- V) HIGH SPEED TEST
- VI) BEAD UNSEATING RESISTANCE TEST FOR TUBELESS TYRE

INDIAN STANDARDS ON TYRES

- **IS 15627: 2005 – Automotive Vehicles – Pneumatic tyres for two and three – wheeled motor vehicles – Specification;**
- **IS 15633 : 2005 – Automotive vehicles – Pneumatic tyres for passenger car vehicles – Diagonal and radial ply – Specification, and**
- **IS 15636: 2012 - on Automotive vehicles – Pneumatic tyres for commercial vehicles – Diagonal and radial ply – Specification**

ECE REGULATION ON TYRES

- **ECE R 75 - Uniform Provisions Concerning the Approval of Pneumatic Tyres for Motorcycles and Mopeds.**
- **ECE R 30 - Uniform provisions concerning the approval of pneumatic tyres for motor vehicles and their trailers.**
- **ECE R 54 - Uniform provisions concerning the approval of pneumatic tyres for commercial vehicles and their trailers.**

IS 15627:2005

- **SCOPE - This standard prescribes the general, dimensional and performance requirements of new pneumatic tyres for two and three wheeled motor vehicles.**

TESTS INCLUDED IN IS 15627:2005

- **I) TYRE MARKING**
- **II) TYRE DIMENSIONS**
- **III) TREAD WEAR INDICATOR**
- **IV) TYRE STRENGTH TEST**
- **V) ENDURANCE TEST**
- **VI) LOAD/SPEED PERFORMANCE TEST**
- **VIII) DYNAMIC GROWTH(FOR 2 & 3 WHEELER TYRES)**

TESTS ARE INCLUDED IN FMVSS 109

- **I) TYRE MARKING**
- **II) TYRE DIMENSIONS**
- **III) TREAD WEAR INDICATOR**
- **IV) TYRE STRENGTH TEST**
- **V) ENDURANCE TEST**
- **VI) HIGH SPEED TEST**

TESTS ARE INCLUDED IN ECE R - 75

- **I)TYRE MARKING**
- **II)TYRE DIMENSIONS**
- **III)LOAD/SPEED PERFORMANCE TEST**
- **IV)DYNAMIC GROWTH(FOR 2 & 3 WHEELER TYRES)**

IS 15633 : 2005

- **SCOPE- This standard specifies the general, dimensional and the performance requirements of new radial ply and diagonal ply pneumatic tyres, designed for vehicles in categories M1, T1 and T2.**

TESTS INCLUDED IN IS 15633:2005

- **I) TYRE MARKING**
- **II) TYRE DIMENSIONS**
- **III) TREAD WEAR INDICATOR**
- **IV) TYRE STRENGTH TEST**
- **V) ENDURANCE TEST**
- **VI) LOAD/SPEED PERFORMANCE TEST**
- **VIII) BEAD UNSEATING RESISTANCE TEST(FOR TUBELESS TYRES)**

TESTS ARE INCLUDED IN FMVSS 109

- **I) TYRE MARKING**
- **II) TYRE DIMENSIONS**
- **III) TREAD WEAR INDICATOR**
- **IV) TYRE STRENGTH TEST**
- **V) ENDURANCE TEST**
- **VI) HIGH SPEED TEST**
- **VII) BEAD UNSEATING RESISTANCE TEST(FOR TUBELESS TYRES)**

TESTS ARE INCLUDED IN ECE R - 30

- **I)TYRE MARKING**
- **II) TYRE DIMENSIONS**
- **III) TREAD WEAR INDICATORS**
- **III) LOAD/SPEED PERFORMANCE TEST**

IS 15636: 2012

- **SCOPE - This standard specifies the general, dimensional, and performance requirements of new pneumatic tyres designed primarily, but not only, for vehicles in categories M2,M3,N,T3 and T4. However, it does not apply to tyre types identified by speed category symbols corresponding to speeds below 80 km/h.**

TESTS ARE INCLUDED IN FMVSS 119

- **I) TYRE MARKING**
- **II) TREAD WEAR INDICATOR**
- **III) TYRE STRENGTH TEST**
- **IV) ENDURANCE TEST**
- **V) HIGH SPEED TEST**

TESTS ARE INCLUDED IN ECE R - 54

- **I)TYRE MARKING**
- **II) TYRE DIMENSIONS**
- **III) LOAD/SPEED PERFORMANCE TEST**
- **IV) ENDURANCE TEST**

DIFFERENCE BETWEEN INDIAN STANDARDS AND FMVSS

- **Dynamic Growth of Tyres (For 2 and 3 wheeler vehicle tyres) is not covered under FMVSS, rest all tests are there in FMVSS 109 and 119. Low Inflation Pressure Performance Test, which is covered in FMVSS 139, is not covered in any Indian Standard on Tyres.**

Comparison of IS 15627:2005, ECE R- 75 and FMVSS 119

TESTS	IS 15627 : 2005	ECE R - 75	FMVSS 119
Tyre marking	√	√	√
Tyre dimensions	√	√	√
Tread wear indicator	√	X	√
Tyre strength test	√	X	√
Endurance test	√	X	√
Load/Speed performance test	√	√	√
Dynamic Growth	√	√	X

Comparison of IS 15633:2005, ECE R- 30 and FMVSS 109

TESTS	IS 15633:2005	ECE R-30	FMVSS 109
Tyre Markings	√	√	√
Tyre Dimensions	√	√	√
Tread wear indicators	√	√	√
Tyre strength test	√	X	√
Endurance test	√	X	√
Load/Speed performance test	√	√	√
Bead Unseating Resistance Test(For Tubeless Tyres)	√	X	√

FMVSS 119

TESTS	IS 15636 : 2005	ECE R- 54	FMVSS 119
Tyre marking	√	√	√
Tyre dimensions	√	√	X
Tread wear indicator	√	X	√
Tyre strength test	√	X	√
Endurance test	√	√	√
Load/Speed performance test	√	√	√

Indian Standard on Tubes

- **IS 13098 – Automotive Vehicles – Tubes for Pneumatic Tyres – Specification**
  - **Materials, Form and Fit**
  - **Elongation test**
  - **Splice Strength test**
  - **Set after Ageing**
  - **Accelerated Ageing**
  - **Air Tightness**

Indian Standard on Wheel Rims

- **IS 10694(Part 1):1993Automotive vehicles - Rims - General requirements Part 1 Nomenclature designation marking and measurement (first revision)**
- **IS 10694(Part 2):1996 Automotive vehicles - Rims - General requirements Part 2 Passenger car (second revision)**
- **IS 10694(Part 3):1991 Automotive vehicles - Rims - General requirements Part 3 Commercial vehicles rims (first revision)**
- **IS 10694(Part 4):1983 General requirements for rims for automotive vehicles Part 4 Scooter and scooter derivative rim**

Indian Standard on Wheel Rims

- **IS 10694(Part 5):1987 General requirements for rims for automotive vehicles Part 5 Moped, motorcycle and motorcycle derivative rims (first revision)**
- **IS 10694(Part 6):1988 General requirements for rims for automotive vehicles Part 6 Rims for agricultural tractors, tillers and implements (first revision)**
- **IS 10694(Part 7):1983 General requirements for rims for automotive vehicles Part 7 Industrial truck rims**
- **IS 10694(Part 8):1983 General requirements for rims for automotive vehicles Part 8 Earthmoving machine rims (first Revision)**

Future Perspective

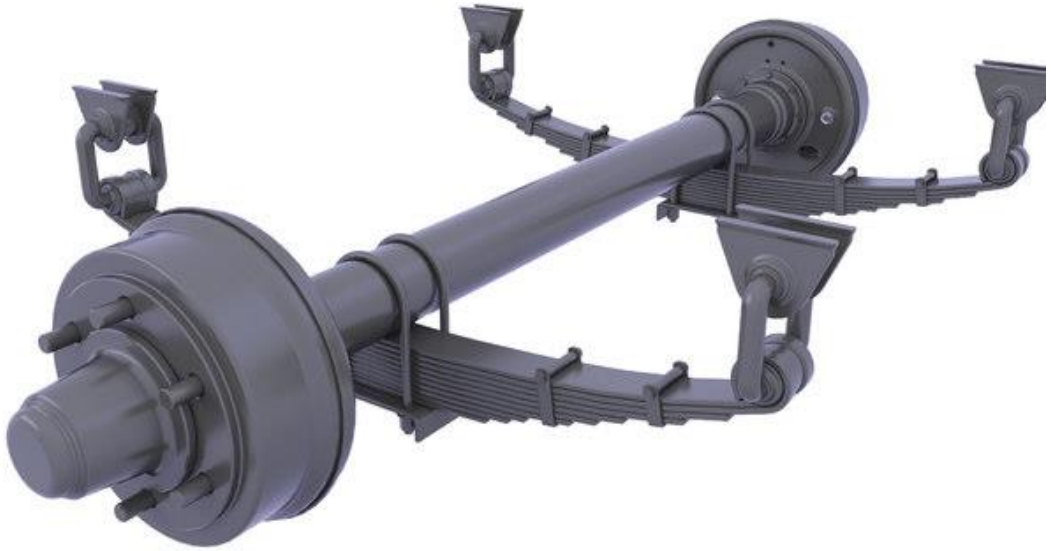
- **Many new vehicles are coming which are sensitive to :**
  - **Speed**
  - **Acceleration**
  - **Braking**
  - **Ride comfort**
  - **Cornering forces etc**
- **Tyres for such vehicles require additional tests such as**
  - **Ride comfort test**

Future Perspective (Contd..)

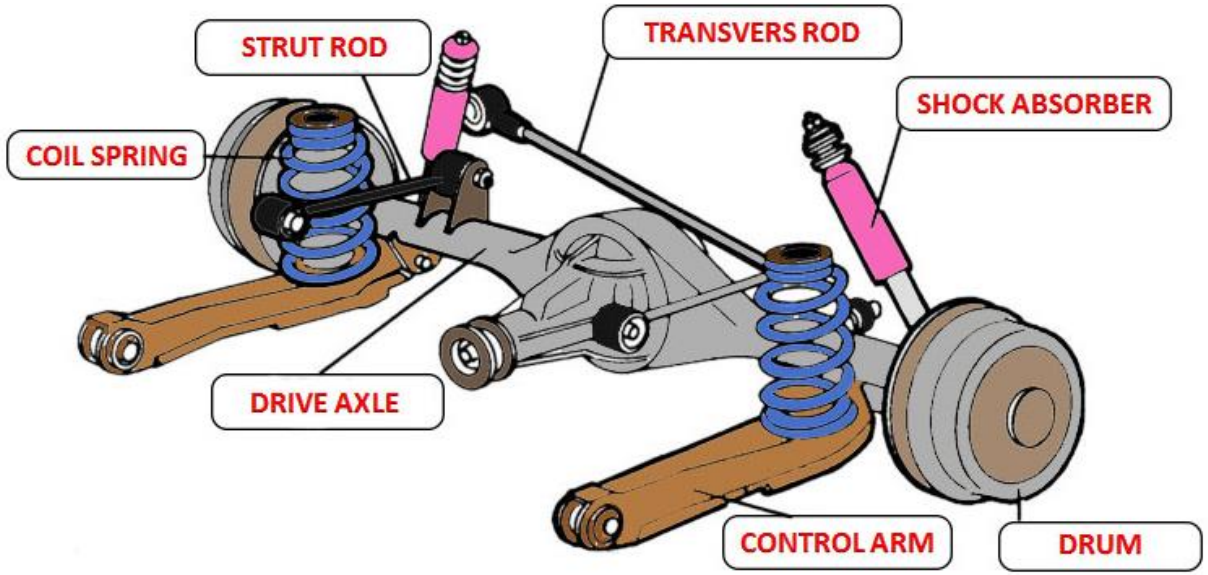
- **Handling and Brake Performance test**
- **Stability test**
- **Rolling Resistance coefficient**
- **Wear Resistance test**
- **Side wall strength**
- **Exterior noise**
- **Uniformity test**

Future Perspective (Contd..)

- **Anti damage performance**
- **Durability test**
- **Flat Spot**
- **Rain grove handling**
- **Brittle point temperature**
- **Anti pitch cut performance etc.**



Suspension Systems

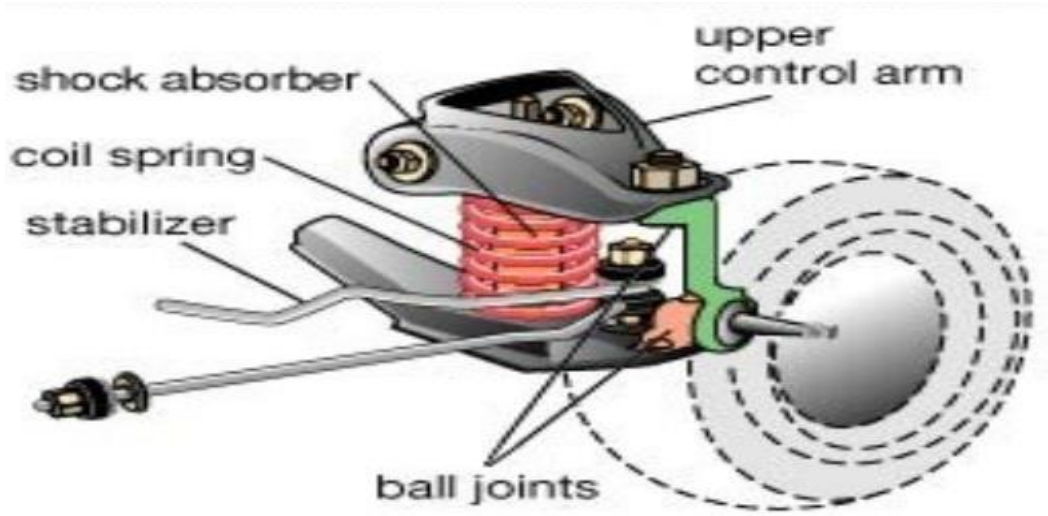


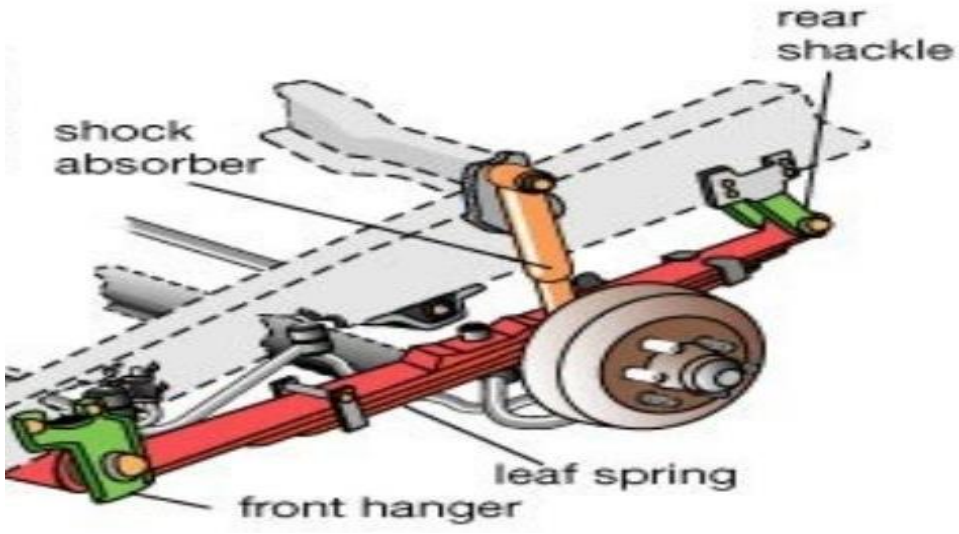
Suspension system

- Suspension is the term given to the system of springs, shock absorbers and linkages that connects a vehicle to its wheels.
- Serve a dual purpose – contributing to the vehicle's handling and braking.
- Protects the vehicle itself and any cargo or luggage from damage and wear

Springs

Helical Springs





Leaf Springs

Standards on Helical Springs

IS Number	IS Title
IS/ISO 2162-2 : 1993 ISO 2162: Part-2: 1993	Technical product documentation - Springs: Part 2 presentation of data for cylindrical helical compression springs
IS 7906 : Part 1 : 1997 (First Revision)	Helical compression springs: Part 1. design and calculation for springs made from circular section wire and bar (First Revision)
IS 7906 : Part 2 : 1975	Helical compression springs: Part 2 specification for cold coiled springs made from circular section wire an d bar
IS 7906 : Part 3 : 1975	Helical compression springs: Part 3 data sheet for specifications for springs made from circular section wire and bar
IS 7906 : Part 4 : 1987	Helical compression springs: Part 4 selection of standard cold coiled springs made from circular section wire and bar

Standards on Helical Springs

IS Number	IS Title
IS 7906 : Part 5 : 2004 (Second Revision)	Helical compression springs: Part 5 hot coiled springs made from circular section bars - Specification (Second Revision)
IS 7906 : Part 6 : 1978	Helical compression springs: Part 6 design and calculations for springs made from rectangular section bar - Steel
IS 7906 : Part 7 : 1989	Helical compression springs: Part 7 quality requirements for cylindrical coil compression springs used mainly as vehicle suspension springs
IS 7906 : Part 8 : 1989	Helical compression springs: Part 8 method of inspection of hotcoiled compression springs made from circular section bars
IS 7907 : Part 1 : 2004 (First Revision)	Helical extension springs october 2004: Part 1 design and calculation for springs made from circular section wire and bar (First Revision)

Standards on Helical Springs

IS Number	IS Title
IS 7907 : Part 2 : 1976	Helical extension springs: Part 2 specification for cold coiled springs made from circular section wire and bar
IS 7907 : Part 3 : 1975	Helical extension springs: Part 3 data sheet for specifications for springs made from circular section wire and bar
IS 7907 : Part 4 : 1987	Specification for helical extension springs: Part 4 selection of standard cold coiled springs made - From circular section wire and bar

Standards on Leaf Springs

IS Number	IS Title
IS 8924 : 1978	Specification for bushes for leaf spring assemblies for automotive suspension
IS 9484 : 1980	Specification for centre bolts for leaf springs
IS 9574 : 2004 (Second Revision)	Leaf springs assembly clips - Specification (Second Revision)
IS 10876 : 1984	Specification for buckles for laminated springs for railway rocling stock

THANK YOU !!!