Tire & Wheel Fundamentals
Tire Function

- Provide traction (friction) with the road surface
- Provide cushion between the road and the metal wheel
Tire Construction

- **Tube Tires**
  - Have a tube inside the tire
  - Tube is filled with air
  - Used on some trucks & motorcycles
  - Not common on Passenger vehicles

- **Tubeless Tires**
  - Tire is filled with air
  - Air is held between the tire & the wheel
  - Used on most Passenger vehicles

- **Both made with “Plies”**
  - **Plies** – Layers of cord, shaped on a form & impregnated with rubber
Tire Construction Cont.

Bias Ply

- Plies are placed in a criss-cross pattern to create the structure of the tire

Pros:

- Strong in all directions because of the overlapping plies

Cons:

- Plies move against each other generating heat
- Tread tends to “squirm” as it meets the road increasing wear
Tire Construction Cont.

Bias Belted

- Stabilizer Belts are placed over top of the plies to stabilize the tire and help protect from punctures.
Tire Construction Continued

Radial

- Plies are placed parallel to each other from one bead to the other
- Belts are then added to the top of the plies parallel to the bead for added strength
- Tread is then Vulcanized to the top of the belts

Pros

- More flexible than Bias Ply tires
- Keeps more rubber on the road while turning, reducing skid
- Better fuel economy because of less resistance
- Less tire wear

Cons

- Not as stiff
Tire Sizing

What do all the numbers mean???
Tire Sizing

What do all the numbers mean???

LT 205/65 R 17 92 T

Can you tell me know???
Tire Type

- Letter designates tire type:
  - “P” Passenger tire
  - “LT” Light truck tire
  - “C” Commercial tire
  - “T” Temporary/spare tire
Tire Width

- Tread width in millimeters
- This tire’s width would be 235 mm
Aspect Ratio

- Tire height-to-width ratio
- Aspect ratio = 75
- Sidewall height is 75% of the tire width
- Aspect ratio of this tire is 235mm × 75% = 176mm tall sidewall (235×0.75 = 176)

Yes this is rounded from 176.25
“R” designates the tire is a radial tire

Radial tires have plies that go from bead to bead
Rim Diameter

- Rim diameter is given in inches
  - 13 = 13"
  - 14 = 14"
  - 15 = 15" etc.
Mud and Snow Rating

- M+S stands for mud and snow (used on all-season tires)
- Good all-weather performance
- May not be suitable in heavy snow

- Driving in snow? tire should have the mountain snowflake symbol
- Meets severe snow standards set out by RMA
- Recommended in weather 7°C or Colder
Treadwear Rating

- Treadwear is given as a number
- the higher the number, the longer the tire will last
  - Note: Treadwear is not always reliable between different tire manufacturers
Traction Rating

- Traction (wet braking test) is given as an AA, A, B, or C rating
  - AA = best traction
  - A = intermediate traction
  - B = acceptable traction
  - C = poor traction rating
Temperature Rating

- Temperature is given as an A, B, or C rating
  - A = best
  - B = intermediate
  - C = acceptable
- The higher the rating, the more resistant to temperature build-up
- The more a tire heats up, the quicker it wears
Maximum Tire Inflation (Cold)

Labeled on the sidewall of the tire

Never Exceed this rating when the tire is cold

Where do you find the proper inflation value for a vehicle?

On the inside of the drivers door

In the owners manual
The maximum speed at which the vehicle should travel

Can be shown in three ways on a tire:

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<thead>
<tr>
<th>Type</th>
<th>Speed Rating</th>
<th>Maximum Speed</th>
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<tr>
<td>L</td>
<td>75 mph</td>
<td>120 km/h</td>
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<tr>
<td>M</td>
<td>81 mph</td>
<td>130 km/h</td>
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<tr>
<td>N</td>
<td>87 mph</td>
<td>140 km/h</td>
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<td>P</td>
<td>93 mph</td>
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<tr>
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<td>170 km/h</td>
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<tr>
<td>S</td>
<td>112 mph</td>
<td>180 km/h</td>
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<tr>
<td>T</td>
<td>118 mph</td>
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<tr>
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</tr>
<tr>
<td>V</td>
<td>149 mph</td>
<td>240 km/h</td>
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</table>
What is the Speed Rating of the following tire?

Q - 99mph - 160km/h - Studless and Studable winter tires
Maximum Load

- the weight a tire can carry at the recommended air pressure
- e.g. 1300 lbs
- Are the tires needed for a minivan or delivery van?
- Don’t do what this person did!
Load Index

- 2-digit # that determines the tire’s maximum load carrying capacity

**Came into effect in 1991 and placed after the tire size:**

225/50R16 **89S**
## Load Index

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</table>
What is the Load Index of the following tire?

87 - 1201lbs - 560kg
Tire Sizing

What do all the numbers mean???

LT 205/65 R 17 92 T

Can you tell me know???
DOT Codes

DOT: Department of Transportation

Before 2000 DOT codes had 3 digits
Now DOT codes have 4 digits

First 2 digits = week of the year the tire was made (01 = first week in January)

3rd digit (2000 and older) = year (1=1991)

3rd & 4th digits (after 2000) = year (01 = 2001)

Example: DOT 8PY806
The 8PY is the manufacturing shift code and the 806 is the date the tire was actually made (8th week of 2006)
Inflation & Wear Problems
Inflation & Wear Problems

- under inflated: excessive wear on outer tread
- over inflated: excessive wear in middle of tread

wear bars flush with tread: tire needs replacing!
Tire wear from misalignment

Front

TOE

Toe Out

Toe In

CAMBER

CAMBER ANGLE

Positive

Vertical

Camber ANGLE

Negative

Vertical
Tire Rotation

- Must be used with directional tires.
- Reduces balancing issues and ply separation.

Most common Rotation Pattern
Split Rims

- used on many ¾ ton pick-ups into the early 70’s
- DO NOT demount, inflate or install!
Inflation Cage

- This is a MUST if you are inflating a split rim!
Wheel Balance

Wheel tramp

Static imbalance

Wheel Balance

imbalance causes vibration in the vehicle or a steering wheel that shakes

Wheel shimmy

Dynamic imbalance

wheel balancers correct this imbalance in the wheel/tire assembly
Wheel Balance

Proper Balance

- Single weight on outside
- Single weight on inside

Improper Balance

- Two weights on one side that are not contacting each other
Wheel Terminology

- **SAFETY RIDGES**: Prevent tire from coming off the rim during a blowout
- **WELL**: Allows the tire to be mounted on the wheel without tearing it
Wheel Offset

- **Positive Offset**
- **Zero Offset**
- **Negative Offset**
Wheel Torque Sequence
Wheel Torque Sequence

Why are these sequences used?

- To tighten the wheel on evenly
- So you don’t bend or stretch the studs
Measuring lug patterns

4-Lug: Middle of two holes directly across from one another.

5-Lug: Back of hole to the center of the second bolt hole.

6-Lug: Same as 4-lug

8-Lug: Same as 4-lug
“Demo Time”

Tire Replacement

Tire Balancing

Tire Repair