

2004 SUSPENSION

Tires And Wheels - Vue

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Wheel Nut	125 N.m	92 lb ft
Wheel Nut Cap	5 N.m	44 lb in

DIAGNOSTIC INFORMATION AND PROCEDURES

TIRE DIAGNOSIS - IRREGULAR OR PREMATURE WEAR

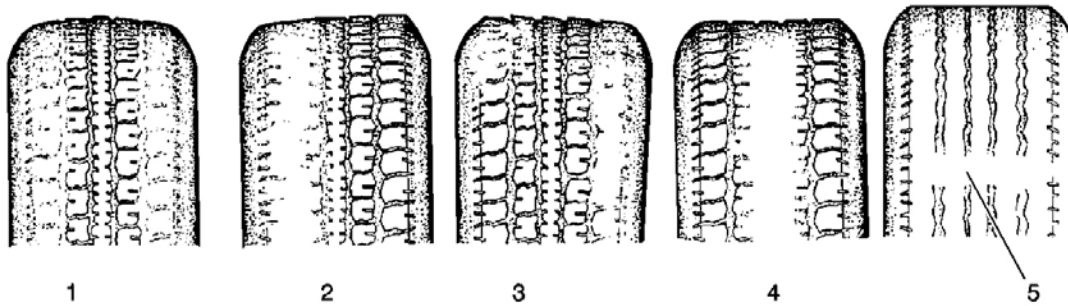


Fig. 1: Tire Wear

Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 1

Callout	Component Name
1	Under-inflation, Hard Cornering, Lack of Regular Rotation
2	Incorrect Wheel Alignment, Hard Cornering, Lack of Regular Rotation
3	Incorrect Wheel Alignment, Shock Absorber Failure
4	Over-inflation, Heavy Acceleration, Lack of Regular Rotation
5	Normal Wear to the Wear Indicator

Inspection Procedure

1. Inspect the front tire wear.

2. Inspect the rear tire wear.
3. Rotate the tires if any of the following conditions exist:
 - The amount of time or mileage since the last tire rotation matches the maintenance schedule.
 - The outer tread blocks are worn more than the middle tread blocks (1).
 - The outer tread blocks are worn more than the inner tread blocks (2).
 - The middle tread blocks are worn more than the outer tread blocks (4).
4. Measure the wheel alignment if any of the following conditions exist:
 - The tread blocks have feathered edges (3).
 - The outer tread blocks are worn more than the inner tread blocks (2).
 - The inner tread blocks are worn more than the outer tread blocks (2).
5. Inspect the struts or the shock absorbers if the tire tread exhibits a cupped appearance (3).

TIRE DIAGNOSIS - WADDLE COMPLAINT

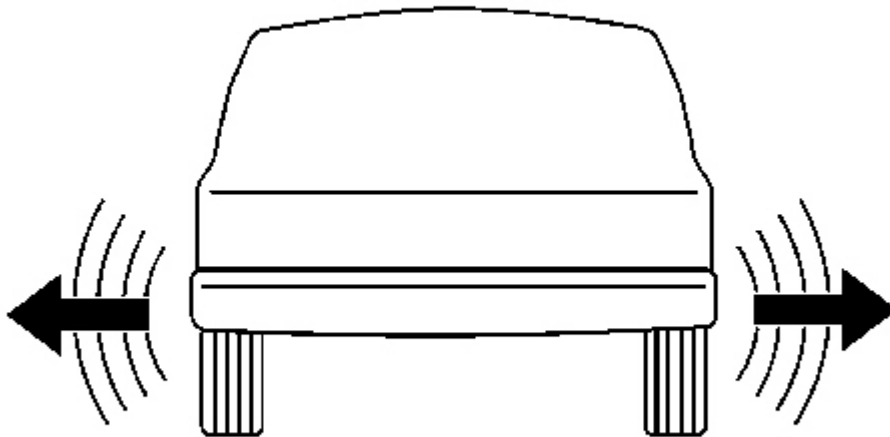


Fig. 2: Identifying Tire Waddle
Courtesy of GENERAL MOTORS CORP.

Tire waddle is a side to side movement at the front of the vehicle and/or the rear of the vehicle. Tire waddle can be caused by the following conditions:

- A steel belt not being straight within the tire
- Excessive lateral runout of the tire
- Excessive lateral runout of the wheel

The tire waddle is most noticeable at a low speed of about 8-48 km/h (5-30 mph). Tire waddle may appear as ride roughness at 80-113 km/h (50-70 mph). Tire waddle may appear as a vibration at 80-113 km/h (50-70 mph).

Inspection Procedure

1. Raise and support the vehicle with safety stands. Refer to **Lifting and Jacking the Vehicle** in General Information.

CAUTION: Wear gloves when inspecting the tires in order to prevent personal injury from steel belts sticking through the tire.

2. Perform the following preliminary inspection:
 1. Mark the tire with a crayon in order to note the start and the stop position.
 2. Rotate each tire and wheel by hand.
 3. Inspect the tire for bulges or bent wheels. Replace as necessary.
3. Use tire substitution in order to identify the faulty tire. Perform the following steps for a tire substitution check:
 1. Use a comparable tire in order to replace each tire, one at a time.
 2. Test drive the vehicle.
 3. If the problem is tire or wheel related, you will eliminate the problem when you remove the faulty tire from the vehicle.

RADIAL TIRE LEAD/PULL CORRECTION

Radial Tire Lead/Pull Correction

Step	Action	Yes	No
DEFINITION: Lead/pull is the deviation of the vehicle from a straight path on a level road with no pressure on the steering wheel.			
1	Did you perform the Vehicle Leads/Pull diagnostic table in Suspension General Diagnosis?	Go to Step 2	Go to Vehicle Leads/Pulls in Suspension General Diagnosis
2	Road test the vehicle to verify the complaint. Select a smooth level surface to perform the test. Does the condition exist?	Go to Step 3	System OK
3	1. Cross-switch the front tire/wheel assemblies. Refer to Tire and Wheel Removal and Installation . 2. Road test the vehicle on a smooth level surface. Does the vehicle still lead/pull?	Go to Step 4	System OK

4	Does the vehicle lead/pull in the opposite direction?	Go to Step 5	Go to Measuring Wheel Alignment in Wheel Alignment
5	<ol style="list-style-type: none"> 1. Cross-switch the left front tire/wheel assembly with the left rear tire/wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> . 2. Road test the vehicle on a smooth level surface. <p>Does the vehicle still lead/pull?</p>	Go to Step 6	Go to Step 7
6	<ol style="list-style-type: none"> 1. Cross-switch the right front tire/wheel assembly with the right rear tire/wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> . 2. Road test the vehicle on a smooth level surface. <p>Does the vehicle still lead/pull?</p>	Go to Measuring Wheel Alignment in Wheel Alignment	Go to Step 8
7	Replace the left rear tire. Refer to <u>Tire Mounting and Dismounting</u> . Is the repair complete?	Go to Step 9	-
8	Replace the right rear tire. Refer to <u>Tire Mounting and Dismounting</u> . Is the repair complete?	Go to Step 9	-
9	Verify proper vehicle operation. Does the original condition still exist?	Go to Step 1	System OK

REPAIR INSTRUCTIONS

TIRE AND WHEEL REMOVAL AND INSTALLATION

Tools Required

J 39544-KIT Torque Limiting Socket Set

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

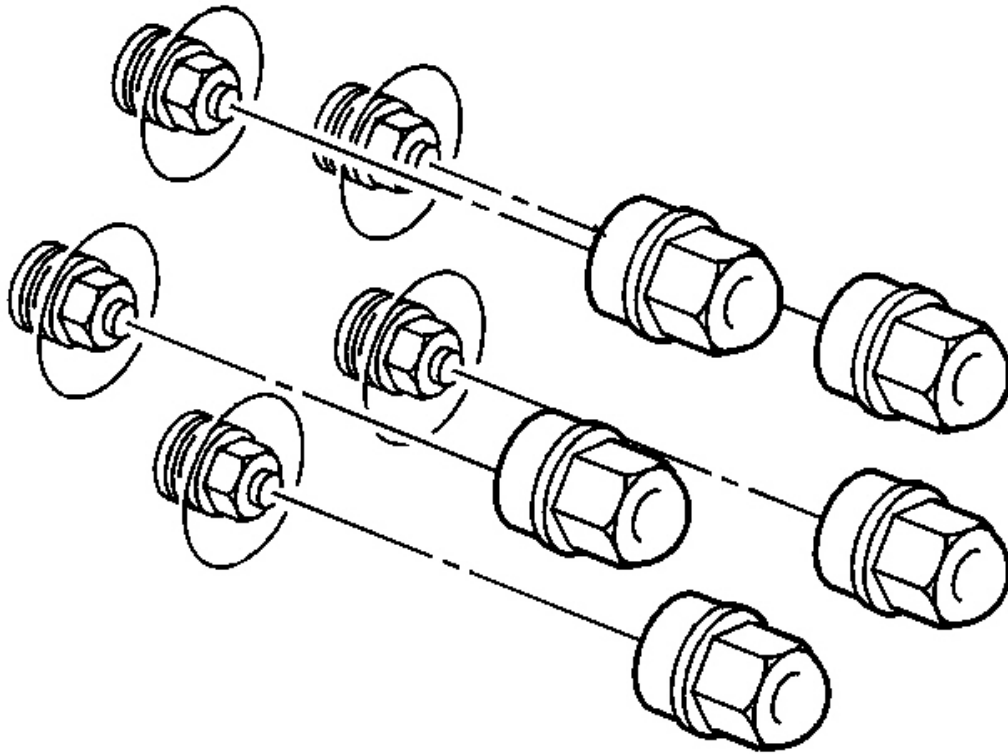


Fig. 3: Wheel Center Cap & Nut Caps
Courtesy of GENERAL MOTORS CORP.

2. Remove the wheel center cap, if equipped.
3. Remove the wheel nut caps, if equipped.

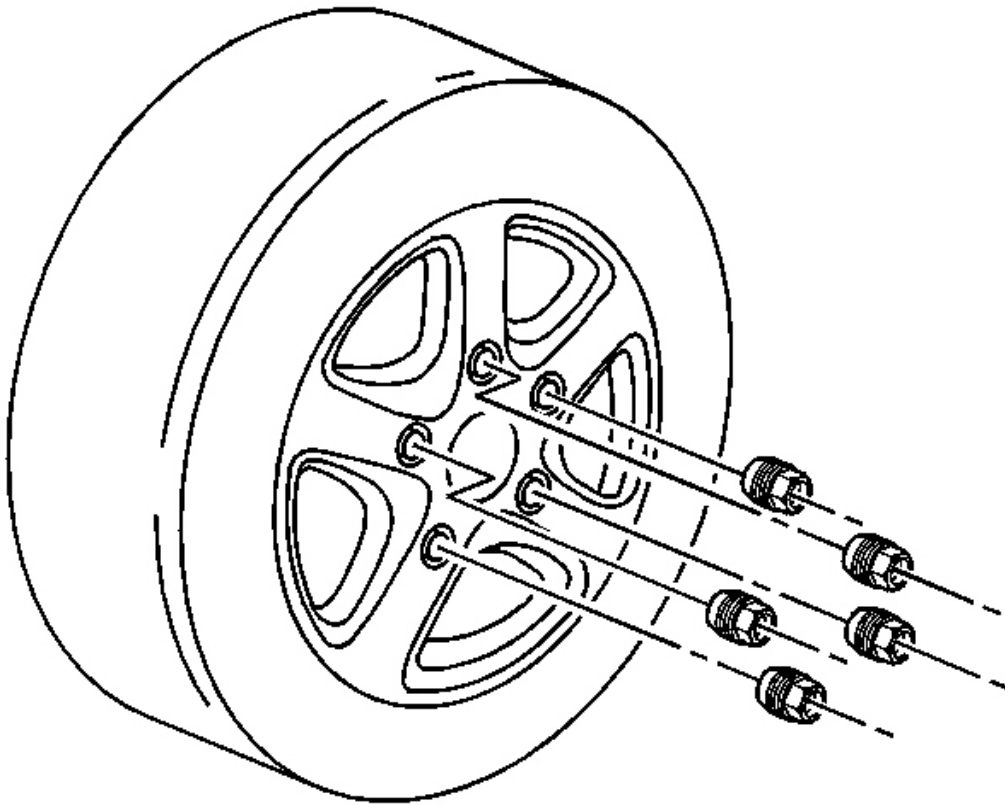


Fig. 4: Wheel Hub & Wheel Nuts
Courtesy of GENERAL MOTORS CORP.

4. Mark the relationship of the wheel to the hub.
5. Remove the wheel nuts.

CAUTION: If penetrating oil gets on the vertical surfaces between the wheel and the rotor or drum it could cause the wheel to work loose as the vehicle is driven, resulting in loss of control and an injury accident.

NOTE: Removing the wheel may be difficult because of foreign materials or a tight fit between the wheel and the hub/rotor. Slightly tap the tire side wall with a rubber mallet in order to remove the wheel. Failure to follow these instructions may result in damage to the wheel.

6. Remove the tire and wheel assembly from the vehicle. If the tire and wheel assembly is difficult to

remove, perform the following steps:

1. Install and tighten all wheel nuts on the affected wheel.
2. Loosen each wheel nut 2 turns.
3. Lower the vehicle.
4. Rock the vehicle from side to side.
5. Start the engine.
6. Drive the vehicle forward slightly.
7. Apply the brakes quickly and firmly.
8. Drive the vehicle backward slightly.
9. Apply the brakes quickly and firmly.
10. Repeat this procedure, if necessary.

Installation Procedure

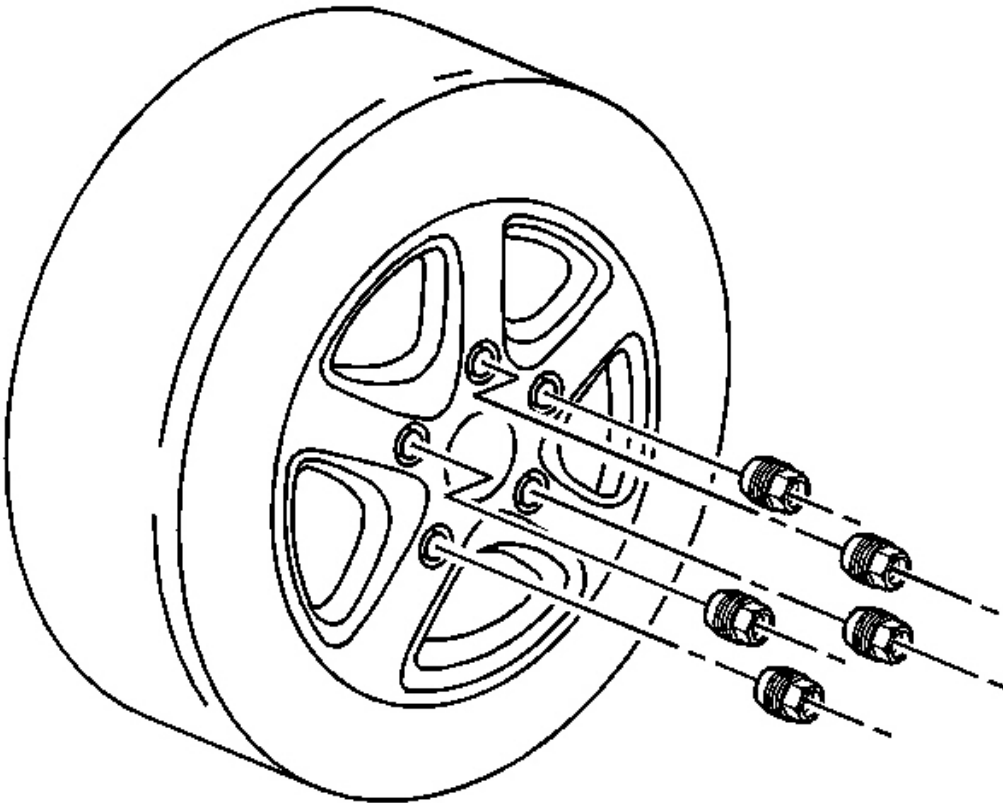


Fig. 5: Wheel Hub & Wheel Nuts

Courtesy of GENERAL MOTORS CORP.

CAUTION: Before installing the wheels, remove any buildup of corrosion on the wheel mounting surface and brake drum or disc mounting surface by scraping and wire brushing. Installing wheels with poor metal-to-metal contact at the mounting surfaces can cause wheel nuts to loosen. This can cause a wheel to come off when the vehicle is moving, causing loss of control and possibly personal injury.

IMPORTANT: Wheel nuts, studs, and mounting surfaces must be clean and dry.

1. Remove any corrosion or foreign material from the wheel and the hub mounting surfaces.
2. Clean the threads on the wheel studs and wheel nuts.
3. Install the tire and wheel assembly. Align the locating mark of the wheel to the hub.
4. Install the wheel nuts.

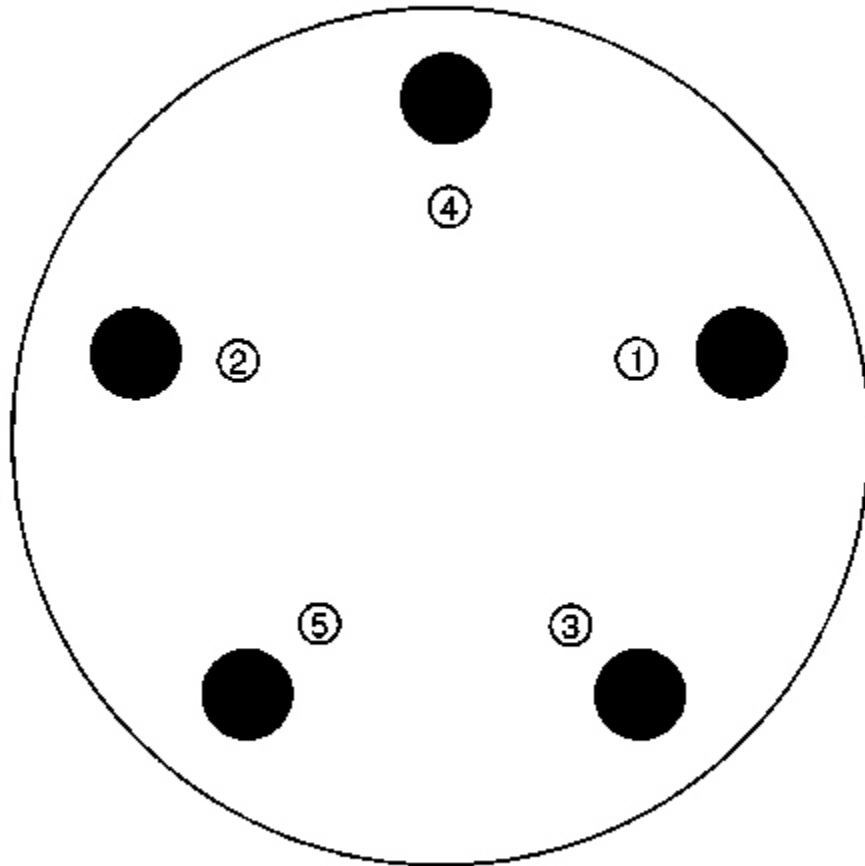


Fig. 6: Identifying Wheel Nut Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: A torque wrench or J 39544 must be used to ensure that wheel nuts are tightened to specification. Never use lubricants or penetrating fluids on wheel stud, nuts, or mounting surfaces, as this can raise the actual torque on the nut without a corresponding torque reading on the torque wrench. Wheel nuts, studs, and mounting surfaces must be clean and dry. Failure to follow these instructions could result in wheel, nut, and/or stud damage.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Tighten the nuts evenly and alternately in a cross or star pattern, in order

to avoid excessive runout.

- Using the **J 39544-KIT** , tighten the wheel nuts in a cross or star pattern.

Tighten: Tighten the nuts to 125 N.m (92 lb ft).

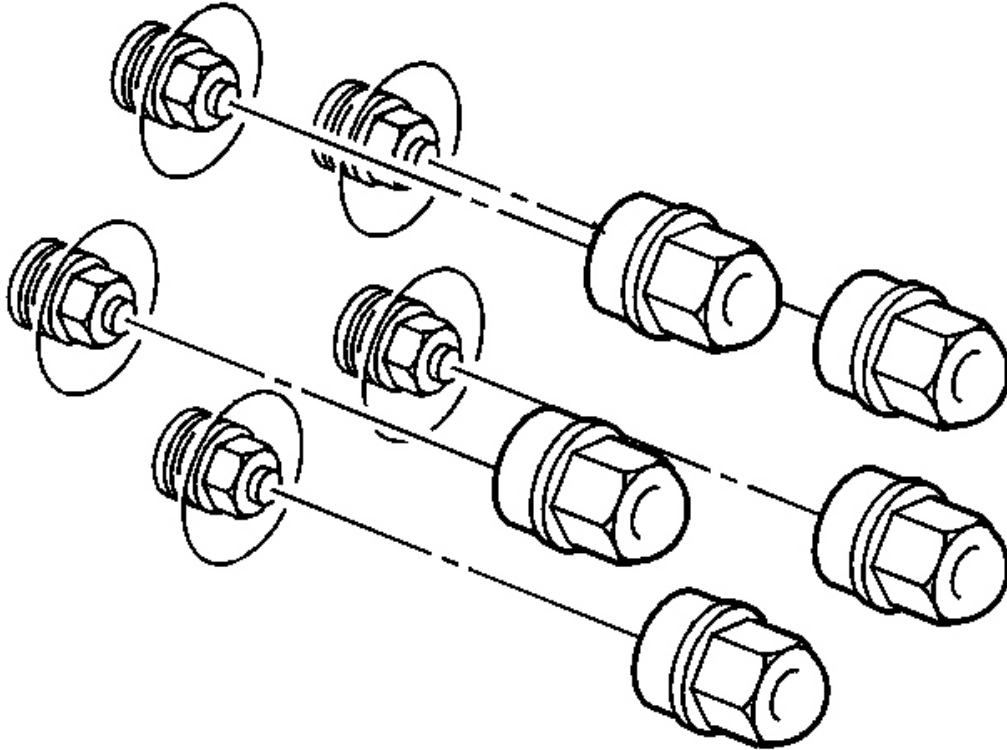


Fig. 7: Wheel Center Cap & Nut Caps
Courtesy of GENERAL MOTORS CORP.

- Install the wheel center cap, if equipped.
- Install the wheel nut caps, if equipped.

Tighten: Tighten the caps to 5 N.m (44 lb in).

- Lower the vehicle.

Many different materials and techniques are available on the market in order to repair tires. Not all of the materials and techniques work on some types of tires. Tire manufacturers have published detailed instructions on how and when to repair tires. Obtain the instructions from the manufacturer. If the vehicle is equipped with a compact spare tire, do not repair the compact spare.

TIRE MOUNTING AND DISMOUNTING

NOTE: Use a tire changing machine in order to dismount tires. Do not use hand tools or tire irons alone in order to remove the tire from the wheel. Damage to the tire beads or the wheel rim could result.

NOTE: Do not scratch or damage the clear coating on aluminum wheels with the tire changing equipment. Scratching the clear coating could cause the aluminum wheel to corrode and the clear coating to peel from the wheel.

NOTE: Damage to either the tire bead or the wheel mounting holes can result from the use of improper wheel attachment or tire mounting procedures. It takes up to 70 seconds for all of the air to completely exhaust from a large tire. Failure to follow the proper procedures could cause the tire changer to put enough force on the tire to bend the wheel at the mounting surface. Such damage may result in vibration and/or shimmy, and under severe usage lead to wheel cracking.

1. Deflate the tire completely.

IMPORTANT: Rim-clamp European-type tire changers are recommended.

2. Use the tire changer in order to remove the tire from the wheel.
3. Use a wire brush or coarse steel wool in order to remove any rubber, light rust or corrosion from the wheel bead seats.

NOTE: When mounting the tires, use an approved tire mounting lubricant. **DO NOT** use silicon or corrosive base compounds to lubricate the tire bead and the wheel rim. A silicon base compound can cause the tire to slip on the rim. A corrosive type compound can cause tire or rim deterioration.

4. Apply an approved Lubricant to the tire bead and the wheel rim.
5. Use the tire changer in order to install the tire to the wheel.

CAUTION: To avoid serious personal injury, do not stand over tire when inflating. The bead may break when the bead snaps over the safety hump. Do not exceed 275 kPa (40 psi) pressure when inflating any tire if beads are not seated. If 275 kPa (40 psi) pressure will not seat the beads, deflate, relubricate the beads and reinflate. Overinflating

may cause the bead to break and cause serious personal injury.

6. Inflate the tire to the proper air pressure.
7. Ensure that the locating rings are visible on both sides of the tire in order to verify that the tire bead is fully seated on the wheel.

TIRE ROTATION

Rotate the tires and wheels at frequent intervals to equalize wear. Refer to **Scheduled Maintenance** in Maintenance and Lubrication. In addition to scheduled rotation, rotate the tire and wheel whenever uneven tire wear is noticed.

Radial tires tend to wear faster in the shoulder area, particularly in front positions. Radial tires in non-drive locations may develop an irregular wear pattern that may increase tire noise. This makes regular rotation especially necessary.

Refer to **Tire and Wheel Removal and Installation** .

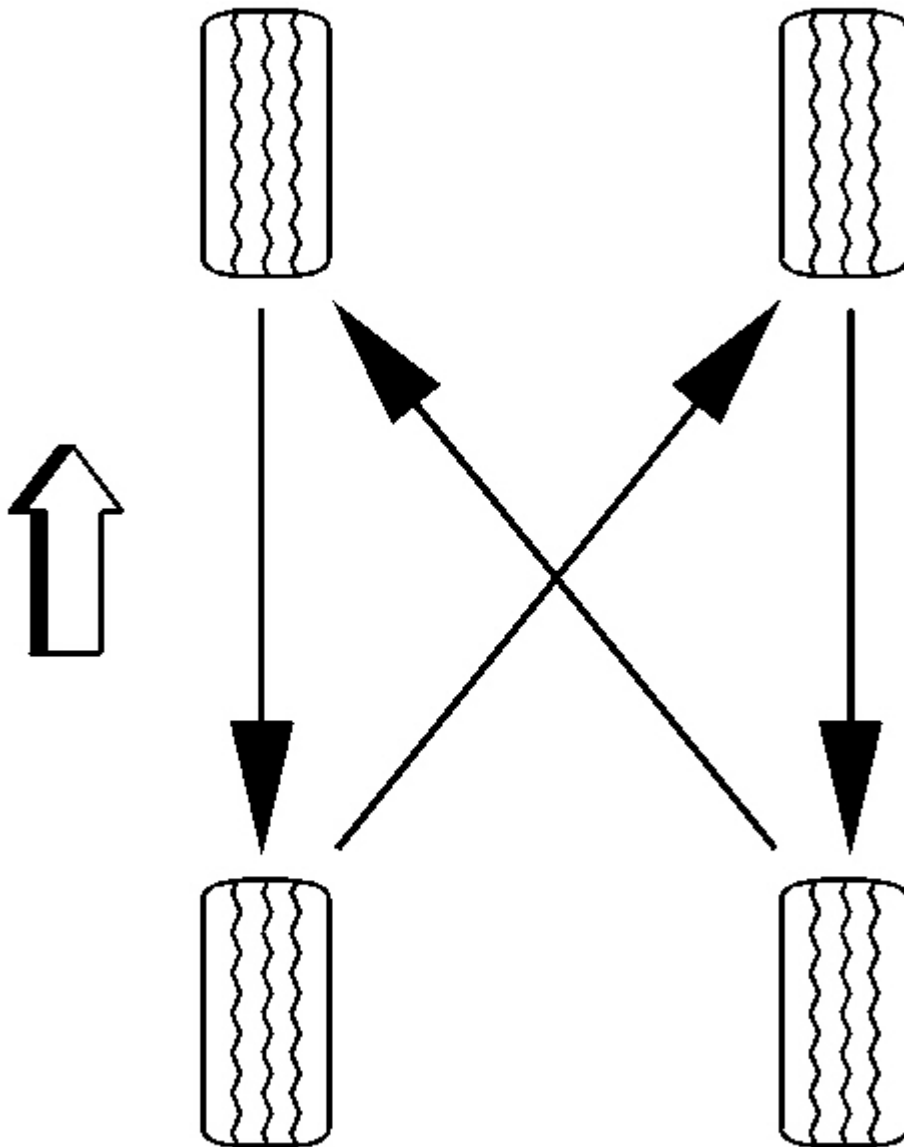


Fig. 8: Tire Rotation Pattern
Courtesy of GENERAL MOTORS CORP.

Always use a 4-wheel rotation. After rotation, check the wheel nuts for specified torque. Then, set the tire pressure.

DESCRIPTION AND OPERATION

GENERAL DESCRIPTION

The factory installed tires are designed to operate satisfactorily with loads up to and including the full rated load capacity when these tires are inflated to the recommended pressures.

The following factors have an important influence on tire life:

- Correct tire pressures
- Correct wheel alignment
- Proper driving techniques
- Tire rotation

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

TREAD WEAR INDICATORS DESCRIPTION

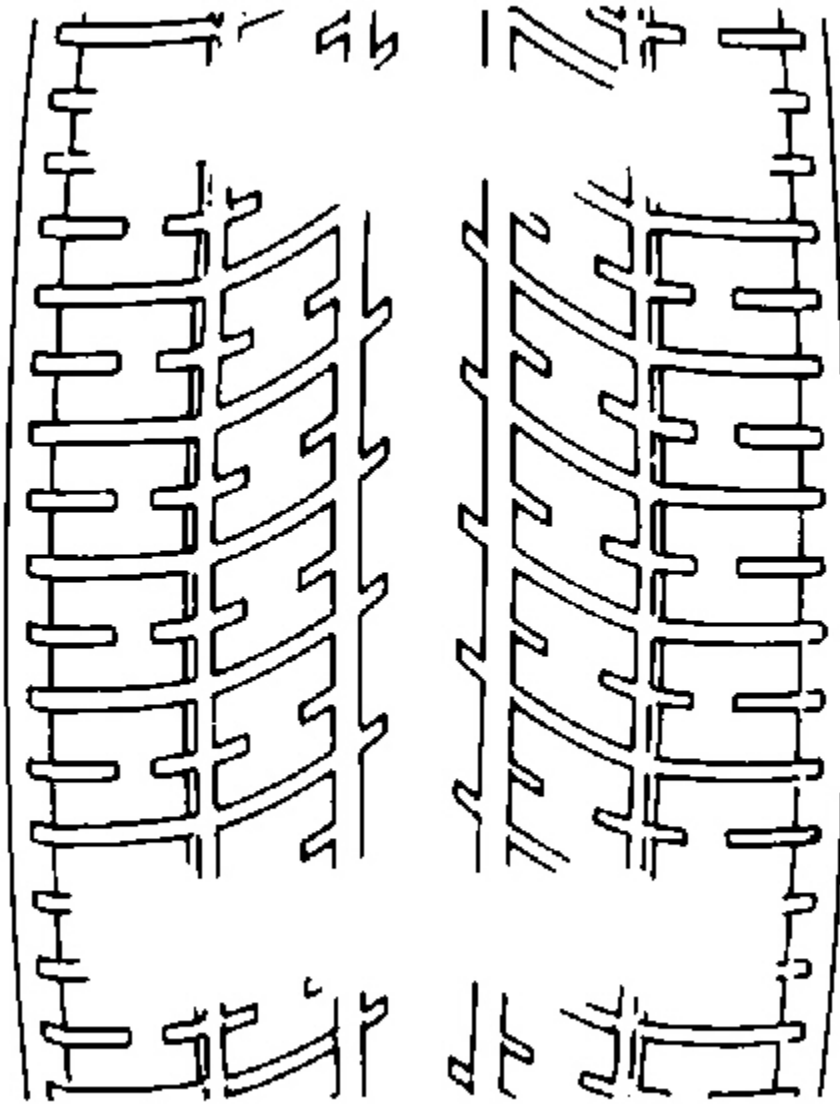


Fig. 9: Tread Wear Indicators
Courtesy of GENERAL MOTORS CORP.

The original equipment tires have tread wear indicators that show when you should replace the tires.

The location of these indicators are at 72 degree intervals around the outer diameter of the tire. The indicators appear as a 6 mm (0.25 in) wide band when the tire tread depth becomes 1.6 mm (2/32 in).

METRIC WHEEL NUTS AND BOLTS DESCRIPTION

Metric wheel/nuts and bolts are identified in the following way:

- The wheel/nut has the word Metric stamped on the face.
- The letter M is stamped on the end of the wheel bolt.

The thread sizes of metric wheel/nuts and the bolts are indicated by the following example: M12 x 1.5.

- M = Metric
- 12 = Diameter in millimeters
- 1.5 = Millimeters gap per thread

TIRE INFLATION DESCRIPTION

When you inflate the tires to the recommended inflation pressures, the factory-installed wheels and tires are designed in order to handle loads to the tire's rated load capacity. Incorrect tire pressures, or under-inflated tires, can cause the following conditions:

- Vehicle handling concerns
- Poor fuel economy
- Shortened tire life
- Tire overloading

Inspect the tire pressure when the following conditions apply:

- The vehicle has been sitting at least 3 hours.
- The vehicle has not been driven for more than 1.6 km (1 mi).
- The tires are cool.

Inspect the tires monthly or before any extended trip. Adjust the tire pressure to the specifications on the tire label. Install the valve caps or the extensions on the valves. The caps or the extensions keep out dust and water.

The kilopascal (kPa) is the metric term for pressure. The tire pressure may be printed in both kilopascal (kPa) and psi. One psi equals 6.9 kPa.

Inflation Pressure Conversion (Kilopascals to PSI)

kPa	psi	kPa	psi
140	20	215	31
145	21	220	32
155	22	230	33
160	23	235	34
165	24	240	35

170	25	250	36
180	26	275	40
185	27	310	45
190	28	345	50
200	29	380	55
205	30	415	60
Conversion: 6.9 kPa = 1 psi			

Tires with a higher than recommended pressure can cause the following conditions:

- A hard ride
- Tire bruising
- Rapid tread wear at the center of the tire

Tires with a lower than recommended pressure can cause the following conditions:

- A tire squeal on turns
- Hard steering
- Rapid wear and uneven wear on the edge of the tread
- Tire rim bruises and tire rim rupture
- Tire cord breakage
- High tire temperatures
- Reduced vehicle handling
- High fuel consumption
- Soft riding

Unequal pressure on the same axle can cause the following conditions:

- Uneven braking
- Steering lead
- Reduced vehicle handling

Refer to the Tire Placard for specific tire and wheel applications and tire pressures.

ALL SEASONS TIRES DESCRIPTION

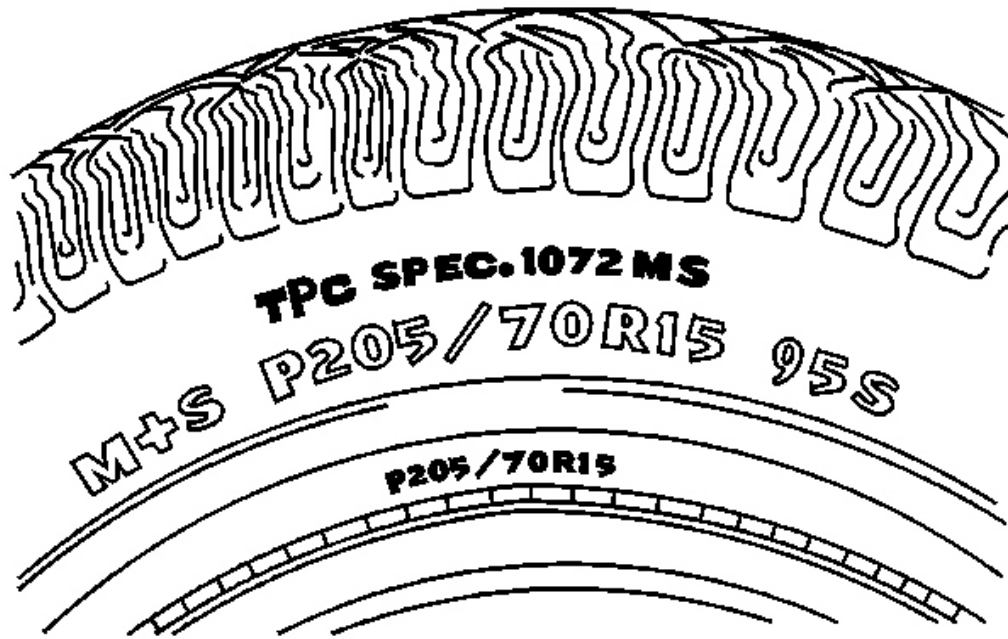


Fig. 10: Tire Performance Criteria (TPC) Rating
Courtesy of GENERAL MOTORS CORP.

Most Saturn vehicles are equipped with steel belted all-season radial tires as standard equipment. These tires qualify as snow tires, with a higher than average rating for snow traction than the non-all season radial tires previously used. Other performance areas, such as wet traction, rolling resistance, tread life, and air retention, are also improved. This is done by improvements in both tread design and tread compounds. These tires are identified by an M + S molded in the tire side wall after the tire size. The suffix MS is also molded in the tire side wall after the TPC specification number.

P-METRIC SIZED TIRES DESCRIPTION

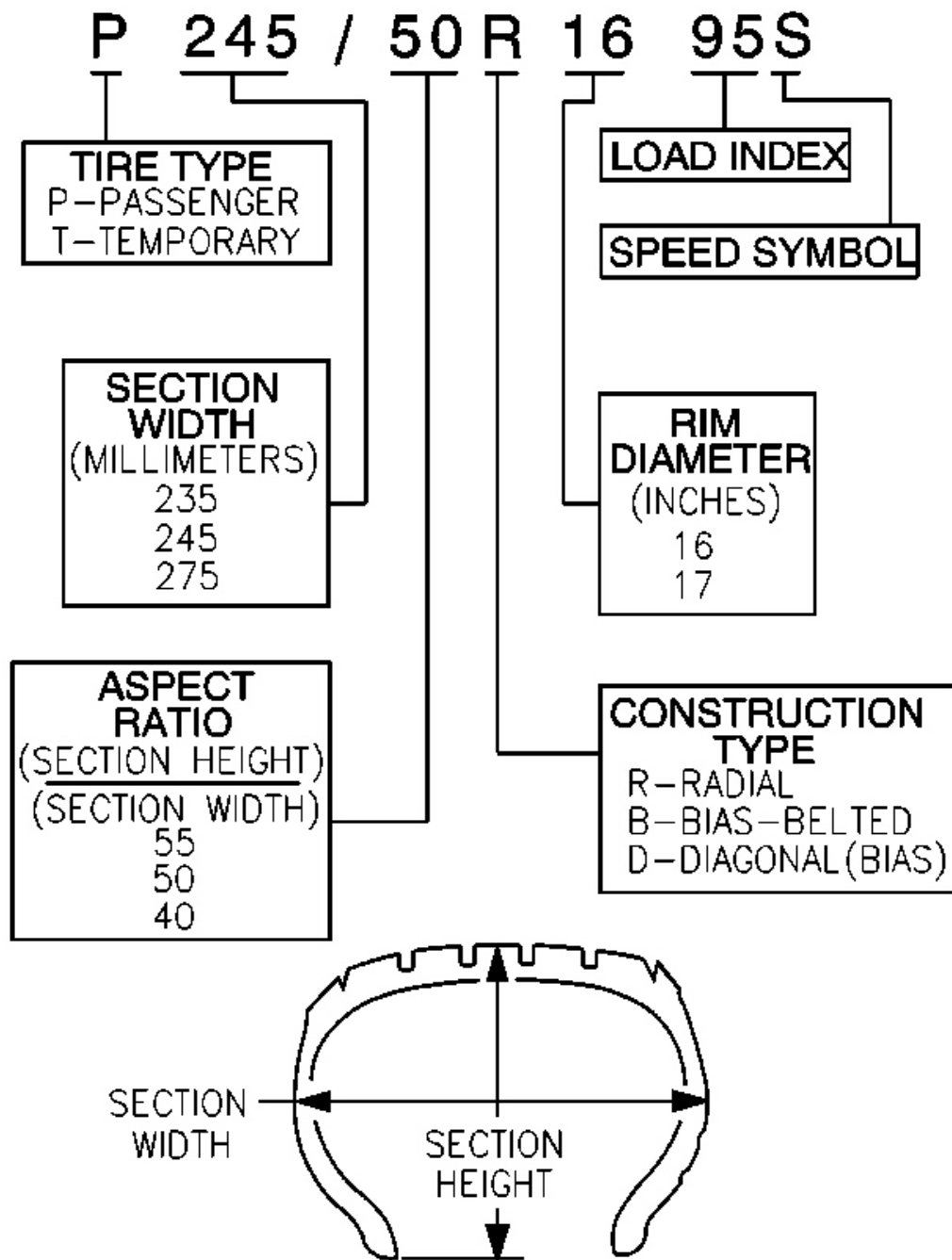


Fig. 11: P-Metric Sized Tire Marking
Courtesy of GENERAL MOTORS CORP.

Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. Replacement tires should be of the same tire performance criteria TPC specification number including the same size, the same load range, and the same construction as those originally installed on the vehicle. Consult a tire dealer if you must replace the P-metric tire with other sizes. Tire companies can best recommend the closest match of alphanumeric to P-metric sizes within their own tire lines. The above illustration may not correspond with your vehicle, but is meant as an example.

REPLACEMENT WHEELS DESCRIPTION

Replace the wheel if any of the following conditions exist:

- The wheel exhibits excessive runout
- The wheel is bent
- The wheel is cracked
- The wheel is severely rusted
- The wheel is severely corroded

IMPORTANT: Air leaks caused by porosity on aluminum wheels are repairable.

- The wheel leaks air

CAUTION: If you are replacing the wheel(s), the wheel stud(s), the wheel nut(s) or the wheel bolt(s), install only new Saturn original equipment parts. Installation of used parts or non-Saturn original equipment parts may cause the wheel to loosen, loss of tire air pressure, poor vehicle handling and loss of vehicle control resulting in personal injury.

NOTE: The use of non-Saturn original equipment wheels may cause:

- **Damage to the wheel bearing, the wheel fasteners and the wheel**
- **Tire damage caused by the modified clearance to the adjacent vehicle components**
- **Adverse vehicle steering stability caused by the modified scrub radius**
- **Damage to the vehicle caused by the modified ground clearance**
- **Speedometer and odometer inaccuracy**

Replace the wheel, the wheel studs and the wheel/nuts, or the wheel bolts if applicable, if any of the following conditions exist:

- The wheel has elongated bolt holes.
- The wheel/nuts, or bolts if applicable, loosen repeatedly.

Steel wheel identification is stamped into the wheel near the valve stem.

Aluminum wheel identification is cast into the inboard side of the wheel.

STEEL WHEEL REPAIR DESCRIPTION

NOTE: Do not heat wheels in an attempt to soften them for straightening or repair damage from striking curbs, etc. Do not weld wheels. The alloy used in these wheels is heat-treated and uncontrolled heating from welding affects the properties of the material.


NOTE: The use of tubes in tubeless tires is not a recommended repair due to the fact that speed ratings are greatly reduced.

If leaks are found in a steel wheel, replace the wheel with a wheel of original equipment quality.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/ Description
	<p>J 39544-KIT Torque Limiting Socket Set</p>