

# Introduction to Automotive Service

## Chapter 35 TIRES & WHEELS

### Opening Your Class

KEY ELEMENT	EXAMPLES
<b>Introduce Content</b>	This course or class serves as an introduction to the world of automotive service. It correlates material to task lists specified by ASE and NATEF.
<b>Motivate Learners</b>	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
<b>State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.</b>	<p>Explain learning objectives to students.</p> <ol style="list-style-type: none"> <li>1. Prepare for ASE Suspension and Steering (A4) certification test content area "E" (Wheel and Tire Diagnosis and Repair).</li> <li>2. Discuss how tires are constructed.</li> <li>3. Discuss tire sizes and ratings.</li> <li>4. Explain the construction and sizing of steel and alloy wheels and attaching hardware.</li> <li>7. Demonstrate the correct lug nut tightening procedure and torque.</li> </ol>
<b>Establish the Mood or Climate</b>	Provide a <b>WELCOME</b> , Avoid put downs and bad jokes.
<b>Complete Essentials</b>	Restrooms, breaks, registration, tests, etc.
<b>Clarify and Establish Knowledge Base</b>	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

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### 1. SLIDE 1 CH35 TIRES & WHEELS

2. SLIDE 2 **EXPLAIN** Purpose & Function of Tires

3. SLIDE 3 **EXPLAIN** Parts of a Tire

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### **VIDEOS: Wheels and Tires (29 Links)**

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4. SLIDE 4 **EXPLAIN** Figure 35-1 (a) typical tire tread depth gauge. The center movable plunger is pushed down into the groove of the tire. (b) tread depth is read at the top edge of the sleeve. In this example, tread depth is 6/32 in.

**DEMONSTRATION:** Show typical tread depth gauge. explain how to use it, **SEE FIGURE 35-1**

**DISCUSSION:** Ask the students to discuss other possible symptoms of bad or defective tires. Ask the students to discuss the importance of tread depth and to discuss why all tire manufacturers don't use the same standard **depth**.

**HANDS-ON TASK:** Have the students use a tread depth gauge to measure tread depth. Ask them to read you the gauge and indicate depth of tread.

5. SLIDE 5 **EXPLAIN** Figure 35-2 Wear indicators (wear bars) are strips of bald tread that show when tread depth is down to 2/32 in., legal limit in many states.

**DEMONSTRATION:** Show the students examples of tires with wear bars, **FIGURE 35-2**

**DISCUSSION:** Discuss whether there is a generally accepted practice regarding repair of tires with sidewall punctures. Ask students to discuss why it is necessary to replace a tire if tire's bead is cut or damaged. Ask students to discuss

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which are stronger: bias-ply tires or radial-ply tires.

**HANDS-ON TASK:** Using a tire crayon, have students circle wear bars on both new & used tires.

6. **SLIDE 6 EXPLAIN** Figure 35-4 Hydroplaning can occur at speeds as low as 30 mph (48 km/h). If the water is deep enough and the tire tread cannot evacuate water through its grooves fast enough, the tire can be lifted off the road surface by a layer of water. Hydroplaning occurs at lower speeds as the tire becomes worn.
7. **SLIDES 7 EXPLAIN** Parts of a Tire
8. **SLIDE 8 EXPLAIN FIGURE 35-4** Typical construction of a radial tire. Some tires have only one body ply, and some tires use more than two belt plies..
9. **SLIDE 9 EXPLAIN** Figure 35-5 major splice of a tire can often be seen and felt on the inside of tire. The person who assembles (builds) tire usually places a sticker near major splice as a means of identification for quality control.
10. **SLIDE 10 EXPLAIN** Parts of a Tire

**DEMONSTRATION:** Using both new and used tires, show the students the major Splice.

**DISCUSSION:** Ask the students to discuss why damage to the inner liner will cause a flat tire.

11. **SLIDE 11 EXPLAIN** Tire Size

**DISCUSSION:** Ask the students to discuss problems that would develop by using a space-saving spare tire over an extended period of time.

**DEMONSTRATION:** Show how to decode several tire sizes using service description.

**HANDS-ON TASK:** Have the students decode several tire sizes using service description

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When changing from an older tire measuring system to a newer system, speedometer calibration should be checked.

**DEMONSTRATION:** show how to decode the Metric tire coding and explain it

**HANDS-ON TASK:** Have students decode several metric tire sizes.

12. **SLIDE 12 EXPLAIN CHART 35-1** Speed ratings are based on continuous operation at the speed rating speed.  
\*The exact speed rating for a particular Z-rated tire is determined by tire manufacturer and may vary according to size. For example, not all Brand “X” Z-rated tires are rated at 170 mph, even though one size may be capable of these speeds

**DISCUSSION:** Ask the students why tires are manufactured with H-speed ratings of 130 mph or 210 km/h despite the fact that driving that fast would not only be unsafe but also illegal in most areas of the world.

13. **SLIDE 13 EXPLAIN** Uniform Tire Quality Grading System
14. **SLIDE 14 EXPLAIN Figure 35-6** typical “Uniform Tire Quality Grading System” (UTQGS) ratings imprinted on the tire sidewall
15. **SLIDE 15 d DOT** Tire Code

**DISCUSSION:** Ask the students to discuss how important DOT date code is when deciding to purchase a tire.

16. **SLIDE 16 EXPLAIN** Wheels
17. **SLIDE 17 EXPLAIN Figure 35-7** wheel rim well provides a space for the tire to fit during mounting; the bead seat provides a tire-to-wheel sealing surface; the flange holds the beads in place.
18. **SLIDE 18 EXPLAIN FIGURE 35-8** A typical JWL symbol for the Japan Wheel Light Metal standard mark
19. **SLIDE 19 EXPLAIN** Aluminum Wheels

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When installing aftermarket wheels using non-stock lug nuts, wire tie a set of stock lug nuts to the spare tire wheel

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**DEMONSTRATION:** Show the students examples of several wheels and explain how to determine the size of wheel and the exact shape of flange area.

**DISCUSSION:** Ask the students to discuss why the flange area shape and the angle that the rim drops down from the flange are important.

**HANDS-ON TASK:** Have the students use sticky notes or masking tape to label the parts of the rim.

20. **SLIDE 20 EXPLAIN** Figure 35-9 (a) A rubber snap-in style tire valve assembly. (b) A metal clamp-type tire valve assembly used on most high pressure (over 60 PSI) tire applications such as is found on many trucks, RVs, and trailers. The internal Schrader valve threads into the valve itself and can be replaced individually, but most experts recommend replacing the entire valve assembly every time the tires are replaced to help prevent air loss.
21. **SLIDE 21 EXPLAIN** Lug nuts
22. **SLIDE 22 EXPLAIN** FIGURE 35-10 Various styles of lug nuts

**DISCUSSION:** Ask the students to discuss why some OEMS use lug nuts and other manufacturers use lug bolts. **FIGURE 35-10**

23. **SLIDE 23 EXPLAIN** Tire & Wheel Service

**DISCUSSION:** Ask the students to compare DOT standards & E.C.E. (Economic Commission for European Small "e") standards. Ask students to discuss whether US should have anti-noise

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standards similar to E.C.E pass-by noise limits.

24. **SLIDE 24 EXPLAIN Figure 35-11** The tire pressure placard (sticker) on the driver's side door or door jamb indicates the specified tire pressure. The specified inflation pressure is when the tires are cold and the vehicle has not been driven for several hours
25. **SLIDE 25 EXPLAIN** Tire & Wheel Service

**DEMONSTRATION: Show the students how to determine proper tire pressure by using the information on door placards.**

**Tire Pressure and Bulge**

**Tire Pressure and Temperature**

**Tire Rotation**

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**HANDS-ON TASK: Have students compare tire pressure recommendations of several automobiles by using the information on door placards.**

26. **SLIDE 26 EXPLAIN FIGURE 35-12** method most often recommended is modified X method. Using this method, each tire eventually is used at each of four wheel locations. An easy way to remember sequence, whether front-wheel drive or rear-wheel drive, is to say to yourself, "Drive wheels straight, cross nondrive wheels."
27. **SLIDES 27-28 EXPLAIN** Tire & Wheel Service

**ANIMATION: Tighten Lug Nuts**

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29. **SLIDE 29 EXPLAIN FIGURE 35-13** torque-limiting adapter (torque stick) for use with an air impact wrench still requires care to prevent over tightening. The air pressure to the air impact should be limited to 125 PSI (860 kPa) in most cases, and the proper adapter must be selected for the vehicle being serviced. The torque adapter absorbs any torque beyond its designed rating. Most adapters are color coded for easy identification as to the size of lug nut and torque value.
30. **SLIDE 30 EXPLAIN FIGURE 35-14** Always tighten



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wheel lug nuts (or studs) in a star pattern to ensure even pressure on the axle flange, brake rotors or drums, and the wheel itself

31. SLIDES 31-32 **EXPLAIN** Tire & Wheel Service

**Most tire shops have bolt circle templates. The templates have several bolt circles on them. This makes it faster to identify a bolt circle.**

**HANDS-ON TASK:** Have the students inspect tires on an assigned vehicle.

**ON-VEHICLE NATEF TASK (A4-A-3)** Research applicable vehicle and service information, such as suspension and steering system operation, vehicle history, service precautions, & TSBs **(P1)**

**SEARCH INTERNET** Have the students search the Internet to research the process of vulcanization. Ask them to prepare to report on vulcanization and its importance to the automotive industry during the next class.

**Homework:** complete Ch35 crossword puzzle:  
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