Automotive Steering, Suspension, & Alignment 7e

Chapter 5 TIRE & WHEEL SERVICE

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of **Automotive Steering and Suspension Systems with Wheel Alignment and Drive Axles.** It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	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.
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.	Explain learning objectives to students as listed on SLIDE. 1. State the importance for proper inflation pressure. 2. Discuss proper tire mounting procedures. 3. Discuss radial runout and lateral runout. 4. Discuss how to balance wheel and tire assembly (static and dynamic). 5. Discuss how to repair tire using internal patch. **This chapter will help you prepare for ASE Suspension and Steering (A4) certification test content area "E" (Wheel and Tire Diagnosis and Repair)**
Establish the Mood or Climate	Provide a ***WELCOME,*** Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	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.

NOTE: This lesson plan is based on Automotive Steering, Suspension, & Alignment 7th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com
LINK CHP 5: Chapter Images

ICONS	Chapter 5 Tire & Wheel Service
	**1. SLIDE 1 CH5 TIRE AND WHEEL SERVICE**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED**
	**Wheels and Tires (29 Links)**
	**At the beginning of this class, you can download the crossword puzzle & Word Search from the links below to familiarize your class with the terms in this chapter & then discuss them**
	**Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF)**
	2. **SLIDE 2 EXPLAIN Figure 5-1** Using soapy water from a spray bottle is an easy method to find the location of an air leak from a tire 3. **SLIDE 3 EXPLAIN Figure 5-2** chart shows the relationship between tire inflation pressure and load capacity of the tire. 4. **SLIDE 4 EXPLAIN Figure 5-3** chart shows that a drop in inflation pressure has a major effect on fuel economy. 5. **SLIDE 5 EXPLAIN Figure 5-4** Note that if a tire is underinflated by 5 PSI, the life expectancy is reduced by 20% and by about 40% if the inflation pressure is less than specified by 10 PSI
	**DEMONSTRATION: Show the students how to use a spray bottle containing soapy water to check for the location of an air leak in a tire.**
	**DISCUSSION: Ask the students to discuss reasons for not overinflating tires.**
	**ON-VEHICLE NATEF TASK Inspect tire condition and check for loss of air pressure**

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	**DEMONSTRATION: Show students an example of a temporary inflation pump and show how it is used. FIGURE 5-5**
	**DEMONSTRATION: Show students an aerosol can of sealer that is provided as standard equipment on vehicles not equipped with conventional spare tires. FIGURE 5-6**
	6. **SLIDE 6 EXPLAIN FIGURE 5–5** temporary inflation pump that uses 12 volts from cigarette lighter to inflate tire 7. **SLIDE 7 EXPLAIN FIGURE 5–6** Many vehicle manufacturers include an aerosol can of sealer on vehicles that are not equipped with a conventional spare tire. 8. **SLIDE 8 EXPLAIN FIGURE 5-7** Most shops that use nitrogen inflation install green tire value cap to let others know that nitrogen, rather than air has been used to inflate tire.
	**Tires, Air Vs N2, a** **Tire Pressure and Bulge**
 	**DISCUSSION: Ask the students to discuss whether inflating tires with nitrogen is really necessary.**
	9. **SLIDE 9 EXPLAIN Figure 5-8** Excessively worn tire showing the belt material on the inside edge. This tire requires replacement.
	10. **SLIDE 10 EXPLAIN Figure 5-9** bulge in a tire as a result of either an injury to sidewall, such as contact with a curb, or an internal fault in tire. This tire requires replacement.
	11. **SLIDE 11 EXPLAIN Figure 5-10** Wear on the outside shoulder only is an indication of an alignment problem. 12. **SLIDE 12 EXPLAIN Figure 5-11** display at a Lexus dealer used to show customers a visual representation of what a tire looks like at various tread depth amounts.
	13. **SLIDE 13 EXPLAIN Figure 5-12** Always tighten wheel lug nuts (or studs) in a **star pattern** to ensure even pressure on axle flange, brake rotors or drums, and the wheel itself. 14. **SLIDE 14 EXPLAIN Figure 5-13** Most manufacturers

recommend using hand tools rather than an air impact wrench to remove and install lock-type lug nuts to prevent damage.

DEMONSTRATION: Show the students examples of lug nuts and anti-theft lug nuts.
FIGURE 5-13

15. **SLIDE 15 EXPLAIN Figure 5-14** torque wrench being used to tighten lug nuts on a pickup truck.

DEMONSTRATION: Show the students how to properly tighten lug nuts by using a star pattern.
FIGURE 5-13, 5-14, 5-15

DISCUSSION: Ask the students to discuss possible results of tightening lug nuts in the wrong sequence.

Tighten Lug Nuts

16. **SLIDE 16 EXPLAIN Figure 5-15** torque-limiting adapter (torque stick) for use with an air impact wrench still requires care to prevent overtightening. 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.

DEMONSTRATION: Show the students some examples of color-coded torque-limiting adapters.
FIGURE 5-15

SAFETY NOTE: Using torque-limiting adapters to remove lug nuts can cause adapters to fail, causing injury

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	**ON-VEHICLE NATEF TASK** **Diagnose vibration and pull concerns; determine necessary action**
	**Tire Rotation**
	**Tire Rotation, FWD Vehicle**
	17. **SLIDE 17** **EXPLAIN** **Figure 5-16** This wheel was damaged because the lug nuts were not properly torqued.
	18. **SLIDE 18** **EXPLAIN** **Figure 5-17** method most often recommended is modified X method. Using this method, each tire eventually is used at each of 4 wheel locations. An easy way to remember the sequence, whether front wheel drive or rear wheel drive, is to say to yourself, "Drive wheels straight, cross non-drive wheels."
	**DISCUSSION:** **Ask students to discuss why modified-X method of rotating tires is recommended method. Ask students to discuss why some OEMS do not recommend rotating tires.**
	**ON-VEHICLE NATEF TASK** **Rotate tires according to manufacturer's Recommendations.**
	**ON-VEHICLE NATEF TASK** **Reinstall wheel; torque lug nuts**
	**SEARCH INTERNET:** **Have the students search Internet to research temporary mobility kits. Ask the students to prepare a short report on what they are, their advantages and disadvantages, and a list of automobiles that have them as standard equipment. Have a discussion during next class.**
	19. **SLIDE 19** **EXPLAIN** **Figure 5.18** A tire runout gauge being used to measure the radial runout of a tire.
	20. **SLIDE 20** **EXPLAIN** **Figure 5.19** To check wheel radial runout, the dial indicator plunger tip rides on a horizontal surface of wheel, such as the bead seat.
	21. **SLIDE 21** **EXPLAIN** **Figure 5.20** To check lateral runout, the dial indicator plunger tip rides on a vertical surface of the wheel, such as the wheel flange.

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	Remove and Replace Tire & Wheel (View) (Download) **Replace Wheel Stud (View) (Download)**
	22. **SLIDE 22 EXPLAIN Figure 5.21** The most accurate method of measuring wheel runout is to dismantle the tire and take dial indicator readings on the inside of wheel rim.
DEMO	**DEMONSTRATION: Show the students how to use a runout gauge to check lateral & RADIAL runout. FIGURE 5-19, 5-20, 5-21**
	HANDS-ON TASK: Have students use tire runout gauges to measure radial runout of 2 different tires.
DEMO	**DEMONSTRATION: Show how to measure wheel runout by taking dial indicator readings on inside of wheel rim. FIGURE 5-21**
	23. **SLIDE 23 EXPLAIN FIGURE 5.22** Cleaning the bead seat of an alloy wheel using an abrasive pad
	Tire Lateral Runout (View) **Tire Radial Runout (View)**
We Support NATEF	**ON-VEHICLE NATEF TASK Measure wheel, tire, axle flange, and hub runout; determine necessary action**
DEMO	**DEMONSTRATION: Show the students how to correctly use an air powered wire brush to clean the bead area of a wheel. FIGURE 5-22**
QUESTION	**DISCUSSION: Ask students to discuss how a rim leak on a new set of tires could affect a shop's reputation.**
QUESTION	**DISCUSSION: Ask the students to discuss symptoms of tires with excessive runout.**

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	24. **SLIDE 24 EXPLAIN FIGURE 5.23** When installing a tire-pressure monitoring system sensor, be sure that the flat part of the sensor is parallel to the center section of the rim. 25. **SLIDE 25 EXPLAIN FIGURE 5.24** Many new tires have painted dots placed there at the tire manufacturer. 26. **SLIDE 26 EXPLAIN FIGURE 5.25** Always check the wording on tires and install them correctly to insure that the tire performs as designed. 27. **SLIDE 27 EXPLAIN FIGURE 5.26** Note the difference in the shape of the rim contour of the 16 inch and 16 1/2 inch diameter wheels. While it is possible to mount a 16 inch tire on a 16 1/2 inch rim, it cannot be inflated enough to seat against the rim flange.
	28. **SLIDE 28 EXPLAIN FIGURE 5.27** Rendered (odorless) animal fat is recommended by some manufacturers of tire changing equipment for use as a rubber lubricant. 29. **SLIDE 29 EXPLAIN Figure 5-28** wheel balancer detects heavy spots on the wheel and tire, and indicate where to place weight to offset both static and dynamic imbalance.
	**DISCUSSION: Ask the students to discuss when the use of liquid tire stop leak would be recommended.**
	30. **SLIDE 30 EXPLAIN Figure 5-29** assortment of wheel weights designed to fit different shaped rims.
	**DEMONSTRATION: Show the students examples of wheel weights used for variously shaped rims.**
	31. **SLIDE 31 EXPLAIN FIGURE 5.30A** Using a rim gauge can be tricky as shape may appear to match several patterns on gauge. This "AW" shape is not a good match. 32. **SLIDE 32 EXPLAIN FIGURE 5.30B** Using the gauge shape for "MC" appears to be a perfect match to their rim flange.
	**DEMONSTRATION: SHOW STUDENTS HOW TO USE A RIM GAUGE**

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	**HANDS-ON TASK: HAVE STUDENTS MEASURE SEVERAL DIFFERENT RIMS**
	33. **SLIDE 33 EXPLAIN Figure 5-31** Stick-on weights used to balance alloy wheels of this Prowler. 34. **SLIDE 34 EXPLAIN Figure 5-32** Wheel weight pliers are specially designed to remove and install wheel weights
	**DEMONSTRATION: Show how to use wheel weight pliers. Show how to remove a tire valve by using a tire valve remover.**
	**HANDS-ON TASK: Have the students remove and install wheel weights by using wheel weight pliers.**
	35. **SLIDE 35 EXPLAIN FIGURE 5.33** A tire balancer that can also detect radial and lateral force variation and instruct operator where to rotate the tire to achieve the best ride, or indicate a bent wheel. 36. **SLIDE 36 EXPLAIN FIGURE 5–34** Liquid tire stop leak was found in all four tires. This liquid caused the tires to be out of balance
	**DISCUSSION: Ask the students to discuss customer complaints due to tire imbalance.**
	**HANDS-ON TASK: Have the students perform the Prebalance Checks**
	**DISCUSSION: Ask the students to discuss the proper number of weights to use on a tire.**
	37. **SLIDE 37 EXPLAIN Figure 5-35** pin plate adapter that is designed to support the wheel/tire assembly on a tire balancer instead of using a centering cone. 38. **SLIDE 38 EXPLAIN FIGURE 5.36 (A)** hubcentric plastic ring partially removed from an aftermarket wheel. 39. **SLIDE 39 EXPLAIN FIGURE 5.36 (b)** A hubcentric plastic ring left on the hub when removing a wheel

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	40. **SLIDE 40 EXPLAIN FIGURE 5.37** A tire should only be repaired if the hole is within the tire puncture repair area. Do not make a repair that is located in the shoulder or belt edge part of the tire.
	**DISCUSSION: Ask the students to discuss possible effects on a tire if the tire's bead seat is not cleaned properly before tire is installed.**
	41. **SLIDE 41 EXPLAIN Figure 5-38** stitching tool being used to force any trapped air out from under the patch. 42. **SLIDE 42 EXPLAIN Figure 5-39** rubber plug being pulled through a hole in the tire. The stem is then cut off flush with the surface of the tire tread.
	**DEMONSTRATION: Show the students examples of various tire repair products, then show students how to apply a plug patch when repairing a tire.**
	**ON-VEHICLE NATEF TASK Repair tire using internal patch**
	**HANDS-ON TASK: Have the students remove tire valves by using tire valve removers & balance a set of tires.**
	**ON-VEHICLE NATEF TASK Dismount and remount tire on wheel; balance**
	**DISCUSSION: Ask the students to discuss whether tires should be balanced based on a mileage schedule or only if they exhibit problems.**
	43. **SLIDES 43-72 OPTIONAL EXPLAIN TIRE REPAIR**
	**SEARCH INTERNET: Have the students search the Internet for tire manufacturers' recommendations for tire repairs.**