Automotive Technology 6th Edition
Chapter 118 Rear Suspension and Service
Opening Your Class

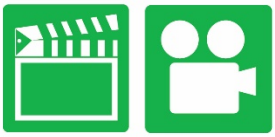
KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
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 below: 1. Describe solid rear axles and leaf spring suspensions. 2. Distinguish between trailing arm and semi-trailing arm rear suspensions. 3. Distinguish between independent and semi-independent rear suspensions. 4. Explain rear suspension service, including replacement of rear shocks and rear springs. 5. This chapter will help prepare for ASE Suspension and Steering (A4) certification content area "B" (Suspension System 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: Lesson plan is based on 6th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

DOWNLOAD Chapter 118 Chapter Images: From

http://www.jameshalderman.com/automotive_principles.html

NOTE: You can use Chapter Images or possibly Power Point files:

ICONS	Chapter 118 Rear Suspension
	**1. SLIDE 1 CH118 REAR SUSPENSIONS & SERVICE**
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED** **http://www.jameshalderman.com/automotive_principles.html** **DOWNLOAD** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF**
	**Videos**
	
	**2. SLIDE 2 EXPLAIN Figure 118-1** Solid axles are used on rear-wheel-drive vehicles as well as front-wheel-drive vehicles.
	3. SLIDE 3 EXPLAIN Figure 118-2 solid axle supports the springs, so the axle and suspension components are unsprung weight. When one wheel rides over a bump, the force of impact transfers through the solid axle to the opposite side, leading to unstable handling
	**DISCUSS FREQUENTLY ASKED QUESTION:**
	**DISCUSSION: Ask the students to discuss what Hotchkiss drives are and why they are called Hotchkiss drives.**
	4. SLIDE 4 EXPLAIN Figure 118-3 When the axle housing reacts against the force of axle shaft rotation, the front of the differential tilts upward, creating axle windup.
	**5. SLIDE 5 EXPLAIN Figure 118-4** A typical rear-wheel-drive pickup truck rear suspension equipped with leaf springs. This type of arrangement is called a Hotchkiss drive and the drive train forces are controlled by the rear suspension components.
	6. SLIDE 6 EXPLAIN Figure 118-5 exploded view of a beam axle with multi-leaf springs

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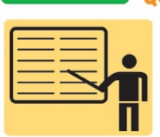
	**DEMONSTRATION: Show examples of leaf springs**
	**DISCUSSION: Ask the students to discuss why some rear suspensions use one set of trailing arms while other rear suspensions use two sets.**
	**ON-VEHICLE ASEEDUCATION TASK C12: Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.**
	7. **SLIDE 7 EXPLAIN Figure 118-6** trailing arm rear suspension with solid axle used on FWD vehicle. 8. **SLIDE 8 EXPLAIN FIGURE 118–7** This rear suspension systems use a torque arm to control axle windup. If the rubber torque arm bushings (cushions) are worn, a loud "bang" could be heard and felt when accelerating suddenly.
	**Broken Panhard Rod will cause tires to hit wheel house when cornering: FIGURE 118-8**
	**DISCUSSION: Ask the students to discuss how the length of a Panhard Rod will affect rear axle movement: FIGURE 118-8**
	9. **SLIDE 9 EXPLAIN Figure 118-8** A typical beam axle rear suspension, which uses trailing arms and coil springs along with a track rod, also called a Panhard rod, to control side-to-side axle movement. 10. **SLIDE 10 EXPLAIN Figure 118-9** Ford rear suspension uses upper & lower semi-trailing arms to mount rear axle & watts linkage to control side-to-side
	**DISCUSSION: Ask the students to discuss which is better: rear suspension with a trailing arm or a rear suspension with a semitrailing arm.**
	11. **SLIDE 11 EXPLAIN Figure 118-10** An independent rear suspension provides a better ride because less weight is unsprung and the suspension is able to react quickly to bumps in the road without affecting the opposite side.
	

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 	12. **SLIDE 12 EXPLAIN FIGURE 118-11** A typical short/long-arm independent rear suspension. 13. **SLIDE 13 EXPLAIN Figure 114-12** independent rear suspension uses a MacPherson strut, two parallel lower transverse control arms, and a trailing arm. 14. **SLIDE 14 EXPLAIN Figure 114-13** toe-control rod provides an extra brace to keep the rear wheels straight ahead during braking and acceleration on this modified-strut-type independent rear suspension. 15. **SLIDE 15 EXPLAIN FIGURE 118–14** transverse mono-type leaf spring used on rear suspension of a Chevrolet Corvette. **DISCUSSION: Ask the students to discuss which is better: a transverse-leaf-spring independent rear suspension that uses an H-shaped lower control arm, or a transverse-leaf spring suspension that uses two parallel lower links and a trailing arm** 16. **SLIDE 16 EXPLAIN Figure 114-15** The crossbeam is placed toward the front of the vehicle rather than the centerline of the rear wheels on a semi-independent- type rear suspension. 17. **SLIDE 17 EXPLAIN Figure 114-16** semi-independent rear suspension with MacPherson struts. 18. **SLIDE 18 EXPLAIN Figure 114-17** Check all rubber bushings for excessive cracking. 19. **SLIDE 19 EXPLAIN Figure 114-18** Carefully inspect the bump stops for damage during a thorough visual inspection. 20. **SLIDE 20 EXPLAIN Figure 114-19** A broken spring was discovered during a routine under-vehicle visual inspection. Notice the witness marks that show that the spring coils have been hitting each other. 21. **SLIDE 21 EXPLAIN Figure 114-20** The shock absorber needs to be disconnected before removing the coil spring. Installation is the reverse of removal procedure. 22. **SLIDE 22 EXPLAIN Figure 118-21** The center bolt is used to hold the leaves of the leaf spring together. However, the hole for the center bolt also weakens the leaf spring. The crack shown is what a technician discovered when the leaf spring was removed during the diagnosis of a sagging rear suspension.

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	**DISCUSS CASE STUDY: *Harsh Riding Buick*** **The owner requested that all of shock absorbers be replaced on a ten-year-old Buick. The rear was equipped with air shocks as part of ride leveling system. During a test-drive after installing all four shocks, technician noticed that it seemed to ride much harsher than normal for a Buick. The technician asked the owner to ride along to verify that it was not usual to ride as harsh as it was. Puzzled as to why this occurred, the technician contacted parts store which then asked their supplier about the issue. It was discovered that air shocks were not cycled before they were installed. Installing air shocks/struts requires cycling shock/strut to spread lubricant inside diaphragm to avoid binding. The installing technician should inflate air diaphragm through air fitting until shock/strut fully extends. Then shock can be kept fully extended to make it easier to install. After removing rear shocks and inflating them as instructed, and reinstalling, Buick rode normally.** **Summary:** • **Complaint—service technician was concerned that Buick rode harsher than normal after new shock absorbers were installed.** • **Cause—proper installation procedure was not followed prior to installing the air shock on the rear.** • **Correction—air shocks were removed and cycled and then inflated before being reinstalled which solved harsh ride concern.**

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	**DISCUSS CASE STUDY: *Strange Leakage*** **The owner of a small business drove company pickup truck into shop to get it ready to load for day's delivery. It was a very cold day in northern Ohio with temperature well below freezing (32°F (0°C)). After about 15 minutes, business owner noticed that "something" was leaking from underneath the rear of the truck. • SEE FIGURE 118–22.** **Not sure what it was, the owner called a local automotive repair shop and asked for help. The shop sent a technician to look at truck. The service technician noticed that one of the rear shock absorbers had leaked all of hydraulic fluid out of bottom of shock. • SEE FIGURE 118–23. Obviously, both rear shock absorbers would require replacement because shocks should always be replaced in pairs. The service technician recommended that all four (both front and both rear) shocks be replaced to restore proper handling. Knowing that front shock absorbers were operating under the same conditions as the rear and were same age, truck owner approved replacement of all four shock absorbers.** **Summary:** • **Complaint—A liquid was found leaking from underneath a truck.** • **Cause—Hydraulic fluid had leaked from a rusty shock absorber.** • **Correction—Based on the owner's approval, all four shocks were replaced.** **23. SLIDE 23 EXPLAIN FIGURE 118–22** Whatever was leaking appeared to be a clear liquid but it did not smell like gasoline. What could it be from rear of truck? **24. SLIDE 24 EXPLAIN FIGURE 118–23** The source of the leak was discovered to be hydraulic shock fluid that had leaked from the bottom of shock and not from

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	around the shaft seal, which is the most likely location for shocks to leak. Apparently, rust had eaten through housing of the shock. **DISCUSSION: Ask the students to discuss causes of leaf spring breakage other than metal fatigue, corrosion, & overloading**
	**DEMONSTRATION: Show the students how to use a pry bar for rear suspension servicing**
	**DISCUSSION: Ask the students to discuss why the tops of some rear shocks are fastened inside vehicles**
	**Be sure to check OEM service information before removing shock absorbers.**
	**OPTIONAL SEARCH INTERNET): Have students use Internet for information on other components that need to be changed when leaf springs are used**